DRAFT FINAL

LONG-TERM MONITORING AND MAINTENANCE PLAN
AREA OF CONTAMINATION 50
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MA

OCTOBER 2017

Prepared for:
U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

Prepared by:
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100
Marlborough, MA 01752
Contract No.: W912WJ-15-C-0002

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The United States Department of Defense, Department of Army, funded wholly or in part the preparation of this document and work described herein under Contract No. W912WJ-15-C-0002. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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CERTIFICATION:

I hereby certify that the enclosed Plan, shown and marked in this submittal, is that proposed to be incorporated with Contract Number W912WJ-15-C-0002. This document was prepared in accordance with the U.S. Army Corps of Engineers (USACE) Scope of Work and is hereby submitted for Government approval.

Reviewed By:

10/16/17

KGS Project Manager **Date**

Received By:

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USACE Project Manager **Date**

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ABC®	Anaerobic BioChem®
AOC	area of contamination
ARCADIS	ARCADIS U.S., Inc./G&M, Inc.
Army	U.S. Army
bgs	below ground surface
BRAC	Base Realignment and Closure
°C	degrees Celsius
cis-1,2-DCE	*cis*-1,2-dichloroethene
COC	contaminant of concern
cVOC	chlorinated volatile organic compound
DPT	direct push technology
DO	dissolved oxygen
DoD	Department of Defense
DRFTA	Devens Reserve Forces Training Area
ERD	enhanced reductive dechlorination
ft	feet
ft/day	feet per day
FDSA	Former Drum Storage Area
HGL	HydroGeoLogic, Inc.
IRZ	in situ reactive zone
IWS	in-well stripping
KGS	KOMAN Government Solutions, LLC.
LTM	long-term monitoring
LTMMP	Long-Term Monitoring and Maintenance Plan
mg/L	milligrams per liter
mS/cm	milliSiemens per centimeter
MAAF	former Moore Army Airfield
MassDEP	Massachusetts Department of Environmental Protection
MassDevelopment	Massachusetts Development and Finance Agency
MiHPT	Membrane Interface Probe-Hydraulic Profiling Tool
MS	matrix spike
MSD	matrix spike duplicate
mV	millivolt
NTU	nephelometric turbidity unit
ORP	oxidation-reduction potential
%	percent
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
PCE	tetrachloroethene
PID	photoionization detector
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
ROD	Record of Decision
Sovereign	Sovereign Consulting Inc.

SU	standard units
SVE	soil vapor extraction
trans-1,2-DCE	*trans*-1,2-dichloroethene
TCE	trichloroethene
µg/L	micrograms per liter
µm	micron
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Long-Term Monitoring and Maintenance Plan (LTMMP) revision is to update the long-term monitoring (LTM) approach to account for changes in the plume and site's geochemistry, and to present the revised approach for the Enhanced Reductive Dechlorination (ERD) injection program. This revision updates the *Final Long-Term Monitoring Plan, AOC 50, Devens, Massachusetts*. (HydroGeoLogic Inc.[HGL], 2012) and the *Enhanced Reductive Dechlorination Operations and Maintenance Manual, Addendum I* (HGL, 2009). This revision provides descriptions of the planned tasks, methodologies, and objectives to evaluate whether the site continues to make progress toward achieving site cleanup goals associated with remediation at Area of Contamination (AOC) 50, Devens, Massachusetts. KOMAN Government Solutions, LLC (KGS) prepared this LTMMP for the U.S. Army Corps of Engineers (USACE) under contract number W912WJ-15-C-0002.

1.2 Background

The AOC 50 site is located on the northeastern boundary of the former Moore Army Airfield (MAAF), within the former North Post portion of the former Fort Devens Army Installation, Ayer, Massachusetts (**Figure 1**). Fort Devens was identified for cessation of operations and closure under Public Law 101-510, the Defense Base Realignment and Closure (BRAC) Act of 1990, and was officially closed in March 1996. Portions of the property formerly occupied by Fort Devens were retained by the U.S. Army (Army) for reserve forces training and renamed the Devens Reserve Forces Training Area (DRFTA). Areas not retained as part of the DRFTA were transferred to new owners (Massachusetts Development and Finance Agency [MassDevelopment] and the U.S. Fish and Wildlife Service) for reuse and redevelopment. The DRFTA was renamed the U.S. Army Garrison Fort Devens in 2009.

All but approximately 14 acres of the former MAAF (approximately 246 acres total) were transferred to MassDevelopment for reuse in 1997. Currently, the airfield is closed to aircraft traffic and is used by the Massachusetts State Police for training and vehicle storage. The former MAAF is zoned for Special Use II and Innovation and Technology Business. Under the Devens Reuse Plan (November 14, 1994), Special Use II and Innovation and Technology Business includes a broad range of industrial, light industrial, office, and research and development uses. There are currently no plans for development of the former MAAF, although the area can be developed if interested parties are identified. Devens Army Installation retained approximately nine acres of the former airfield for vehicle storage and maintenance and approximately four acres in and around the AOC 50 Source Area for remediation activities.

Sources of groundwater contamination at AOC 50 include two World War II fueling systems, a drywell formerly connected to the parachute shakeout tower, and the tetrachloroethene (PCE) drum storage area; these sources are collectively referred to as the AOC 50 Source Area. The AOC

50 Source Area is comprised of less than two acres and surrounds Buildings 3803 (the former parachute shop), 3840 (the former parachute shakeout tower), 3824 (a gazebo), and 3801 (the former 10th Special Forces airplane parachute simulation building). Although these sources have been removed or taken out of commission, groundwater underlying AOC 50 contains elevated concentrations of volatile organic compounds (VOCs), most notably the chlorinated volatile organic compound (cVOC) PCE. The primary area of groundwater contamination at AOC 50 is referred to as the Southwest Plume, which extends from the Source Area approximately 3,000 feet (ft) downgradient toward the Nashua River.

Investigations performed in 1997, 1998, 2000, and 2005 defined the longitudinal and lateral extents of the plume. Supplemental investigations performed in 2014 confirmed the lateral extents of the plume, at that time, and demonstrated that the direction of the plume remains consistent with the direction of groundwater flow.

In 2014, Sovereign conducted a Membrane Interface Probe Hydraulic Profiling Tool (MiHPT) Source Area Investigation in accordance with the *Source Area Investigation Work Plan, Area of Contamination 50* (Sovereign Consulting Inc. [Sovereign] and HGL, 2014). The study and its results, detailed in the *AOC 50 Source Area MiHPT Investigation Summary Report* (Sovereign, 2015), support the former dry well as a primary former source. The former floor drain in the parachute tower (connected to the former dry well) did not appear to be a secondary source based on the lack of shallow cVOC responses in the MiHPT points. In portions of the Source Area that did contain cVOCs, the higher concentrations were generally restricted to deeper depths.

The MiHPT study also evaluated the effectiveness of the current remedial strategy. The report concluded the fixed screen injection well network was effective in addressing cVOC concentrations in the shallow aquifer, but a more targeted approach for deeper impacts would be required. The study found denser, lower permeability deeper soils containing cVOC concentrations that were not being effectively treated at that time.

2.0 REMEDIAL OPERATIONS

Remedial options at AOC 50 were implemented to degrade contaminants of concern (COCs) found in the source area as well as in downgradient groundwater. ARCADIS U.S., Inc. /G&M, Inc. (ARCADIS) conducted a pilot study to evaluate ERD and in-well stripping (IWS) in Area 5, at the downgradient portion of the plume. Based on the results of the pilot study, the full-scale remedy was implemented by ARCADIS in September 2004. The remedy was comprised of ERD in the source area and in a series of transects throughout the plume (**Figure 2**), IWS at the downgradient edge of the plume in Area 5, and soil vapor extraction (SVE) in the AOC 50 source area.

The SVE system was discontinued in 2005 as monitoring data indicated that recoverable compounds had been removed. The IWS was discontinued in 2013. An evaluation of the IWS central processing unit will be conducted in 2017 and a schedule for repair or replacement will be provided after the evaluation is complete. Full scale ERD injections were started in 2004 and the injections were initially conducted on a monthly basis. In 2009 the injections were decreased to a semiannual basis. The injections were decreased to an annual basis in 2015 and the approach was further modified at that time to utilize a longer lasting substrate and augment the fixed injection wells with direct injections of the substrate into the subsurface to target residual contamination.

The ERD remedy has significantly reduced the cVOC mass throughout the plume through use of substrate injections via injection wells and recent direct injections into the subsurface via direct push technology (DPT) (**Figures 3, 4, 5, 6, 7, 8, 9, and 10**). Evaluation of 2016 monitoring data after the 2015 injections indicates anaerobic biodegradation is occurring in the groundwater downgradient of many of the injection areas even though injections were not conducted in 2016 (KGS, 2017).

The need for injections will be evaluated annually. The timing, placement of injection, method of injection, specific substrate, percent weight of substrate, and volume of each injection will be designed prior to each injection event based on results of the ongoing long-term groundwater monitoring program. A brief memorandum detailing the specifics of injection plan will be provided to the regulatory agencies 60 days prior to the start of the injection event.

The record of decision (ROD) and 60% design estimated injections would be conducted for a period of a 10 to 15 years (USACE, 2004; ARCADIS, 2005). The total estimated time to achieve cleanup levels was 27 years. As cVOC mass continues to decrease throughout the plume, injections will be phased out and residual plume contaminants will be monitored until cleanup levels are attained.

2.1 Enhanced Reductive Dechlorination Substrate

ERD is bioremediation technology where organic substrate is injected into the subsurface to create reducing conditions and promote the growth of microorganisms that are capable of degrading chlorinated ethenes such as PCE. These microorganisms use the chlorinated ethenes as their respiration electron acceptors, thereby removing chlorine atoms and transforming PCE to trichloroethene (TCE), TCE to dichloroethene (DCE), DCE to vinyl chloride (VC), and VC to ethene. Hydrogen is the primary electron donor for the chlorinated ethene reducing microbes. Hydrogen can be produced in-situ through the fermentation of readily degradable organic compounds such as sugars, molasses, vegetable oil, whey, and various lactates.

There are two basic requirements for complete reductive dechlorination:

- sufficient electron donor to achieve strongly reducing conditions, and
- bacteria capable of efficient dechlorination.

It is recognized that the establishment of reducing conditions can mobilize metals such as iron, manganese, and arsenic, which naturally occur in the aquifer formation at AOC 50. Elevated metals have been detected in monitoring wells near areas where injections have been completed.

The AOC 50 remedy includes injection of an organic carbon substrate into injection wells and direct injections of the substrate into the subsurface via DPT. Groundwater is treated as it flows through the injection areas. The initial design of the remedy included the use of injection wells installed in transects oriented perpendicular to groundwater flow along the plume. The use of injection transects allows the naturally occurring metals to precipitate out of solution in the regions between the transects. Monitoring is conducted to ensure that this approach is effective and that a large-scale plume of metals in groundwater is not being developed.

The injection of an organic substrate promotes the activity of naturally occurring microorganisms to reduce dissolved oxygen (DO) concentrations and generate the hydrogen electron donor supply. The resulting effect is the development of reducing conditions in groundwater, as needed to support the reductive dechlorination process. Although metals are mobilized to some extent during this process, the degree of metals mobilization is similar to that previously observed. Groundwater sampling is performed to monitor metals mobilization, cVOC degradation, and the extent of reduced groundwater conditions.

The injections will use products called Anaerobic BioChem® (ABC®), ABC®-Ole', and ABC®-Ole'+. ABC® is a patented mixture of lactates, fatty acids, and a phosphate buffer. ABC® contains soluble lactic acid as well as slow-and long-term releasing components. The phosphate buffer provides phosphates, which are a micronutrient for bioremediation. In addition, the buffer helps to maintain the pH in a range that is best suited for bacteria. The product, ABC®-Ole', consists of a modified blend of ABC® and a fatty acid (a kind of vegetable oil). The fatty acids absorb to the soil, providing longer residence time in the treated area. This process includes both short-term consumption of lactates in the product and long-term consumption of the fatty acids such that remediation will start quickly and the half-life will be longer. The product ABC®-Ole'+ includes zero valent iron (ZVI) in the mixture and is added to the direct injections to allows for the rapid and complete dechlorinating of target compounds. The degradation process via the ZVI is an abiotic reductive dichlorination process occurring on the surface of the granular iron. Degradation rates using ZVI are several orders of magnitude greater than under natural conditions. The Ole' component of the ABC®-Ole'+ provides a longer residence time of the ABC® component of the injected substrate in the treated area. ZVI is not used in injection wells due to the likelihood for clogging of the well screens. Additional information regarding the substrate is provided in Appendix C.

The volume and percent weight of the specific substrate to be injected at specific locations will be designed prior to each injection event based on results of the ongoing long-term groundwater monitoring program. The injection plan for each event will be reported to the regulatory agencies in a brief memorandum prior to each injection event.

2.2 Injection Placement

The ERD remedy has significantly reduced the cVOC mass throughout the plume through use of substrate injections via injection wells and direct injections into the subsurface via DPT (**Figures**

3, 4, 5, 6, 7, 8, 9, and 10). The ERD remedy will continue with injection of the organic substrate described above. The placement of injections via existing injection wells and direct injections for each injection event will be designed to target residual contamination identified through ongoing groundwater monitoring. Areas where COC concentrations have achieved cleanup goals through prior treatment, and those exhibiting sufficiently reduced groundwater conditions [i.e., DO less than 0.5 milligrams per liter (mg/L), and a negative oxidation-reduction potential (ORP)], will not receive additional ERD substrate injections. The placement of injections will be designed prior to each injection event based on results of the ongoing long-term groundwater monitoring program. The existing injection well network is described in the subsections below.

2.2.1 Area 1

A network of 21 injection wells is available in Area 1 (Source Area), as shown on **Table 1 and Figure 2**. The injection wells in this area were installed within and downgradient of the former drywell and the former drum storage areas. In addition, direct injection of ERD via DPT has been conducted in areas immediately downgradient of the parachute tower and former dry well.

The aquifer materials within Area 1 are characterized by higher silt content and lower hydraulic conductivities than in the Southwest Plume. Hydraulic conductivities in the Area 1 are less than 5 feet per day as compared to hydraulic conductivities on the order of 25 to 50 feet per day in the area of the Southwest Plume.

2.2.2 Area 2

Area 2 is located approximately 450 feet downgradient of the Source Area (**Figure 2**). A line of four injection wells, IW-20 to IW-23, were installed with 30-foot spacing between each injection well measured perpendicular to groundwater flow. The injection well screens were set at approximately 75 to 95 feet below ground surface (bgs) corresponding to the depth interval exhibiting the highest historical PCE concentrations. An additional injection well, IW-37, was installed northwest of IW-20 with injection screens constructed at depth of approximately 79 to 99 feet bgs. Monitoring well G6M-07-01X (screened from 78 to 98 ft bgs) was converted to an injection well. No further ERD injections are planned for Area 2 because the current groundwater concentrations indicate groundwater in Area 2 has achieved the cleanup criteria **(Table 2)**.

2.2.3 Area 3

Area 3 is located approximately 850 feet downgradient of the Source Area and approximately 450 feet downgradient of Area 2 (**Figure 2**). A line of five injection wells, IW-24 to IW-28, were installed with 30-foot spacing between each injection well measured perpendicular to groundwater flow. The injection well screens were set at 70 to 90 feet bgs, corresponding with the depth interval with the highest PCE concentration.

2.2.4 Area 4

Area 4 is located approximately 1,540 feet downgradient of the Source Area and 700 feet downgradient of Area 3 (**Figure 2**). A line of six injection wells, IW-29 to IW-34, were installed with 30-foot spacing between each injection well measured perpendicular to groundwater flow. The injection well screens are set from approximately 95 to 115 feet bgs (IW-32, IW-33, IW-34), 100 to 120 ft bgs (IW-31), and 105 to 125 ft bgs (IW-29 and IW-30), corresponding with the depth with the highest PCE concentration. Monitoring wells G6M-05-02X (IW-35) (109 to 129 ft bgs) and G6M-06-01X (10 to 126 ft bgs) were converted to injection wells and IW-36 (106 to 126 ft bgs) was installed to provide greater plume coverage northwest of IW-34.

2.2.5 Area 5

Area 5 is located approximately 2,000 feet downgradient of the Source Area and approximately 420 feet downgradient of Area 4 (**Figure 2**). A line of six injection wells, IW-1 through 1W to IW-6, were installed with 30-foot spacing between each injection well. The injection well screens are set approximately 115 to 135 feet bgs, an interval corresponding with the depth interval with the highest PCE concentration. Monitoring well G6M-02-05X was converted to an injection well (120 to 135 ft bgs). Injection well 39 (125 to 145 ft bgs) was installed just northwest of the Area 5 transect.

2.3 Enhanced Reductive Dechlorination Injection Activities

The first full scale ERD injection event was conducted in October 2004 utilizing molasses as the ERD substrate. HGL revised the ERD injection program in November 2008 by changing the substrate utilized from molasses to ABC®.

Remedial evaluations conducted in 2015 reviewed historical groundwater data and the 2014 MiPHT Study results and determined that areas of deeper contamination were not being effectively treated in Area 1. The evaluation indicated that injections into existing injection wells were preferentially treating the shallow impacts due to soil conditions. The 2015 injection program was modified to address deeper areas of residual contamination present in the Source Area. The work included directly injecting substrate at depth using DPT, which resulted in more effective placement and deeper distribution of the ERD product. In addition, a new substrate product was utilized in Area 1 to increase residence time.

The 2015 ERD injections included the use of ABC®-Ole' and ABC®-Ole'+, and ABC®. Injections were performed at 15 Area 1 DPT injection locations, 12 Area 1 fixed-screen injection wells, five Area 2 injection wells, five Area 3 injection wells, seven Area 4 injection wells, and six Area 5 injection wells. Evaluation of 2016 monitoring data after the 2105 injections indicates anaerobic biodegradation is occurring in the groundwater downgradient of many of the injection areas even though injections were not conducted in 2016 (KGS, 2017).

The ERD injection program is evaluated after each event and adapted as needed to improve the effectiveness of the injection program. A summary of the ERD injections will be presented in the Annual Report. Maintenance of injection wells will be conducted as issues (e.g., reduced injection rate of the injection media) are identified. Injections wells where reduced injection rates of the injection media are observed will be redeveloped prior to the next injection event.

2.3.1 Substrate Injection Quantities

Injection volumes at each zone are dependent upon current groundwater concentrations and chemistry. The volume and percent weight of the specific substrate to be injected at specific locations will be designed prior to each injection event based on results of the ongoing long-term groundwater monitoring program.

Use of persistent ABC®-Ole' and ABC®-Ole'+, was intended to extend the active treatment period for the cVOCs. Given the longevity of the ABC®-Ole' substrate and decrease of cVOC mass, ERD injections will be conducted on a less frequent basis than previous injections and the cVOC concentrations will be monitored until cleanup levels are achieved.

2.3.2 Substrate Injection System

The ERD substrate is mixed on-site using a mixing tank and water obtained from an on-site potable water source. The substrate is mixed with the potable water immediately prior to injection. The substrate is pumped directly from the mixing tank/tanker truck to a distribution system, which allows the substrate solution to be delivered in measured quantities. The substrate is introduced to the bottom of each direct injection point or well. A specific volume of substrate is pumped into at 5-ft section at low pressure (less than five pounds per square inch[psi] at the wellhead). The process is repeated every five feet of the injection interval until the appropriate volume for the injection point is completed.

The injections are paced to minimize sudden and sustained mounding effect generated during single day events. Substrate injections are staggered within each transect and boring to avoid an injection pressure wave that could potentially displace contaminated groundwater beyond its existing defined perimeter. The single injection point scheme ensures adequate and thorough distribution of the ERD substrate within its intended target zone. A staggered arrangement minimizes groundwater mounding within any particular injection area. No two adjacent wells in any transect are injected sequentially. Injections proceed from the outer wells to the interior transect wells. If substantial mounding (greater than approximately six inches) is observed in adjacent monitoring wells, then the injection rate will be reduced to decrease the amount of mounding.

2.3.3 Substrate Injection Documentation

The ERD injection activities, observations, and results are documented in a bound field notebook. Each injection log records the observed flow rate and pressure utilized at the pump and recorded at the well head, total quantities of injected substrate, water used per well, and any physical observations noted during the process. In addition, monitoring of groundwater elevations and total methane at the injection well prior to injection activities is recorded. Surrounding observation wells are monitored periodically during injection activities to observe potential groundwater mounding.

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3.0 LONG-TERM MONITORING AND MAINTENANCE PROGRAM

The objectives of the long-term groundwater monitoring program at AOC 50 are to monitor groundwater conditions, to evaluate the effectiveness of the remedial system, and to document that COC concentrations decrease over time to a level that achieves the cleanup goals established in the ROD. A review of historical groundwater data concluded that the use of ERD was effective at reducing the COC concentrations. This review is illustrated in **Figures 3**, **4**, **5, 6, 7, 8, 9, and 10.** Historical 2004, 2010, 2014, 2015, and 2016 PCE plume maps indicate a significant reduction in the plume area attributed to the ERD process. Historical monitoring results are presented in **Table 2**. Continued monitoring in concert with ERD remediation will effectively achieve the objectives outlined in the ROD.

To achieve the stated objectives in the Source Area and Southwest Plume, the monitoring program needs to document the establishment of reducing conditions (i.e., low DO and ORP), increased total organic carbon (TOC) concentrations, and degradation of PCE and its anaerobic biological degradation compounds (TCE, *cis*-1,2-dichloroethene [*cis*-1,2-DCE], trans-1,2-dichloroethene, [*trans*-1,2-DCE], 1,1-dichloroethene [1,1-DCE], and VC) as achieved through implementation of the ERD remedy. The program also monitors the mobilization of metals (iron, manganese, and arsenic) and dissolved methane to determine if adjustments in the ERD strategy are warranted.

In addition, once the remedy has reduced the COC VOCs to site cleanup goals, groundwater monitoring will be performed to monitor the geochemistry of the aquifer (including mobilized metals) to verify the aquifer returns to an acceptable condition for the protection of human health and the environment. The cleanup goals for the primary target COCs at AOC 50 are as follows: PCE [5 microgram per liter (μg/L)], TCE (5 μg/L), *cis*-1,2-DCE (70 μg/L), VC (2 μg/L), and a secondary target analyte arsenic (10 μg/L).

Due to ongoing ERD substrate injections and changes in the plume extent and composition, a re-evaluation of the LTM program is required in regard to monitoring wells incorporated into the monitoring network, frequency of monitoring, and required analytes. The ERD injections have reduced the extent of the PCE plume, but have also generated changes in the plume composition and groundwater geochemistry. The monitoring well network was evaluated relative to groundwater flow at the site, the PCE plume extent, and the groundwater geochemistry.

The LTM program includes the measurement of water levels **(Table 3)** and collection of groundwater samples for off-site laboratory analysis at selected wells on a semiannual, annual, or biennial (every other year) basis (**Table 4**). Wells within the Source Area and portions of the plume where ERD is performed are monitored on a semiannual basis to track COC concentration trends and geochemistry conditions. Wells where ERD has successfully reduced COC concentrations to the cleanup levels, where arsenic concentrations are elevated due to previous ERD injections, and wells close to the current plume perimeter are sampled annually to monitor the plume extent and aquifer conditions related to the ERD injections. Wells outside of the historic plume extent where data have shown little change over time, but data would help confirm plume delineation or metals concentrations are monitored biennially.

Maintenance needs, including well development, of the monitoring wells identified during sampling activities will be addressed as they arise. Monitoring wells that are sampled as part of the LTMMP, with greater than 0.5 foot of sediment accumulated in the well, will be redeveloped.

A discussion of the groundwater at AOC 50, followed by a description of the wells selected for sampling and the monitoring methodology is presented below.

3.1 Hydrogeologic Conditions

Numerous groundwater monitoring wells, MicroWells®, and boreholes have been installed at the former MAAF and AOC 50 to characterize the site's hydrogeology. The following section describes the hydrogeologic environment based on a review of the data presented within the *Remedial Investigation Report Area of Contamination (AOC) 50* (Harding Lawson Associates [HLA], 2000), *Final Feasibility Study, AOC 50, Devens Reserve Forces Training Area* (ARCADIS 2002a), *Supplemental Investigation Report* (ARCADIS 2002b), *Final Long-Term Monitoring Plan, AOC 50, Devens, Massachusetts* (HGL, 2012), *Enhanced Reductive Dechlorination Operations and Maintenance Manual Addendum I* (HGL, 2009), subsequent investigations and LTM events up to and including the fall 2016 event.

A single water table aquifer occurs within the overburden deposits below the former MAAF and AOC 50. Restrictions to vertical groundwater flow, such as narrow silty clay layers, are present, but are not obvious in boring logs within the 'kame' glacial deposit or along the Nashua River. These thin, silty-clay layers were encountered during the MiHPT investigation (Sovereign, 2015) conducted in 2014, within the AOC 50 Source Area. These thin layers reduce the vertical permeability, contribute to a slight increase in the water table elevation, and increase the difference between shallow and deep water levels. These thin, silty-clay layers are also less permeable than the surrounding sands and this results in less ERD material being accepted in the thin layers.

Measurements of the depth to groundwater have been collected from a network of monitoring wells and sampling points on a regular basis since 1997. Groundwater is encountered at approximately 10 ft bgs in the AOC 50 Source Area and approximately 64 ft bgs at the southwestern end of the former MAAF. Groundwater elevations within deeper wells at and to the north of AOC 50 typically have lower heads indicating that there is a downward hydraulic gradient within this area.

The Nashua River is the controlling hydrologic feature of AOC 50 and the former MAAF area. As groundwater beneath AOC 50 moves downgradient in a southwesterly direction toward the Nashua River, vertical gradients become neutral. Vertical gradients reverse and become upward along the Nashua River, as would be expected near such a discharge feature. These changes in gradient demonstrate that groundwater is recharged near the AOC 50 Source Area, travels below the former MAAF, and discharges to the Nashua River.

The historical and ongoing groundwater monitoring at the site shows a consistent groundwater flow direction from the northeast to the southwest. The flow direction has not varied over the course of the monitoring. Hydraulic conductivities at the Site range from 1 feet/day (ft/day) to more than 50 ft/day, with seepage velocities ranging from 0.024 to 1.19 ft/day. The groundwater average velocity for the Site is approximately 0.60 ft/day.

3.2 Groundwater Monitoring Program

Groundwater monitoring well locations were selected to provide representative samples from impacted groundwater areas and ERD treatment areas. The selected wells evaluate the site progress toward achieving the cleanup goals and changes in the site's groundwater chemistry downgradient of the in situ reactive zones (IRZ). **Table 3** lists the selected monitoring wells for water level measurement. **Table 4** lists the selected monitoring wells for groundwater sampling and presents the sampling rationale, analytical parameters, and sampling frequency. **Figure 11** presents the locations of the wells in the LTM program. **Table 5** lists the well screen information and descriptions for wells at AOC 50.

The LTM program includes seven wells sampled semiannually to evaluate cVOC degradation, inorganic solubilization, and geochemistry. The 34 wells sampled annually to provide a more comprehensive network to evaluate cVOC extent and inorganic solubilization (i.e., the mobilization of iron, manganese and arsenic). The six wells sampled biennially provide confirmation of plume delineation or metals concentrations. A discussion of the current monitoring network is presented below.

3.2.1 North Plume

Wells G6M-96-22A and G6M-96-22B, located north of Route 2A, are monitored for water level elevations to verify groundwater flow direction. These locations have been removed from the LTM program because COC concentrations in this area have been below the PCE cleanup criterion since 2001 and all COCs have been below cleanup criteria since 2009. Future sampling of these wells may be considered when Source Area wells (Area 1) achieve cleanup criteria and long-term monitoring of the aquifer water quality to pre-remedial conditions is required.

3.2.2 Area 1 (Source Area)

A total of 14 monitoring wells from Area 1 are incorporated into the LTM program (**Table 4**). At the Former Drum Storage area, G6M-07-02X is monitored semiannually for VOCs, metals, and geochemistry where residual contamination is present above cleanup levels. G6M-04-10A is also monitored semiannually for VOCs, metals, and geochemistry to monitor the edge of the residual contamination. G6M-04-10X and G6M-04-13X are monitored annually for VOCs to monitor plume extent in an area where VOC concentrations have decreased due to treatment. Arsenic concentrations at G6M-04-10X and G6M-04-13X have been below 2 µg/L for the past five years and; therefore, regular sampling for metals is not needed.

Well G6M-13-05X is monitored semiannually for VOCs, metals, and geochemistry data for groundwater conditions in an area of elevated PCE concentrations.

Well G6M-02-08X is monitored annually for VOCs, metals, and geochemistry data for plume extent and groundwater conditions in the IRZ created near the former drywell. Well G6M-13-06X is monitored annually for VOCs, metals, and geochemistry for plume extent and groundwater conditions in the IRZ downgradient of the former drywell.

Wells G6M-95-19X and G6M-95-20X monitor groundwater conditions upgradient of the former drywell area and the Former Drum Storage Area and are sampled annually. Both wells are sampled for VOCs and G6M-95-20X is sampled for metals due to historically elevated arsenic concentrations.

Well G6M-04-09X is located approximately 100 ft downgradient of the Source Area and along with G6M-04-15X is monitored for VOCs and metals for plume extent and to monitor historically elevated arsenic concentrations.

Further downgradient, well G6M-04-22X monitors groundwater conditions downgradient of the former drywell. Well G6M-04-31X monitors groundwater conditions south of the Former Drum Storage Area. These wells, along with G6M-04-11X, are sampled biennially rather than annually based on a consistent trend of diminished VOC concentrations. The samples will be analyzed for VOCs and metals.

3.2.3 Area 2 (Southwest Plume)

Three monitoring wells comprise the LTM well network in Area 2. Well G6M-02-01X is located approximately 60 ft downgradient of the ERD injection transect and well G6M-04-03X is located approximately 200 ft downgradient of the ERD injection transect. Well G6M-04-01X is located approximately 50 ft upgradient of the ERD injection transect. All three of the wells are sampled annually to monitor the VOC concentrations and IRZ that was created by previous injections. These wells are screened in the deep portion of the aquifer where the COC impact was present and where the ERD treatment was previously applied. The VOC cleanup goals were achieved at the three monitoring wells by 2016 but arsenic concentrations are currently elevated in the IRZ.

3.2.4 Area 3 (Southwest Plume)

Four monitoring wells (G6M-03-07X, G6M-04-02X, G6M-04-04X, and G6M-13-03X) are incorporated into the well network in Area 3. Well G6M-04-02X is located approximately 50 ft upgradient and indicates there is residual contamination upgradient of the injection well transect. G6M-04-02X will be monitored semiannually to monitor the degradation of the residual contamination and geochemistry at the well. Well G6M-03-07X is located approximately 60 ft downgradient of the ERD transect and will be sampled annually to provide the VOC and geochemical data to monitor the IRZ. Well G6M-13-03X is located approximately 50 ft crossgradient of the injection well transect, and will be sampled biennially to monitor potential contamination north of the historic plume location. Well G6M-04-04X is located approximately 200 ft downgradient of the ERD transect and is sampled annually to monitor VOC concentrations in an area were VOC concentrations decreased due to treatment and arsenic concentrations are currently elevated in the IRZ.

3.2.5 Area 4 (Southwest Plume)

Four monitoring wells are incorporated into the monitoring well network in Area 4. This includes semiannual sampling of well G6M-13-02X, located 150 feet downgradient of the injection well transect, for VOCs, metals, and geochemistry, where VOC concentrations remain above the cleanup levels. Well G6M-02-13X, located approximately 60 feet downgradient of the ERD transect, and well G6M-02-04X, located approximately 150 ft upgradient of the ERD transect, are sampled on an annual basis to monitor VOC concentrations in an area were VOC concentrations decreased due to treatment and arsenic concentrations are currently elevated in the IRZ. In addition, well G6M-97-28X is included for annual sampling to monitor elevated arsenic concentrations.

3.2.6 Area 5 (Southwest Plume)

A total of 22 monitoring wells are incorporated into the well network in Area 5. This network includes annual sampling of wells in the IRZ created by injections in the Area 5 injection well transect that has resulted in the reduction of PCE to the cleanup goal and elevated arsenic concentrations at a number of locations (i.e., MW-3, MW-7, and G6M-02-11X). These wells will be sampled for VOCs and metals.

There is residual plume contamination at G6M-97-05B and G6M-13-01X, which will be sampled semiannually for VOCs, metals, and geochemistry.

To monitor the eastern extent of the plume, wells G6M-13-04X and G6M-03-10X will be monitored annually for VOCs and metals, to monitor plume extent and elevated arsenic concentrations.

In the downgradient portion of the plume, wells G6M-04-06X, G6M-02-07X, XSA-12-95X, XSA-12-97X, and XSA-12-98X will be sampled annually to monitor VOC trends and metals concentrations. Wells G6M-04-7X and XSA-12-96X will be sampled semiannually to monitor VOC trends and metals concentrations.

Well G6M-04-05X will be sampled biennially for VOCs. At G6M-04-05X there have been a few detections of VOCs and arsenic since 2010, all of which were below the cleanup goals. Wells G6M-02-12X and G6M-03-08X will be sampled biennially for VOCs and metals. At G6M-02-12X there have been no detections of VOCs since 2014 and decreasing arsenic concentrations. At G6M03-08X there have been no detections of PCE since 2011 and low arsenic concentrations.

Monitoring well G6M-02-06X, located on the east side of the Nashua River and monitoring well G6M-04-14X, located on the west side of the Nashua River, are sampled annually to monitor groundwater quality downgradient of the plume.

To monitor the western extent of the plume, two new monitoring wells will be installed on the west side of the plume. The wells will be sampled initially for VOCs, metals, and geochemistry parameters. The wells will be monitored annually for VOCs and metals for three years, after which the sampling frequency will be reviewed. During well installation, groundwater profiling for VOCs will be conducted every ten feet from 30 feet below the water table to bedrock. A 10-foot well screen will be installed at the highest concentration of plume contaminants. If no VOCs are detected, the screen will be set at the estimated plume elevation based on adjacent locations.

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4.0 SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER

This section constitutes the sampling and analysis plan for AOC 50. It was prepared in accordance with the guidelines set forth in the *Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories* (Version 5.1, 2017) and U.S. Environmental Protection Agency (USEPA), Region 1, *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells* (USEPA, Region 1, 2010).

Two groundwater monitoring events will be performed (semiannual in the spring and annual in the fall). The monitoring wells included in the long-term monitoring and maintenance program are listed in **Table 4**. Construction details for wells at AOC 50 are summarized in **Table 5**.

Groundwater monitoring will be conducted semiannually for wells used to evaluate residual plume contamination and to monitor COC and geochemistry fluctuations influenced from the ERD injections. The semiannual monitoring will also be used to plan the injection strategy for each ERD event. Other wells will be monitored annually to assess the overall remedy effectiveness and the long-term effects of the ERD treatment. Annual monitoring of wells downgradient of the plume will be conducted to monitor dissolved inorganics that may have been mobilized from the cVOC plume area, and to be protective of the river. Biennial monitoring of select wells will be performed during the fall event to augment the long-term evaluation of site COCs.

Recommendations/modifications will be made as appropriate, regarding sampling frequency, monitoring locations, and analyses for subsequent year(s) in the Annual Reports and subsequent revisions of this LTMMP. These documents will be submitted to the regulatory agencies for review.

4.1 Analytical Methods and Analytes

Analytical methods and analytes utilized for the AOC 50 LTM sample events will be in accordance with this document and the *Quality Assurance Project Plan – Annual Long Term Monitoring and Maintenance Program* (KGS, June 2016). **Table 6** lists the analytical parameters, methods, sample containers, and preservation requirements for groundwater monitoring. Specific analytical parameters and methods to be used during AOC 50 LTM sample events are summarized below.

- VOCs - SW846/8260B or 8260C;
- Dissolved Metals (arsenic, iron and manganese) – SW846/6010B/6020A;
- Dissolved Gases (methane, ethane, ethane) – RSK-175;
- Alkalinity – SM2320B;
- Nitrate/Nitrite-N –E353.2;
- Sulfate – SW9056A or E300;
- Sulfide – SW9034; and
- Total Organic Carbon (TOC) – SW9060;

Field measurements will be collected during groundwater monitoring low-flow well purging activities to compliment laboratory analytical methods. Specific parameters will include pH, temperature, specific conductance, DO, ORP, and turbidity. The collection of field measurements is discussed in Section 4.3.2.

4.2 Pre-sampling activities

Prior to conducting the sampling event, the appropriate equipment and supplies shall be obtained, and the laboratory shall be contacted (approximately two weeks prior to commencement of the sampling event) to communicate and coordinate the sampling event. The following sections provide a more detailed discussion of the pre-sampling activities that will be conducted prior to the collection of groundwater samples at AOC 50.

4.2.1 Equipment and Supplies

The following equipment and supplies will be utilized in the collection of low-flow groundwater samples:

- Variable speed submersible bladder pumps and peristaltic pumps,
- Water level indicator,
- DO, pH specific conductance, ORP, and temperature probes (within a single unit) and appropriate calibration solutions, turbidity meter (separate meter from the above unit), flow-through cell,
- Pre-preserved sample containers, equipped with Teflon®-lined lids or septa,
- Decontamination supplies including powdered lab grade detergent,
- VOC-free deionized water,
- 500-milliliter graduated cylinder,
- Graduated 5-gallon buckets for purge water and decontamination,
- Plastic sealable bags,
- 0.45 micron (µm) in-line filters,
- Well keys,
- Field logbook and field sampling forms,
- Chain of custody forms and seals,
- Cooler with packing material and ice to cool all samples to 4 degrees Celsius (ºC), +/- 2 ºC,
- Trip blanks (for VOC analyses), and
- Paper towels.

4.2.2 Site Location, Security and Access

Arrangements will be made to coordinate LTM activities at AOC 50 with appropriate site personnel. Some AOC 50 wells may not be accessible due to training activities at the Moore Army Airfield. Every effort will be made to ensure that LTM activities are conducted in a timeframe that is acceptable to all stakeholders.

4.2.3 Initial Well Opening and Inspection

Olfactory and visual observations will be made upon opening the well casing protective cap. Such observations, including any detected odors, will be documented in the logbook. The general condition of the protective cover, its associated concrete apron, well casing protective cap, and the well casing will be inspected and noted in the logbook. Any damage, evidence of tampering, or immediately necessary repairs will be communicated to the USACE-NAE Project Manager.

4.2.4 Water Level Measurements

Prior to well purging or sampling, groundwater measurements will be made using an electronic water level indicator. Water levels will be recorded from the top of the well plastic casing and will be recorded to the nearest 0.01 foot. The probe will be cleaned following the appropriate decontamination procedures between sample points. The depth to water will be measured in each well using the decontaminated water level indicator, taking care not to lower the probe below the water surface any further than necessary. Depth to water will be determined with as little physical disturbance of the water in the wells as possible. Note that dedicated tubing may be suspended in the well during water-level measurements. A round of water level measurements shall be taken on the day prior to sample collection for use in contouring a synoptic water level event **(Table 3)**. Water level measurements shall also be collected during sampling and recorded on the Monitoring Well Sampling Log located in **Appendix A**.

4.3 Sampling Procedures

4.3.1 Equipment Calibration

Some equipment to be used during the LTM event will require periodic calibration to ensure optimum performance, including the photoionization detector (PID), YSI 600XL (or suitable alternative) water quality meter, and turbidimeter. This equipment will be calibrated in accordance with manufacturer's instructions before its initial use at the site and at the beginning of each work day thereafter. The equipment calibration also will be checked at the conclusion of each work day. Calibrations will be documented in log books or on log sheets.

4.3.2 Low-Flow Well Purging

Each groundwater monitoring well will be purged in accordance with the USEPA Region 1 Guidance Document titled *Low Stress (low-flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells* (USEPA, Region 1, 2010), included as **Appendix B**. The goal of low-flow purging and sampling is to remove stagnant water from the well and collect representative samples at near ambient conditions. Dedicated and non-dedicated variable speed submersible bladder pumps along with peristaltic pumps will be used to purge the wells. Tubing for the dedicated wells will be Teflon-lined.

A properly calibrated water quality parameter probe will be fitted into the flow-through cell provided with the instrument with the included mounting hardware. Flow rates of 0.1 to 0.5 liters per minute (L/min) will be used for purging. The pump will be operated at a flow rate where minimal drawdown occurs during purging. The goal of low-flow purging is for the drawdown to be less than or equal to 0.3 feet.

Water quality measurements will be used as the basis for establishing the stabilization of the well water. Well stabilization parameters will include pH, specific conductance, temperature, ORP, and turbidity. Turbidity samples must be collected from a spigot placed on the sample tubing prior to the flow-through cell and measured with a stand-alone meter. The parameters will be measured every 3 to 5 minutes until stabilization of all parameters is achieved. Stabilization has been reached when pH measurements remain constant within 0.1 standard unit, specific conductance is constant within 3%, the temperature is constant within 3%, ORP is constant within 10 millivolts (mV) and the turbidity is either constant within 10% for values above 5 Nephelometric Turbidity Units (NTU) or below 5 NTUs for three consecutive readings. If field parameters fail to stabilize in a particular well after two hours, sample collection may proceed and shall be noted on the Sample Collection Log. All measurements will be tabulated on Monitoring Well Sampling Logs (**Appendix A**). Observations such as odors, water color, or the appearance of soil particles or iron floc will also be recorded on the Sampling Log.

4.3.3 Sample Containers and Preservatives

Laboratory provided sample containers will be used during LTM events. Sample containers will not be reused. The laboratory will pre-preserve sample containers as appropriate for the analysis to be performed. Field personnel will conduct a visual check to ensure that pre-preserved sample containers contain preservative. A summary of the sample containers, preservation, and holding times for water samples are presented in **Table 6**.

4.4 Sample Collection

Dedicated and non-dedicated variable speed submersible bladder pumps along with peristaltic pumps will be used to collect samples from groundwater monitoring wells. The objectives and methods for this procedure are described in USEPA's Region 1 Guidance Document entitled *Low Stress (low-flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells* (USEPA, Region 1, 2010) that is presented in **Appendix B**. The goal of sampling monitoring wells is to provide groundwater quality data that is representative of actual aquifer conditions with minimal alteration caused by inappropriate or variable sampling techniques. Typically, flow rates of 0.1 to 0.5 L/min are used; however, this is dependent on site-specific hydrogeology (USEPA, 2010).

Once groundwater quality parameters have stabilized, groundwater samples will be collected directly from the tubing connected to the pump. The sampling flow rate will be the same flow rate that was used during the purging process to maintain equilibrium between the well and the formation. The flow-through cell will be bypassed or disconnected during the collection of samples. Sample containers will be filled by allowing water from the pump to gently enter the containers with minimal disturbance. Sampling will begin with the VOC portion of the sample and then continue with other aliquots of the sample. Water samples for dissolved metals will be field-filtered using a 0.45-µm filter and collected directly into preserved sample bottles. Once full, containers will be stored in a cooler and placed on ice immediately. All samples will be labeled as described in Section 4.4.1 and immediately placed in a cooler with ice to maintain a sample temperature of approximately 2 to 6 ^{o}C.

If any wells have insufficient yield (low recharge), purging will be interrupted before the water level drops below the pump intake to avoid introducing air into the discharge line.

4.4.1 Sample Identification

Each sample will be assigned a unique field sample identifier. Field personnel will generate a label for each sample container that will contain the sample identifier, date and time of sample collection, the sampler's initials, analytical parameters, and type of preservation used. The sampler will initial any change in the label information prior to the sample collection.

A sample numbering system will be used to identify each sample collected and submitted for analysis. The purpose of the numbering system is to assist in the tracking of samples and to facilitate retrieval of analytical results. The field sample ID will be used on sample labels, sample tracking forms, chain of custody forms, field logbooks, and for other applicable documentation. The field sample ID will follow the format used for previous LTM events. Duplicate sample IDs will specify the AOC from which the sample was collected without revealing the parent sample ID to the laboratory. Matrix spike (MS)/matrix spike duplicate (MSD) sample IDs will be indicative of the parent sample ID. Examples are listed below:

<u>Sample Location:</u>	<u>Sample ID:</u>
Monitoring Well G6M-13-02X	G6M-13-02X_SPR17

Blind Duplicate from Monitoring Well G6M-13-02X AOC50-Dup1

4.4.2 Quality Assurance/Quality Control Samples

During each sampling event field quality assurance (QA)/quality control (QC) samples shall be collected in accordance with the project quality assurance project plan (QAPP). All field QA/QC samples shall be preserved, shipped, and analyzed with the other samples from the sampling event. A summary of required field QA/QC samples is presented below:

Field Duplicate Samples

Field duplicate samples shall be taken immediately following the preparation of the field sample collected from the sampling location. Field duplicate samples shall be prepared in the same way as the field samples and shall be identified as a duplicate on the sample container label. The specific sampling location of field duplicate samples shall be selected using a biased method. Field duplicate samples will be collected at a frequency of 1 per 10 field samples.

Trip Blank

Trip blanks will be submitted to the laboratory in conjunction with VOC samples. Trip blanks are used to identify the potential for contamination associated with sample shipment, containers, and storage to affect the samples in a shipment. Trip blanks will be provided by the laboratory by filling preserved volatile organic analyte (VOA) vials with American Society for Testing and Materials (ASTM) Type II water. A set of trip blanks will be included in each cooler containing samples for VOC analysis and returned to the laboratory with the environmental samples.

Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples shall be taken immediately following the preparation of the regular sample collected from the sampling location. The MS/MSD samples shall be prepared and identified on the sample container label in the same manner as the regular sample and noted on the Chain of Custody. A MS/MSD sample set is to be collected for every 20 regular field samples collected. The specific sampling location of MS/MSD samples shall be selected at random.

Rinseate Blanks

Sampling methods may include the use of both dedicated and non-dedicated sampling equipment. Therefore, some gauging or sampling equipment may be used in more than one well and will require decontamination between uses. In these cases, rinseate blanks will be prepared and submitted for analysis to determine the potential for cross-contamination from the sampling equipment. Rinseate blanks will be prepared at a frequency of one per AOC per LTM event. Rinseate blanks are prepared by decontaminating the field equipment according to the procedure specified in Section 4.5.4, followed by pumping deionized water through the submersible pump and capturing the rinseate water in a sample bottle.

4.5 Post-Sampling Activities

4.5.1 Total Well Depth Measurement

The total depth in each well will be measured and recorded following the collection of groundwater samples. Water level data will be recorded on a Monitoring Well Sampling Log Form (**Appendix A**). The total depth measurements will be used to evaluate potential well screen failure or the need for well development. The water level probe end and tape will be decontaminated before use in the first well, between each well, between sample locations, and at the conclusion of sampling activities in accordance with established procedures.

4.5.2 Chain of Custody

Sample custody will be maintained at all times. A sample is considered to be in custody under the following situations:

- The sample is directly in your possession;
- The sample is clearly in your view;
- The sample is placed in a locked location; or
- The sample is in a designated secure area.

Documentation of the chain of custody of the samples is necessary to demonstrate that the integrity of the samples has not been compromised between collection and delivery to the laboratory. A chain of custody record is necessary to document the transfer of custody from the field to the laboratory will accompany each sample cooler. All information requested in the chain of custody record will be completed. If samples are shipped by an overnight courier, the air bill number assigned by the overnight courier will be listed on the chain of custody record or the general logbook. One copy of the custody form will be retained by the samplers and placed in the project records file. The remaining pages will be sealed in a plastic bag and placed inside the cooler. Adhesive custody seals will be used to demonstrate that the samples and coolers have not been tampered with during shipment. The seals will be initialed and dated by field personnel and will be placed across the cooler lids in such a manner that they will be visibly disturbed upon opening of the cooler.

Upon receipt at the laboratory, the chain of custody forms will be completed and a cooler receipt form will be completed. It is the responsibility of the laboratory to document the condition of custody seals and sample integrity upon receipt.

4.5.3 Sample Delivery/Shipment to Laboratory

Sample containers will be placed inside sealed plastic bags as a precaution against cross-contamination caused by leakage or breakage. Bagged sample containers will be placed in insulated coolers with bubble wrap or other wrapping to eliminate the chance of breakage during delivery or shipment. Ice in plastic bags will be placed in the coolers to keep the samples between 2 and 6 ºC throughout storage and shipment.

Sample delivery or shipment will be performed in strict accordance with all applicable U.S. Department of Transportation regulations. The samples will be transported from the site to the laboratory by laboratory personnel or shipped to the laboratory by an overnight courier service. Arrangements will be made between the team and the contract laboratory point-of-contact for samples that are to be delivered to a laboratory on a weekend so that holding times and cooler temperatures are not compromised.

4.5.4 Equipment Decontamination

All non-dedicated sampling equipment must be properly decontaminated prior to sample collection, between sampling locations, and following a sampling event. Decontamination of non-dedicated equipment is necessary to prevent cross-contamination between samples. Equipment such as pumps, water level meters, water quality meters, and miscellaneous tools and equipment which contact the sample will be decontaminated. Decontamination will occur between individual sampling locations. If chemicals (i.e., nitric acid or methanol) are used for decontamination, they will be collected and properly containerized for off-site disposal at an approved facility.

4.5.5 Investigation-Derived Waste

The low-flow sampling methodology outlined above will significantly limit the volume of purge water generated during sampling. Purge water will be containerized at the wellhead of each well and will be returned to the ground at the point of collection, consistent with USEPA and Massachusetts Department of Environmental Protection (MassDEP) requirements. Decontamination fluids containing methanol or nitric acid will be containerized, labeled, sealed with a custody seal, and removed for disposal per applicable hazardous and/or non-hazardous waste generation procedures.

4.5.6 Data Validation

Data validation is a process in which analytical data generated by the laboratory is evaluated against a specific set of requirements and criteria, and appropriate qualifications are applied, if necessary, according to the usability and limitations of the data. Validation examines the analytical data from four perspectives, as follows:

- Technical requirements;
- Contractual requirements;
- Determination of compliance; and
- Determination and action of how to define the usability or qualify the data.

Level II validation procedures will be performed by applying, where appropriate, the acceptance criteria presented in the most current *Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories* (DoD, 2017), the *Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses* (EPA Region I, 1996a, 1996b, 2004, and 2008). The data will be evaluated for compliance to method guidelines and the following criteria, as appropriate:

- Adherence to specified holding times and sample preservation conditions;
- Detected constituents in the field and laboratory method blanks;
- Surrogate recoveries;
- Laboratory control sample (LCS/LCSD) duplicate precision and accuracy;
- MS/MSD precision and accuracy; and
- Field duplicate precision.

The Project Chemist will review all final validation of the project data for compliance with the method-specific quality assurance/quality control guidelines for precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS).

Data validation will be performed for each SDG from each sampling event using the Automated Data Review (ADR) software along with a Chemist review of the ADR results. The laboratory will produce SEDD Stage 2a data deliverables, consistent with DOD QSM valid values that have been screened against the ADR project electronic QAPP provided by KGS. The laboratory will provide KGS with error-free SEDD Stage 2a deliverables (.xml file with warning log files). The KGS project chemist will process the SEDD files through the ADR and prepare a data validation report incorporating the ADR report output. The ADR output will be adjusted by the Project Chemist based on professional judgment to complete the validation process. The ADR EDD files generated by the ADR will be compiled and submitted to the USACE Project Chemist.

4.6 Field Documentation

4.6.1 Field Logbooks

During site activities, field logbooks will be maintained to record information related to site activities, health and safety, level of protection worn and any upgrades, visitors to the site, sampling activities/locations and observations. Field logbooks will be bound volumes with sequentially numbered pages. No pages will be removed from the logbooks for any reason. If corrections are necessary, they will be made by drawing a single line through the original entry (so that original entry can still be read) and writing the corrected entry alongside it. The correction will be initialed and dated. Information to be recorded, if appropriate, will include, but is not limited to, the following:

- Project name and number,
- Arrival and departure times,
- Personnel on site and their affiliation,
- Date and time,
- Weather conditions,
- Site activities,
- Names and affiliations of visitors,
- Sample location (including field sketches, if appropriate),
- Location ID
- Field Sample ID number,
- Sample time,
- Field Measurements,
- Sampling equipment used,
- Analyses requested,
- Sample preservation,
- Associated QC samples,
- Sample Documentation,
- Decontamination procedures,
- Field observations,
- Photographic records,
- Other project specific information, and
- Changes or deviations to the project scope or the procedures specified in this LTMMP.

All entries will be in ink with any corrections crossed out with a single line, initialed and dated. Each page of the logbook will be signed and dated at the bottom by each individual making an entry. The logbooks will be marked with the project number and the sequential number of the logbook (i.e., Logbook #1, #2, etc.) using indelible, waterproof ink. At the completion of field activities, the logbooks will be maintained in the project files.

4.6.2 Groundwater Sample Collection Sheets

Indelible water proof ink will be used to record data and observations on Groundwater Sample Collection Logs, which will be maintained by sampling personnel to supplement the field logbook. An example of the monitoring well sampling log to be used is provided in **Appendix A**. Copies of the groundwater sample collection logs will be maintained in the project files.

4.6.3 Photographic Documentation

Photographs may be obtained during LTM events only if site conditions change or new sample locations added. Digital images will be downloaded from the digital media to the digital project files.

4.6.4 Project File

Project files will be maintained at KGS's Westborough, Massachusetts office and, after completion of field and analytical work, will include a minimum of the following project records:

- Project plans and specifications, if any,
- Field logbooks and data records,
- Photographs, maps, and drawings,
- Sample identification documents,
- Chain of custody records (copies),
- Analytical data package from the laboratory, including QC documentation,
- Data review report,
- Report notes and calculations,
- Progress and technical reports,
- Correspondence and other pertinent information, and
- Authorizations (e.g., property access, well installation forms, etc.).

4.6.5 Reporting

The reporting for the long-term monitoring is scheduled on an annual basis. Annual Reports will be submitted to the USACE, USEPA, and MassDEP. The Annual Report will include a description of site activities, an evaluation and summary of the semiannual and annual groundwater sampling results, an assessment of the groundwater elevation data, a summary of the ERD injections, identification of any issues or problems encountered, and progress of the remediation

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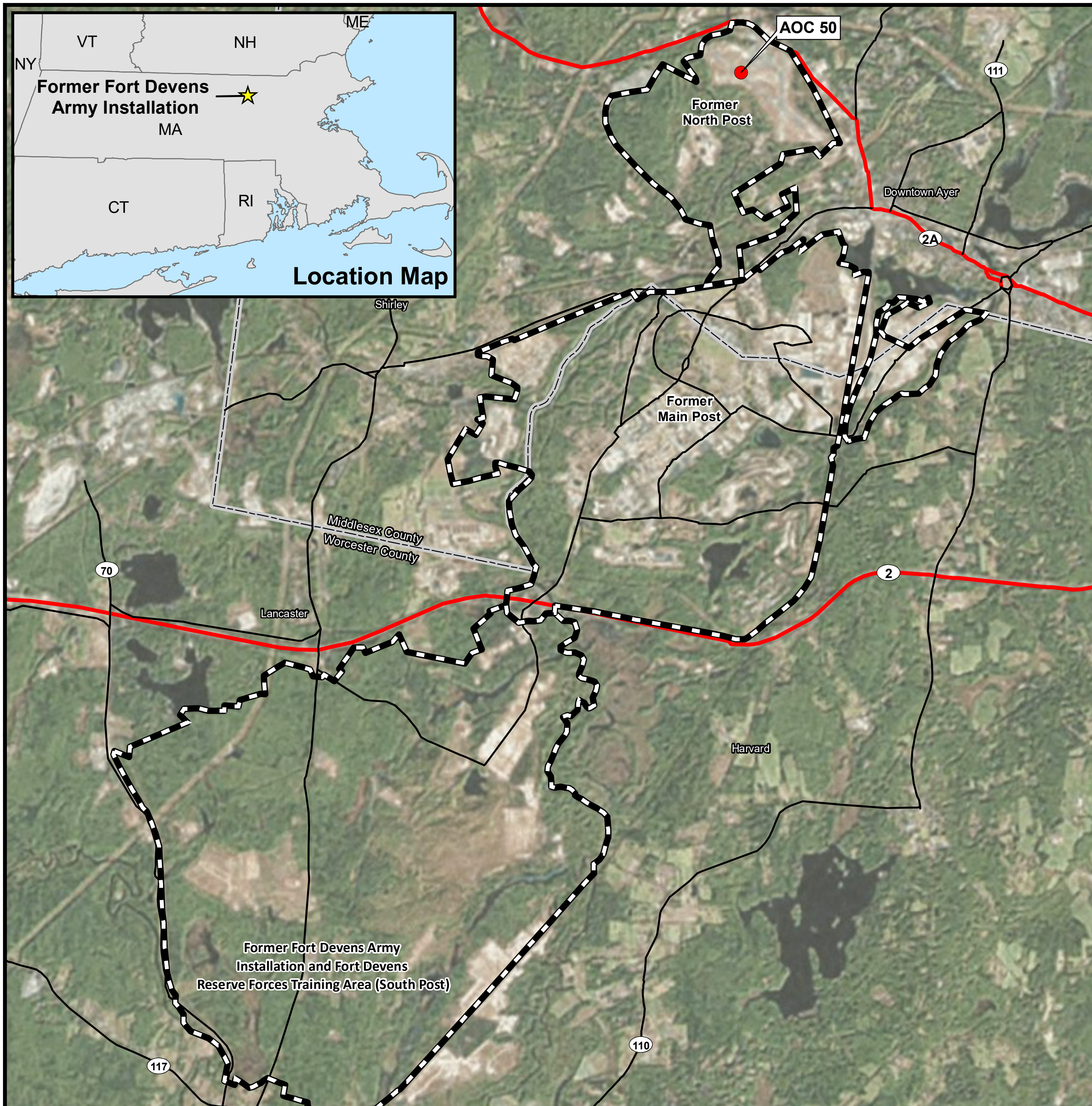
FIGURES



Legend

- Area of Contamination (AOC)
- Highway
- Major Road
- County Line
- Former Fort Devens Boundary

N W E S

Aerial Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 1
AOC 50 Site Location

2017 LTMMP
AOC 50

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

0 0.5 1
Miles

Date:
10/13/2017

Figure
1

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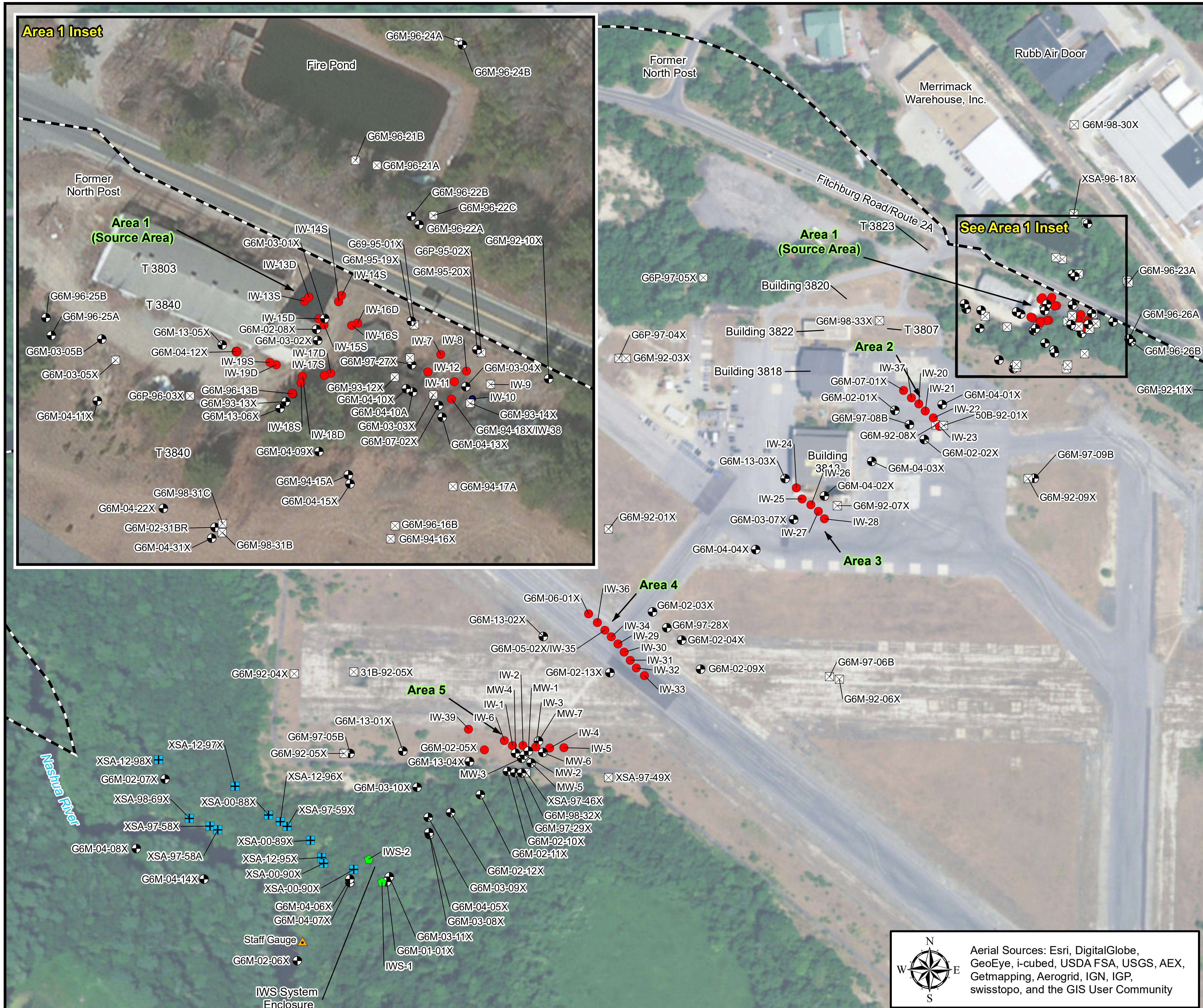

Figure 2
Site Layout
AOC 50

Legend

- Monitoring Well
- Injection Well
- MicroWell
- Monitoring Well - Destroyed/Abandoned
- In-Well Stripping System Well
- Staff Gauge
- G6M-92-11X Well/Gauge/Piezometer Identification
- Former Fort Devens Boundary

Notes:
IWS = In-well stripping
LTM = Long-term monitoring

2017 LTMMP
AOC 50

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

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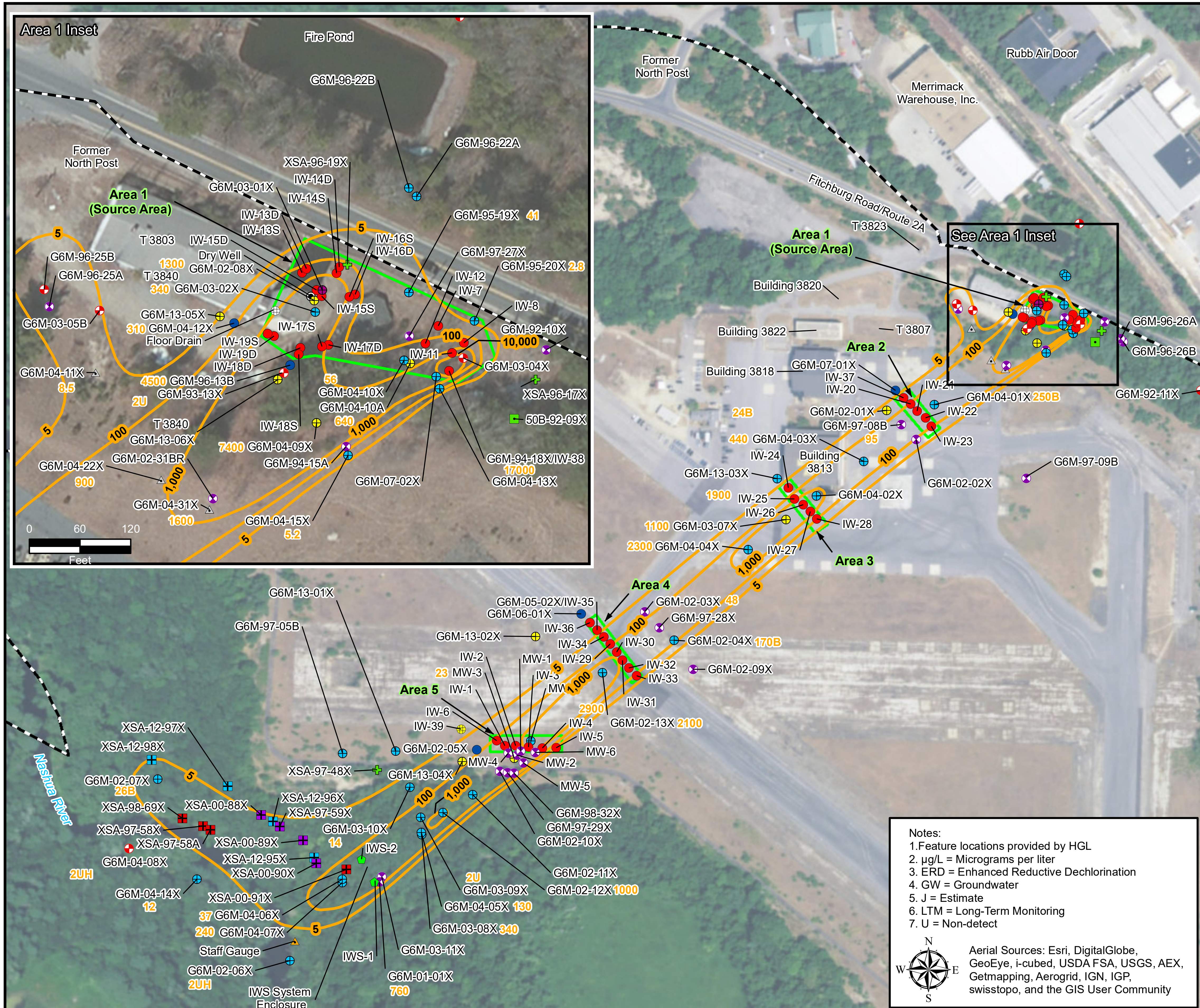
Feet

Date: 10/13/2017

Figure 2

File: LTMMP2017_AOC50_SiteLayout.mxd

Figure 3
Tetrachloroethene Concentration in Groundwater, 2004, AOC 50



Notes:
1. Feature locations provided by HGL
2. µg/L = Micrograms per liter
3. ERD = Enhanced Reductive Dechlorination
4. GW = Groundwater
5. J = Estimate
6. LTM = Long-Term Monitoring
7. U = Non-detect

Aerial Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- ERD LTM Well - Sampled Semi-Annually
- ERD LTM Well - Sampled Annually
- ERD LTM Well - Sampled Biennially
- ERD LTM Well - Sampled Every 3 Years
- LTM Well - Gauge Only
- Monitoring Well
- Monitoring Well Converted to Injection Well
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- 5 Tetrachloroethene Contour (µg/L)
- 1.7 Tetrachloroethene Concentration (µg/L)
- Former Fort Devens Boundary
- ERD Injection Well Transect

2017 LTMMP
AOC 50

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Devens, Massachusetts

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0 150 300
Feet

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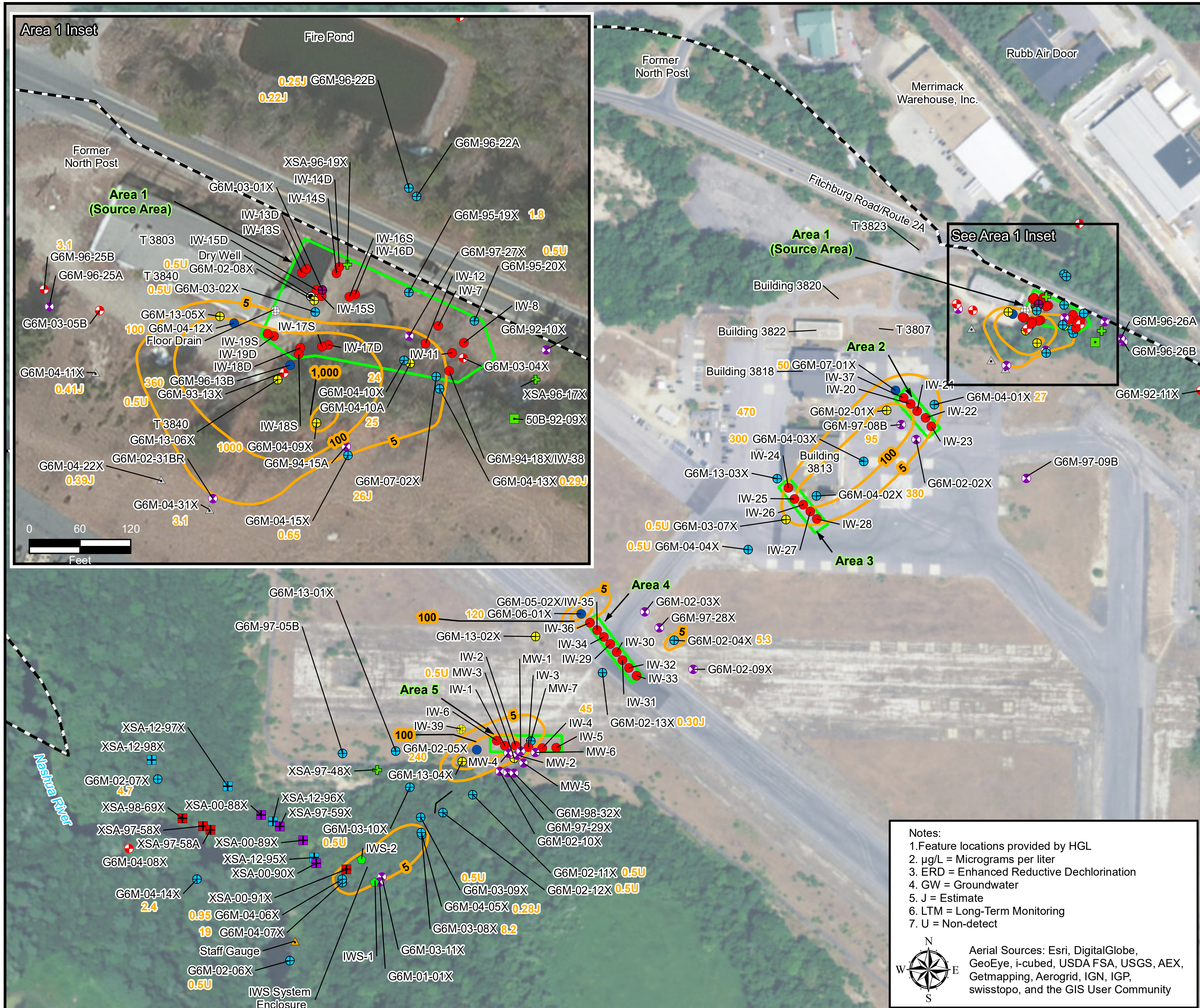
Figure 3

KGS

File: LTMMP2017_AOC50_PCE_2004.mxd

Figure 4
Tetrachloroethene Concentration in Groundwater, 2010, AOC 50



Notes:
1. Feature locations provided by HGL
2. µg/L = Micrograms per liter
3. ERD = Enhanced Reductive Dechlorination
4. GW = Groundwater
5. J = Estimate
6. LTM = Long-Term Monitoring
7. U = Non-detect

Aerial Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- ERD LTM Well - Sampled Semi-Annually
- ERD LTM Well - Sampled Annually
- ERD LTM Well - Sampled Biennially
- ERD LTM Well - Sampled Every 3 Years
- LTM Well - Gauge Only
- Monitoring Well
- Monitoring Well Converted to Injection Well
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- Tetrachloroethene Contour (µg/L)
- 1.7 Tetrachloroethene Concentration (µg/L)
- Former Fort Devens Boundary
- ERD Injection Well Transect

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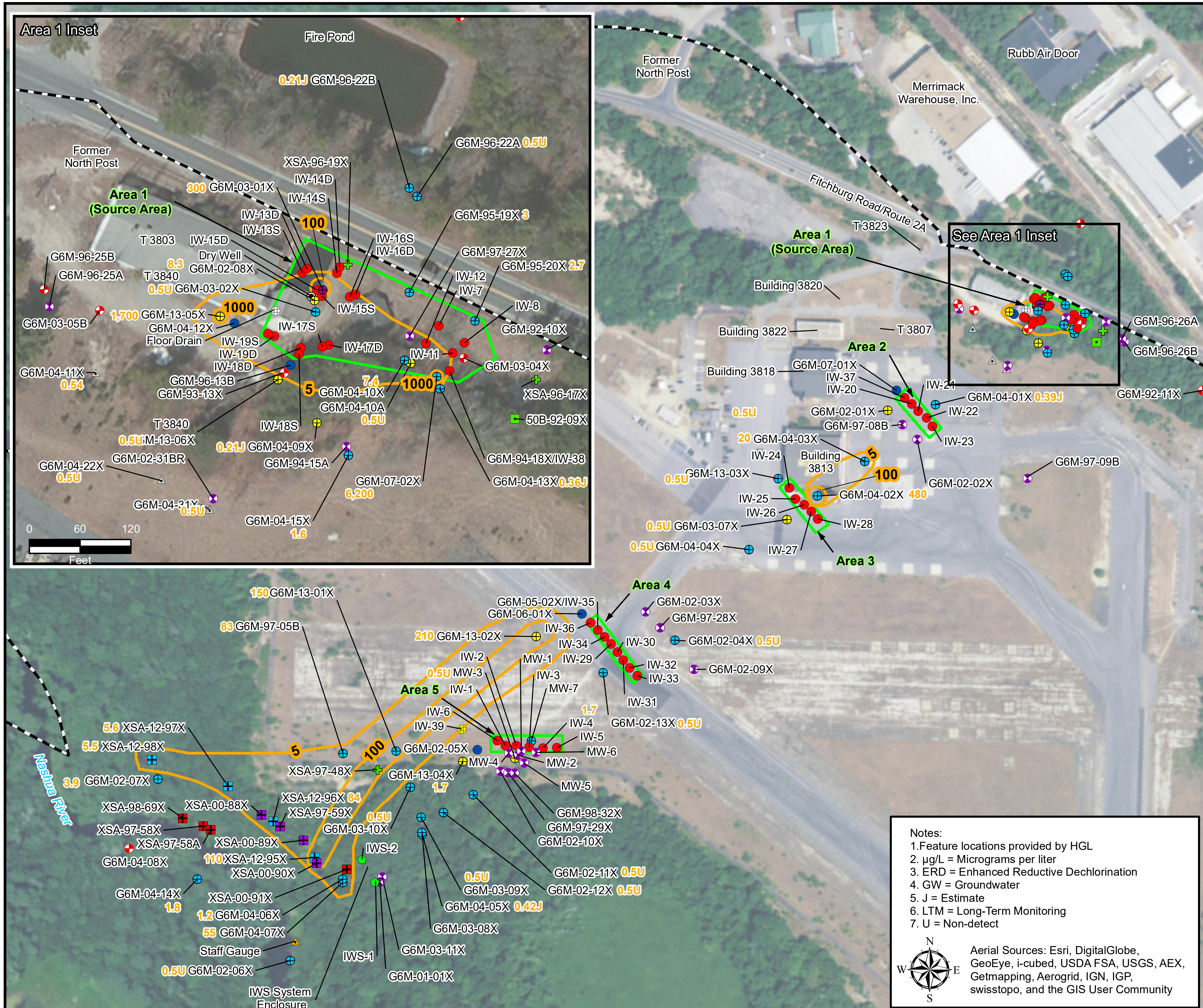
0 150 300
Feet

Date: 10/13/2017

Figure 4

File: LTMMP2017_AOC50_PCE_2010.mxd

Figure 5
Tetrachloroethene Concentration in Groundwater, 2014, AOC 50



Notes:
1. Feature locations provided by HGL
2. µg/L = Micrograms per liter
3. ERD = Enhanced Reductive Dechlorination
4. GW = Groundwater
5. J = Estimate
6. LTM = Long-Term Monitoring
7. U = Non-detect

Aerial Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- ERD LTM Well - Sampled Semi-Annually
- ERD LTM Well - Sampled Annually
- ERD LTM Well - Sampled Biennially
- ERD LTM Well - Sampled Every 3 Years
- LTM Well - Gauge Only
- Monitoring Well
- Monitoring Well Converted to Injection Well
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- 1.7 Tetrachloroethene Concentration (µg/L)
- 5 Tetrachloroethene Contour (µg/L) Selection
- Former Fort Devens Boundary
- ERD Injection Well Transect

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0 150 300
Feet

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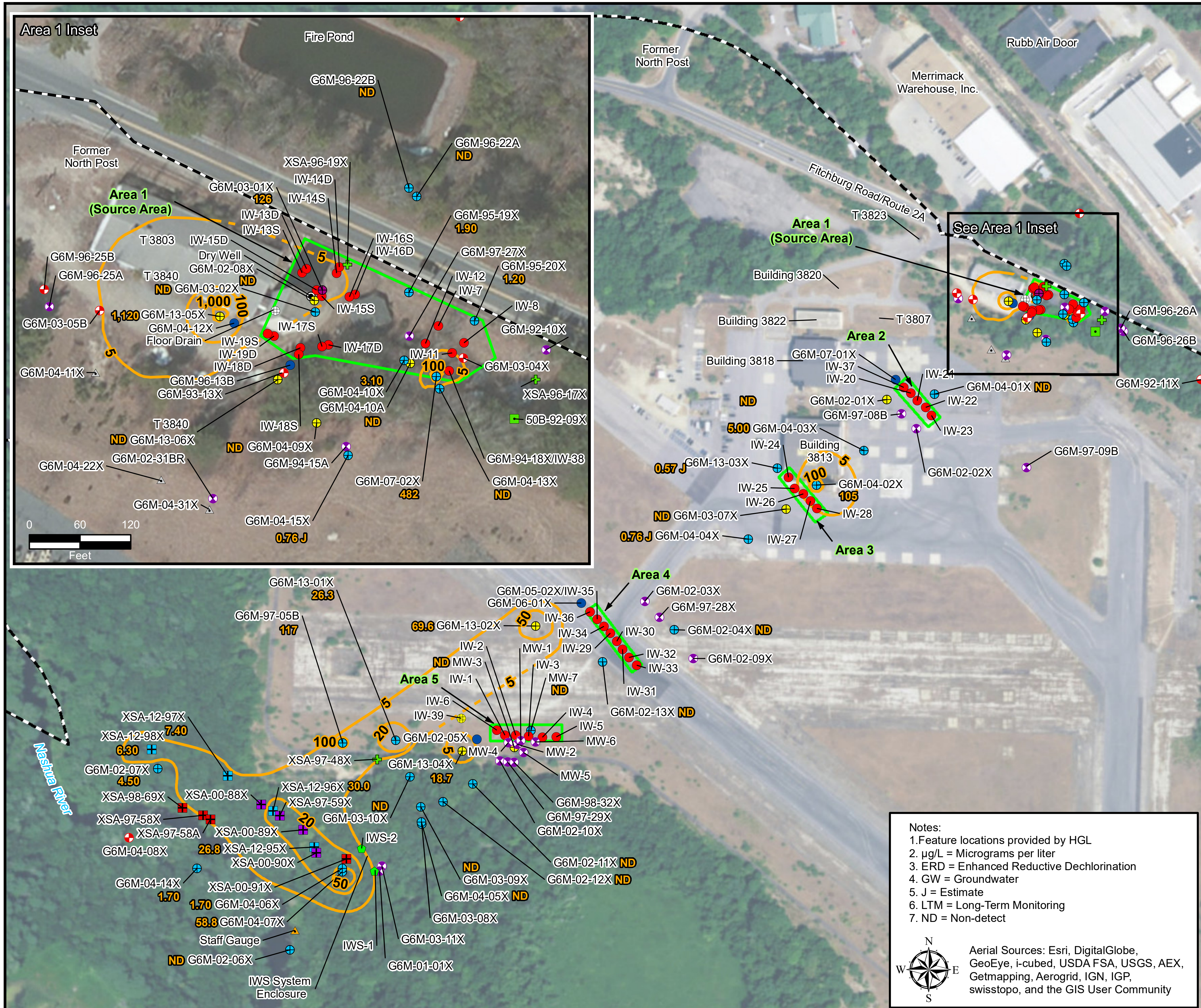
Figure 5

KGS

File: LTMMP2017_AOC50_PCE_2014.mxd

Figure 6
Tetrachloroethene Concentrations in Groundwater, 2015, AOC 50



Legend

- ERD LTM Well - Sampled Semi-Annually
- ERD LTM Well - Sampled Annually
- ERD LTM Well - Sampled Biennially
- ERD LTM Well - Sampled Every 3 Years
- LTM Well - Gauge Only
- Monitoring Well
- Monitoring Well Converted to Injection Well
- In-Well Stripping System Well
- MicroWell® Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- 5 Tetrachloroethene Contour (µg/L)
- Inferred Tetrachloroethene Contour (µg/L)
- 69.6 Tetrachloroethene Concentration (µg/L)
- Former Fort Devens Boundary
- ERD Injection Well Transect

Notes:
1. Feature locations provided by HGL
2. µg/L = Micrograms per liter
3. ERD = Enhanced Reductive Dechlorination
4. GW = Groundwater
5. J = Estimate
6. LTM = Long-Term Monitoring
7. ND = Non-detect

N W E S

Aerial Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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0 150 300
Feet

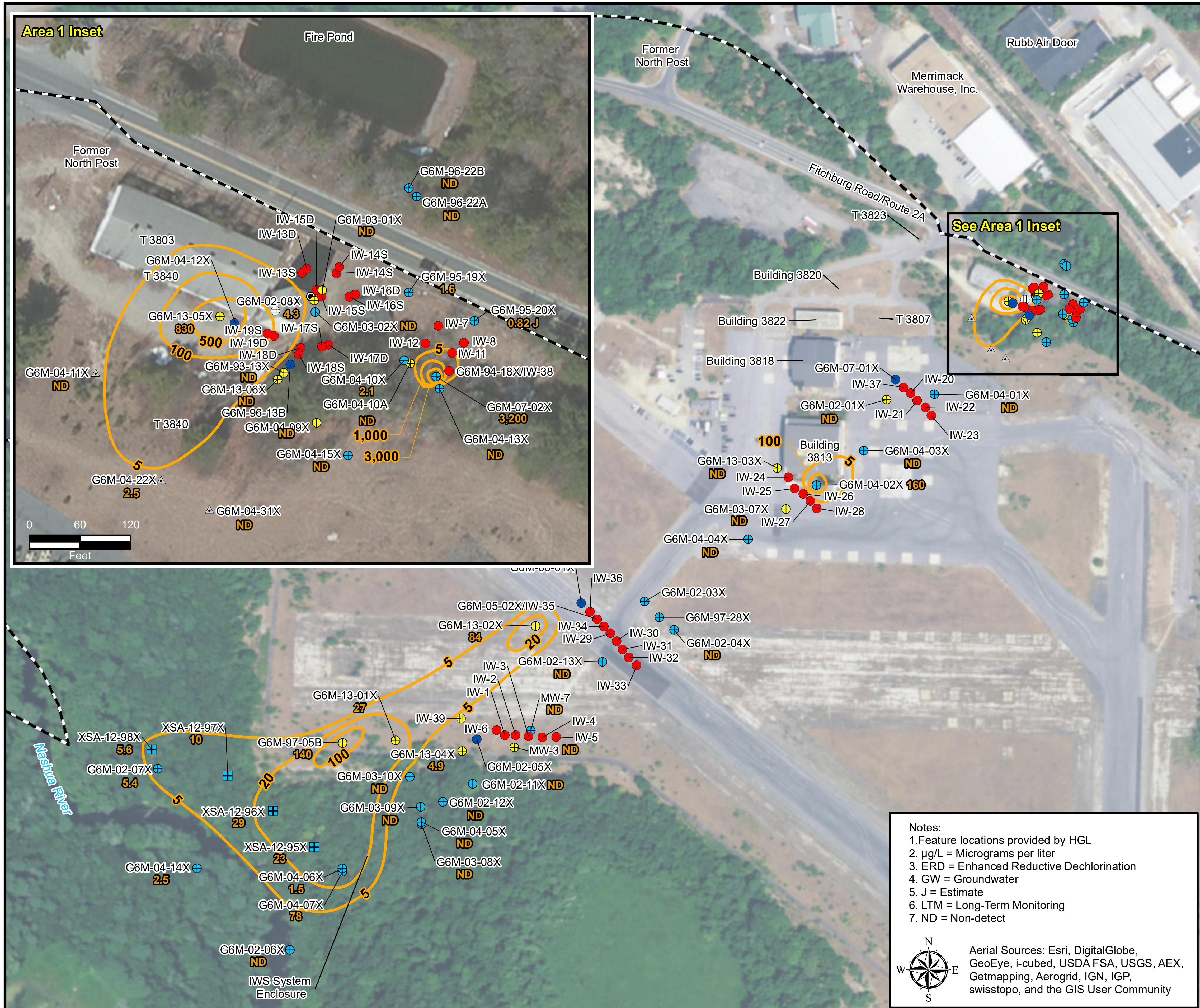
Date: 10/13/2017

Figure 6

KGS

File: LTMMP2017_AOC50_PCE_Oct2015.mxd

Figure 7
Tetrachloroethene Concentration in Groundwater, 2016, AOC 50



Notes:
1. Feature locations provided by HGL
2. μg/L = Micrograms per liter
3. ERD = Enhanced Reductive Dechlorination
4. GW = Groundwater
5. J = Estimate
6. LTM = Long-Term Monitoring
7. ND = Non-detect

Aerial Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- ERD LTM Well - Sampled Semi-Annually
- ERD LTM Well - Sampled Annually
- ERD LTM Well - Sampled Biennially
- Monitoring Well Converted to Injection Well
- MicroWell - Sampled Annually
- Injection Well
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- 5 Interpretive Tetrachloroethene (PCE) Contour (μg/L)
- 160 Tetrachloroethene (PCE) Concentration (μg/L)
- Former Fort Devens Boundary

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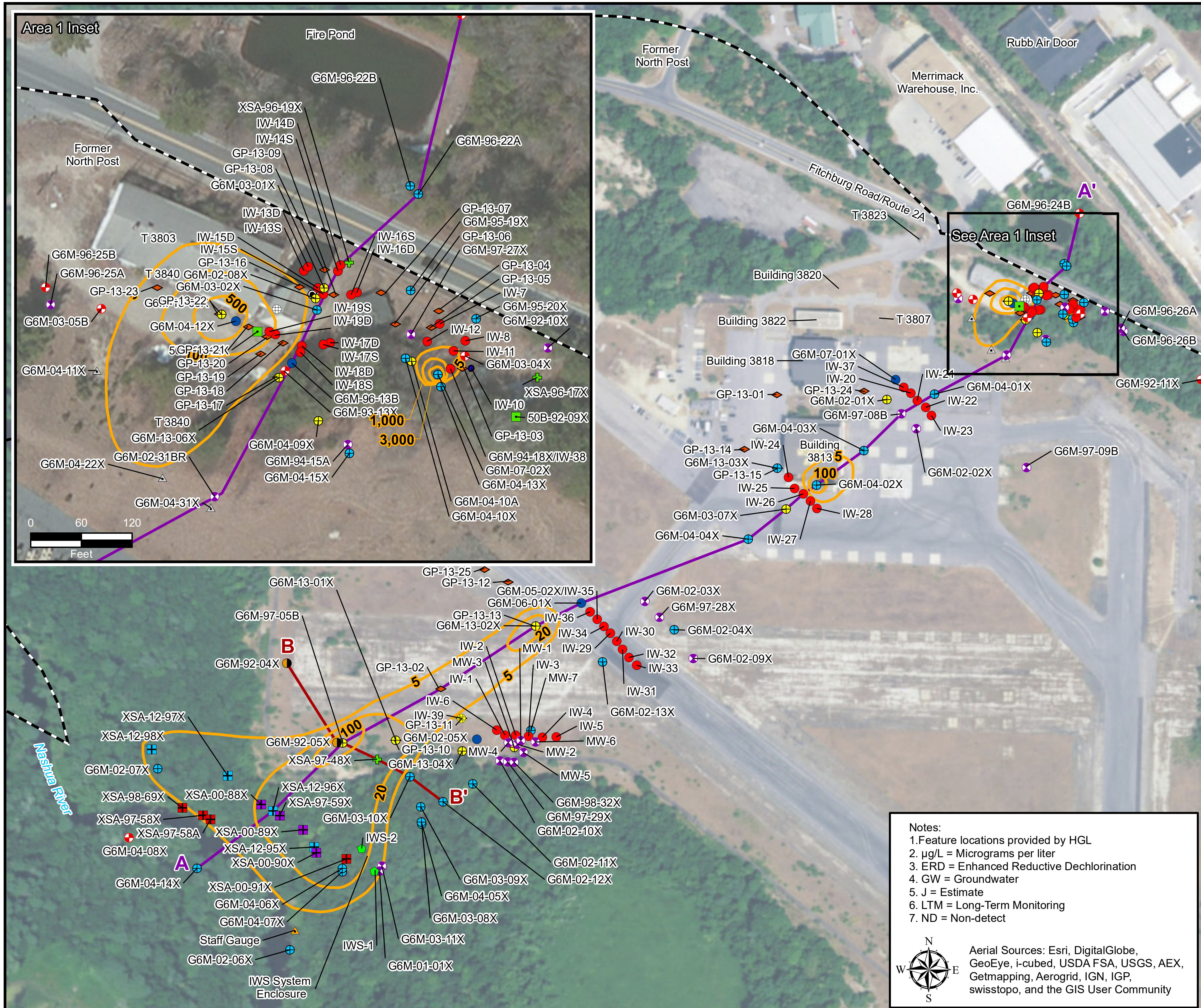
0 150 300 Feet	Date: 10/13/2017	Figure 7	KGS

File: LTMMP2017_AOC50_PCE_Nov2016.mxd

Figure 8
Cross-Section Plan View
AOC 50



Legend

- ERD LTM Well - Sampled Semi-Annually
- ERD LTM Well - Sampled Annually
- ERD LTM Well - Sampled Biennially
- Abandoned Well
- Historic Soil Boring
- Historic Vertical Groundwater Profiling Location
- In-Well Stripping System Well
- Injection Well
- Injection Well Installed 01/2014
- LTM Well - Gauge Only
- MicroWell
- MicroWell - Gauge Only
- MicroWell - Sampled Annually
- Monitoring Well
- Monitoring Well Converted to Injection Well
- Staff Gauge
- Vertical Groundwater Profiling Location
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- 5 Interpretive Tetrachloroethene (PCE) Contour (µg/L) - (November 2016)
- Cross-Section A-A'
- Cross-Section B-B'
- Former Fort Devens Boundary

Notes:
1. Feature locations provided by HGL
2. µg/L = Micrograms per liter
3. ERD = Enhanced Reductive Dechlorination
4. GW = Groundwater
5. J = Estimate
6. LTM = Long-Term Monitoring
7. ND = Non-detect

Aerial Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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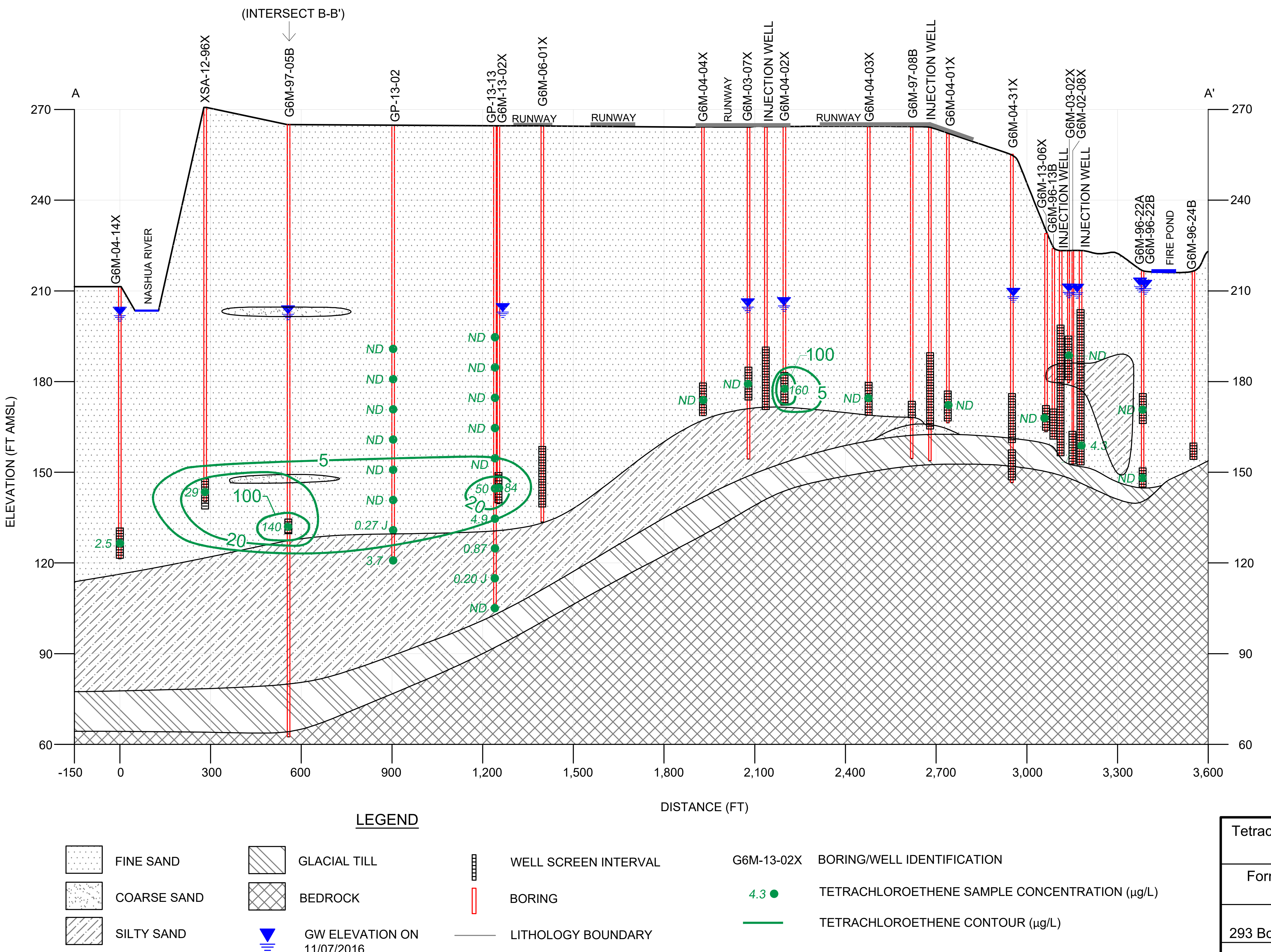
0 150 300
Feet

Date: 10/13/2017

Figure 8

KGS

File: LTMMP2017_AOC50_XSectLoc.mxd



NOTES:

FT = FEET
FT AMSL = FEET ABOVE MEAN SEA LEVEL
J = THE ANALYTE WAS DETECTED AT THE REPORTED CONCENTRATION; THE QUANTITATION IS AN ESTIMATE
µg/L = MICROGRAMS PER LITER

ND = NON-DETECT

GROUNDWATER PROFILING RESULTS AT GP-13-02 AND GP-13-13 WERE FROM 2013.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

CROSS SECTION FEATURES INCLUDING WELL LOCATIONS, SCREEN LOCATION AND LITHOLOGY FOR THE EASTERN PORTION OF THE CROSS-SECTION (G6M-04-04X TO G6M-96-24) BASED ON "FIGURE 4.10 TETRACHLOROETHENE PLUME IN GROUNDWATER (CROSS SECTION A-A') PRIOR TO ERD INJECTIONS" BY HGL ON 03/31/2014.

Tetrachloroethene Plume in Groundwater - Cross Section, A-A'
AOC 50, November 2016

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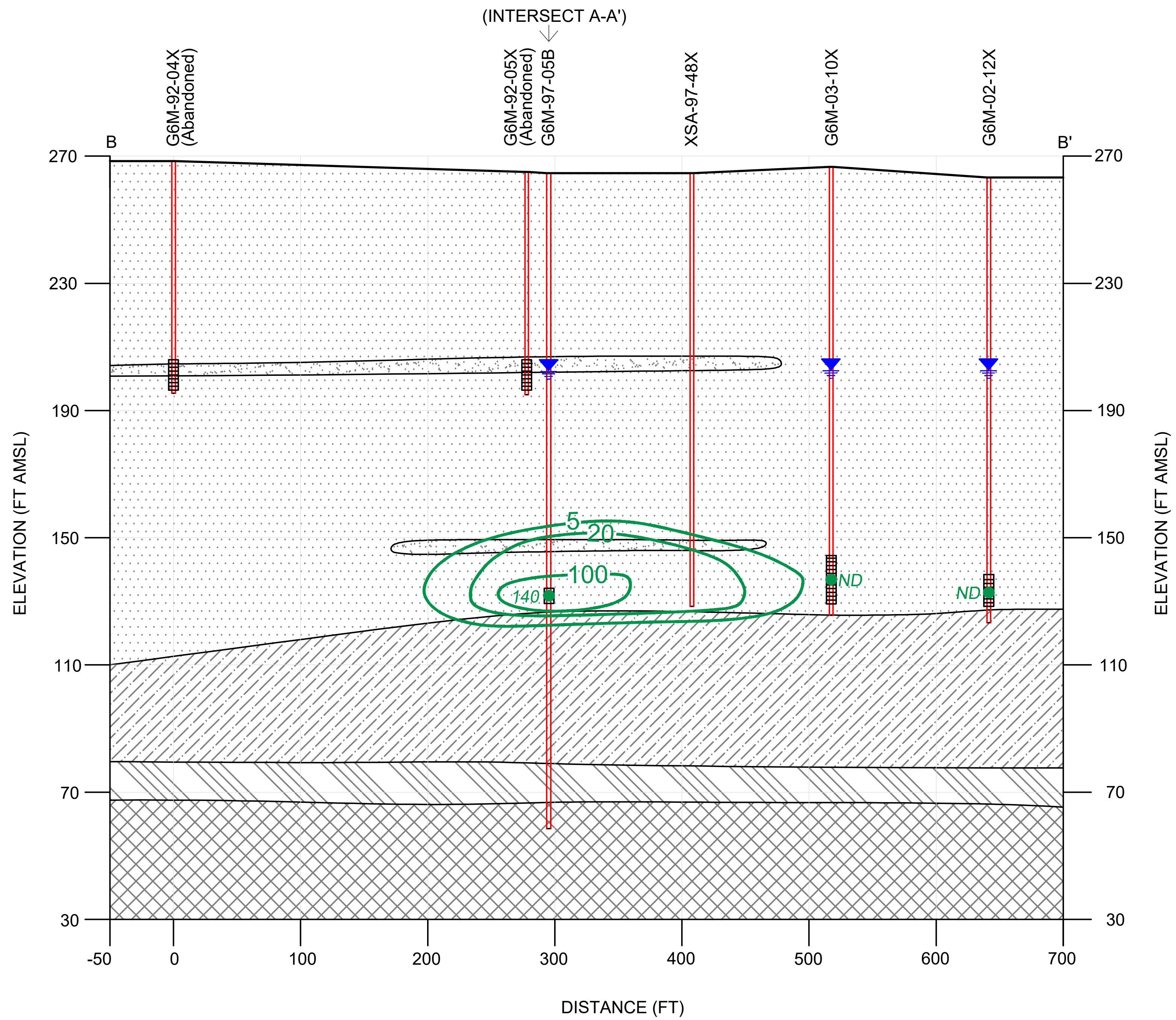
Date:	Figure
10/13/2017	9

File: LTMMP2017_AOC50_XSections.dwg Date: 10/13/2017



LEGEND

- FINE SAND
- COARSE SAND
- SILTY SAND
- GLACIAL TILL
- BEDROCK
- GW ELEVATION ON 11/07/2016
- WELL SCREEN INTERVAL
- BORING
- LITHOLOGY BOUNDARY
- G6M-03-10X — BORING/WELL IDENTIFICATION
- *140* ● — TETRACHLOROETHENE SAMPLE CONCENTRATION (µg/L)
- TETRACHLOROETHENE CONTOUR (µg/L)

NOTES:

FT = FEET
FT AMSL = FEET ABOVE MEAN SEA LEVEL
µg/L = MICROGRAMS PER LITER

ND = NON-DETECT

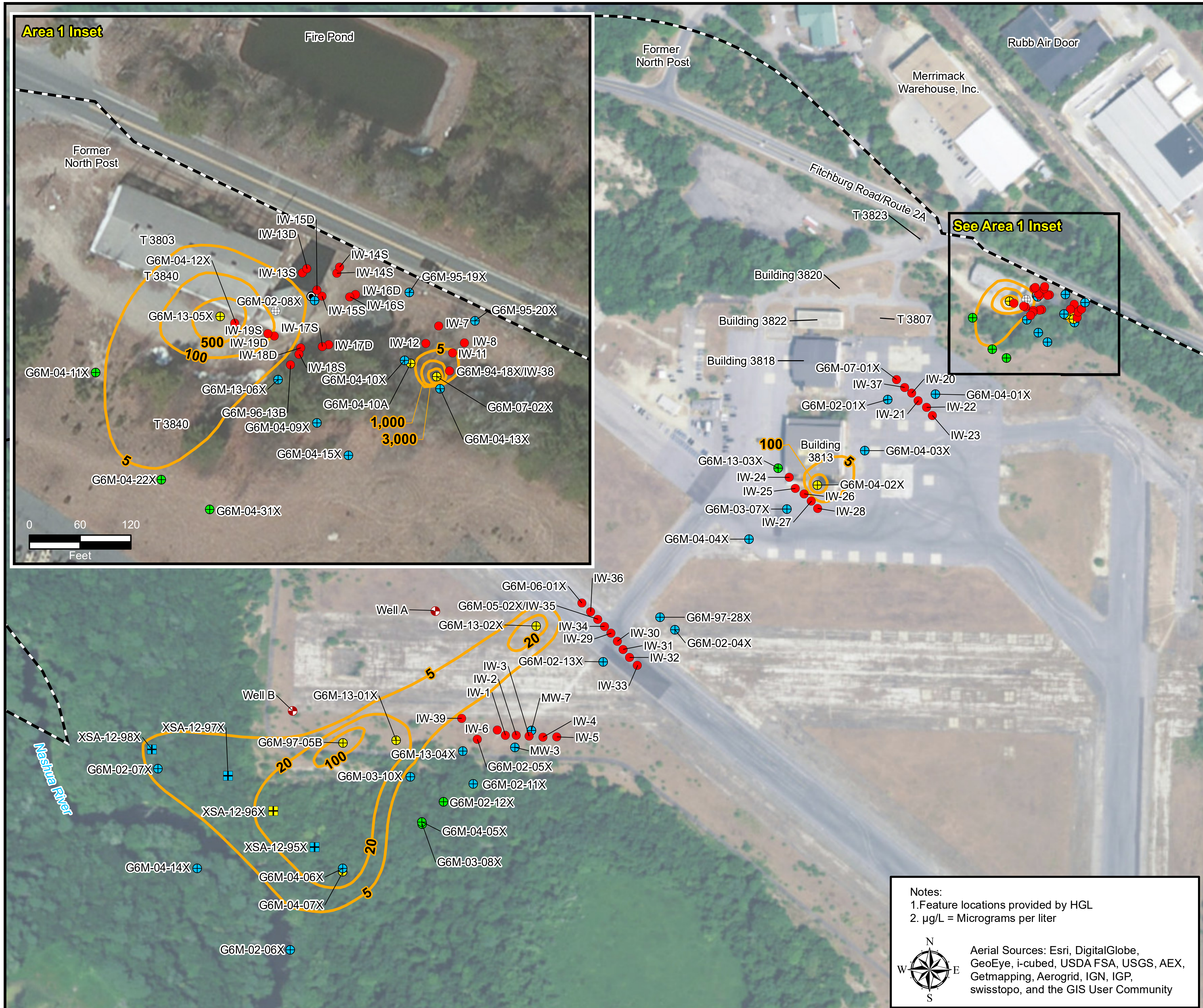
STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

CROSS SECTION FEATURES INCLUDING WELL LOCATIONS, SCREEN LOCATION AND LITHOLOGY AT G6M-92-04X, G6M-97-05B AND XSA-97-78X BASED ON "FIGURE 6 TETRACHLOROETHENE PLUME IN GROUNDWATER (CROSS SECTION C-C') OCTOBER 2013" BY HGL ON 03/31/2014.

Tetrachloroethene Plume in Groundwater - Cross Section, B-B' AOC 50, November 2016		
Former Fort Devens Army Installation and Sudbury Annex Devens, Massachusetts		
KOMAN Government Solutions, LLC 293 Boston Post Road West, Suite 100, Marlborough, MA 01752		
Date: 10/13/2017	Figure 10	KGS

File: L:\MMP2017_AOC50_XSections.dwg Date: 10/13/2017

Figure 11
Proposed Monitoring Network
AOC 50



Legend

- Proposed Monitoring Well
- Monitoring Well - Sampled Annually
- Monitoring Well - Sampled Semi-Annually
- Monitoring Well - Sampled Biennially
- MicroWell - Sampled Annually
- MicroWell - Sampled Semi-Annually
- Injection Well
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- 5 Interpretive Tetrachloroethene (PCE) Contour (μg/L) (November 2016)
- Former Fort Devens Boundary

2017 LTMMP
AOC 50

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Devens, Massachusetts

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	Date:	Figure	
0 150 300 Feet	10/16/2017	11	KGS

File: LTMMP2017_AOC50_PropMWNetwork.mxd

TABLES

Table 1
Injection Well Construction Details
AOC 50, Former Fort Devens Army Installation
Devens, MA

Area	Well ID	Soil Drilling Method	Media Screened	Well Construction Material	Completion Depth (ft bgs)	Well Screen Interval (ft bgs)	Well Screen Elevation (ft amsl)	Measuring Point Elevation[1] (ft amsl)
Area 5	IW-1	Hollow-Stem Auger	Soil	2" ID PVC	135	115-135	150-130	266.27
	IW-2	Hollow-Stem Auger	Soil	2" ID PVC	135	115-135	149.9-129.9	266.24
	IW-3	Hollow-Stem Auger	Soil	2" ID PVC	135	115-135	150-130	266.05
	IW-4	Hollow-Stem Auger	Soil	2" ID PVC	135	115-135	149.6-129.6	266.18
	IW-5	Hollow-Stem Auger	Soil	2" ID PVC	135	115-135	149-129	265.76
	IW-6	Hollow-Stem Auger	Soil	2" ID PVC	135	115-135	149.97-129.97	267.03
	G6M-02-05X	Hollow-Stem Auger	Soil	2" ID PVC	135	120-135	145.4-130.4	266.50
	IW-39	Rotosonic	Soil	2" ID PVC	145	125-145	142.24-122.24	267.24
Area 1	IW-38/G6M-94-18X	Drive & Wash	Soil	2" ID PVC	92	22.5-27.5	201.1-191.1	225.85
	G6M-04-12X	Hollow-Stem Auger	Soil	2" ID PVC	64	54-64	170.66-160.66	226.41
	IW-7	Hollow-Stem Auger	Soil	2" ID PVC	30	10-30	213.21-193.21	226.32
	IW-8	Hollow-Stem Auger	Soil	2" ID PVC	30	10-30	213.31-193.31	225.57
	IW-11	Hollow-Stem Auger	Soil	2" ID PVC	30	10-30	213.61-193.61	226.21
	IW-12	Hollow-Stem Auger	Soil	2" ID PVC	30	10-30	213.06-193.06	225.55
	IW-13s	Hollow-Stem Auger	Soil	2" ID PVC	46	21-46	202.91-177.91	226.09
	IW-13d	Hollow-Stem Auger	Soil	2" ID PVC	71	46.71	177.96-152.96	226.14
	IW-14s	Hollow-Stem Auger	Soil	2" ID PVC	43	18-43	205.46-180.46	225.78
	IW-14d	Hollow-Stem Auger	Soil	2" ID PVC	73	43-73	180.46-150.46	225.25
	IW-15s	Hollow-Stem Auger	Soil	2" ID PVC	44	19-44	204.36-179.36	225.58
	IW-15d	Hollow-Stem Auger	Soil	2" ID PVC	69	44-69	179.56-154.56	225.99
	IW-16s	Hollow-Stem Auger	Soil	2" ID PVC	43	18-43	205.46-180.46	225.50
	IW-16d	Hollow-Stem Auger	Soil	2" ID PVC	68	43-68	180.16-155.16	225.64
	IW-17s	Hollow-Stem Auger	Soil	2" ID PVC	42	17-42	206.26-181.26	225.98
	IW-17d	Hollow-Stem Auger	Soil	2" ID PVC	67	42-67	181.16-156.16	226.06
	IW-18s	Hollow-Stem Auger	Soil	2" ID PVC	41	16-41	207.76-182.76	226.06
	IW-18d	Hollow-Stem Auger	Soil	2" ID PVC	63	38-63	185.76-160.76	225.68
	IW-19s	Hollow-Stem Auger	Soil	2" ID PVC	41	16-41	208.06-183.06	226.26
	IW-19d	Hollow-Stem Auger	Soil	2" ID PVC	66	41-66	183.06-158.06	226.29
	G6M-96-13B	Drive & Wash	Soil	2" ID PVC	62.5	52.3-62.3	171.5-161.5	225.78

Table 1
Injection Well Construction Details
AOC 50, Former Fort Devens Army Installation
Devens, MA

Area	Well ID	Soil Drilling Method	Media Screened	Well Construction Material	Completion Depth (ft bgs)	Well Screen Interval (ft bgs)	Well Screen Elevation (ft amsl)	Measuring Point Elevation[1] (ft amsl)
Area 2	IW-20	Hollow-Stem Auger	Soil	2" ID PVC	97	77-97	186.15-166.15	263.05
	IW-21	Hollow-Stem Auger	Soil	2" ID PVC	92	72-92	191.16-171.16	262.97
	IW-22	Hollow-Stem Auger	Soil	2" ID PVC	91	71-91	192.1-172.1	262.87
	IW-23	Hollow-Stem Auger	Soil	2" ID PVC	96	76-96	187.37-167.37	263.16
	IW-37	Hollow-Stem Auger	Soil	2" ID PVC	99	79-99	Not surveyed	Not surveyed
	G6M-07-01X	Hollow-Stem Auger	Soil	2" ID PVC	99	78-98	184.9-164.9	262.9
Area 3	IW-24	Hollow-Stem Auger	Soil	2" ID PVC	90	70-90	195.19-175.19	267.37
	IW-25	Hollow-Stem Auger	Soil	2" ID PVC	90	70-90	194.95-174.95	267.08
	IW-26	Hollow-Stem Auger	Soil	2" ID PVC	90	70-90	194.58-174.58	264.37
	IW-27	Hollow-Stem Auger	Soil	2" ID PVC	90	70-90	194.1-174.1	263.88
	IW-28	Hollow-Stem Auger	Soil	2" ID PVC	90	70-90	193.61-173.61	263.02
Area 4	IW-29	Hollow-Stem Auger	Soil	2" ID PVC	125	105-125	160.02-140.02	264.63
	IW-30	Hollow-Stem Auger	Soil	2" ID PVC	125	105-125	160-140	264.77
	IW-31	Hollow-Stem Auger	Soil	2" ID PVC	120	100-120	164.93-144.93	264.71
	IW-32	Hollow-Stem Auger	Soil	2" ID PVC	115	95-115	169.77-149.77	264.64
	IW-33	Hollow-Stem Auger	Soil	2" ID PVC	115	95-115	169.74-149.74	264.61
	IW-34	Drive & Wash	Soil	2" ID PVC	124	104-124	Not surveyed	Not surveyed
	IW-35/G6M-05-02X	Drive & Wash	Soil	2" ID PVC	129	109-129	Not surveyed	Not surveyed
	IW-36	Drive & Wash	Soil	2" ID PVC	131	106-126	Not surveyed	Not surveyed
	G6M-06-01X	Drive & Wash	Soil	2" ID PVC	131	106-126	158.54-138.54	264.54
	IW-9	Hollow-Stem Auger	Soil	2" ID PVC	32	12-32	211.06-191.06	Abandoned 2012
	IW-10	Hollow-Stem Auger	Soil	2" ID PVC	30	10-30	213.51-193.51	Abandoned 2012

Notes:

[1] Reference point is top of riser

amsl - above mean sea level   ft - feet
bgs - below ground surface   PVC - poly vinyl chloride

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
North Plume	G6M-96-22A	10/16/2001	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.50	5.1	210	2	0	15.95
North Plume	G6M-96-22A	2/28/2002	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	0.10U	-	-	5.70	8.37	183.5	1.78	0.5	12.41
North Plume	G6M-96-22A	9/21/2004	2U	2U	2U	2U	1U	2U	-	-	-	5U	1U	54	-	-	-	-	-	5.75	6.73	187.9	1.885	1.59	11.59
North Plume	G6M-96-22A	9/29/2005	2U	2U	2U	2U	1U	2U	-	-	-	5U	1U	52	-	-	-	-	-	5.95	4.9	223.1	3.18	0.38	10.75
North Plume	G6M-96-22A	9/20/2006	2U	2U	2U	2U	1U	2U	-	-	-	5U	0.10U	42	-	-	-	-	-	5.68	4.78	176.3	1.814	1.85	11.03
North Plume	G6M-96-22A	9/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	6U	0.1U	78	-	-	-	-	-	5.50	6.95	-101.1	1.404	5.0	12.38
North Plume	G6M-96-22A	10/17/2008	0.55	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	8U	0.2U	2,240	-	-	-	-	-	5.57	1.41	123.8	1.378	1.8	10.07
North Plume	G6M-96-22A	10/16/2009	0.25J	29	0.27J	0.5U	0.5U	0.5U	-	-	-	8U	0.2U	7,120	-	-	-	-	-	5.91	0.25	228.5	2.288	0	11.31
North Plume	G6M-96-22A	10/7/2010	0.22J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	7,670	-	-	-	-	-	5.72	0.21	141.2	3.623	0	9.31
North Plume	G6M-96-22A	10/7/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	6,860	-	-	-	-	-	5.6	0.18	59.9	2.144	0	10.13
North Plume	G6M-96-22A	10/15/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	12,400	-	-	-	-	-	5.82	0.36	110.5	2.915	0	14.55
North Plume	G6M-96-22A	10/18/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	6,010	-	-	-	-	-	6.05	0.58	177.1	1.524	0	11.1
North Plume	G6M-96-22A	11/4/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	2.5U	0.019U	3,160	-	-	-	-	-	6.12	3.75	203.7	0.774	0.86	-
North Plume	G6M-96-22A	10/14/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.10 U	3,810	-	-	-	-	-	6.11	2.77	122.9	1.333	0.21	-
North Plume	G6M-96-22A	11/8/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.05 U	2,300						4.64	3.73	129.4	0.983	0.75	11.89
North Plume	G6M-96-22B	10/19/2001	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.76	6.95	176	2.09	0.6	13.13
North Plume	G6M-96-22B	2/28/2002	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	0.10U	-	-	6.35	7.83	198.5	2.002	1.5	12.89
North Plume	G6M-96-22B	1/31/2003	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.48
North Plume	G6M-96-22B	9/21/2004	2U	2U	2U	2U	1U	2U	-	-	-	5U	1U	44	-	-	-	-	-	5.83	6.15	193.9	1.941	2.76	13.86
North Plume	G6M-96-22B	9/29/2005	2U	2U	2U	2U	1U	2U	-	-	-	5U	1U	48	-	-	-	-	-	6.12	5.57	187.7	3.02	1.43	11.15
North Plume	G6M-96-22B	9/20/2006	2U	2U	2U	2U	1U	2U	-	-	-	5U	0.10U	44	-	-	-	-	-	5.53	6.51	179	2.183	0.67	10.19
North Plume	G6M-96-22B	9/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	6U	0.1U	40	-	-	-	-	-	5.73	16.11	-112.1	2.618	13.9	11.86
North Plume	G6M-96-22B	10/17/2008	0.91	0.5U	0.24J	0.5U	0.5U	0.5U	-	-	-	8U	0.2U	67.3	-	-	-	-	-	5.40	1.77	121.3	1.02	0.85	11.56
North Plume	G6M-96-22B	10/16/2009	0.3J	23	0.32J	0.5U	0.5U	0.5U	-	-	-	8U	0.135U	25,500	-	-	-	-	-	6.08	0.31	209.1	1.683	0.04	11.52
North Plume	G6M-96-22B	10/7/2010	0.25J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	3.3J	0.1U	14,600	-	-	-	-	-	6.00	0.48	115.1	2.295	0.49	12.85
North Plume	G6M-96-22B	10/7/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	9,320	-	-	-	-	-	5.98	0.16	30.7	1.899	0	11.27
North Plume	G6M-96-22B	10/15/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.120U	9,980	-	-	-	-	-	6.14	0.25	16.4	2.358	1.17	12.41
North Plume	G6M-96-22B	10/18/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	3.2J	0.1U	14,100	-	-	-	-	-	6.17	0.81	142	2.288	0.31	13.79
North Plume	G6M-96-22B	11/4/2014	0.21J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	4.6J	0.017U	7,180	-	-	-	-	-	6.58	0.45	137.4	1.087	3.55	17.20
North Plume	G6M-96-22B	10/14/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.10 U	5,610	-	-	-	-	-	6.53	1.34	93.5	1.457	2.18	15.00
North Plume	G6M-96-22B	11/8/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.05 U	6,500						5.96	2.66	174	1.362	2.49	11.2
North Plume	G6M-96-24B	10/16/2001	18	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.37	0	81	0.42	19	14.44
North Plume	G6M-96-24B	3/1/2002	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.35	-6.27	106.7	0.43	2.8	17.01
North Plume	G6M-96-24B	1/31/2003	7.5	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.61
North Plume	G6M-96-24B	1/12/2004	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.41
North Plume	G6M-96-24B	9/24/2004	13	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.17	0.2	152.2	0.422	0.44	19.31
North Plume	G6M-96-24B	12/17/2004	8.1	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.05	0.46	259.6	0.384	2.43	15.12
North Plume	G6M-96-24B	4/13/2005	8.2	1U	2.8	1U	1U	1U	-	-	-	-	-	-	-	-	-	-	-	5.32	0.2	216.6	0.429	2.49	10.84
North Plume	G6M-96-24B	7/6/2005	7.6	2U	3.0	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.69	1.34	242.8	0.77	0.02	14.12
North Plume	G6M-96-24B	9/30/2005	7.2	2U	3.6	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.77	0.29	198.3	1.022	7.7	16.26
North Plume	G6M-96-24B	12/15/2005	7.4	2U	3.1	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.97	0.14	242.8	0.9	2.1	19.14
North Plume	G6M-96-24B	3/23/2006	4.2	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.99	0.23	404.5	0.458	1.31	12.78
North Plume	G6M-96-24B	6/23/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	4.62	0.85	526.9	0.443	0.88	15.18
North Plume	G6M-96-24B	9/22/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.93	0.3	141	0.407	4.23	16.89
North Plume	G6M-96-24B	12/14/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.54	0.17	74.8	0.56	0.2	16.2
North Plume	G6M-96-24B	3/30/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.90	0.5	-43.6	0.62	0.15	12.58
North Plume	G6M-96-24B	6/13/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.10	0.16	138.9	0.727	220.2	12.48
North Plume	G6M-96-24B	9/13/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.05	3.93	-95.7	0.689	9.9	11.3
North Plume	G6M-96-24B	12/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.33	0.3	106.2	0.802	0.8	14
North Plume	G6M-96-24B	10/7/2008	0.4J	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	15	8.0U	0.352U	448	10U	46	0.13U	10	0.03UJ	6.04	0.54	92.4	0.51	30	14.4
North Plume	G6M-96-24B	1/22/2009	1.4U	2.3U	1.8U	1.3U	1.2U	1.3U	1.2U	1.5U	4.2	8.0U	226J	315	10UJ	32	0.13U	9.3	0.03U	6.16	0.45	149.6	0.479	65	13.4

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																		Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
North Plume	G6M-96-24B	5/11/2009	0.29J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	5.87	0.20	90.8	0.304	23.1	12
Area 1	G6M-03-01X	10/21/2009	380	65	670	25U	25U	25U	-	-	-	-	-	-	-	-	-	-	-	6.52	0.88	-153.5	0.559	7.25	11.99
Area 1	G6M-03-01X	10/16/2012	200	60	200	10U	10U	550	-	-	-	-	-	-	-	-	-	-	-	6.51	0.95	-69.4	1.776	2.28	20.17
Area 1	G6M-03-01X	6/12/2014	0.29J	37	19	0.59	0.51	68	-	-	-	-	-	-	-	-	-	-	-	6.52	1.95	11.7	0.812	13.1	16.73
Area 1	G6M-03-01X	10/31/2014	300	310	98	0.5U	0.5U	34	-	-	-	-	-	-	-	-	-	-	-	6.40	0.75	-106.6	1.263	8.57	9.6
Area 1	G6M-03-01X	6/18/2015	0.65 J	37	53	0.50 U	0.55 J	18.8	-	-	-	-	-	-	-	-	-	-	-	6.36	1.82	19.9	1.093	22.9	13.63
Area 1	G6M-03-01X	9/10/2015	103	67	65	2.40	1.40	62.8	10 U	68.9	8,640	46.0	41.8	7,080	5.30	-	0.076 J	10.30	2.0 U	6.00	0.61	-55.0	1.881	4.38	12.57
Area 1	G6M-03-01X	10/13/2015	126	190	141	5.20	1.50	57.5	-	-	-	-	-	-	-	-	-	-	-	6.27	0.28	-83.5	2.096	3.61	13.25
Area 1	G6M-03-01X	2/22/2016	1.0 U	81	87	1.9	1.0 U	50.6	10 U	95.5	16,300	23.5	20.0	6,330	6.4	144	0.11 U	3.4 J	2.0 U	6.62	2.11	33.6	1.162	4.98	8.46
Area 1	G6M-03-01X	6/15/2016	9.6	180	180	8.8	1.4	99	-	-	-	-	-	-	-	-	-	-	-	5.84	2.81	-48.3	1.726	5.61	12.87
Area 1	G6M-03-01X	11/10/2016	1.0 U	130	180	4.0	1.4	140	-	-	-	-	-	-	-	-	-	-	-	6.25	0.47	-84.7	1.097	2.4	8.21
Area 1	G6M-04-09X	9/24/2004	7,400	4.2	9.0	2U	1U	2U	-	-	-	5U	1UJ	160	-	-	-	-	-	5.15	3.84	637.6	0.495	0.82	9.54
Area 1	G6M-04-09X	9/28/2005	3,200	5U	5U	5U	5U	5U	-	-	-	5U	1U	37	-	-	-	-	-	5.92	3.41	678.4	0.169	2.07	10.21
Area 1	G6M-04-09X	9/21/2006	190	2U	2U	2U	1U	2U	-	-	-	5U	0.10U	50	-	-	-	-	-	5.83	8.18	215.6	0.102	5.51	15.4
Area 1	G6M-04-09X	9/12/2007	440	22	31	2U	1U	2U	-	-	-	5U	0.83	390	-	-	-	-	-	6.22	2.18	49.7	0.179	4.3	14
Area 1	G6M-04-09X	10/17/2008	4,000	330	410	50U	50U	44	-	-	-	63.4	13.3	5,700	-	-	-	-	-	6.23	0.66	-36.2	0.497	9.2	10.50
Area 1	G6M-04-09X	10/21/2009	1,600	210	210	50U	50U	51	-	-	-	70.8	13	3,960	-	-	-	-	-	5.80	0.58	33.3	0.376	4.53	12.35
Area 1	G6M-04-09X	10/8/2010	1,000	420	990	0.79	0.89	7.8	-	-	-	69.9	14.3	15,300	-	-	-	-	-	6.17	0.99	-20.8	0.388	1.58	11.9
Area 1	G6M-04-09X	6/9/2011	260	140	950	0.56	1.7	200	-	-	-	203	43.3	9,820	-	-	-	-	-	6.14	0.35	-49.3	0.562	0.03	11.27
Area 1	G6M-04-09X	10/7/2011	20U	23	910	20U	20U	240	-	-	-	291	107	50,900	45	-	-	-	-	6.45	0.14	-105.8	0.626	2	10.1
Area 1	G6M-04-09X	5/9/2012	970	250	510	40U	40U	340	-	-	-	344	76.7	17,800	9.1J	-	-	-	-	6.66	0.08	-85.2	0.495	12.5	10.11
Area 1	G6M-04-09X	10/16/2012	260	70	100	20U	20U	350	-	-	-	225	41.7	13,800	3.0J	-	-	-	-	6.24	0.31	-79.9	0.289	10.3	10.75
Area 1	G6M-04-09X	5/22/2013	5.9	3.6	5.9	0.81	0.5U	9.9	-	-	-	321	135	30,800	11	-	-	-	-	6.29	0.15	-84.7	0.812	4.21	8.74
Area 1	G6M-04-09X	10/22/2013	0.5U	0.5U	52	0.53	0.5U	38	-	-	-	551	303	27,100	34	-	-	-	-	6.64	3.3	-130.9	0.917	18.5	10
Area 1	G6M-04-09X	6/12/2014	1.4	0.75	12	0.6	0.5U	26	-	-	-	607	315	19,200	29	-	-	-	-	6.37	0.26	-82.0	1.392	3.64	10.42
Area 1	G6M-04-09X	11/3/2014	0.21J	0.5U	0.43J	0.21J	0.5U	0.83	-	-	-	600	339	16,500	31	-	-	-	-	6.59	0.05	-129.2	1.03	21.8	10.47
Area 1	G6M-04-09X	6/17/2015	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	-	-	-	351	159	3,560	14.10	-	-	-	-	6.33	0.64	-65.0	1.384	96	14.03
Area 1	G6M-04-09X	10/14/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	577	241	5,600	16.4	-	-	-	-	6.61	0.13	134.9	1.604	15.3	10.75
Area 1	G6M-04-09X	2/19/2016	1.0 U	1.0 U	0.55 J	1.0 U	1.0 U	1.0 U	10 U	10 U	16,700	514	202	3,600	13.4	439	0.37	4.5 J	2.0 U	6.74	1.09	-95.7	1.280	12.42	9.9
Area 1	G6M-04-09X	6/15/2016	1.0 U	0.85 J	1.0	1.0 U	1.0 U	0.61 J	-	-	-	550	200	3,100	14.0	-	-	-	-	6.38	2.56	-87.6	2.118	11.48	11.23
Area 1	G6M-04-09X	11/9/2016	1.0 U	1.0 U	0.67 J	1.0 U	1.0 U	0.56 J	-	-	-	430	160	2,600	-	-	-	-	-	7.32	0.52	-139.7	1.277	21.7	8.53
Area 1	G6M-04-11X	9/20/2004	8.5	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.54	3.42	374.7	0.782	16.8	14.39
Area 1	G6M-04-11X	9/26/2005	7.8	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.96	5.14	94.6	0.39	8.7	10.63
Area 1	G6M-04-11X	9/20/2006	4.0	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.24	6	129	0.38	5.99	14.35
Area 1	G6M-04-11X	9/11/2007	2.1	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.87	6.59	46.5	0.38	14.8	11.82
Area 1	G6M-04-11X	10/17/2008	1.4	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.53	5.62	98.1	0.302	3.5	9.54
Area 1	G6M-04-11X	10/16/2009	1.1	53	1U	1U	1U	1U	-	-	-	-	-	-	-	-	-	-	-	6.46	7.04	176	0.225	4.2	9.76
Area 1	G6M-04-11X	10/8/2010	0.41J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.71	6.95	152.6	0.247	3.15	9.59
Area 1	G6M-04-11X	10/6/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.77	2.5	87.7	0.219	4.0	10.61
Area 1	G6M-04-11X	10/16/2012	0.62	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.36	9.4	161.8	0.224	0	10.14
Area 1	G6M-04-11X	10/31/2014	0.54	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.88	7.12	167.7	0.163	0.91	10.43
Area 1	G6M-04-11X	11/10/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	-	-	-	-	-	-	-	-	6.65	6.67	25.6	0.167	1.18	10.28
Area 1	G6M-04-12X	9/20/2004	310	7.5	56	2U	1U	2U	-	-	-	5U	1.0	44	-	-	-	-	-	11.03	0.86	102.6	2.003	5.22	9.63
Area 1	G6M-04-12X	9/26/2005	250	6.8	49	2U	1U	2U	-	-	-	15	1U	360	-	-	-	-	-	8.41	1.05	234.2	1.961	1.65	-
Area 1	G6M-04-12X	9/18/2006	470	9.4	60	2U	1U	2U	-	-	-	6.5	0.10U	550	-	-	-	-	-	7.21	3.22	253.5	1.764	7.11	12.69
Area 1	G6M-04-12X	9/10/2007	350	11	50	2U	1U	2U	-	-	-	2U	0.1U	580	-	-	-	-	-	6.84	1.73	90.2	2.613	29.8	12.19
Area 1	G6M-04-12X	10/16/2008	360	7.7J	35	10U	10U	10U	-	-	-	3.1J	0.2U	360	-	-	-	-	-	7.23	1.45	91.2	2.623	2.00	12.44
Area 1	G6M-04-12X	10/19/2009	170	22U	28	10U	10U	10U	-	-	-	2.3J	0.2U	308	-	-	-	-	-	6.72	1.8	66.7	2.543	5.91	11.5
Area 1	G6M-04-12X	10/8/2010	100	4.4	22	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	336	-	-	-	-	-	6.57	1.75	208.0	3.632	2.35	10.62
Area 1	G6M-04-12X	6/9/2011	180	3.9	19	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	209	-	-	-	-	-	7.26	1.38	25.6	2.816	9	10.24
Area 1	G6M-04-12X	10/4/2011	280	4.6	27	4.0U	4.0U	4.0U	-	-	-	5U	0.1U	200	-	-	-	-	-	6.62	1.06	63.8	2.332	2.44	13.35

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																		Field Parameters					
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 1	G6M-04-12X	5/9/2012	160	5.0U	12	5.0U	5.0U	5.0U	-	-	-	4.1J	0.1U	155	-	-	-	-	-	6.7	1.34	85.1	2.68	1.42	12.32
Area 1	G6M-04-12X	10/16/2012	120	5.0U	14	5.0U	5.0U	5.0U	-	-	-	5U	0.1U	156	-	-	-	-	-	6.6	2.11	62.5	3.799	2.03	12.96
Area 1	G6M-04-12X	5/22/2013	220	3.4J	18	5.0U	5.0U	5.0U	-	-	-	3.8J	0.1U	92.5	-	-	-	-	-	6.55	0.87	120.8	2.927	2.58	12.5
Area 1	G6M-04-12X	10/22/2013	190	3.7J	23	4.0U	4.0U	4.0U	-	-	-	5U	0.1U	106	-	-	-	-	-	6.58	1.6	133.7	2.231	4.88	12.27
Area 1	G6M-04-12X	6/10/2014	130	2.7	13	0.50U	0.50U	0.50U	-	-	-	5U	0.1U	75	-	-	-	-	-	6.59	0.84	178.9	2.675	13.04	14.4
Area 1	G6M-04-15X	9/21/2004	5.2	2U	5.3	2U	1U	2U	-	-	-	5U	4.8	8,100	-	-	-	-	-	5.26	0.82	410	2.64	0.23	11.25
Area 1	G6M-04-15X	9/28/2005	9.1	2U	6.4	2U	1U	2U	-	-	-	33	1.8	4,400	-	-	-	-	-	5.11	0.39	248.1	0.674	0.29	11.78
Area 1	G6M-04-15X	9/20/2006	3.5	2U	5.2	2U	1U	2U	-	-	-	20	2.0	4,300	-	-	-	-	-	4.60	1.07	-100.3	1.555	0.95	11.07
Area 1	G6M-04-15X	9/11/2007	2.7	2U	2U	2U	1U	2U	-	-	-	18	0.75	2,100	-	-	-	-	-	6.21	3.21	85.1	1.353	3.5	11.29
Area 1	G6M-04-15X	10/17/2008	4.8	1.0	2.3	0.5U	0.5U	0.5U	-	-	-	36.3	3.01	3,010	-	-	-	-	-	6.34	1.5	-8.1	0.910	4.0	11.1
Area 1	G6M-04-15X	10/19/2009	1.9	14	3.2	0.5U	0.5U	0.5U	-	-	-	48.9	4.8	3,130	-	-	-	-	-	6.19	0.31	24.4	0.799	4.68	11.1
Area 1	G6M-04-15X	10/8/2010	0.65	0.34J	3.2	0.5U	0.5U	0.5U	-	-	-	59.1	4.76	2,900	-	-	-	-	-	6.14	0.3	3.2	0.704	1.34	10.85
Area 1	G6M-04-15X	10/6/2011	0.52	0.5U	3.7	0.5U	0.5U	0.5U	-	-	-	55.5	3.75	3,470	-	-	-	-	-	6.12	0.05	37.3	0.446	4.89	19.25
Area 1	G6M-04-15X	10/16/2012	1.0	0.5U	3.9	0.5U	0.5U	0.5U	-	-	-	111	11.1	4,300	-	-	-	-	-	6.15	0.49	-48.6	0.76	1.08	14.33
Area 1	G6M-04-15X	10/18/2013	0.97	0.27J	2.2	0.5U	0.5U	0.5U	-	-	-	112	14.5	3,530	-	-	-	-	-	5.68	0.24	14.1	0.838	1.33	18.79
Area 1	G6M-04-15X	11/4/2014	1.60	0.29J	2.2	0.5U	0.5U	0.5U	-	-	-	135	33.4	14,000	-	-	-	-	-	6.08	0.14	-16	1.937	3.61	12.98
Area 1	G6M-04-15X	10/14/2015	0.76 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	103	45.0	21,200	-	-	-	-	-	5.93	0.69	-38.2	4.011	1.24	13.62
Area 1	G6M-04-15X	11/10/2016	1.0 U	0.95 J	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	55	16	14,000	-	-	-	-	-	4.64	0.5	-21.4	2.929	4.6	13.9
Area 1	G6M-04-22X	9/21/2004	900	24	110	2U	1U	2U	-	-	-	5U	1U	990	-	-	-	-	-	6.30	4.78	192.2	0.897	19	13.17
Area 1	G6M-04-22X	9/28/2005	210	6.8	45	2.5	1U	2U	-	-	-	5U	1U	120	-	-	-	-	-	5.52	6.13	391.3	0.757	21	14.07
Area 1	G6M-04-22X	9/20/2006	200	8.7	54	2U	1U	2U	-	-	-	5U	0.43	4,500	-	-	-	-	-	5.68	2.8	197.8	1.048	6.98	15.37
Area 1	G6M-04-22X	9/11/2007	95	12	75	2U	1U	9.4	-	-	-	390	250	44,000	-	-	-	-	-	6.92	0.28	-160.8	2.25	20.7	13.43
Area 1	G6M-04-22X	10/17/2008	18	3.7	53	0.44J	1U	26	-	-	-	439	421	15,900	-	-	-	-	-	6.34	0.28	-106.1	2.104	18	12.88
Area 1	G6M-04-22X	10/19/2009	7.2	9.7	16	0.5U	0.5U	4.9	-	-	-	320	355	9,360	-	-	-	-	-	6.26	1.27	-48.7	2.181	290	14.32
Area 1	G6M-04-22X	10/8/2010	0.39J	2.2	7.1	0.23J	0.5U	4.7	-	-	-	522	210	3,020	-	-	-	-	-	6.32	2.51	-59.7	1.691	22.2	14.77
Area 1	G6M-04-22X	10/6/2011	0.5U	0.5U	13	0.5U	0.5U	7.5	-	-	-	534	232	15,800	-	-	-	-	-	6.25	0.39	-53.4	0.016	6.47	12.2
Area 1	G6M-04-22X	10/12/2012	0.5U	0.5U	5.7	0.5U	0.5U	6.6	-	-	-	657	162	9,080	-	-	-	-	-	6.41	0.6	-66.8	1.701	8.66	12.39
Area 1	G6M-04-22X	10/18/2013	-	-	-	-	-	-	-	-	-	767	-	-	-	-	-	-	-	6.12	0.29	-68.7	1.113	14.3	12.78
Area 1	G6M-04-22X	11/4/2014	0.5U	0.5U	2.0	0.72	0.5U	4.6	-	-	-	667	150	1,600	-	-	-	-	-	6.39	0.2	-64	0.951	42.9	13.26
Area 1	G6M-04-22X	10/13/2015	-	-	-	-	-	-	-	-	-	223	-	-	-	-	-	-	-	-	-	-	-	-	-
Area 1	G6M-04-22X	11/9/2016	2.5	1.4	1.2	1.0 U	1.0 U	1.0 U	-	-	-	650	150	960	-	-	-	-	-	6.92	1.22	-73.1	0.74	55.5	7.02
Area 1	G6M-04-31X	9/21/2004	1,600	2U	4.2	2U	1U	2U	-	-	-	5U	1U	190	-	-	-	-	-	5.69	5.1	211	1	2.99	13.27
Area 1	G6M-04-31X	9/28/2005	1,900	5U	5.2	5U	5U	5U	-	-	-	5U	1U	35	-	-	-	-	-	5.63	3.66	305.4	0.388	2.2	9.28
Area 1	G6M-04-31X	9/20/2006	600	6.1	2.5	2U	1U	2U	-	-	-	5U	0.10U	15U	-	-	-	-	-	6.52	0.28	-108.5	0.729	3.56	9.22
Area 1	G6M-04-31X	9/11/2007	340	260	330	2.8	1.3	2U	-	-	-	5U	0.1	890	-	-	-	-	-	6.38	5.61	101.6	0.217	6.9	10.90
Area 1	G6M-04-31X	10/17/2008	110	72	340	20U	20U	730	-	-	-	103	68.4	9,710	-	-	-	-	-	6.43	2	-72.7	0.636	9.0	9.42
Area 1	G6M-04-31X	10/21/2009	86	11	270	10U	10U	560	-	-	-	311	181	16,900	-	-	-	-	-	5.82	1.96	-102.01	0.626	6.23	10.26
Area 1	G6M-04-31X	10/8/2010	3.1	1.1	7.4	0.30J	0.5U	31	-	-	-	428	127	9,620	-	-	-	-	-	6.41	0.93	-107.6	0.728	1.21	9.54
Area 1	G6M-04-31X	10/6/2011	18	5.3	38	0.5U	0.5U	37	-	-	-	635	223	15,800	-	-	-	-	-	6.62	0.07	-112.4	1.333	2.89	11.23
Area 1	G6M-04-31X	10/12/2012	25	31	61	2.0U	2.0U	72	-	-	-	556	181	8,940	-	-	-	-	-	6.62	0.43	-104.6	1.193	4.58	11.36
Area 1	G6M-04-31X	10/18/2013	-	-	-	-	-	-	-	-	-	498	-	-	-	-	-	-	-	6.36	1.71	-87.6	1.656	1.13	10.83
Area 1	G6M-04-31X	11/4/2014	0.5U	0.51	6.9	0.23J	0.5U	3.4	-	-	-	468	121	9,690	-	-	-	-	-	6.51	0.12	-95.5	1.775	9.01	11.58
Area 1	G6M-04-31X	10/13/2015	-	-	-	-	-	-	-	-	-	420	-	-	-	-	-	-	-	5.93	0.84	-144.3	3.98	9.80	8.97
Area 1	G6M-04-31X	11/10/2016	1.0 U	0.95 J	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	430	-	-	-	-	-	-	-	6.15	0.89	-95.8	2.49	2.95	14.11
Area 1	G6M-13-05X	1/30/2014	250	10U	16	10U	10U	10U	-	-	-	-	-	-	-	-	-	-	-	8.63	0.37	-86.6	1.112	3.09	11.35
Area 1	G6M-13-05X	6/10/2014	1,200	12	70	0.40J	0.54	0.50U	-	-	-	10.7	0.299 J	556	-	-	-	-	-	7.65	0.46	-107	0.515	8.19	11.34
Area 1	G6M-13-05X	11/4/2014	1,700	13J	77	32U	32U	32U	-	-	-	6.6	0.233	565	-	-	-	-	-	7.43	0.47	-93.6	0.417	9.73	18.31
Area 1	G6M-13-05X	6/16/2015	1,520	12	62	0.50 U	0.50 U	0.50 U	-	-	-	5.20	0.05 U	229	-	-	-	-	-	7.04	1.63	57.0	0.398	33.2	12.71
Area 1	G6M-13-05X	10/13/2015	1,120	11	63	1.0 U	1.0 U	1.0 U	-	-	-	2.3 J	0.10 U	235	-	-	-	-	-	7.22	0.99	59.5	0.525	2.14	11.23
Area 1	G6M-13-05X	2/10/2016	770	5.2 J	24	10 U	10 U	10 U	10 U	10 U	10 U	4.0 U	0.10 U	199	1.0 U	25	1.4	10 U	2.0 U	6.2	4.39	244.6	0.523	20.2	9.67
Area 1	G6M-13-05X	6/15/2016	1,200	9.6	50	10 U	10 U	10 U	-	-	-	3.0	0.022 J	130	-	-	-	-	-	6.41	0.89	55.2	0.582	2.59	12.33

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 1	G6M-13-05X	11/10/2016	830	7.2 J	31	10 U	10 U	10 U	-	-	-	3.0 U	0.05 U	54	-	-	-	-	-	6.57	2.63	20.9	0.404	2.47	9.16
Area 1	G6M-95-20X	10/16/2001	4.4	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.90	7.2	212	0.27	4.1	11.2
Area 1	G6M-95-20X	2/25/2002	5.0	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.59	12.37	155.7	0.171	7.67	11.53
Area 1	G6M-95-20X	2/27/2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	-	-	-	-	-	-	-	10.42
Area 1	G6M-95-20X	9/21/2004	2.8	2U	2U	2U	1U	2U	-	-	-	5U	1U	15U	-	-	-	-	-	5.76	8.88	205.5	0.544	0	11.25
Area 1	G6M-95-20X	9/26/2005	2.3	2U	2U	2U	1U	2U	-	-	-	5U	1U	15U	-	-	-	-	-	5.62	8.75	328.7	0.741	0.95	11.42
Area 1	G6M-95-20X	9/19/2006	2.2	2U	42	2U	1U	2U	-	-	-	71	350	39,000	-	-	-	-	-	6.31	0.76	-108	2.715	4.19	12.17
Area 1	G6M-95-20X	9/12/2007	2U	2U	11	2U	1U	2U	-	-	-	160	110	15,000	-	-	-	-	-	6.49	3.19	-114.3	0.74	73.7	12.6
Area 1	G6M-95-20X	10/15/2008	0.38J	0.2J	2.5	0.5U	0.5U	0.5U	-	-	-	97.2	45.6	5,250	-	-	-	-	-	6.45	0.49	-104.4	0.511	4.2	9.54
Area 1	G6M-95-20X	10/16/2009	0.5U	37J	3.1	0.5U	0.5U	0.5U	-	-	-	166	206	7,660	-	-	-	-	-	6.61	0.29	-81.4	0.898	8.81	13.42
Area 1	G6M-95-20X	10/6/2010	0.5U	0.5U	5.1	0.5U	0.5U	1.8	-	-	-	149	546	12,200	-	-	-	-	-	6.49	0.11	-124.3	2.047	36.6	14.15
Area 1	G6M-95-20X	10/7/2011	0.5U	0.5U	1.5	0.5U	0.5U	0.5U	-	-	-	108	57.8	3,610	-	-	-	-	-	6.59	0.10	-112.9	0.234	4.0	14.3
Area 1	G6M-95-20X	10/15/2012	0.5U	0.5U	1.0	0.5U	0.5U	0.5U	-	-	-	112	67.9	3,140	-	-	-	-	-	6.58	0.60	-98.2	0.526	4.83	12.73
Area 1	G6M-95-20X	10/18/2013	0.5U	0.29J	0.59	0.5U	0.5U	0.5U	-	-	-	79.9	30	1,760	-	-	-	-	-	6.56	0.18	-79.5	0.41	3.37	12.63
Area 1	G6M-95-20X	10/31/2014	2.7	0.53	0.5U	0.5U	0.5U	0.5U	-	-	-	7.9	20.3	1,160	-	-	-	-	-	6.59	0.16	-105.1	0.688	4.03	10.88
Area 1	G6M-95-20X	10/13/2015	1.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	32.2	110	614	-	-	-	-	-	6.61	0.55	-55	0.722	2.86	12.15
Area 1	G6M-95-20X	11/8/2016	0.82 J	1.0	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	26	14	940	-	-	-	-	-	4.99	0.54	-5.6	0.799	7.04	13.62
Area 1	G6M-96-13B	10/15/2001	3,600	39	220	12	1U	1.1J	-	-	-	-	-	-	-	-	-	-	-	6.10	2.9	219	0.12	6.8	12.55
Area 1	G6M-96-13B	2/25/2002	5,200	34	200	1.4J	1U	1.5J	-	-	-	-	-	-	-	-	-	-	-	6.40	3.85	181.5	1.142	6.59	13.56
Area 1	G6M-96-13B	1/31/2003	3,800	31	190	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.13
Area 1	G6M-96-13B	9/20/2004	4,500	35	210	2U	1U	2.1	0.022	0.12	1.7	5U	1	15U	1U	38	5.4J	19	2.0	6.30	3.57	186.4	1.035	0.5	11.41
Area 1	G6M-96-13B	12/13/2004	2,500	24	150	2U	1U	2U	0.05	0.025	24	5U	1U	23	5U	35	5.0	31M	2U	6.26	2.57	316.5	0.787	2.68	12.51
Area 1	G6M-96-13B	3/28/2005	4,500	200U	180J	200U	200U	200U	0.17	0.22	37	5U	2.6M	1,600	5.7	47	0.46	17	2UJ	6.24	0.87	21.2	0.943	0.68	10.08
Area 1	G6M-96-13B	8/10/2005	2,800	190	1,500	3.6	4.8	6.8	0.15	0.44	2.9	32	24J	8,100	140	98.9	0.23	4.6	5.3	4.35	0.16	-35.6	0.838	3.5	-
Area 1	G6M-96-13B	9/26/2005	3,700	140	570	5U	5U	5U	0.054	0.33	18	44	51J	12,000	200	134	0.28	11	11	4.98	1.32	-45.9	1.071	4.54	13.5
Area 1	G6M-96-13B	12/13/2005	3,400	130	350	10U	5U	10U	0.069	0.35	31	46.3	63J	12,100	140	150	0.05U	11	4.5	5.51	0.13	-52.1	0.851	0.9	16.38
Area 1	G6M-96-13B	3/20/2006	2,100	250	400	2U	1.2	2.5	0.036	0.42	97	38	96	17,000	360	300	0.207	6.77	2.4	5.68	0.17	-161.5	0.759	7.1	15.13
Area 1	G6M-96-13B	6/20/2006	1,900	280	370	2U	1U	3.5	0.044	0.27	200	48J	100	16,000	110	310	0.2U	4.21	4.8	5.46	0.62	-86.8	1.252	2.63	13.27
Area 1	G6M-96-13B	9/18/2006	880	370	530	2U	1.3	9.4	0.022J	0.43	2,400	150	110	20,000	300	370	0.262	4.56	3.0	6.14	0.48	-120.9	1.555	2.19	12.5
Area 1	G6M-96-13B	12/11/2006	830	340	620	2U	1.6	7.3	0.020J	0.047	9,000	190	130	27,000	360	-	-	6.06	1.2	6.28	14.07	-260	1.93	2.1	11.04
Area 1	G6M-96-13B	3/27/2007	940	290	590	2.6	2.1	26	0.025U	0.96	22,000	250	230	35,000J	140	-	-	4.3	1.6	5.71	0.1	-16.8	1.861	1.79	12.5
Area 1	G6M-96-13B	6/11/2007	1,200	280	610	2U	1.7	55	0.025U	0.68	22,000	200	200	15U	260	-	-	8.17	2.2	6.24	0.15	-97.5	1.87	1322	12.04
Area 1	G6M-96-13B	9/10/2007	2,600	130J	590	2U	1.6	38	0.036	6.3	32,000	240	210	25,000	270	410	0.2U	580	2.8	6.25	0.4	-136.3	1.866	15.5	12.96
Area 1	G6M-96-13B	12/11/2007	750	99	830	2U	1.5	110	0.005J	3.6	26,000	260	230	25,000	240	-	-	429	2.4	6.11	1.92	-25.7	1.907	8.0	11.98
Area 1	G6M-96-13B	3/10/2008	1,200	140	1,000	2U	1.7	140	0.025U	8.3	29,000	240	240	26,000	210	-	-	5U	2.0	6.18	1.55	-90.2	1.958	6.4	11.33
Area 1	G6M-96-13B	10/15/2008	7.3J	6.5J	490	10U	10U	350	1.2U	5.7	9,700	172	290	39,500	91.8U	470	0.13U	21	0.03UJ	6.19	0.90	-59.2	2.046	11	12.96
Area 1	G6M-96-13B	5/7/2009	190	75	310	10U	10U	95	1.2U	13	46,000	169	323	38,600	74	740J	0.13U	32	0.03U	6.09	0.10	-97.6	1.909	4.0	10.53
Area 1	G6M-96-13B	10/19/2009	440	140	290	10U	10U	89	1.2U	9.2	52,000	173	325	36,000	54	630	0.022U	53	0.041	6.32	1.53	-93.1	2.054	13.6	-
Area 1	G6M-96-13B	4/21/2010	93	29	100	2.0U	2.0U	57	1.3U	15	37,000	217	400J	39,100	130	610	0.13U	0.71J	0.041	6.21	0.13	18.2	2.496	10.99	-
Area 1	G6M-96-13B	10/6/2010	360	150	150	1.5	0.70	65	1.2U	18	96,000	222	366	37,500	57	95	0.045J	1.1J	0.03U	6.19	0.22	-103.4	2.547	12.9	12.34
Area 1	G6M-96-13B	6/9/2011	740	90	270	1.9	1.4	86	3.7	44	110,000	242	304	25,100	75	300	0.023J	0.49J	0.03U	6.22	0.09	-112	2.126	13.1	11.49
Area 1	G6M-96-13B	10/4/2011	160	24	79	8.0U	8.0U	43	1.2U	1.5U	98,000	284	335	25,300	73	620	0.13U	0.35J	0.03U	6.36	0.02	-77.8	1.733	20	10.82
Area 1	G6M-96-13B	5/9/2012	130	47	150	5.0U	5.0U	38	44	100	29,000	298	231	16,600	51	500	0.13U	0.58J	0.13	6.47	1.7	-89.7	1.68	12.1	16.85
Area 1	G6M-96-13B	10/11/2012	130	48	130	5.0U	5.0U	76	81	190	62,000	282	209	17,100	38	480	0.13U	5.0U	0.14	6.26	0.44	-66.4	2.335	7.09	10.87
Area 1	G6M-96-13B	5/22/2013	170	55	230	2.7J	5.0U	100	1.1U	86	23,000	395	241	18,600	29	540J	0.13U	5.0U	0.12J	6.23	0.15	-84.3	2.27	13	9.71
Area 1	G6M-96-13B	10/17/2013	78	38	200	4.0U	4.0U	170	2.4	36	18,000	365	234	17,600	37	560	0.13U	5.0U	0.058	6.46	0.15	-113.1	1.728	17.3	10.91
Area 1	G6M-96-25B	10/15/2001	360	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.81	5.3	142	0.498	3.9	12
Area 1	G6M-96-25B	2/25/2002	130	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.70	11.51	158.5	0.15	9.75	13.7
Area 1	G6M-96-25B	2/27/2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	-	-	-	-	-	-	-	13.8
Area 1	G6M-96-25B	1/31/2003	52	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17
Area 1	G6M-96-25B	9/20/2004	56	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	4.98	7.63	593	0.589	0.0	13.7

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
Area	Well ID	Date	PCE (µg/L)	TCE (µg/L)	*cis* -1,2-DCE (µg/L)	*trans* -1,2-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Methane (µg/L)	Dissolved Arsenic (µg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (µg/L)	TOC (mg/L)	Alkalinity (mg/L)	Nitrate/ Nitrite (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	pH (SU)	DO (mg/L)	ORP (mV)	SpC (mS/cm)	Turbidity (NTUs)	Temp °C
Area 1	G6M-96-25B	9/26/2005	40	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.82	6.74	314.1	0.587	1.1	17
Area 1	G6M-96-25B	9/19/2006	44	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.20	7.64	223.5	0.496	1.46	12.2
Area 1	G6M-96-25B	9/11/2007	16	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.91	6.29	96.6	0.802	9.5	16.3
Area 1	G6M-96-25B	10/17/2008	1.7	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.80	8.41	89.7	0.151	4.0	14.5
Area 1	G6M-96-25B	10/16/2009	1.9	38J	0.5UJ	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.27	8.08	183.5	0.404	4.7	10.5
Area 1	G6M-96-25B	10/8/2010	3.1	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	5.80	6.70	190.2	0.622	1.59	16.3
Area 1	G6M-96-25B	10/6/2011	0.58	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.85	8.11	69.8	0.131	4.5	16.8
Area 1	G6M-96-25B	10/16/2012	2.0	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	5.87	7.09	181.7	0.572	7.76	12.7
Area 1/FDSA	G6M-02-08X	5/17/2002	2,300	35	250	2U	1U	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.04
Area 1/FDSA	G6M-02-08X	1/31/2003	3,600	46	480	2.3	1U	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.98
Area 1/FDSA	G6M-04-08X	9/24/2004	4.2	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.29	0.81	-75.5	0.632	52.8	15.68
Area 1/FDSA	G6M-02-08X	3/31/2005	1,300	38J	250	50U	50U	50U	0.049	0.79	1.2	5U	0.3J	770	15	62	1.1	6.2	2U	7.08	9.1	-50	0.563	24.6	9.64
Area 1/FDSA	G6M-02-08X	7/5/2005	1,000	130	1,800	12U	12U	12U	0.16	0.22	3	33	110	29,000	450	350	0.05U	3.7	8.3	4.23	1.66	19.1	1.616	4.72	14.95
Area 1/FDSA	G6M-02-08X	9/27/2005	560	26	1,300	1U	1.8	2.5	0.11	0.25	21	270	310J	75U	1,200	466	0.05U	320J	16	5.03	0.33	-68.6	1.965	3.16	18.79
Area 1/FDSA	G6M-02-08X	12/16/2005	300	24	1,200	4U	2U	4U	0.19	0.36	2.1	4.4B	350J	15U	1,500	520	0.05U	57	9.4	5.46	0.03	-31.4	1.999	66.4	9.72
Area 1/FDSA	G6M-02-08X	3/21/2006	180	25	1,300	2U	2.1	2.3	0.084	0.24	15	80	470	40,000	3,000	1,400	1U	245	14	5.46	0.33	-62.5	2.45	6.98	15.04
Area 1/FDSA	G6M-02-08X	6/21/2006	230	30	850	2U	1U	2U	0.14	0.23	19	100	970	44,000	5,700	1,800	1.67	759	40	4.80	1.32	-25.2	4.528	45.4	12.38
Area 1/FDSA	G6M-02-08X	9/20/2006	150	25	1,300	2U	1.6	2U	0.072	0.14	11	77	860	29,000	4,400	1,000	2U	655	16	5.20	1.57	-14.4	4.503	53.4	19.59
Area 1/FDSA	G6M-02-08X	12/12/2006	140	28	910	2U	1.1	2U	0.18	0.17	30	73	1,000	32,000	6,400	-	-	13.6	110	4.93	0.67	-38.3	6.436	108.6	7.42
Area 1/FDSA	G6M-02-08X	3/28/2007	60	14	500	2U	1U	2U	0.31	0.14	62	72	1,200	30,000J	7,200	-	-	1,170	80	4.46	0.21	-144.5	7.243	60.9	11.74
Area 1/FDSA	G6M-02-08X	6/13/2007	110	8.4	420	2U	1U	2U	0.092	0.11	180	130	1,200	33,000	6,800	-	-	1,160	82	4.70	1.78	24.1	6.948	1328.4	9.25
Area 1/FDSA	G6M-02-08X	9/13/2007	140	74	1,400	2U	1U	2U	0.22	0.17	120	410	1,100	37,000	4,400	3,000	0.2U	890	200	5.34	2.68	-150.5	6.823	28.2	11.52
Area 1/FDSA	G6M-02-08X	12/10/2007	250	66	1,100	2U	2.0	3.3	0.14	0.23	240	360	1,200	42,000	7,700	-	-	414	120	5.17	0.15	-115.7	7.569	10.8	11.11
Area 1/FDSA	G6M-02-08X	3/10/2008	32	5.5	170	2U	1U	2U	0.36	0.15	280	570	970	20,000	11,000	-	-	770	16	4.28	0.5	-55.7	7.828	13.8	15.4
Area 1/FDSA	G6M-02-08X	10/6/2008	49	4.5J	81	5U	5U	5U	6.3U	7.9U	3,000	103J	598	7,630	4,190	1,800	0.13U	610	0.75UJ	4.52	-0.12	-25.9	4.495	65	12.25
Area 1/FDSA	G6M-02-08X	1/21/2009	29	18U	39	11U	14U	11U	1.2U	1.5U	3,400	76	474J	6,650	2,900J	3,000	0.13U	710	0.39	4.76	0.15	39.2	3.739	46.4	13.10
Area 1/FDSA	G6M-02-08X	5/7/2009	25	20U	29	20U	20U	20U	1.3U	5.8	3,500	53.2	356	5,130	3,000	550J	0.092J	410	0.053	3.97	0.4	71.4	3.538	15.4	14.96
Area 1/FDSA	G6M-02-08X	10/20/2009	0.5U	0.5U	0.31J	0.5U	0.5U	0.5U	1.3U	1.6U	2,300J	70.6	486	6,840	2,300	40	1.3U	440	0.3UJ	4.61	1.88	79.4	3.973	20.1	12.49
Area 1/FDSA	G6M-02-08X	4/21/2010	11J	2.0UJ	75J	2.0UJ	2.0UJ	2.0UJ	1.3U	1.6U	4,400	98.9	447 J	8,720	3,400	40	1.3U	130	0.28	4.49	0.10	28.2	3.353	22.3	11.07
Area 1/FDSA	G6M-02-08X	10/7/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	27,000	73.4	381	8,080	2,400	860	2.6U	100	0.095	4.47	0.33	58.0	3.209	4.33	12.69
Area 1/FDSA	G6M-02-08X	6/9/2011	13	0.5U	140	0.5U	0.5U	1.6	1.2U	1.5U	83,000	155	473	14,000	2,800	1,100	6.5U	99J	0.38	4.64	0.11	18.9	2.968	11	11.14
Area 1/FDSA	G6M-02-08X	10/4/2011	8.0U	8.0U	210	8.0U	8.0U	8.0U	1.2U	1.5U	28,000	194	491	15,900	2,400	230	0.13U	86	0.091	4.81	0.02	18.1	2.376	4.99	13.73
Area 1/FDSA	G6M-02-08X	5/10/2012	9.8	8.0U	270	8.0U	8.0U	8.0U	1.2U	1.5U	14,000	184	581	19,000	1,900	730	0.13U	64	1.8	5.16	0.21	-9.9	3.338	3.29	11.46
Area 1/FDSA	G6M-02-08X	10/15/2012	12	4.0U	270	4.0U	4.0U	6.2	1.2U	1.5U	3,600	121	523	20,300	1,800	900	0.080J	37	0.096	4.85	0.32	-1.0	2.915	3.76	10.42
Area 1/FDSA	G6M-02-08X	5/23/2013	20	8.0U	510	8.0U	8.0U	24	1.2U	1.5U	11,000	160	460	18,200	1,600	610	0.041J	5.3	3.5J	4.88	0.10	9.4	2.618	4.01	-
Area 1/FDSA	G6M-02-08X	10/22/2013	13U	13U	500	13U	13U	51	3.6	84	40,000	200	428	15,400	1,100	630	0.13U	8.9	3.8	5.23	0.27	1.1	1.308	10.8	8.2
Area 1/FDSA	G6M-02-08X	6/12/2014	12	1.5	400	0.5U	0.7	140	1.3UJ	1.6UJ	9,400	241	420	10,100	670	700J	0.13U	1.0J	0.03U	5.23	0.21	11.2	2.023	6.68	16.6
Area 1/FDSA	G6M-02-08X	11/3/2014	8.3	5U	260	5U	5U	44	4.4	7.7	26,000	258	461	10,400	1,400	590	0.13U	0.96J	0.03U	5.28	0.12	-33.6	0.994	33.6	15
Area 1/FDSA	G6M-02-08X	6/16/2015	10 U	10 U	98.8	10 U	10 U	10 U	10 U	10 U	1,410	318	455	10,200	1,020	582	0.15	8.6 J	1.0 U	5.43	2.94	43.0	1.476	110	13.62
Area 1/FDSA	G6M-02-08X	9/9/2015	20 U	20 U	83.8	20 U	20 U	20 U	10 U	10 U	10,600	340	428	8,780	976	-	0.078 J	15.8	4.80	5.59	0.07	-39.2	1.337	12.0	13.71
Area 1/FDSA	G6M-02-08X	10/13/2015	20 U	21 U	83.5	21 U	21 U	21 U	10 U	10 U	18,400	320	483	9,410	1280	526	0.11 U	7.1 J	2.0 U	5.02	0.33	0.4	1.689	47.8	9.80
Area 1/FDSA	G6M-02-08X	2/10/2016	2.9	2.0 U	49.0	2.0 U	2.0 U	4.7	10 U	10 U	14,500	272	1,150	12,100	3,110	879	0.10 J	5.3 J	2.0 U	4.89	0.47	52.6	2.906	17.2	10.44
Area 1/FDSA	G6M-02-08X	6/14/2016	10 U	10 U	35.0	10 U	10 U	10 U	2.80	1.0 UJ	19,000	220	1,200	8,000	2,600	1,200	0.05 U	1.3	1.0 U	5.21	0.33	29.1	3.37	10.71	16.41
Area 1/FDSA	G6M-02-08X	11/10/2016	4.3	1.0 U	27	1.0 U	1.0 U	2.1	1.1 U	1.0 U	11,000	230	880	8,600	2,100	1,000	0.053 J	0.58 J	7.0	5.27	0.77	-0.9	1.37	9.44	8.3
Area 1/FDSA	G6M-03-02X	5/12/2003	1,300	2U	4.4	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.92
Area 1/FDSA	G6M-03-02X	10/11/2004	690	2U	5.6	2U	1U	2U	0.051	0.03	2.6	5U	1U	17	1U	12	3.7	20	1.7J	6.29	8.25	97.4	0.321	12.1	8.83
Area 1/FDSA	G6M-03-02X	12/15/2004	200	2U	5	2U	1U	2U	0.056	0.063	3.4	5U	1U	610	390	29	2.4	30	2U	5.86	1.75	-132.9	0.382	1.93	12.75
Area 1/FDSA	G6M-03-02X	3/29/2005	340	20U	14J	20U	10U	20U	0.15	0.34	5.1	640	140	49,000	1,300	366	0.2U	230	6.7J	5.23	0.65	-20.1	1.654	28.7	15.46
Area 1/FDSA	G6M-03-02X	6/29/2005	190	11	91	2.5U	2.5U	2.5U	0.29	0.65	43	130	220J	35,000J	1,200	431	0.05U	74	11	4.62	1.13	2.9	1.723	29.1	15.57
Area 1/FDSA	G6M-03-02X	9/29/2005	57	7.8	190	2.5U	2.5U	2.5U	0.2	0.29	560	150	260J	37,000	850	345	0.05U	62	16	4.94	0.53	-73.7	1.752	23.8	11.33
Area 1/FDSA	G6M-03-02X	12/15/2005	39	8U	190	8U	4U	8U	0.17	0.26	4,300	146	290J	38,000	1,100	550	0.05U	66	16	5.42	4.55	13.9	1.65	19.7	12.12

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
Area	Well ID	Date	PCE (µg/L)	TCE (µg/L)	*cis*-1,2-DCE (µg/L)	*trans*-1,2-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Methane (µg/L)	Dissolved Arsenic (µg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (µg/L)	TOC (mg/L)	Alkalinity (mg/L)	Nitrate/ Nitrite (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	pH (SU)	DO (mg/L)	ORP (mV)	SpC (mS/cm)	Turbidity (NTUs)	Temp °C
Area 1/FDSA	G6M-03-02X	3/21/2006	17	2U	140	2U	1U	2U	0.016J	0.14	6,700	140	320	37,000	1,400	1,200	2U	88.4	8.8	5.56	0.16	-47.7	1.731	17.3	13.35
Area 1/FDSA	G6M-03-02X	6/21/2006	8.2	2U	160	2U	1U	2U	0.044	0.12	10,000	240	410	23,000	1,300	1,000	1U	120	9.6	3.21	0.89	140.1	2.428	11.6	10.08
Area 1/FDSA	G6M-03-02X	9/20/2006	9.7	2.3	230	2U	1U	2U	0.05	0.2	8,700	200	440	21,000	1,300	570	1U	115	8.4	5.55	0.71	-27.8	2.029	13.7	11.46
Area 1/FDSA	G6M-03-02X	12/12/2006	6.9	2U	180	2U	1U	2U	0.047	0.16	6,800	170	350	11,000	890	-	-	53	8.0	5.85	1.31	-43.1	2.326	26.7	12.11
Area 1/FDSA	G6M-03-02X	3/28/2007	13	2.2	320	2U	1U	2U	0.033	0.11	9,800	230	470	14,000J	920	-	-	74.5	9.2	5.38	0.17	-62.3	2.523	14.9	12.75
Area 1/FDSA	G6M-03-02X	6/12/2007	11	2U	650	2U	1.4	17	0.025U	0.14	21,000	200	360	10,000	840	-	-	39	8.4	5.77	0.38	-59.3	2.268	39.5	12
Area 1/FDSA	G6M-03-02X	9/12/2007	12	2.1	800	2U	1U	81	0.006J	0.6	17,000	230	350	12,000	740	790	0.2U	580	20	5.44	10.26	-122.8	2.156	18.1	12.29
Area 1/FDSA	G6M-03-02X	12/10/2007	3.8	2U	720	2U	1.8	94	0.005J	1.4	14,000	290	390	29,000	1,000	-	-	24.7	7.0	5.67	6.03	-80.2	2.802	5.3	12.33
Area 1/FDSA	G6M-03-02X	3/10/2008	2U	2U	590	2U	1.8	50	0.098	3.4	11,000	320	410	100,000	2,000	-	-	50U	4.8	5.47	0.51	-55.9	3.113	24.5	11.74
Area 1/FDSA	G6M-03-02X	10/15/2008	5U	5U	260	5U	5U	27	1.2U	10	12,000	193	366	108,000	454	860	0.13U	59	0.03UJ	5.6	0.75	-28.1	2.376	15	11
Area 1/FDSA	G6M-03-02X	5/7/2009	4.0U	4.0U	220	4.0U	4.0U	12	1.2U	18	23,000	188	396	56,700	900	1,100J	0.13U	44	0.03U	5.45	0.32	-46.7	1.962	4.81	11.27
Area 1/FDSA	G6M-03-02X	10/19/2009	10U	20U	290	10U	10U	9.5J	1.3U	14	18,000	205	423	43,400	290	920	0.13U	300	0.03U	5.99	2.56	-44.2	1.832	11.9	-
Area 1/FDSA	G6M-03-02X	4/21/2010	2.0UJ	2.0UJ	120J	2.0UJ	2.0UJ	9.3J	1.3U	16	16,000	189	566J	39,600	1,200	1,000	0.13U	0.28J	0.03U	5.85	0.29	18.9	1.902	7.28	18.13
Area 1/FDSA	G6M-03-02X	10/6/2010	0.5U	0.5U	3.2	0.5U	0.5U	0.42J	1.2U	20	35,000	118	580	36,100	810	1,100	0.29	0.40J	0.03U	5.65	0.57	-21.1	2.137	5.47	13.03
Area 1/FDSA	G6M-03-02X	10/4/2011	13U	13U	410	13U	13U	30	1.2U	63	47,000	379	352	12,400	190	3,300	0.13U	0.51J	0.035	6.32	0.09	-86.1	1.14	13	16.73
Area 1/FDSA	G6M-03-02X	10/11/2012	2.0U	2.0U	59	2.0U	2.0U	34	1.2U	540	39,000	270	295	10,200	140	500	0.051J	5.0U	0.49	6.13	0.46	-68.9	1.31	9.5	23.98
Area 1/FDSA	G6M-03-02X	10/22/2013	1.3U	1.3U	44	1.3U	1.3U	36	1.2U	200	44,000	296	212	6,750	57	300	0.13U	5.0U	0.19	6.24	0.41	-68.8	0.609	9.19	17.97
Area 1/FDSA	G6M-03-02X	10/30/2014	0.5U	0.27J	6.6	0.5U	0.5U	6.3	1.2U	12	38,000	254	251	6,090	340	450	0.13U	0.23J	0.03U	6.45	0.33	-61.7	0.82	13.6	10.2
Area 1/FDSA	G6M-03-02X	10/13/2015	1.0 U	1.0 U	6.0	1.0 U	1.0 U	5.30	10 U	10 U	17,600	168	116	3,540	33.0	156	0.062 J	10.2	2.0 U	5.85	0.39	-86.6	0.679	23.1	13.10
Area 1/FDSA	G6M-03-02X	11/10/2016	1.0 U	0.54 J	18	1.0 U	1.0 U	6.4	1.1 U	1.0 U	17,000	180	260	3,900	120	300	0.05 U	0.44 J	1.9	6.21	0.25	-57	0.73	8.87	9.15
Area 1/FDSA	G6M-03-04X	10/21/2009	4.2U	4.0U	81	4.0U	4.0U	4.1	-	-	-	-	-	-	-	-	-	-	-	6.04	0.7	-99.6	0.635	24.5	19.6
Area 1/FDSA	G6M-03-04X	10/16/2012	0.5U	0.5U	0.5U	0.5U	0.5U	1.3	-	-	-	-	-	-	-	-	-	-	-	6.79	0.7	-123	0.622	80.4	22.98
Area 1/FDSA	G6M-04-10A	9/20/2004	2,900	2.5	3.4	2U	1U	2U	0.021	0.03	1.1	5U	1	170	1U	41	4.5J	22	2	5.91	3.75	206.5	0.552	1.7	10.79
Area 1/FDSA	G6M-04-10A	12/14/2004	2,400	2U	2U	2U	1U	2U	0.015	0.096	1500	5U	1U	120	5U	25	1.7	13	2U	5.89	2.81	215.4	0.965	2.04	9.62
Area 1/FDSA	G6M-04-10A	3/30/2005	640	40U	40U	40U	40U	40U	0.33	0.07	1.4	8.4	1.2	8,100	52	107	0.33	16	2U	5.90	4.22	68.3	1.01	1.76	10.99
Area 1/FDSA	G6M-04-10A	8/11/2005	380	45	390	2U	2U	2U	0.24	0.23	3.4	77	87J	50,000J	240	359	.05U	7.8	1U	5.65	1.84	11.9	0.977	14.9	10.06
Area 1/FDSA	G6M-04-10A	9/27/2005	340	88	260	1U	1U	1U	0.08	0.15	110	190	230J	76,000	330	442	0.084	3.0J	5.9	6.33	1.89	-1.9	1.135	4.3	10.77
Area 1/FDSA	G6M-04-10A	12/14/2005	1,500	180	220	2U	1U	2U	0.048	0.13	6,800	179	250J	32,500	370	480	0.05U	3.7	7.4	6.41	1.57	-64.8	0.985	1.9	10.24
Area 1/FDSA	G6M-04-10A	3/21/2006	4,400	180	450	2U	1U	8.3	0.025U	0.69	20,000	180	220	8,100	180	390	0.2U	4.08	2	6.72	0.27	-121.4	0.676	7.51	9.75
Area 1/FDSA	G6M-04-10A	6/20/2006	6,100	650	330	2U	1U	27	0.025U	0.12	16,000	160	220	5,700	120	340	0.2U	4.32	3.2	6.34	0.22	-99.8	0.893	9.82	10.97
Area 1/FDSA	G6M-04-10A	9/19/2006	1,000	15	59	2U	1U	14	0.23	0.11	11,000	170	97	5,000	61	150	0.311	5.2	1.2	6.56	1.14	-86.9	0.43	6.0	14.64
Area 1/FDSA	G6M-04-10A	12/13/2006	450	37	860	2U	1.2	76	0.025U	0.12	22,000	150	96	4,800	73	-	-	1.82	1.6	6.91	0.14	-111	0.662	27.3	6.31
Area 1/FDSA	G6M-04-10A	3/28/2007	1,200J	230J	680J	2U	1.6J	60J	0.65	0.26	20,000	380	260	27,000J	130	-	-	2.07	1U	6.1	0.19	-89.9	1.188	15.4	11.18
Area 1/FDSA	G6M-04-10A	6/12/2007	760	140	900	2U	2.1	130	0.54	1.1	23,000	310	260	15,000	190	-	-	1U	2.4	6.58	0.19	-145.2	1.295	128.5	15.77
Area 1/FDSA	G6M-04-10A	9/11/2007	2,700	99J	400	2U	1U	91	0.35	0.47	18,000	240	290	13,000	220	440	0.2U	54	2.4	6.42	1.72	-138.2	0.864	42.3	13.97
Area 1/FDSA	G6M-04-10A	12/11/2007	830	8.8	280	2U	1U	90	0.3	0.52	31,000	330	280	12,000	270	-	-	3.57	3.0	6.4	1.2	-70.1	1.366	8.0	10.09
Area 1/FDSA	G6M-04-10A	3/10/2008	200	830	670	3.4	1.8	37	0.34	0.61	25,000	340	230	35,000	210	-	-	10	2.2	6.53	0.94	-123.8	1.362	24	9.82
Area 1/FDSA	G6M-04-10A	10/6/2008	4,000	450	990	100U	100U	1,400	1.3U	11	16,000	247	187	9,100	34	210	0.13U	12	0.03UJ	6.38	0.21	-168	0.948	15	15.25
Area 1/FDSA	G6M-04-10A	1/21/2009	1,500	390	1,400	1,100U	0.67J	1,200	1.2U	9.6	53,000	250	234J	7.8	46J	20U	0.13U	20	0.03UJ	6.6	0.2	-112.6	0.937	7.02	14.25
Area 1/FDSA	G6M-04-10A	5/7/2009	380	41	390J	10U	10U	420	1.2U	11	34,000	292	194	17,200	49	590J	0.13U	24	0.03U	6.4	0.8	-125	1.165	4.2	11.25
Area 1/FDSA	G6M-04-10A	10/20/2009	2,700	290	2,100	50U	50U	1,400	1.3U	15	11,000	220	127	8,960	21	350	0.13U	8.7	0.03U	6.42	0.17	-121.4	0.805	11.43	12.63
Area 1/FDSA	G6M-04-10A	4/21/2010	170	21	170	4.0U	4.0U	130	1.3U	15	21,000J	286	297J	18,200J	120	670	0.017J	0.65J	0.03U	6.58	0.70	-139.5	0.880	7.00	14.71
Area 1/FDSA	G6M-04-10A	10/6/2010	25	10J	600	20U	20U	190	1.2U	14	51,000	296	119	4,280	26	260	0.13U	0.98J	0.03U	6.32	0.17	-85.2	0.694	6.24	13.56
Area 1/FDSA	G6M-04-10A	6/9/2011	110	36	300	0.5U	0.5U	170	1.2U	5.7	92,000	295	198	9,140	63	660	0.13U	1.2J	0.03U	6.4	0.39	-105.1	1.243	5.1	10.45
Area 1/FDSA	G6M-04-10A	10/4/2011	850	170	1,100	40U	40U	270	1.2U	74	36,000	322	304	17,600	160	750	0.13U	1.1J	0.22	6.07	0.21	-94	0.629	8.18	8.25
Area 1/FDSA	G6M-04-10A	5/10/2012	180	120	610	20U	20U	200	1.1U	250	46,000	367	183	6,700	16	340	0.13U	0.70J	0.10	6.49	0.48	-107.7	0.71	9.05	10.96
Area 1/FDSA	G6M-04-10A	10/15/2012	2.0U	2.0U	26	2.0U	2.0U	110	1.2U	44	14,000	291	185	8,250	64	340	0.092J	5.0U	0.13J	6.43	0.6	-103.7	0.92	5.5	10.36
Area 1/FDSA	G6M-04-10A	5/23/2013	0.5U	0.5U	13	0.53	0.5U	15	1.2U	1.5U	18,000	342	400	7,110	200	650	0.11J	0.84J	0.1J	6.37	1.3	-84.4	1.311	11	10.6
Area 1/FDSA	G6M-04-10A	10/17/2013	360J	92J	130J	10U	10U	14J	1.2U	9.4	24,000J	292	341	5,000	150	650	0.13U	1.1J	0.034J	6.37	0.29	-95.5	1.756	9.78	10.48
Area 1/FDSA	G6M-04-10A	6/12/2014	0.5U	0.23J	1.4	0.5U	0.5U	5.1	2.2J	1.6UJ	9,500J	264	164	3,730	29	200J	0.13U	17	0.03U	6.36	0.59	-82.7	1.761	10.93	10.89
Area 1/FDSA	G6M-04-10A	11/3/2014	0.5U	0.5U	0.92	0.5U	0.5U	4.4	1.2U	3.6J	21,000	288	184	2,100	34	240	0.13U	16J	0.03U	6.62	0.15	-136.9	1.742	16.98	11.17

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 1/FDSA	G6M-04-10A	6/19/2015	0.50 U	0.50 U	0.50 J	0.50 U	0.50 U	5.00	5.0 U	5.0 U	7,510	274	145	1,940	18.3	278	0.11 U	21.70	1.0 U	6.62	0.51	-94.6	2.201	8.06	10.47
Area 1/FDSA	G6M-04-10A	10/13/2015	1.0 U	1.0 U	0.72 J	1.0 U	1.0 U	1.60	10 U	10 U	15,000	292	205	2,360	26.7	241	0.099 J	8.6 J	2.0 U	6.53	0.08	-119.6	2.367	17	11.30
Area 1/FDSA	G6M-04-10A	6/14/2016	1.0 U	0.64 J	1.1	1.0 U	1.0 U	4.0	1.1 U	1.0 UJ	13,000	220	82	1,700	10.0	190	0.05 U	7.3	1.0 U	5.94	0.23	-66.6	1.878	7.73	11.89
Area 1/FDSA	G6M-04-10A	11/9/2016	1.0 U	0.49 J	0.96 J	1.0 U	1.0 U	1.40	1.1 U	1.0 U	7,100	220	92	3,200	5.5	86	0.05 U	17	1.5	6.50	0.37	-96.9	1.44	5.27	8.47
Area 1/FDSA	G6M-04-10X	9/20/2004	70	7.5	32	2U	1U	2U	0.019	0.039	1.0	5U	1.0	260	1U	11	6.7J	21	3.4	5.59	6.87	246.2	0.902	0.95	10.24
Area 1/FDSA	G6M-04-10X	12/14/2004	65	7.8	35	2U	1U	2U	0.022	0.053	2.2	5U	1U	200	5U	10U	6.6	23	2U	5.40	7.57	424.2	0.816	5.5	16.22
Area 1/FDSA	G6M-04-10X	3/31/2005	56	6.8	30	2U	2U	2U	0.022	0.86	1.1	5U	1U	190	0.4J	10U	1.5	25	2U	5.18	7.65	256.7	1.337	0.41	13.05
Area 1/FDSA	G6M-04-10X	7/1/2005	50	5.4	23	2U	1U	2U	0.035	0.05	12	4.2	1UJ	10U	5.9	43.5	1.7	12	1U	5.33	6.09	265.2	1.502	0.90	17.5
Area 1/FDSA	G6M-04-10X	9/27/2005	48	4.7	23	2U	1U	2U	0.010J	0.018J	16	5U	1U	170	4	7.7	1.4	26	1U	5.26	6.68	450.9	1.123	0.50	14.74
Area 1/FDSA	G6M-04-10X	12/14/2005	67	6.3	27	2U	1U	2U	0.016J	0.034	11	5U	1U	164	5U	9.8	1.5	28	1U	5.49	6.78	205.1	1.032	3.40	10.78
Area 1/FDSA	G6M-04-10X	3/22/2006	76	9.1J	32	2U	1U	2U	0.015J	0.025J	25	5U	.1U	200	5.6	10U	1.44	23.6	1U	5.57	6.74	195.7	0.94	1.45	10.62
Area 1/FDSA	G6M-04-10X	6/20/2006	87	10	47	2U	1U	2U	0.013J	0.012J	18	5U	0.1U	240	5U	10U	1.69	25.2	1U	5.08	6.23	248.8	1.512	1.9	10.93
Area 1/FDSA	G6M-04-10X	9/19/2006	65	6.8	32	2U	1U	2U	0.026	0.025J	13	5U	0.10U	240	2.2J	8.0	1.27	22.2	1U	5.21	6.94	273.9	1.66	4.68	12.18
Area 1/FDSA	G6M-04-10X	12/13/2006	64	7.2	35	2U	1U	2U	0.008J	0.011J	28	5U	0.1U	280	5U	-	-	27	1U	5.38	7.9	39.3	2.16	0.59	11.34
Area 1/FDSA	G6M-04-10X	3/28/2007	56	5.9	26	2U	1U	2U	0.017J	0.054	21	5U	0.21	290J	5U	-	-	27.9	1U	5.21	6.37	77.9	1.947	3.71	10.56
Area 1/FDSA	G6M-04-10X	6/12/2007	28	2.4	9.9	2U	1U	2U	0.010J	0.065	18	5U	0.1U	250	5U	-	-	31.2	1U	5.35	6.31	230.7	3.15	14	15.88
Area 1/FDSA	G6M-04-10X	9/11/2007	35	3.4	13	2U	1U	2U	0.008J	0.010J	13	6U	0.1U	270	5U	10U	1.4	2000	1U	5.29	8.98	-40.6	2.617	10.5	14.25
Area 1/FDSA	G6M-04-10X	12/11/2007	20	2U	6.4	2U	1U	2U	0.010J	0.028	5.3	5U	0.1U	230	5U	-	-	34.7	1U	5.46	5.62	27.7	3.66	2.8	14.5
Area 1/FDSA	G6M-04-10X	3/11/2008	22	2.1	9.7	2U	1U	2U	0.004J	0.010J	4.1	5U	0.16	250	5U	-	-	28	1U	4.99	6.42	213.5	2.89	0	13.63
Area 1/FDSA	G6M-04-10X	10/15/2008	18	1.6	8.4	0.5U	0.5U	0.5U	1.2U	1.5U	6.1	8.0U	0.2U	265	10U	30	1.4	27	0.03U	5.28	6.58	247.1	3.339	1.4	11.75
Area 1/FDSA	G6M-04-10X	5/7/2009	15	1.2	5	0.5U	0.5U	0.5U	1.3U	1.6U	0.76	8.0U	0.2U	213	10U	20UJ	1.2	33	0.03U	5.20	5.86	196.8	2.229	1.53	11.22
Area 1/FDSA	G6M-04-10X	10/20/2009	9.8	4.8	5.2	0.5U	0.5U	0.27J	1.3U	1.6U	19	8U	0.139U	197	10U	20U	1.1	29	0.03U	5.20	5.72	226.2	2.651	2.68	11.56
Area 1/FDSA	G6M-04-10X	4/21/2010	24	1.5	6.5	0.5U	0.5U	0.5U	1.3U	1.6U	87	5.0U	0.1U	200	10U	25	1.4	31	0.03U	5.26	5.13	187.2	2.760	4.00	14.4
Area 1/FDSA	G6M-04-10X	10/6/2010	24	1.8	7.9	0.5U	0.5U	0.5U	1.2U	1.5U	3.7	5U	0.1U	208	10U	25	1.8	28	0.03U	5.18	5.63	225.7	2.937	0.00	12.4
Area 1/FDSA	G6M-04-10X	10/4/2011	9.0	0.5U	1.9	0.5U	0.5U	0.5U	1.2U	1.5U	47	5U	0.1U	173	4.5J	20U	1.3	28	0.03U	5.01	4.46	192.8	1.078	1.16	11.3
Area 1/FDSA	G6M-04-10X	10/15/2012	15	0.72	1.9	0.5U	0.5U	0.5U	1.2U	1.5U	32	5U	0.103U	224	10U	20U	1.2	35	0.03U	5.53	5.25	204	3.135	0.33	12.88
Area 1/FDSA	G6M-04-10X	10/17/2013	6.2	0.28J	0.5J	0.5U	0.5U	0.5U	1.2U	1.5U	5,500	3.3J	1.27	262	2.7J	20U	0.95	37	0.03U	5.32	3.9	164.1	4.698	2.89	13.02
Area 1/FDSA	G6M-04-10X	11/3/2014	7.4	0.27J	0.47J	0.5U	0.5U	0.5U	1.2U	1.5U	200	2.5U	1.32	308	5U	20U	1.3J	30J	0.03U	5.27	5.28	148.4	2.562	0.97	12.55
Area 1/FDSA	G6M-04-10X	9/9/2015	2.8	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5.0 U	5.0 U	5.0 U	2.0 U	0.114	383	0.81 U	-	0.92	34.7	1.0 U	5.38	3.32	169.9	2.257	4.98	13.13
Area 1/FDSA	G6M-04-10X	10/13/2015	3.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	10 U	4.0 U	0.10 U	344	1.0 U	7.2	1.10	35.4	2.0 U	5.31	2.86	202.1	3.174	28.5	12.33
Area 1/FDSA	G6M-04-10X	2/9/2016	2.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	6.9 J	4.0 U	0.053 J	274	1.0 U	7.1	0.91	35.1	2.0 U	5.49	2.49	196.7	1.922	19.3	8.62
Area 1/FDSA	G6M-04-10X	6/14/2016	3.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.3	5.1 J	27	3.0 U	0.073	330	0.63 J	9.4	1.0	35.0	1.0 U	5.72	1.77	102.1	3.364	0.96	11.60
Area 1/FDSA	G6M-04-10X	11/9/2016	2.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	170	3.0 U	0.036 J	420	0.72 J	10	0.58	32	2.2	5.70	0.76	67.9	1.546	4.27	9.16
Area 1/FDSA	G6M-04-13X	9/21/2004	8.0	2U	2U	2U	1U	2U	-	-	-	5U	1U	350	-	-	-	-	-	5.96	8	551.8	0.138	1.75	16.01
Area 1/FDSA	G6M-04-13X	9/26/2005	2U	2U	2U	2U	1U	2U	-	-	-	5U	1U	15U	-	-	-	-	-	6.43	10.5	180	0.042	3.8	17.24
Area 1/FDSA	G6M-04-13X	9/18/2006	2U	2U	2U	2U	1U	2U	-	-	-	5U	0.10U	15U	-	-	-	-	-	5.65	8.63	213.9	0.076	12.1	13.33
Area 1/FDSA	G6M-04-13X	9/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	5U	0.1U	15U	-	-	-	-	-	6.07	8.7	147.4	140	14.1	13.36
Area 1/FDSA	G6M-04-13X	10/17/2008	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	8U	0.2U	50U	-	-	-	-	-	5.22	9.98	124.4	0.046	45	10.56
Area 1/FDSA	G6M-04-13X	10/20/2009	25U	16J	25U	25U	25U	25U	-	-	-	2J	0.132U	50U	-	-	-	-	-	5.78	10.61	283.7	0.049	12.2	11.05
Area 1/FDSA	G6M-04-13X	10/7/2010	0.29J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.102U	25U	-	-	-	-	-	5.83	8.84	147.3	0.048	2.87	10.33
Area 1/FDSA	G6M-04-13X	10/4/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	14.0J	-	-	-	-	-	5.54	9.15	208.7	0.024	13.5	11.43
Area 1/FDSA	G6M-04-13X	10/16/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	5.1J	-	-	-	-	-	6.28	9.95	108.1	0.047	17.2	11.11
Area 1/FDSA	G6M-04-13X	10/22/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	5.92	10.69	120.9	0.021	45.6	10.28
Area 1/FDSA	G6M-04-13X	11/3/2014	0.36J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	2.5U	0.0247U	7.5U	-	-	-	-	-	6.23	6.38	147.6	0.029	35.2	15.24
Area 1/FDSA	G6M-04-13X	10/14/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.10 U	15 U	-	-	-	-	-	6.85	8.83	114.7	0.045	1.07	14.69
Area 1/FDSA	G6M-04-13X	11/10/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.05 U	3.0 U	-	-	-	-	-	6.13	8.22	-8.8	0.027	2.69	6.8
Area 1/FDSA	G6M-07-02X	12/12/2007	50	2U	2U	2U	1U	2U	0.024J	0.022J	0.73	5U	0.1U	64	5U	-	-	16.2	1U	5.9	7.54	194.2	0.148	5.4	9.8
Area 1/FDSA	G6M-07-02X	3/11/2008	1,800	2U	2U	2U	1U	2U	0.014J	0.019J	7.1	5U	0.1U	35	5U	-	-	26	1U	5.7	7.5	165.5	0.108	0	10.96
Area 1/FDSA	G6M-07-02X	10/15/2008	170	5.0U	5.0U	5.0U	5.0U	5.0U	1.2U	10	12,000	5.5J	0.2U	21.2J	10U	20U	0.13U	11	0.030UJ	5.34	9.25	93.2	0.067	19	10.69
Area 1/FDSA	G6M-07-02X	5/11/2009	46	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	7	7.1	0.2U	5.8J	5.7J	20U	0.062	8.6J	0.030UJ	6.17	9.4	115.7	0.055	4	11.27
Area 1/FDSA	G6M-07-02X	10/20/2009	30J	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	6.2J	6.6	0.2U	50U	10U	20U	0.13U	7.2	0.03UJ	6	9.34	128.9	0.053	9.35	14.5

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 1/FDSA	G6M-07-02X	4/21/2010	63	2U	2U	2U	2U	2U	1.2U	1.5U	3,200	6.2	0.176U	25U	10U	30	0.0098J	6.8	0.03U	6.10	0.33	139.3	0.034	12	16.26
Area 1/FDSA	G6M-07-02X	10/6/2010	26J	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	28	3.4J	0.1U	25U	10U	32	0.21	5.6	0.03U	5.31	6.13	170	0.053	5.48	12.95
Area 1/FDSA	G6M-07-02X	10/4/2011	700	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	46,000	4.6J	0.1U	79.8	10U	31	0.13U	4.4J	0.03U	5.17	0.09	176.5	0.045	8.2	10.89
Area 1/FDSA	G6M-07-02X	10/11/2012	90	190	6.4	5.0U	5.0U	5.0U	1.2U	1.5U	46,000J	5U	0.286	40.1	10U	20U	0.056J	6.4	0.03U	6.28	1.60	76.1	0.068	11.31	19.81
Area 1/FDSA	G6M-07-02X	10/17/2013	1,000	8.7J	20U	20U	20U	20U	1.2U	1.5U	520J	5U	0.1U	31.7	10U	21	0.13U	4.5J	0.03U	6.03	4.25	143	0.060	1.17	20.19
Area 1/FDSA	G6M-07-02X	11/3/2014	14,000	40J	31J	50U	50U	50U	1.2U	1.5U	6,200	2.2J	0.421J	43.3	5U	22	0.13U	4.2J	0.03U	5.85	0.23	70.2	0.040	12.1	9.22
Area 1/FDSA	G6M-07-02X	12/11/2014	6,200	57	50U	50U	50U	50U	-	-	-	-	-	-	-	-	-	-	-	5.39	0.51	218.1	0.098	0.85	7.38
Area 1/FDSA	G6M-07-02X	10/13/2015	482	13.0	1.0 U	3.1 J	1.0 U	1.0 U	10 U	10 U	3,200 J	4.0 U	0.303	32.8	1.0 U	10.3	0.11 U	10.2	2.0 U	5.86	0.27	59.3	0.055	5.95	15.55
Area 1/FDSA	G6M-07-02X	6/14/2016	1,400	10 J	20 U	20 U	20 U	20 U	1.1 U	1.0 UJ	970	3.0 U	0.110	37	1.2	12	0.05 U	6.6	1.0 U	5.56	1.86	94.3	0.06	0.92	10.27
Area 1/FDSA	G6M-07-02X	11/9/2016	3,200	20 U	20 U	20 U	20 U	20 U	1.1 U	1.0 U	100	3.0 U	0.10	41	0.93 J	15	0.062 J	6.0	1.0 U	5.91	1.18	39.5	0.042	2.63	8.23
Area 1/FDSA	G6M-13-06X	1/30/2014	3.9J	8U	300	8U	8U	95	-	-	-	-	-	-	-	-	-	-	-	6.61	0.33	-38.3	2.521	35.9	10.81
Area 1/FDSA	G6M-13-06X	6/12/2014	0.5U	0.44J	180	0.68	0.37J	330	1.3UJ	33J	18,000J	444	365	16,900	160	710J	0.13U	0.68J	0.03U	6.42	0.24	-88.9	1.71	13.7	19.03
Area 1/FDSA	G6M-13-06X	10/30/2014	0.5U	0.5U	14	0.7	0.5U	15	1.2U	63	79,000	558	274	12,500	42	580	0.13U	0.42J	0.03U	6.31	0.24	-99	1.943	20.1	18.31
Area 1/FDSA	G6M-13-06X	6/16/2015	0.50 U	0.50 U	3.9	0.98 J	0.50 U	6.0	10 U	27.3	10,300	546	246	16,900	54.5	510	0.15	1.0 J	1.0 U	6.25	0.11	-40.1	1.989	31.9	11.27
Area 1/FDSA	G6M-13-06X	9/9/2015	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	4.0 J	5.0 U	36.6	18,200	511	269	22,500	82.2		0.11	10 U	6.50	6.02	0.16	-53.6	1.745	4.09	12.15
Area 1/FDSA	G6M-13-06X	10/14/2015	5.0 U	5.0 U	3.2 J	5.0 U	5.0 U	5.0 U	10 U	30.2	11,300	531	260	21,300	61.5	434	0071 J	1.70	1.50	5.71	1.19	100.7	0.904	1.46	19.27
Area 1/FDSA	G6M-13-06X	2/9/2016	1.0 U	1.0 U	2.0	0.80 J	1.0 U	4.6	10 U	31.7	14,500	536	226	12,000	46.0	409	0.17	10 U	2.0 U	6.35	1.07	-23.7	1.204	3.69	7.11
Area 1/FDSA	G6M-13-06X	6/14/2016	1.0 U	1.0 U	1.9	0.59 J	1.0 U	4.2	1.1 U	41.0	13,000	490	280	18,000	150	640	0.05 UJ	0.8 UJ	1.0 U	6.40	0.57	-48.4	2.223	2.27	10.67
Area 1/FDSA	G6M-13-06X	11/8/2016	1.0 U	1.0 U	9.8	0.55 J	1.0 U	7.7	1.1 U	23	11,000	470	250	9,600	55	560	0.05 UJ	1.0 U	5.8	6.42	1.47	-127.3	1.23	4.72	8.19
Area 1/FDSA	G6M-93-13X	10/15/2001	0.55J	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.30	9.9	355	6	1.2	14.88
Area 1/FDSA	G6M-93-13X	9/20/2004	3.8	2U	2U	2U	1U	2U	0.0081	0.014	0.89	5U	1.0	15U	1U	23	1.3J	10	2.7J	6.14	13.07	250.7	0.059	4.31	12.36
Area 1/FDSA	G6M-93-13X	12/13/2004	2U	2U	2U	2U	1U	2U	0.005U	0.005U	3.8	5U	1U	15U	5U	20	1.2	9.6M	2U	6.16	10.41	192.5	0.08	1.42	14.8
Area 1/FDSA	G6M-93-13X	3/29/2005	2U	2U	2U	2U	1U	2U	0.0063	0.28	3.1	5U	1UM	15U	0.6J	22	0.2U	9.1	2U	6.24	10.4	97.3	0.09	0.64	15.91
Area 1/FDSA	G6M-93-13X	6/28/2005	2U	2U	2U	2U	1U	2U	0.023	0.02	9.4	2U	1U	10U	4.9	41.2	0.081	8.2	1U	11.30	11.43	146.1	0.275	2.46	13.31
Area 1/FDSA	G6M-93-13X	9/26/2005	2U	2U	2U	2U	1U	2U	0.006J	0.018J	4.9	5U	1U	15U	3.1	27	0.083	9.5	1U	6.04	7.98	191.8	0.126	18.2	15.19
Area 1/FDSA	G6M-93-13X	12/13/2005	2U	2U	2U	2U	1U	2U	0.008J	0.011J	9.3	5U	1U	15U	4.4J	41	3.4	9.4	1U	6.48	9.55	69.6	0.086	0.5	13.7
Area 1/FDSA	G6M-93-13X	3/21/2006	2U	2U	2U	2U	1U	2U	0.025U	0.046	9.5	5U	0.1U	19	6.8	24	0.2U	6.83	1U	6.87	9.55	-9.4	0.058	0.61	13
Area 1/FDSA	G6M-93-13X	6/19/2006	2U	2U	2U	2U	1U	2U	0.008J	0.008J	5.3	5U	0.1U	28	1.4J	46	0.2UH	4.42	1U	6.33	9.14	190.1	0.087	1.34	11.49
Area 1/FDSA	G6M-93-13X	9/18/2006	2U	2U	2U	2U	1U	2U	0.006J	0.014J	5	5U	0.10U	15U	4.6J	22	0.2U	7.76	1U	6.22	9.33	173.6	0.062	4.62	10.39
Area 1/FDSA	G6M-93-13X	12/11/2006	2U	2U	2U	2U	1U	2U	0.008J	0.038	11	5U	0.1U	15U	5U	-	-	6.55	1U	6.38	10.68	91.3	0.076	2.23	12.11
Area 1/FDSA	G6M-93-13X	3/28/2007	2U	2U	2U	2U	1U	2U	0.005J	0.014J	9.6	5U	0.1U	15U	5U*	-	-	5.74	1U	6.14	9.8	-3.1	0.071	8.73	12.58
Area 1/FDSA	G6M-93-13X	6/11/2007	2U	2U	2U	2U	1U	2U	0.034	0.3	13	5U	0.1U	15U	0.4J	-	-	8.96	1U	6.64	10.12	125.4	0.121	3.3	13.98
Area 1/FDSA	G6M-93-13X	9/11/2007	3.0	2U	2U	2U	1U	2U	0.005J	0.025U	2.8	6U	0.1U	15U	0.7J	99	0.2U	12	1U	6.31	9.67	96.7	0.095	7.1	12.44
Area 1/FDSA	G6M-93-13X	12/10/2007	2U	2U	2U	2U	1U	2U	0.004J	0.007J	1.1	5U	0.1U	15U	5U	-	-	6.92	1U	6.25	8.81	71	0.156	0.6	11.83
Area 1/FDSA	G6M-93-13X	3/10/2008	2U	2U	2U	2U	1U	2U	0.008J	0.05	10	5U	0.2	12,000	34	-	-	100	1U	6.3	3.84	141	0.953	0	16
Area 1/FDSA	G6M-93-13X	10/15/2008	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	5.6	8.0U	0.2U	3,270	10U	110	3.6	34	0.03UJ	6.31	2.97	116.4	0.304	0	15.24
Area 1/FDSA	G6M-93-13X	5/7/2009	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	2.2	3.5J	0.2U	50U	10U	67J	0.71	16	0.03U	6.26	6.1	79.6	0.164	1.1	-
Area 1/FDSA	G6M-93-13X	10/19/2009	0.5U	15	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	6	8U	0.142U	50U	10U	54	0.058J	9.2	0.03UJ	6.42	4.79	182	0.110	1.01	15.69
Area 1/FDSA	G6M-93-13X	4/21/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	440	5.0U	0.115U	25U	6.5J	140	0.13U	10	0.03U	6.19	9.03	37.3	0.109	0.00	15.22
Area 1/FDSA	G6M-93-13X	10/6/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	16	5U	0.1U	25U	10U	63	0.050J	11	0.03U	6.12	4.77	114	0.116	3.42	17.33
Area 1/FDSA	G6M-93-13X	9/9/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	10 U	4.0 U	0.10 U	207	-	-	0.11 U	49.6	2.0 U	6.02	0.16	-53.6	1.745	4.09	12.15
Area 1/FDSA	G6M-93-13X	2/9/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	10 U	4.0 U	0.10 U	12 J	2.2	85.7	0.11 U	73.4	2.0 U	6.21	1.64	232.3	0.35	10.7	8.96
Area 1/FDSA	G6M-93-13X	6/14/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.045 J	130	-	-	-	-	-	6.35	1.01	63.1	0.306	14.0	13.39
Area 1/FDSA	G6M-93-13X	11/8/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.15	230	-	-	-	-	-	6.47	0.91	-29.7	0.192	11.39	9.52
Area 1/FDSA	G6M-95-19X	10/15/2001	110	6.6	42	1.5J	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.46	6.24	202	2.87	8.5	9.84
Area 1/FDSA	G6M-95-19X	9/20/2004	41	2.9	16	2U	1U	2U	-	-	-	5U	1	210	-	-	-	-	-	5.45	7.92	467.5	4.17	3.1	14.08
Area 1/FDSA	G6M-95-19X	9/26/2005	21	2U	5.4	2U	1U	2U	-	-	-	8.3	1U	160	-	-	-	-	-	4.00	4.51	595.3	4.361	0.72	14.45
Area 1/FDSA	G6M-95-19X	9/19/2006	12	2U	2U	2U	1U	2U	-	-	-	5U	0.10U	160	-	-	-	-	-	3.82	6.77	281	4.236	2.41	11.78
Area 1/FDSA	G6M-95-19X	9/12/2007	21	2U	4	2U	1U	2U	-	-	-	5U	0.1U	200	-	-	-	-	-	5.28	7.62	175.1	6.566	0.4	12.46
Area 1/FDSA	G6M-95-19X	10/15/2008	14J	0.39J	1.6J	0.5U	0.5U	0.5U	-	-	-	8U	0.2U	212	-	-	-	-	-	5.35	6.63	267.9	5.306	0.9	12.15
Area 1/FDSA	G6M-95-19X	10/16/2009	20U	540	20U	20U	20U	20U	-	-	-	8U	0.2U	153	-	-	-	-	-	5.22	4.53	232	4.529	1.49	11.54

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
Area	Well ID	Date	PCE (µg/L)	TCE (µg/L)	*cis* -1,2-DCE (µg/L)	*trans* -1,2-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Methane (µg/L)	Dissolved Arsenic (µg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (µg/L)	TOC (mg/L)	Alkalinity (mg/L)	Nitrate/ Nitrite (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	pH (SU)	DO (mg/L)	ORP (mV)	SpC (mS/cm)	Turbidity (NTUs)	Temp °C
Area 1/FDSA	G6M-95-19X	1/15/2010	6.9	0.5U	0.46J	0.75U	0.75U	1.0U	-	-	-	-	-	-	-	-	-	-	-	5.46	4.09	243.8	4.733	2.17	10.45
Area 1/FDSA	G6M-95-19X	10/7/2010	1.8	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	186	-	-	-	-	-	5.34	3.35	159.4	4.211	3.88	9.77
Area 1/FDSA	G6M-95-19X	10/7/2011	2.2	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	242	-	-	-	-	-	5.51	2.9	132.2	2.319	1.1	12.69
Area 1/FDSA	G6M-95-19X	10/15/2012	3.3	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	1,450	-	-	-	-	-	5.53	2.8	225.1	7.618	0.19	9.91
Area 1/FDSA	G6M-95-19X	10/18/2013	2.4	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	2,250	-	-	-	-	-	5.49	1.44	154.9	3.827	5.42	10.34
Area 1/FDSA	G6M-95-19X	11/3/2014	3.0	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	2.5U	0.0847U	1,190	-	-	-	-	-	5.73	3.06	202.5	2.189	2.78	10.00
Area 1/FDSA	G6M-95-19X	10/14/2015	1.9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.10 U	739	-	-	-	-	-	5.85	1.10	170.4	4.126	1.43	10.94
Area 1/FDSA	G6M-95-19X	11/8/2016	1.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.05 U	760	-	-	-	-	-	2.68	1.7	67.5	2.952	3.39	12.48
Area 2	G6M-02-01X	2/28/2002	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.91	4.7	66.6	0.624	14	13.53
Area 2	G6M-02-01X	9/23/2004	24	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.64	2.54	145	0.784	6.11	19.41
Area 2	G6M-02-01X	9/30/2005	110	2U	3.1	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.07	3.82	384.8	0.555	10.9	18.04
Area 2	G6M-02-01X	9/20/2006	1,300	12	91	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.19	3.68	-108.2	0.708	9.07	17.33
Area 2	G6M-02-01X	12/14/2006	1,600	18	120	2U	1U	2U	-	-	-	-	-	-	5U	-	-	-	-	6.54	3.64	-34.8	0.831	2.81	14.32
Area 2	G6M-02-01X	3/30/2007	1,700	19	120	2U	1U	2U	0.012J	0.081	-	5U	0.1U	120J	3.3J	-	-	9.43	1U	6.64	4.22	-35.3	0.8	0.78	14.06
Area 2	G6M-02-01X	6/14/2007	1,700	16	97	2U	1U	2U	-	-	-	-	-	-	1.9J	-	-	-	-	6.72	3.3	69.6	0.853	10.4	14.82
Area 2	G6M-02-01X	9/14/2007	1,900	24	150	2U	1U	2U	-	-	-	-	-	-		-	-	-	-	6.57	3.32	102.4	0.747	0.1	14.44
Area 2	G6M-02-01X	12/13/2007	1,600	21J	130J	2U	1U	2U	-	-	-	-	-	-	3.6J	-	-	-	-	6.61	2.73	128	0.807	0	12.57
Area 2	G6M-02-01X	3/14/2008	520	70	600	2U	2.2	2U	0.052	0.16	12	150	26	23000	180	-	-	5U	1U	6.45	0.38	-99.2	1.62	2.7	13.35
Area 2	G6M-02-01X	10/7/2008	180	49	360	10U	10U	10U	6.3U	9.5	5,000	141	14.5	5,880	17.7	200	0.13U	11	0.03UJ	6.97	0.18	-112.9	1.193	8.4	12.07
Area 2	G6M-02-01X	1/21/2009	280	76U	170	1.3U	1.2J	94U	1.3U	24	4,000	148	11,200J	4,500	11J	170	0.13U	7.0U	0.03U	7.13	0.39	-142.7	1.279	1.2	11.08
Area 2	G6M-02-01X	5/6/2009	610	190	100	10U	10U	54	1.2U	29	29,000	133	18.7	3,950	13	220J	0.059J	8.4	0.03U	6.69	0.2	-127.7	1.085	1.15	11.42
Area 2	G6M-02-01X	10/20/2009	820	180	76	40U	40U	47	1.3U	9	5,000J	108	11.8	2,470	4.6J	130	0.074J	7.6	0.03UJ	6.66	1.24	32.9	0.925	3.52	11.45
Area 2	G6M-02-01X	4/21/2010	37J	53J	95J	2U	2U	69J	1.3U	43	12,000J	164	20.5J	4,480	40	280J	0.024J	4.0J	0.03U	6.70	0.42	-122.0	1.180	1.60	11.63
Area 2	G6M-02-01X	10/6/2010	470	120	72	1.4	1.4	84	1.2U	49	25,000	133	13.7	3,050	10U	120	0.13U	5.2	0.03U	6.39	0.28	-77.8	1.039	3.65	12.53
Area 2	G6M-02-01X	6/9/2011	0.5U	4.3	11	0.69	0.5U	12	1.2U	230	71,000	173	45.9	7,380	90	400	0.11J	3.3J	0.03U	6.42	0.3	-86.3	1.423	0	14.56
Area 2	G6M-02-01X	10/5/2011	0.5U	0.88	3.6	0.5U	0.5U	7.3	1.2U	290	72,000J	271	27.3	5,470	18	190	0.13U	1.4J	0.03U	6.6	0.02	-106	0.681	0.87	12.53
Area 2	G6M-02-01X	5/9/2012	250	310	65	8.0U	8.0U	63	1.1U	260	41,000	271	10.8	2,050	2.3J	86	0.13U	6.8	0.081	6.66	0.07	-79.2	0.798	1.6	12.38
Area 2	G6M-02-01X	10/10/2012	350	120	75	10U	10U	160	1.2U	250	37,000J	220	10.4	2,080	10U	120 J	0.13U	6.5	0.36 J	6.64	0.5	-80.5	0.906	3.71	13.24
Area 2	G6M-02-01X	5/21/2013	0.25J	4.7	8.4	0.67	0.5U	5.2	1.2U	220	22,000	272	35.6	7,450	43	240J	0.13UJ	3.0J	0.076J	6.57	0.14	-91.7	1.439	0.71	14.22
Area 2	G6M-02-01X	10/17/2013	0.5U	2.4	11	0.58	0.5U	14	1.2U	450J	52,000	323	40.3	4,000	2.6J	140	0.13U	5.0U	0.078	6.66	0.22	-117.5	0.753	2.24	13.12
Area 2	G6M-02-01X	6/11/2014	0.5U	0.5U	1.4	0.5U	0.5U	2.6	1.3UJ	16J	5,300J	449	83.9J	4,260	9.5J	210J	0.13U	1.2U	0.030U	6.73	0.25	-103.1	1.174	4.68	13.08
Area 2	G6M-02-01X	10/30/2014	0.5U	0.21J	1.5	0.5U	0.5U	0.87	15	40	24,000	384	47.9	1,820	5U	86	0.13U	2.3J	0.03U	6.57	0.23	-130.8	0.959	1.81	12.73
Area 2	G6M-02-01X	6/17/2015	0.50 U	0.50 U	0.53 J	0.50 U	0.50 U	0.50 U	5.0 U	6.0 J	712	418	61.9	1,760	6.20	66.6	0.11 U	0.50 U	1.0 U	6.80	0.25	-91.1	0.671	8.45	13.66
Area 2	G6M-02-01X	9/10/2015	1.0 U	0.5 J	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.3 J	8,550	374	60.9	1,750	2.10	-	0.061 J	0.96 J	2.0 U	6.77	0.24	-110.5	0.807	0.81	16.00
Area 2	G6M-02-01X	10/16/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	14,200	360	56.2	1,750	2.14	54.6	0.11 U	1.1 J	2.0 U	6.86	0.11	-128.2	1.109	2.79	16.08
Area 2	G6M-02-01X	2/18/2016	1.0 U	1.0 U	0.89 J	1.0 U	1.0 U	0.53 J	10 U	10 U	12,500	347	52.5	2,420	6.8	155	0.10 U	1.5 J	2.0 U	7.01	0.8	31.9	1.659	3.95	10.29
Area 2	G6M-02-01X	6/13/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 UJ	22,000	450	100	2,700	7.7	150	0.021 J	0.8 U	1.0 U	6.87	0.21	-145.7	1.691	5.91	17.21
Area 2	G6M-02-01X	11/9/2016	1.0 U	1.0 U	0.69 J	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	18,000	430	62	2,100	3.1	140	0.05 U	1.0 U	1.8	6.92	0.23	-13.04	1.743	4.67	13.12
Area 2	G6M-04-01X	9/23/2004	250	3.6	21	2U	1U	2U	-	-	-	5U	1U	220	-	-	-	-	-	6.82	3.92	245.2	2.391	9.42	15.38
Area 2	G6M-04-01X	9/28/2005	140	2U	9.2	2U	1U	2U	-	-	-	5.1	1U	170	-	-	-	-	-	6.49	5.85	202.3	2.699	7.29	13.21
Area 2	G6M-04-01X	9/20/2006	150	2U	7.2	2U	1U	2U	-	-	-	5U	0.10U	220	-	-	-	-	-	5.87	4.88	-91.4	2.92	3.53	11.85
Area 2	G6M-04-01X	9/14/2007	290	2U	8.6	2U	1U	2U	-	-	-	6U	0.1U	130	-	-	-	-	-	6.00	5.21	155.3	2.055	35.8	12.16
Area 2	G6M-04-01X	10/20/2008	270J	11J	10UJ	10UJ	10UJ	10UJ	-	-	-	8UJ	0.2UJ	53.1J	-	-	-	-	-	7.32	3.37	96.2	0.999	3.5	17.25
Area 2	G6M-04-01X	10/20/2009	190	130	360	13U	13U	15	-	-	-	8U	0.107U	113	-	-	-	-	-	5.79	2.25	342.4	0.908	4.8	13.38
Area 2	G6M-04-01X	10/7/2010	27	19	120	0.68	0.29J	140	-	-	-	5U	1.05	164	-	-	-	-	-	6.14	0.29	124.3	1.312	1.55	11.53
Area 2	G6M-04-01X	10/5/2011	14	7.6	36	0.71	0.5U	160	-	-	-	3.7J	0.381	261	-	-	-	-	-	6.27	0.48	69.9	1.132	3.3	12.65
Area 2	G6M-04-01X	10/12/2012	5.5	4.0U	18	4.0U	4.0U	130	-	-	-	3.5 J	0.742	925	-	-	-	-	-	6.36	0.38	19.1	1.7	1.85	12.4
Area 2	G6M-04-01X	10/17/2013	0.5U	0.78	0.99	0.29J	0.5U	14	-	-	-	6.0	1.06	8,890	-	-	-	-	-	6.46	0.40	17.4	2.509	2.49	14.53
Area 2	G6M-04-01X	10/31/2014	0.39J	0.52	0.56	0.37J	0.5U	7.9	-	-	-	164	59.4	28,900	-	-	-	-	-	6.69	0.48	-95.3	1.85	19.6	13.34
Area 2	G6M-04-01X	9/10/2015	1.0 U	1.0 U	0.93 J	1.0 U	1.0 U	0.75 J	10 U	10 U	6,240	162	31.7	9,040	18.9	-	0.12	3.6 J	2.0 U	7.15	0.45	-152.7	1.880	41.6	15.91
Area 2	G6M-04-01X	10/14/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	382	96.4	24,400	-	-	-	-	-	6.78	0.10	-133.0	2.878	4.83	12.46

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 2	G6M-04-01X	2/18/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	7,060	75.5	16.4	7460	11.8	411	0.10 U	13.8	2.0 U	6.68	1.67	182.6	1.624	6.39	9.49
Area 2	G6M-04-01X	6/13/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	380	80.0	19,000	-	-	-	-	-	6.69	0.65	-120.3	3.639	17.6	17.67
Area 2	G6M-04-01X	11/9/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	320	95	19,000	-	-	-	-	-	6.76	0.42	-82	2.631	4.6	11.4
Area 2	G6M-04-03X	9/23/2004	440	2U	3.3	2U	1U	2U	0.22	0.036	100	5U	1U	3,100	1.4	53	5.1	23	2.2	6.37	3.41	446.5	1.236	12.2	12.85
Area 2	G6M-04-03X	9/27/2005	680	14	10	1U	1U	1U	0.19	0.32	52	5U	0.6J	3,500	6.0	81.5	0.35	38J	1U	6.29	0.79	377.5	1.361	9.62	12.87
Area 2	G6M-04-03X	9/22/2006	2,600	420	6.3	2U	1U	2U	0.049	0.3	17	5U	0.10U	2,900	7.2	190	0.2U	16.6	1U	6.30	0.43	152.1	0.524	3.52	15.12
Area 2	G6M-04-03X	9/14/2007	770	68	2.7	2U	1U	2U	0.062	0.11	3	38	0.87	2,300	1.6J	100	0.2U	24	1U	7.29	0.49	-110.3	0.294	3.6	14.18
Area 2	G6M-04-03X	10/16/2008	160	18	7.6	5U	5U	5U	1.3U	1.6U	6.2J	94.8	0.2U	930	10U	150J	0.10U	8.0	0.03U	10.48	2.01	18	0.539	5.8	14
Area 2	G6M-04-03X	10/15/2009	16	8.4	8.6	0.5U	0.5U	0.5U	1.3U	1.6U	2,000	148	2.02	3,270	10U	240	0.13U	7U	0.03U	8.80	1.49	-46.9	0.227	5.0	13.3
Area 2	G6M-04-03X	10/7/2010	300	52	94	0.62	0.25J	29	1.2U	3.5	29,000	133	5.47	3,910	10U	120	0.13U	4.8J	0.03U	6.67	2.47	-35.2	0.345	9.09	14.76
Area 2	G6M-04-03X	10/5/2011	7.3	1.8	7.5	0.5U	0.5U	4.6	1.2U	1.5U	29,000	72.9	0.19U	559	3.1J	130	0.13U	6.0	0.03U	10.63	0.49	6.3	0.307	0	12.74
Area 2	G6M-04-03X	10/10/2012	8.7	1.9	6.3	0.5U	0.5U	16	1.2U	170	38,000	65.8	0.261	1,320	10U	160	0.096J	8.0	0.03U	10.65	1.09	-18.4	0.556	6.84	13.84
Area 2	G6M-04-03X	10/17/2013	190	87	200	4U	4U	86	1.2U	270	51,000	31.6	32.7	8,450	2.5J	67	0.13U	8.6	0.03U	6.55	0.69	-77.3	0.583	28	15.41
Area 2	G6M-04-03X	10/30/2014	20	15	53	0.38J	0.5U	19	1.2U	17	6,700	14.4	0.29	114	4.7J	420	0.13U	7.5	0.03U	10.60	1.99	-70.1	1.152	24.3	13.53
Area 2	G6M-04-03X	9/11/2015	11	9.3	39.6	1.0 U	1.0 U	5.5	10 U	10 U	3,450	105	22.9	2,720	5.30	-	0.068 J	7.0 J	2.0 U	7.71	0.36	-194.0	1.079	11.6	14.60
Area 2	G6M-04-03X	10/14/2015	5.0	3.20	43.0	1.0 U	1.0 U	6.8	10 U	10 U	8,190	232	75.1	11,300	8.2	337	0.13 J	7.0 J	2.0 U	6.79	1.03	-68.4	1.208	9.64	12.80
Area 2	G6M-04-03X	2/18/2016	0.60 J	0.59 J	25.3	1.0 U	1.0 U	7.3	10 U	10 U	12,500	673	97.0	15,200	8.1	456	0.10 U	1.2 J	2.0 U	8.56	0.99	212.9	0.799	11.2	6.66
Area 2	G6M-04-03X	11/10/2016	1.0 U	0.65 J	5.8	1.0 U	1.0 U	4.1	1.1 U	25 J	20,000	380	110	31,000	9.8	390	0.05 U	2.2	1.0 U	6.47	0.43	-74.1	1.018	6.66	11.47
Area 2	G6M-97-08B	10/18/2001	92	6.1	36	1.6J	1U	2U	-	-	-	-	-	-	-	-	-	0	-	5.60	4.8	224	0.13	18	14.17
Area 2	G6M-97-08B	2/26/2002	100	5.9	32	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.87	5.13	186.4	1.157	5.3	12.77
Area 2	G6M-97-08B	9/22/2004	220	9.3	41	2U	1U	2U	0.0075	0.005U	1.3	5U	1U	26	1U	10U	6.1	12	1.5J	5.69	4.66	252.8	1.516	18.3	12.89
Area 2	G6M-97-08B	12/16/2004	200	7.7	41	2U	1U	2U	0.13	0.072	0.92	5U	1U	25	5U	10U	6.1	12	5.4	5.79	8.78	165	1.633	3.81	16.41
Area 2	G6M-97-08B	3/30/2005	95	3.4J	16	4U	2U	4U	0.015	0.032	0.54	5U	1U	21	0.4J	12	0.8	7	2U	5.58	8.06	202.8	0.999	9.42	15.56
Area 2	G6M-97-08B	6/28/2005	140	8	36	1.4	1U	2U	0.016	0.041	35	2U	1J	27	7.1	16.7	1.4	12	1U	11.30	4.94	173.7	1.506	8.16	13.88
Area 2	G6M-97-08B	9/27/2005	180	7.5	42	2U	1U	2U	0.013J	0.027	0.39	5U	1U	33	4.4	15.9	1.3	16	1U	5.60	5.73	319.2	1.713	2.82	13.47
Area 2	G6M-97-08B	12/12/2005	120	5.7	27	2U	1U	2U	0.04	0.11	26	5U	1U	28.1	0.6J	23	0.05UJ	13	1U	5.87	4.19	171.1	1.11	0.7	15.76
Area 2	G6M-97-08B	3/23/2006	240	8.8	44	2U	1U	2U	0.022J	0.13	12	5U	0.1U	46	5U	13	1.25	13.7	1U	5.85	5.13	181.5	1.44	3.16	14.21
Area 2	G6M-97-08B	6/21/2006	220	11	35	2U	1U	2U	0.019J	0.086	24	5U	0.17	1,300	16	66	0.809	13.5	1	5.90	2.39	141.1	2.015	1.48	-
Area 2	G6M-97-08B	9/19/2006	190	14	55	2U	1U	2U	0.078	0.13	18	130	21	13,000	270	300	0.2U	23.6	2.8	5.79	1.58	47.6	2.287	4.58	12.47
Area 2	G6M-97-08B	12/13/2006	200	11	75	2U	1U	2U	0.004J	0.038	1,700	160	83	20,000	440	-	-	49.6	2.8	6.07	1.43	-72.8	3.107	5.21	13.56
Area 2	G6M-97-08B	3/30/2007	200	8.5	46	2U	1U	2U	0.028	0.19	6,000	130	170	26,000J	620	-	-	126	4.6	5.36	0.46	14.8	3.626	1.13	12.47
Area 2	G6M-97-08B	6/14/2007	140	5.5	37	2U	1U	2U	0.025U	0.021J	7,900	100	370	24,000	760	-	-	120	6.4	5.66	1.68	-45.4	3.659	1.0	9.9
Area 2	G6M-97-08B	9/12/2007	170	8.4	43	2U	1U	3	0.004J	0.05	8,400	120	370	18,000	630	650	0.2U	1500	3.2	5.66	2.72	-31.4	3.924	5.5	11.04
Area 2	G6M-97-08B	12/14/2007	150J	5.7J	31J	2UJ	1UJ	4.5J	0.006J	0.054	10,000	150	280	12,000	520	-	-	92	5.6	5.84	0.75	-45.3	3.673	0	11.83
Area 2	G6M-97-08B	3/12/2008	150	6.5	32	2U	1U	6.8	0.008J	0.15	9,800	160	190	8,100	270	-	-	38	2.8	5.94	2.15	-66.4	3.091	0	12.36
Area 3	G6M-03-07X	5/12/2003	1,200	7.2	34	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.74
Area 3	G6M-03-07X	9/24/2004	1,700	6.3	31	2U	1U	2U	0.035	0.28	5.7	5U	1UJ	20	1U	10U	4.3J	12	1.6J	5.77	7	168.3	0.341	84.6	16.04
Area 3	G6M-03-07X	12/16/2004	1,500	6	35	2U	1U	2U	0.026	0.08	0.39	5U	1U	190	5U	10U	4.2	12	2.9	6.02	17.09	321.7	0.348	8.46	14.01
Area 3	G6M-03-07X	3/30/2005	1,100	91	140	40U	20U	40U	0.078	0.21	1.8	18	18	10,000	29	76	0.33	8	2U	6.33	1.9	-54.6	0.671	0.7	14.14
Area 3	G6M-03-07X	6/29/2005	940	78	940	40U	20U	40U	0.06	0.34	3.9	31	39J	15,000J	83	118	0.079	6.4	1U	11.97	1.12	-20.1	0.915	5.93	8.48
Area 3	G6M-03-07X	9/29/2005	300	44	1000	2.3	2.7	1U	0.068	0.45	660	46	210J	30,000	290	307	0.05U	3.2	12	6.20	2.7	-62	1.266	7.68	14.74
Area 3	G6M-03-07X	12/12/2005	92	22	710	20U	10U	20U	0.078	0.13	13,000	96.1	190	46,600	220	320	0.05UJ	2U	6.2	6.5	0.22	-82.1	1.038	3.6	14.16
Area 3	G6M-03-07X	3/24/2006	110	23	430	2U	2	270	0.010J	2	22,000	130	280	48,000	260	590	0.2U	1	8.6	6.87	0.17	-130.5	1.39	10.1	11.35
Area 3	G6M-03-07X	6/21/2006	9.5	3.6	180	2U	1U	310	0.073	21	21,000	140	460	59,000	280	570	0.2U	1U	4.8	5.13	0.7	-170.4	2.258	31.4	13.04
Area 3	G6M-03-07X	9/19/2006	47	7.9	260	2U	1U	300	0.037	9.2	25,000	140	470	44,000	290	460	0.926	1.27	5	6.48	0.27	-147.2	2.15	15.1	12.69
Area 3	G6M-03-07X	12/14/2006	190	30	310	2U	1.3	160	0.025	5.9	26,000	220	400	38,000	300	-	-	2.44	2.8	6.37	0.17	-160	2.155	6.19	12.57
Area 3	G6M-03-07X	3/29/2007	2U	2U	35	2U	1U	360	0.08	5.1	15,000	190	420	20,000J	130	-	-	1U	4.4	6.32	2.46	-69.3	1.787	39.6	13.39
Area 3	G6M-03-07X	6/14/2007	37	8.1	190	2U	1U	200	0.025U	2.3	25,000	220	490	37,000	310	-	-	10.5	2.4	6.40	1.31	-159	2.386	9.7	13.63
Area 3	G6M-03-07X	9/13/2007	27	13	290	2.2	1.1	140	0.008J	12	26,000	210	500	29,000	72	560	0.2U	420	4.8	6.26	3.08	-174.9	2.743	117.6	14.45
Area 3	G6M-03-07X	12/14/2007	2.6	2U	9.8	**3.0**	1U	120	0.010J	34	25,000	270	320	12,000	140	-	-	10U	4.0	6.51	0.99	-123.7	2.138	70.9	13.23
Area 3	G6M-03-07X	3/14/2008	2U	2U	2.3	2U	1U	4.3	0.11	26	30,000	210	230	11,000	130	-	-	5U	4.0	6.41	1.06	-85.5	1.897	235.9	14.9

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 3	G6M-03-07X	10/7/2008	5U	2.2J	5U	21	5U	5U	6.3U	12	14,000	246	348	5,370	64.3	190	190	24	0.03UJ	6.24	0.10	-44.4	1.742	16	14.09
Area 3	G6M-03-07X	1/22/2009	1.4U	2.3U	1.7J	15	1.7U	3.6	1.2U	10	16,000	227	338J	5,000	110J	20U	0.13U	37	0.03U	6.6	1.20	-74.9	1.743	30	14.38
Area 3	G6M-03-07X	5/6/2009	0.5U	0.5U	1.8	20	0.5U	2.6	1.2U	9.9	28,000	351	361	5,500	66	720J	0.025J	32	0.03U	5.88	0.21	-117.9	1.735	20.3	14.21
Area 3	G6M-03-07X	10/15/2009	0.27J	0.5U	2.3	19	0.5U	2.2	1.1U	7.3	16,000	318	251	4,870	44	550	0.13U	30	0.03UJ	6.25	0.88	-100.4	1.362	5.6	13.4
Area 3	G6M-03-07X	4/21/2010	0.5U	0.5U	0.88	5.3	0.5U	1.3	1.3U	6.3	27,000	339	176J	2,000	46	320	0.13U	0.11J	0.03U	6.46	0.69	-106.3	1.086	8.9	16.20
Area 3	G6M-03-07X	10/5/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	14	48,000	346	164	4,650	16	35	0.13U	0.27J	0.03U	6.35	0.11	-106.1	1.276	4.56	-
Area 3	G6M-03-07X	6/8/2011	0.5U	0.5U	1.7	7.8	0.5U	2.1	1.2U	13	72,000	381	158	3,540	41	460	0.13U	5.0U	0.10	6.25	0.08	-87	0.841	9.82	15.28
Area 3	G6M-03-07X	10/5/2011	0.5U	0.5U	0.86	5.6	0.5U	1.4	1.2U	1.5U	48,000	375	133	2,500	39	320	0.13U	5.0U	0.049	6.4	0.02	-42	0.764	6.0	9.73
Area 3	G6M-03-07X	5/9/2012	0.5U	0.5U	1.2	4.4	0.5U	0.92	1.2U	200	74,000	388	131	3,090	31	320	0.13U	0.35J	0.063	6.52	0.14	-111.7	1.046	2.43	12.88
Area 3	G6M-03-07X	10/11/2012	0.5U	0.5U	0.74	3.4	0.5U	1.5	1.2U	800	97,000	365	116	2,900	26	270	0.027J	5.0U	0.04	6.5	0.34	-96.2	0.962	4.81	15.32
Area 3	G6M-03-07X	5/21/2013	0.5U	0.5U	1	3.4	0.5U	0.77	1.2U	1.5U	22,000	413	114	2,150	23	180J	0.13UJ	5.0U	0.03UJ	6.01	0.17	-64.9	0.923	1.28	14.79
Area 3	G6M-03-07X	10/16/2013	0.5U	0.5U	0.86	2.9	0.5U	1.3	1.2U	33	31,000	434	120	2,340	26	340	0.13U	5.0U	0.065	6.53	0.21	-102.4	0.901	1.01	9.71
Area 3	G6M-03-07X	6/11/2014	0.40J	0.5U	0.72	3	0.5U	2.5	1.3UJ	3.5J	10,000J	422	105J	1,670	45	260J	0.13U	0.52U	0.03J	6.32	0.28	-48.4	0.787	2.54	11.63
Area 3	G6M-03-07X	10/30/2014	0.5U	0.5U	0.69	2.8	0.5U	1.1	1.2U	1.8	54,000	355	78.5	1,400	22	180	0.13U	0.38J	0.03U	6.49	0.24	-120.7	0.532	5.63	12.93
Area 3	G6M-03-07X	6/18/2015	0.50 U	0.50 U	0.62 J	2.10	0.50 U	0.77 J	5.0 U	5.7 J	12,400	97.1	107	1,810	27.1	262	0.15 U	0.50 U	1.0 U	6.40	0.16	-94.9	0.626	15.1	16.20
Area 3	G6M-03-07X	9/14/2015	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	6.0 J	11,900	436	103	1,700	25.2	-	0.086 J	0.94 J	2.0 U	6.45	0.56	-112.8	0.545	5.16	14.23
Area 3	G6M-03-07X	10/14/2015	1.0 U	1.0 U	0.59 J	1.80	1.0 U	0.73 J	10 U	6.5 J	16,600	441	102	1,660	243	161	0.085 J	2.3 J	2.0 U	6.61	0.24	-76.2	0.754	5.37	12.30
Area 3	G6M-03-07X	2/10/2016	1.0 U	1.0 U	1.0 U	1.80	1.0 U	0.78 J	10 U	5.0 J	12,800	461	96.7	1,360	24.7	194	0.18	10 U	2.0 U	6.49	0.84	-68.8	0.704	16.1	11.20
Area 3	G6M-03-07X	6/16/2016	1.0 U	0.61 J	0.73 J	1.50	1.0 U	0.73 J	1.1 U	1.0 U	28,000	440	90	1,600	26	200	0.05 U	0.8 U	1.0 U	6.46	0.29	-71.9	0.759	9.0	17.00
Area 3	G6M-03-07X	11/10/2016	1.0 U	1.0 U	0.44 J	1.4	1.0 U	0.63 J	1.1 U	16	23,000	420	81	1,400	22	170	0.05 UJ	1.0 U	1.0 U	5.50	0.29	-86	0.48	17.4	14.89
Area 3	G6M-04-02X	9/23/2004	1,900	2U	3.8	2U	1U	2U	-	-	-	5U	1U	86	-	-	-	-	-	6.59	7.25	152.4	0.704	9.52	13.09
Area 3	G6M-04-02X	9/28/2005	1,800	5U	5U	5U	5U	5U	-	-	-	5U	1U	15U	-	-	-	-	-	5.21	6.54	294	0.607	12	18.36
Area 3	G6M-04-02X	9/20/2006	1,100	170	2.2	2U	1U	2U	-	-	-	5U	0.10U	24	-	-	-	-	-	5.22	2.88	-101.5	0.696	10.61	17.15
Area 3	G6M-04-02X	9/14/2007	710	98	290	21	1U	2U	-	-	-	48	16	13,000	-	-	-	-	-	6.52	2.91	-31.3	1.356	2.3	15.3
Area 3	G6M-04-02X	10/16/2008	320	47	290	5U	5U	5U	-	-	-	135	56.6	6,530	-	-	-	-	-	6.32	0.74	-143.6	1.302	3.8	15.75
Area 3	G6M-04-02X	10/15/2009	400	110	15	8U	8U	8U	-	-	-	78.3	20.8	3,580	-	-	-	-	-	6.19	0.9	-25	1.011	4.0	14.12
Area 3	G6M-04-02X	10/6/2010	380	54	27	20U	20U	20U	-	-	-	182	40.2	5,530	-	-	-	-	-	6.25	0.51	-50.1	1.071	3.53	13
Area 3	G6M-04-02X	6/8/2011	-	-	-	-	-	-	-	-	-	317	42.7	4,540	-	-	-	-	-	6.44	0.76	-95.9	0.678	1.9	13.61
Area 3	G6M-04-02X	10/5/2011	630	93	13U	13U	13U	13U	-	-	-	172	18.1	4,370	-	-	-	-	-	6.24	0.41	1	0.669	6.6	15.18
Area 3	G6M-04-02X	5/8/2012	-	-	-	-	-	-	-	-	-	225	15.5	3,980	-	-	-	-	-	6.36	0.2	-25.6	0.475	1.12	14.93
Area 3	G6M-04-02X	10/12/2012	160	30	5.0U	5.0U	5.0U	5.0U	-	-	-	228	16.9	4,890	-	-	-	-	-	6.33	0.44	-33.5	0.534	2.02	15.92
Area 3	G6M-04-02X	5/21/2013	-	-	-	-	-	-	-	-	-	143	7.29	5,400	-	-	-	-	-	5.98	0.36	18.3	0.699	0.74	13.55
Area 3	G6M-04-02X	10/17/2013	140	31	5.7	4.0U	4.0U	4.0U	-	-	-	231	20.6	6,800	-	-	-	-	-	5.70	0.37	-12.3	0.485	3.75	15.8
Area 3	G6M-04-02X	6/11/2014	-	-	-	-	-	-	-	-	-	137	13.9J	5,900	-	-	-	-	-	6.15	0.62	4.5	0.795	2.48	18.26
Area 3	G6M-04-02X	10/30/2014	480	70	33	0.5U	0.5U	2.7J	-	-	-	160	40.5	5,980	-	-	-	-	-	6.34	0.28	-63.1	0.628	1.86	19.03
Area 3	G6M-04-02X	6/18/2015	62	20.3	15.7	0.50 U	0.50 U	1.8	-	-	-	362	82.4	7,220	-	-	-	-	-	6.300	0.320	-101.0	0.500	10.900	13.09
Area 3	G6M-04-02X	9/11/2015	16	7.4	8.8	1.0 U	1.0 U	1.8	10 U	10 U	7,390	343	91.4	6,920	3.3	-	0.067 J	0.87 J	2.0 U	6.590	0.390	-147.8	0.663	2.500	14.02
Area 3	G6M-04-02X	10/16/2015	105	30.5	1.0 U	1.0 U	1.0 U	1.6	-	-	-	237	65.8	7,570	-	-	-	-	-	6.320	0.230	-56.1	0.818	2.430	12.79
Area 3	G6M-04-02X	2/10/2016	333	60.2 J	12.3	2.0 U	2.0 U	1.5 J	10 U	10 U	4,410 J	118	28.3	8,730	2.1	118.0	0.11	10.1	2.0 U	6.740	0.870	-112.9	0.536	10.800	10.04
Area 3	G6M-04-02X	6/13/2016	120	48.0	23.0	1.0 U	1.0 U	3.40	-	-	-	200	44.0	8,000	-	-	-	-	-	6.43	0.34	-56.2	0.875	1.59	13.40
Area 3	G6M-04-02X	11/10/2016	160	60	58	0.37 J	1.0 U	8.40	-	-	-	180.00	48.00	9100.00	-	-	-	-	-	6.62	0.51	-67.3	0.629	4.32	10.3
Area 3	G6M-04-04X	9/24/2004	2,300	7.8	24	2U	1U	2U	0.037	0.12	13	5U	1UJ	560	1U	10U	5.5	20	2U	5.75	5.05	197.3	1.637	169	12.51
Area 3	G6M-04-04X	9/29/2005	1,600	5.4	15	2.5U	2.5U	2.5U	0.018J	0.06	0.44	5U	1U	430	0.5J	5.3	1.4	23	1U	5.34	5.66	295.9	1.666	7.39	13.87
Area 3	G6M-04-04X	9/19/2006	1,600	45	260	2U	1U	2U	0.12	0.095	33	110	84	31,000	120	190	0.2U	10.2	1.6	6.22	0.32	-71.5	1.765	7.64	13.53
Area 3	G6M-04-04X	9/13/2007	600	130	210	2.0	1.2	300	0.005J	7.0	18,000	280	130	25,000	63	270	0.2U	890	1.2	6.57	3.2	-186.6	2.398	3.5	13.04
Area 3	G6M-04-04X	10/16/2008	6.0	8.1	48	2.8	2.5U	150J	1.3U	62	18,000	523	248	19,300	34.6U	520	0.10U	7	0.03UJ	6.40	2.39	-106.2	2.239	4.0	13.16
Area 3	G6M-04-04X	10/15/2009	0.5U	0.5U	4.8	5.2	0.5U	6.9	1.3U	61	38,000J	615	239	16,800	32	520	0.13U	23J	0.03UJ	6.47	0.86	-123.0	1.744	5.0	14.24
Area 3	G6M-04-04X	10/5/2010	0.5U	0.5U	2.8	2.6	0.5U	3.2	1.2U	210	52,000J	529	155	16,900	15	81J	0.13U	5.0U	0.03U	6.35	0.40	-112.0	2.133	3.1	13.59
Area 3	G6M-04-04X	10/5/2011	0.5U	0.5U	1.1	4.1	0.5U	2.7	1.2U	160	31,000J	615	145	16,400	17	350J	0.13U	5.0U	0.049	6.61	0.10	-88	1.042	5	12.99
Area 3	G6M-04-04X	10/11/2012	0.5U	0.5U	0.80	3.7	0.5U	2.6	1.3U	460	51,000	590	133	15,700	13	220	0.13U	5.0U	0.052	6.66	0.39	-108.6	1.693	1.53	14.02
Area 3	G6M-04-04X	10/16/2013	0.5U	0.5U	1.8	3.1	0.5U	3.0	3.5	420	44,000	601	114	11,000	11	240	0.13U	0.94J	0.049	6.57	0.24	-109.9	1.345	4.75	10.96

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																		Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 3	G6M-04-04X	10/30/2014	0.5U	0.5U	0.5U	1.7	0.5U	0.39J	1.2U	85	43,000	453	113	8,520	9.0J	180	0.098J	0.18J	0.03U	6.59	0.42	-145.8	1.537	6.54	11.41
Area 3	G6M-04-04X	9/14/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.91 J	10 U	32.6	9,170	486	11.9 J	10,700 J	7.50	-	0.068 J	3.4 J	2.0 U	6.7	0.28	-180.4	1.264	3.25	14.95
Area 3	G6M-04-04X	10/16/2015	0.76 J	1.0 U	1.0 U	1.0 U	2.80	1.0 U	10 U	61.3	20,000	505	115	10,000	8.5	167	0.11 U	1.6 J	2.0 U	5.99	0.57	-114.6	1.727	3.13	10.70
Area 3	G6M-04-04X	2/19/2016	1.0 U	1.0 U	0.50 J	2.8	1.0 U	1.0	10 U	65.1	13,900	550	114	9,760	7.3	278	0.10	1.3 J	2.0 U	7.68	1.29	-38.7	1.173	3.97	11.53
Area 3	G6M-04-04X	6/16/2016	1.0 U	1.0 U	0.65 J	1.0 U	1.0 U	1.1	9.2	86	31,000	580	120	10,000	8.6	160	0.05 U	30.0	1.0 U	6.51	1.46	-108.1	1.407	4.2	16.19
Area 3	G6M-04-04X	11/8/2016	1.0 U	1.0 U	0.43 J	1.2	1.0 U	0.57 J	3.0	38	20,000	530	120	9,700	7.3	180	0.05 UJ	1.0 U	4.4	6.01	0.32	-106.9	1.402	3.49	13.83
Area 3	G6M-13-03X	1/30/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	5.58	0.69	205	0.2483	1.11	10.87
Area 3	G6M-13-03X	10/30/2014	0.5J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	2.5U	0.0285U	407	-	-	-	-	-	6.39	1.65	183.6	0.1922	15.3	6.67
Area 3	G6M-13-03X	10/16/2015	0.57 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	100 U	362	-	-	-	-	-	5.53	1.58	157.6	2.539	36.6	11.90
Area 3	G6M-13-03X	11/10/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	2.2 J	0.45	420	-	-	-	-	-	4.15	0.43	40	1.54	31.6	12.48
Area 4	G6M-02-03X	2/26/2002	210	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	11.61	2.21	11	1.154	18.1	18.88
Area 4	G6M-02-03X	9/23/2004	48	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	4.95	1.17	632.1	1.374	3.8	17.6
Area 4	G6M-02-03X	9/29/2005	12	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.70	2.9	204.9	1.138	10.67	17.62
Area 4	G6M-02-03X	9/18/2006	10	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.20	0.35	219.4	0.993	4.32	14.39
Area 4	G6M-02-03X	9/14/2015	0.82 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	284	4.0 U	0.10 U	79	1.10	-	1.30	9.7 J	2.0 U	5.67	5.09	93.2	0.722	3.00	14.06
Area 4	G6M-02-03X	6/16/2016	-	-	-	-	-	-	-	-	-	3.0 U	0.05 U	310	-	-	-	-	-	4.87	0.45	139.6	1.658	19.87	16.74
Area 4	G6M-02-03X	11/8/2016	-	-	-	-	-	-	-	-	-	3.0 U	0.029 J	99	-	-	-	-	-	7.58	1.03	-53.7	0.96	3.88	11.73
Area 4	G6M-02-04X	2/26/2002	470	0.88J	1.3J	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.47	3.4	189.5	0.26	24	17.99
Area 4	G6M-02-04X	9/23/2004	170	2U	2.9	2U	1U	2U	-	-	-	5U	1U	15U	-	-	-	-	-	6.29	3.03	175.5	0.453	8.48	19.59
Area 4	G6M-02-04X	9/28/2005	150	2U	6.2	2U	1U	2U	-	-	-	5U	1U	15U	-	-	-	-	-	5.61	2.75	302.3	0.502	12.6	17.26
Area 4	G6M-02-04X	9/20/2006	48	2U	2U	2U	1U	2U	-	-	-	5U	0.10U	15U	-	-	-	-	-	5.84	4.57	189	0.467	8.45	14.49
Area 4	G6M-02-04X	9/13/2007	21	4.2	2U	2U	1U	2U	-	-	-	6U	0.1U	15	-	-	-	-	-	6.39	3.13	93	0.927	4.8	14.85
Area 4	G6M-02-04X	10/16/2008	9.0	2.5U	150	2.5U	2.5U	2.5U	-	-	-	78.2	8.56	7,370	-	-	-	-	-	6.91	1.05	-80	1.126	4.0	12.08
Area 4	G6M-02-04X	10/15/2009	5U	17	120	5U	5U	10	-	-	-	309	82	10,900	-	-	-	-	-	6.55	1.52	-139.8	0.766	2.18	15.6
Area 4	G6M-02-04X	10/4/2010	5.3	2.6	2.1	0.5U	0.5U	0.5U	-	-	-	101	20.2	1,240	-	-	-	-	-	6.48	0.98	-86.9	0.975	2.8	14.68
Area 4	G6M-02-04X	6/9/2011	-	-	-	-	-	-	-	-	-	246	28.2	3,180	-	-	-	-	-	6.67	0.28	-88.3	0.856	0	13.32
Area 4	G6M-02-04X	10/6/2011	0.69	0.80	0.67	0.5U	0.5U	0.5U	-	-	-	292	35.6	2,480	-	-	-	-	-	6.84	0.26	-112.5	0.601	3.71	12.68
Area 4	G6M-02-04X	5/9/2012	-	-	-	-	-	-	-	-	-	451	43.4	2,510	-	-	-	-	-	6.94	0.52	-114.8	0.487	2.9	13.7
Area 4	G6M-02-04X	10/9/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	374	30	1,860	-	-	-	-	-	6.87	0.43	-129.3	0.591	0	13.4
Area 4	G6M-02-04X	5/21/2013	-	-	-	-	-	-	-	-	-	313	28.1	1,890	-	-	-	-	-	6.88	0.3	-110.5	0.745	2.26	13.62
Area 4	G6M-02-04X	10/16/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	370	23.9	1,390	-	-	-	-	-	6.92	0.38	-124.4	0.522	1.32	13.21
Area 4	G6M-02-04X	6/11/2014	-	-	-	-	-	-	-	-	-	175	14.2	997	-	-	-	-	-	6.60	0.59	-10.8	0.956	3.35	13.12
Area 4	G6M-02-04X	11/3/2014	0.5U	0.24J	0.5U	0.5U	0.5U	0.5U	-	-	-	350	15.6	971						7.08	1.42	-111.1	0.55	1.38	14.70
Area 4	G6M-02-04X	6/26/2015	0.60 J	0.52 J	0.91 J	0.50 U	0.50 U	0.50 U				157	10.4	1,060						7.39	0.71	-55.4	1.238	1.55	14.70
Area 4	G6M-02-04X	9/14/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	4,350	408	20.4	995	1.60		0.057 U	9.6 J	2.0 U	7.01	0.40	-152.4	0.40	1.30	14.56
Area 4	G6M-02-04X	10/16/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	320	15.1	1,000	-	-	-	-	-	6.78	0.43	-97.3	0.665	0.86	13.02
Area 4	G6M-02-04X	2/12/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	964	353	22	1,370	1.1	42.3	0.12	8.0 J	2.0 U	7.08	0.79	-79.7	0.711	1.94	11.26
Area 4	G6M-02-04X	6/15/2016	1.0 U	0.59 J	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	470	27	1,400	4.4	250	0.05 U	0.8 U	1.0 U	6.88	0.30	-106.2	1.031	2.84	16.74
Area 4	G6M-02-04X	11/8/2016	1.0 U	1.0 U	1.2	1.0 U	1.0 U	1.0 U	-	-	-	470	21	1,100						7.00	0.89	-153.6	0.268	2.57	13.15
Area 4	G6M-02-13X	8/2/2002	4,600	4	2U	2U	1U	2U	-	-	-	5U	-	-	-	-	-	-	-	6.17	0.54	141	0.665	7.62	13.98
Area 4	G6M-02-13X	9/23/2004	5,000	13	16	2U	1U	2U	0.27	0.15	57	5U	1U	1,200	1U	31	2.3	17	1.8J	6.37	0.34	170.8	0.618	2.14	16.73
Area 4	G6M-02-13X	12/13/2004	4,600	14	21	2U	1U	2U	0.27	0.11	88	5U	1U	1,300	5U	34	2.5	16M	2U	5.79	0.89	274.8	0.518	2.63	18.3
Area 4	G6M-02-13X	3/30/2005	2,100	64J	210	100U	50U	100U	0.16	0.11	38	36	4.2	4,000	8.1	60	0.23	13	2U	5.97	0.89	-22.6	0.735	2.91	15.02
Area 4	G6M-02-13X	8/11/2005	2,300	190	460	5.9	2U	2U	0.026	0.045	46	150	34J	12,000J	66	230	0.05U	2.3	1U	5.82	0.74	-68.8	0.897	5.6	14.76
Area 4	G6M-02-13X	9/29/2005	3,700	120	470	10U	10U	10U	0.16	0.12	420	74	22	6,800	37	110	0.05U	8.9	2.4	6.41	1.26	-89.1	0.71	6.99	15.48
Area 4	G6M-02-13X	12/14/2005	210	50	850	2U	2	2U	0.057	0.087	11,000	477	200J	36,200	290	420	0.083	2U	8.2	6.6	0.11	-134.4	1.389	0.6	15.43
Area 4	G6M-02-13X	3/22/2006	660	37J	640	2U	1U	2U	0.025U	0.009J	21,000	320	170	29,000	280	480	0.2U	8.08	3.0	6.67	0.9	-214.4	1.379	2.37	14.28
Area 4	G6M-02-13X	6/22/2006	160	8.8	440	2U	1U	280	0.025J	0.51	25,000	750	420	30,000	140	480	0.2U	1.15	20	6.54	0.28	-138.7	2.175	16.1	14.68
Area 4	G6M-02-13X	9/18/2006	550	52	160	2U	1U	280	0.15	1.1	24,000	420	160	9,900	52	140	0.2U	8.09	2.8	6.12	0.36	-119.3	1.19	6.9	13.37
Area 4	G6M-02-13X	12/14/2006	460	20	190	2U	1U	220	0.025	0.35	23,000	460	260	12,000	140	-	-	4.25	3.6	6.49	0.19	-73.7	1.748	8.3	10.99
Area 4	G6M-02-13X	3/27/2007	460	39	120	2U	1U	170	0.031	3.7	27,000	400	170	8,400J	37	-	-	9.74	1.6	6.08	0.12	-14.6	1.378	11.2	13.81

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 4	G6M-02-13X	6/13/2007	440	45	48	2U	1U	46	0.025U	6.3	26,000	380	300	9,400	78	-	-	12.7	3.6	6.58	0.46	-178.7	1.926	47.5	12.34
Area 4	G6M-02-13X	9/13/2007	510	150	120	2U	1U	53	0.14	26	20,000	230	88	4,800	18	74	0.2U	480	1U	6.54	0.45	-145.3	1.332	18.2	13.69
Area 4	G6M-02-13X	12/14/2007	690	84J	58J	2U	1U	21J	0.068	21	16,000	210	46	4,500	11	-	-	13	1U	6.51	0.27	-133.2	1.133	3.6	14.17
Area 4	G6M-02-13X	3/12/2008	130	96	29	2U	1U	12	0.092	35	21,000	260	68	7,600	17	-	-	9	1U	6.48	0.57	-140.5	1.221	7.7	14.51
Area 4	G6M-02-13X	10/6/2008	5U	9.7	7.9	5U	5U	7.5	6.5U	8.8	14,000	380	91	4,940	24.3	300	0.13U	11	0.03UJ	6.56	0.28	-173.6	1.071	5.2	13.58
Area 4	G6M-02-13X	1/21/2009	1.4U	5	5.4	1.3U	1.7U	5.7	.25U	3.8	17,000	371	72.1J	3,990	11J	200	0.13U	14	0.03U	6.88	0.28	-121.2	0.821	4	13.07
Area 4	G6M-02-13X	5/6/2009	0.5U	5.1	9.8	0.24J	0.5U	6.2	1.2U	2.6	26,000	351	69.4	3,820	9.4J	300J	0.012J	12	0.03U	6.01	0.29	-93.4	0.916	2.09	14.16
Area 4	G6M-02-13X	10/15/2009	0.92	8.6	16	0.7	0.5U	8.5	1.2U	2.2	7,400	369	93.3	6,800	7J	370	0.13U	13	0.03UJ	6.47	0.24	-148.8	0.932	1.71	14.48
Area 4	G6M-02-13X	4/20/2010	0.5U	0.29J	14	0.42J	0.5U	13	1.3U	6.4	44,000	322	134J	5,790	36	500	0.13U	5.0U	0.03U	6.47	0.28	-7.3	1.219	2.98	14.34
Area 4	G6M-02-13X	10/4/2010	0.30J	1.6	8.3	0.24J	0.5U	8.4	1.2U	9.5	48,000	281	58.5	4,690	10U	370	0.046J	3.3J	0.03U	6.57	0.18	-124.5	1.168	0.90	13.69
Area 4	G6M-02-13X	6/9/2011	-	-	-	-	-	-	-	-	-	302	72.3	6,820	-	-	-	-	-	6.49	0.21	-110.8	1.21	2.19	13.41
Area 4	G6M-02-13X	10/6/2011	0.5U	0.5U	0.96	0.5U	0.5U	2.4	1.2U	1.5U	12,000	258	36.2	5,690	6.7J	110	0.13U	0.45J	0.056	6.65	0.07	-94.6	1.235	2	14.62
Area 4	G6M-02-13X	5/9/2012	-	-	-	-	-	-	-	-	-	205	25.9	6,670	-	-	-	-	-	7	0.16	-118.5	1.281	1.01	11.53
Area 4	G6M-02-13X	10/11/2012	0.5U	0.83	0.69	0.5U	0.5U	0.5U	1.3U	87	22,000	159	24.9	8,190	2.7J	380	0.013J	5.0U	0.03U	6.68	0.34	-109.8	1.195	0	12.32
Area 4	G6M-02-13X	5/21/2013	-	-	-	-	-	-	-	-	-	212	22.3	12,500	-	-	-	-	-	6.88	0.12	-118	0.9	4.89	11.97
Area 4	G6M-02-13X	10/16/2013	0.5U	0.78	1.8	0.27J	0.5U	1.1	1.8	3.9	34,000	140	19.1	11,400	2.5J	350	0.13U	5.0U	0.037	6.87	0.37	-110	0.916	0	11.96
Area 4	G6M-02-13X	6/11/2014	-	-	-	-	-	-	-	-	-	195	20.4	15,800	-	-	-	-	-	6.74	0.27	-85	0.958	3.92	13.63
Area 4	G6M-02-13X	10/29/2014	0.5U	1.3	2.8	0.5U	0.5U	1.8	1.2U	1.5U	7,300	128	12J	7,920J	5U	280	0.13U	0.61J	0.03U	6.86	0.26	-81	0.822	6.49	-
Area 4	G6M-02-13X	6/23/2015	0.50 U	1.7	3.4	0.50 U	0.50 U	2.5	5.0 U	5.0 U	1,840	142	12.5	11,100	2.90	250	0.11 U	2.6 J	1.0 U	6.74	1.24	-107.2	0.817	5.37	14.62
Area 4	G6M-02-13X	9/11/2015	1.0 U	2.8	5.2	1.0 U	1.0 U	4.9	10 U	10 U	832	142	10.5	9,980	2.30		0.067 J	0.52 J	2.0 U	6.45	0.25	-76.0	0.619	2.85	13.41
Area 4	G6M-02-13X	10/16/2015	1.0 U	3.6	1.0 U	1.0 U	1.0 U	3.3	10 U	10 U	473	114	9.77	12,300	3.2	261	0.11 U	1.5 J	2.0 U	6.84	0.31	-87.2	0.667	2.90	8.40
Area 4	G6M-02-13X	2/12/2016	4.5	13.7	13.2	0.51 J	1.0 U	7.7	10 U	10 U	500	145	10.2	11,100	2.1	252	0.11	10 U	2.0 U	7.02	0.59	-102.3	0.671	2.00	9.48
Area 4	G6M-02-13X	6/16/2016	1.0 U	22.0	20.0	0.65 J	1.0 U	9.4	0.87 J	8.2	3,400	96	7.90	11,000	2.4	210	0.05 U	0.8 U	1.0 U	7.03	0.66	-86.6	0.618	4.63	16.47
Area 4	G6M-02-13X	11/8/2016	1.0 U	9.7	65	0.59 J	1.0 U	23	1.1 U	7.8	1,500	110	7.70	12,000	1.7	190	0.05 U	0.63 J	1.0 U	6.98	0.77	-152.9	0.383	2.97	12.31
Area 4	G6M-06-01X	3/30/2006	30	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.03	3.73	-87.8	0.652	70.7	8.22
Area 4	G6M-06-01X	3/30/2007	72	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.73	2.87	138.5	1.005	10.21	10.01
Area 4	G6M-06-01X	9/13/2007	83	2U	2.1	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.60	10.68	-93.9	0.967	6.3	12.69
Area 4	G6M-06-01X	12/14/2007	110	2U	2.3	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.96	2.43	132.9	0.991	3.9	17.46
Area 4	G6M-06-01X	10/16/2008	71	1.8	1.4	1U	1U	1U	-	-	-	-	-	-	-	-	-	-	-	5.51	3.08	118.6	0.956	20	10.8
Area 4	G6M-06-01X	10/15/2009	170	28	6.3J	8U	8U	8U	-	-	-	8U	0.321	50U	-	-	-	-	-	5.82	2.69	85.3	0.832	0.13	13.69
Area 4	G6M-06-01X	10/4/2010	120	3.4J	7.2	4U	4U	4U	-	-	-	5U	0.211U	33.2U	-	-	-	-	-	6	1.72	57.1	1.16	25.1	13.21
Area 4	G6M-06-01X	6/8/2011	190	7.7	7.2	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	5.81	1.39	122	0.979	4.01	17.13
Area 4	G6M-06-01X	10/6/2011	96	30	46	1.3U	1.3U	3.5	-	-	-	3.7J	0.139	38.5	-	-	-	-	-	6.22	0.59	40.8	0.825	13.1	11
Area 4	G6M-06-01X	5/8/2012	310	18	16	10U	10U	10U	-	-	-	5U	0.1U	9.4J	-	-	-	-	-	6.14	0.65	87.4	0.943	2.59	13.07
Area 4	G6M-06-01X	10/10/2012	180	7.6	9.1	4.0U	4.0U	4.0U	-	-	-	5U	0.0522 J	8.8 J	-	-	-	-	-	5.94	0.54	56.2	0.819	2.61	10.6
Area 4	G6M-06-01X	5/21/2013	170	30	17	5.0U	5.0U	2.0J	-	-	-	5U	0.1U	25U	-	-	-	-	-	5.96	0.36	81	1.058	8.89	13.06
Area 4	G6M-07-01X	10/15/2008	26	0.24J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	7.78	2.22	53.9	0.591	608	12.35
Area 4	G6M-07-01X	10/20/2009	21	15	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	7.44	4.11	171.9	0.532	283	27.28
Area 4	G6M-07-01X	10/7/2010	50	0.31J	0.25J	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	7.03	3.62	139	0.414	4.78	10.05
Area 4	G6M-07-01X	10/5/2011	11	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	11.5J	-	-	-	-	-	7.06	4.43	72.9	0.285	130	11.95
Area 4	G6M-07-01X	10/12/2012	19	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	.0886 J	10.8 J	-	-	-	-	-	6.92	3.56	59	0.437	30.2	11.92
Area 4	G6M-07-01X	10/17/2013	15	0.37J	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	5.4J	-	-	-	-	-	6.86	4.34	95.1	0.45	16.4	12.71
Area 4	G6M-13-02X	1/30/2014	120	20	34	0.34J	0.5U	14	-	-	-	-	-	-	-	-	-	-	-	6.44	0.88	53.9	1.099	3.11	16.01
Area 4	G6M-13-02X	6/11/2014	170	54	81	0.53	0.29J	6	-	-	-	3.2J	0.472	32.5	-	-	-	-	-	6.05	0.71	144.8	0.9	4.29	11.56
Area 4	G6M-13-02X	11/3/2014	210	39	95	5U	5U	6.7	-	-	-	2.5U	0.146UJ	20.3J	-	-	-	-	-	6.31	1.3	75.8	0.625	2.27	5.69
Area 4	G6M-13-02X	6/26/2015	105	49.6	38.1	0.50 U	0.50 U	1.10				2.1 J	0.050 U	9.4 J						5.99	1.03	101.6	0.917	9.69	17.13
Area 4	G6M-13-02X	10/16/2015	70	31	1.0 U	1.0 U	1.0 U	1.4 J	-	-	-	4.0 U	0.087	15	-	-	-	-	-	6.27	0.35	72	1.069	2.97	8.03
Area 4	G6M-13-02X	2/22/2016	85.8	24.6	21.1	0.54 J	1.0 U	0.65 J	10 U	10 U	3,560	4.0 U	0.10 U	21.9	0.81 J	56.4	0.28	15.9	2.0 U	6.23	0.9	21.6	0.818	4.89	11.54
Area 4	G6M-13-02X	6/16/2016	77	34	61.0	0.89 J	1.0 U	1.50	-	-	-	1.8 J	0.190	20	-	-	-	-	-	6.17	1.29	3.6	0.937	11.33	16.70
Area 4	G6M-13-02X	11/8/2016	84	27	38	1.0 U	1.0 U	0.93 J	-	-	-	3.0 U	0.05 U	4.7 J						6.30	0.94	-136.1	0.689	2.01	11.9
Area 4	G6M-97-28X	9/14/2015	0.57 J	62.8	37.3	1.60	1.0 U	22.3	10 U	10 U	85.0	4.0 U	0.23	2,110	1.10		0.11 U	12.10	2.0 U	6.21	0.30	67.7	0.256		14.43

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 4	G6M-97-28X	2/12/2016	1.0 U	1.1	1.4	1.0 U	1.0 U	0.53 J	10 U	10 U	235	47.9	2.49	5,690	1.6	111	0.085 J	4.2 J	2.0 U	6.92	1.99	72.8	0.21	8.64	6.05
Area 4	G6M-97-28X	6/16/2016	-	-	-	-	-	-	-	-	-	190	6.0	2,200	-	-	-	-	-	6.68	0.28	-85.3	0.312	2.15	23.12
Area 4	G6M-97-28X	11/8/2016	-	-	-	-	-	-	-	-	-	27	2.2	18,000	-	-	-	-	-	6.72	0.86	-70.9	0.537	11.87	12.8
Area 5	G6M-02-05X	2/28/2002	130	2U	1.9J	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.15	6.61	181.1	0.597	11	15.72
Area 5	G6M-02-05X	1/30/2003	170	2U	2.3	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.65
Area 5	G6M-02-05X	9/30/2005	200	2U	2.6	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	4.73	3.61	441.8	0.512	7.9	15.78
Area 5	G6M-02-05X	9/22/2006	350	2U	2.2	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	5.52	2.14	94.8	0.543	7.38	12.66
Area 5	G6M-02-05X	9/12/2007	510	50	7.9	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.39	0.78	-57.8	0.723	30.6	12.27
Area 5	G6M-02-05X	10/20/2008	390	17	4.4J	10U	10U	10U	-	-	-	-	-	-	-	-	-	-	-	7.00	1.83	-41.9	0.588	3.0	12.42
Area 5	G6M-02-05X	10/19/2009	370	53	10U	10U	10U	10U	1.3U	1.6U	410	49.2	3.82	2,490	10U	57	0.26	19	0.03U	6.22	0.31	30.6	0.699	1.4	12.53
Area 5	G6M-02-05X	10/5/2010	240	100	4.0J	5U	5U	5U	1.2U	1.5U	160	71.2	5.42	2,420	10U	20U	0.025J	13	0.03U	6.25	0.25	-37.5	0.749	5.99	12.27
Area 5	G6M-02-05X	6/8/2011	200	230	78	3.7	0.62	18J	1.2U	10	5,400	105	8.58	2,700	2.6J	180	0.13U	11	0.03U	6.16	0.24	-42.8	0.708	0	12.27
Area 5	G6M-02-05X	10/6/2011	37	140	59	2.0U	2.0U	25	1.2U	15	6,600	125	10.8	2,300	2.1J	530	0.012J	14	0.03U	6.18	0.73	-4.0	0.959	1.4	11.6
Area 5	G6M-02-05X	10/6/2011	37	140	59	2.0U	2.0U	25	1.2U	15	6,600	125	10.8	2,300	2.1J	530	0.012J	14	0.03U	6.18	0.73	-4.0	0.959	1.4	12.36
Area 5	G6M-02-05X	5/9/2012	140	68	17	0.5U	0.5U	0.5U	1.3U	1.6U	3,900	103	8.63	2,060	10U	75	0.13U	14	0.03U	6.19	0.78	9.0	0.682	1.52	12.56
Area 5	G6M-02-05X	10/10/2012	94	44	16	2.0U	2.0U	2.0U	1.2U	1.5U	4,400	73	6.78	1,460	10U	64	0.11J	14	0.03U	6.14	1.92	15.2	0.809	0	11.16
Area 5	G6M-02-05X	5/21/2013	38J	33J	78	0.48J	0.30J	2.3	1.2U	1.5U	2,200	84.1	8.43	1,310	10U	100J	0.13UJ	12	0.03UJ	6.26	0.75	-19.1	0.753	0.77	14.01
Area 5	G6M-02-06X	3/1/2002	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.16	8.91	134.8	0.135	32	12.18
Area 5	G6M-02-06X	9/24/2004	5.5	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.33	9.48	152.8	0.09	0.02	12.31
Area 5	G6M-02-06X	9/30/2005	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.22	8.22	66.4	0.107	4.39	13.26
Area 5	G6M-02-06X	9/21/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.30	7.84	139.3	0.098	10.85	11.26
Area 5	G6M-02-06X	9/14/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	6.94	8.5	-140.7	0.149	7.7	10.88
Area 5	G6M-02-06X	10/20/2008	0.47J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	7.09	7.71	88.8	0.109	6.5	11.28
Area 5	G6M-02-06X	10/14/2009	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	8U	0.2U	50U	-	-	-	-	-	6.98	8.96	26.1	0.115	0.2	11.43
Area 5	G6M-02-06X	10/5/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	6.90	7.66	63.6	0.128	4.38	11.62
Area 5	G6M-02-06X	10/7/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	2.5J	0.1U	25U	-	-	-	-	-	6.87	6.3	24.7	0.076	18.6	11.76
Area 5	G6M-02-06X	10/10/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	7.11	8.89	16.8	0.134	10.53	11.39
Area 5	G6M-02-06X	10/15/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	7.36	9.84	110.9	0.134	2.62	12.86
Area 5	G6M-02-06X	10/30/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.155U	6.0J	-	-	-	-	-	7.21	7.73	73.1	0.101	2.18	13.93
Area 5	G6M-02-06X	10/19/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.10 U	15 U	-	-	-	-	-	7.29	8.05	82.5	0.114	2.23	12.89
Area 5	G6M-02-06X	11/11/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.05 U	3.0 U	-	-	-	-	-	7.86	6.8	-32.7	0.84	4.92	9.57
Area 5	G6M-02-07X	2/26/2002	24	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.34	-0.68	110.3	0.259	46	11.54
Area 5	G6M-02-07X	9/23/2004	26	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.26	1.72	332.8	0.423	25	12.39
Area 5	G6M-02-07X	9/30/2005	16	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.69	6.98	121.2	0.389	7.7	11.08
Area 5	G6M-02-07X	9/21/2006	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.58	3.72	143.6	0.251	14.3	10.8
Area 5	G6M-02-07X	9/13/2007	12	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.68	3.78	43.3	0.334	3	10.49
Area 5	G6M-02-07X	10/20/2008	9.8J	0.27J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	-	-	-	-	-	-	-	-	-	-	-	7.46	3.15	42.8	0.271	12	10.50
Area 5	G6M-02-07X	10/15/2009	6.7J	210	10U	10U	10U	10U	-	-	-	8U	0.127U	50U	-	-	-	-	-	7.41	1.15	-14	0.413	3	11.54
Area 5	G6M-02-07X	1/15/2010	5.7	0.5U	0.5U	0.75U	0.75U	1.0U	-	-	-	-	-	-	-	-	-	-	-	7.53	3.26	150.2	0.344	1.88	11.62
Area 5	G6M-02-07X	10/5/2010	4.7	0.24J	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	7.39	2.57	60.3	0.296	1.33	11.83
Area 5	G6M-02-07X	10/3/2011	3.6	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	7.54	1.58	26.6	0.198	5.12	11.79
Area 5	G6M-02-07X	10/11/2012	4.6	0.5U	0.57	0.5U	0.5U	0.5U	-	-	-	5U	0.0278J	25U	-	-	-	-	-	7.68	1.31	98.1	0.352	2.69	-
Area 5	G6M-02-07X	10/15/2013	1.1	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	2.9J	0.1U	5.1J	-	-	-	-	-	7.62	2.39	99.8	0.911	1.05	-
Area 5	G6M-02-07X	10/29/2014	3.9	0.27J	0.62	0.5U	0.5U	0.5U	-	-	-	2.4J	0.025U	7.8J	-	-	-	-	-	7.41	0.22	10.9	0.535	3.71	11.44
Area 5	G6M-02-07X	10/19/2015	4.5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.10 U	15 U	-	-	-	-	-	7.64	0.35	75.3	0.362	3.69	15.95
Area 5	G6M-02-07X	11/11/2016	5.4	0.75 J	1.0	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.05	11	-	-	-	-	-	7.86	6.8	-32.7	0.084	4.92	9.57
Area 5	G6M-02-11X	8/1/2002	450	2.8	2U	2U	1U	2U	-	-	-	5U	-	-	-	-	-	-	-	6.01	0.46	184	0.984	8.13	13.9
Area 5	G6M-02-11X	8/28/2002	540J	2U	2U	2U	1U	2U	-	-	-	5U	-	-	5U	44	-	-	-	6.05	0.51	173	0.905	6.49	10.7
Area 5	G6M-02-11X	10/29/2002	970	22	3	2U	1U	2U	-	-	-	5U	1U	1700	5U	51	0.10U	17	2.0U	6.02	0.49	51	0.92	5.04	13.2
Area 5	G6M-02-11X	2/3/2003	710	22	2U	20U	1U	2U	-	-	-	5U	1U	-	5U	65	-	-	-	6.22	0.71	178	0.971	12.7	14.12
Area 5	G6M-02-11X	7/16/2003	530	54	33	2U	1U	2U	0.005U	0.014	460	5U	1U	-	5U	120	-	16M	2.0U	6.31	0.86	166	0.813	11.9	16.05

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
Area	Well ID	Date	PCE (µg/L)	TCE (µg/L)	*cis* -1,2-DCE (µg/L)	*trans* -1,2-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Methane (µg/L)	Dissolved Arsenic (µg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (µg/L)	TOC (mg/L)	Alkalinity (mg/L)	Nitrate/ Nitrite (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	pH (SU)	DO (mg/L)	ORP (mV)	SpC (mS/cm)	Turbidity (NTUs)	Temp °C
Area 5	G6M-02-11X	9/26/2003	590	31	37	2U	1U	2U	0.005U	0.005U	1,200	5U	-	1,700	19	-	-	-	-	6.60	0.41	146	0.921	7.2	8.61
Area 5	G6M-02-11X	1/8/2004	300	15	49	2U	1U	2U	0.005U	0.0093	2,300	5U	1U	1,900	5U	150	-	12J	2.0U	6.29	0	104	0.729	0.6	6.55
Area 5	G6M-02-11X	3/10/2004	160	11	53	2U	1U	2U	0.005U	0.068	14,000	5U	1U	2,200	1.8	130	-	9.6	2U	6.39	0.82	103	0.847	7.5	15.58
Area 5	G6M-02-11X	6/4/2004	440	23	54	2U	1U	2U	0.005U	0.01	2,300	5U	1U	1,900	2.4J	110	-	12	1.9J	6.72	12.13	54.5	0.807	21.3	13.72
Area 5	G6M-02-11X	9/22/2004	540	50	140	2U	1U	2U	0.005U	0.005U	13,000	5U	1U	2,400	1.2	100	0.5U	12	1.5J	6.19	0.96	412.7	0.996	1.25	11.09
Area 5	G6M-02-11X	12/15/2004	760	47	120	2U	1U	2U	0.005U	0.021	9,700	5U	1U	2,100	5U	95	1	15	2U	6.35	1.36	200.1	0.675	21.2	13.83
Area 5	G6M-02-11X	3/28/2005	1,100	41	45	40U	40U	40U	0.005U	0.065	10,000	5U	1U	2,200	3.6J	90	0.2U	13	2UJ	6.19	1.02	84.3	0.938	48.3	16.04
Area 5	G6M-02-11X	7/1/2005	1,500	90	280	10U	10U	10U	0.028	0.42	15,000	2.1	1UJ	1,800	9.4	98.4	0.05U	14	1U	5.78	0.37	221.6	0.806	6.66	14.87
Area 5	G6M-02-11X	9/27/2005	240	78	260	2U	1U	16	0.020J	8.1	21,000	5U	1U	2,500	3.4	148	0.05U	5.9J	1U	5.92	0.4	93.6	0.755	0.69	13.00
Area 5	G6M-02-11X	12/12/2005	220	28	50	2U	1U	9.1	0.082	29	24,000	7.8	0.2J	3,100	5.5	270	1.3J	3.5	1U	6.28	0.18	64.8	1.107	8.9	12.95
Area 5	G6M-02-11X	3/21/2006	520	94	230	2.3	1U	60	0.025U	34	17,000	5U	0.1U	1,500	8.2	120	0.2U	8.81	1U	6.45	12	326.6	0.765	7.15	14.52
Area 5	G6M-02-11X	6/22/2006	130	44	20	20	1U	9.2	0.051	78	22,000	5U	1U	6,300	6.1	210	0.2U	2.45	1U	6.19	0.27	59.7	1.231	5.04	14.02
Area 5	G6M-02-11X	9/22/2006	37	17	8.6	2.8	1U	4	0.089	15	21,000	6.9	0.58	9,300	9.8	180	0.2U	4.87	1U	5.93	1.22	-158.9	1.079	4.55	12.97
Area 5	G6M-02-11X	12/13/2006	45	7.9	3.6	4.4	1U	2U	0.24	19	28,000	22	1	16,000	9.3	-	-	1.06	1.2	6.39	0.19	169.6	1.277	6.94	13.71
Area 5	G6M-02-11X	3/27/2007	38	21	3.6	9.8	1U	2U	6.8	28	23,000	120	7.1	24,000J	10	-	-	-	-	6.25	0.61	-39.6	0.912	19	12.57
Area 5	G6M-02-11X	6/13/2007	30	28	12	10	1U	2.8	4.8	33	27,000	310	6.8	18,000	12	-	-	9.62	1.6	6.22	0.65	-36.4	1.198	2.1	11.24
Area 5	G6M-02-11X	9/11/2007	4.4	24	7.9	12	1U	4.3	2.8	36	30,000	420	18	18,000	14	270	0.2U	470	1U	6.24	3.52	-11.1	1.423	9.7	10.99
Area 5	G6M-02-11X	12/13/2007	2.8J	19J	6J	5.5J	1U	4.4J	8.3	16	29,000	470	47	18,000	15	-	-	5U	1	6.36	0.52	-117.9	1.409	0.5	11.79
Area 5	G6M-02-11X	3/11/2008	2U	6.2	2.5	9.7	1U	2U	24	5.8	28,000	570	59	27,000	17	-	-	5U	2.8	6.35	0.41	-90.5	1.56	0.3	11.69
Area 5	G6M-02-11X	10/16/2008	1.3	7.3	6.9	0.8	0.5U	2.2	1.2U	5.4	39,000	1,170	116	8,420	21.2U	240	0.10U	9.3	0.03U	5.8	1.51	-20.6	0.1535	4.0	13.68
Area 5	G6M-02-11X	5/7/2009	0.5U	0.76	0.47J	0.92	0.5U	0.5U	3.1	3.5	42,000	1,060	125	3,950	31	370J	0.13U	17	0.03U	6.04	0.24	-117.5	1.605	0.32	12.08
Area 5	G6M-02-11X	10/14/2009	0.23J	1.4	0.58	0.63	0.5U	0.46J	1.2U	1.5U	55,000	1,070	126	2,390	8.7J	430	0.13U	9.7	0.03U	6.46	0.52	-114.9	1.342	5.0	11.1
Area 5	G6M-02-11X	4/20/2010	0.5U	1.6	24	0.24J	0.5U	5.8	1.2U	2.0	17,000	1,050	106J	3,760	8.7J	500	0.13U	5U	0.03U	6.75	0.38	-130.5	0.778	1.5	11.58
Area 5	G6M-02-11X	10/5/2010	0.5U	0.94	0.52	0.38J	0.5U	0.66	1.2U	1.5U	47,000	956	93.8	1,590	10U	700	0.13U	1.4J	0.03U	6.51	0.72	-136	1.368	0.86	11.57
Area 5	G6M-02-11X	6/9/2011	-	-	-	-	-	-	-	-	-	804	91.6	2,480	-	-	-	-	-	6.6	0.1	-111.1	1.131	4.53	11.66
Area 5	G6M-02-11X	10/3/2011	0.5U	0.5U	0.64	0.5U	0.5U	1.2	1.2U	1.5U	19,000	901	99.9	2,670	7.6J	520	0.13U	5U	0.03U	6.58	0.44	-114.4	0.74	0.95	11.7
Area 5	G6M-02-11X	5/8/2012	-	-	-	-	-	-	-	-	-	769	84.2	2,560	-	-	-	-	-	6.83	0.14	-128.1	1.014	1.03	11.58
Area 5	G6M-02-11X	10/10/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	3.9	1.5U	12,000	683	69.9	1,840	4.2J	390	0.11J	1.3J	0.03U	6.52	0.28	-122.8	1.341	0.84	12.54
Area 5	G6M-02-11X	5/21/2013	-	-	-	-	-	-	-	-	-	649	59.5	3,660	-	-	-	-	-	6.7	0.24	-124.88	1.247	0	18.2
Area 5	G6M-02-11X	10/16/2013	0.5U	0.5U	0.26J	0.20J	0.5U	0.5U	17	1.6U	56,000	616	53	3,230	4.2J	320	0.13U	5.0U	0.03U	6.8	0.22	-114.8	1.243	0.39	14.2
Area 5	G6M-02-11X	6/11/2014	-	-	-	-	-	-	-	-	-	573	50	8,010	-	-	-	-	-	6.84	0.32	-104.4	1.069	1.38	13.5
Area 5	G6M-02-11X	10/29/2014	0.5U	0.5U	0.42J	0.34J	0.5U	0.44J	8.1J	1.5U	15,000	624	64.3J	4,860J	5U	340	0.13U	0.17J	0.03U	6.96	0.35	-156.8	1.224	0.65	12.8
Area 5	G6M-02-11X	6/26/2015	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5.0 U	5.0 U	8,180	578	51.1	10,800	5.80	312	0.17	2.0 J	1.0 U	5.98	2.49	-62.1	0.934	9.2	12.54
Area 5	G6M-02-11X	9/10/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.5 J	10 U	11,500	546	44.4	9,920	5.30		0.087 J	0.78 J	2.0 U	6.29	3.21	44.2	0.570	5.37	14.62
Area 5	G6M-02-11X	10/15/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.8 J	10 U	9,710	551	44.2	10,400	4.9	229	0.062 J	10 U	2.0 U	7.03	0.26	-132.7	0.942	1.12	14.83
Area 5	G6M-02-11X	2/11/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	4,980	584	45.9	9,880	5.1	219	0.10 J	10 U	2.0 U	7.02	0.6	-117.2	0.717	2.14	10.14
Area 5	G6M-02-11X	6/15/2016	1.0 U	1.0 U	0.63 J	1.0 U	1.0 U	1.0 U	4.6	1.0 UJ	11,000	550	35.0	9,000	4.4	250	0.05 U	0.80 U	1.0 U	6.81	2.29	-130.1	0.861	20.9	18.18
Area 5	G6M-02-11X	11/14/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.6	1.0 U	11,000	530	32.0	7,600	4.1	220	0.05 U	1.0 U	1.0 U	7.16	0.92	-127.9	0.632	5.71	11.82
Area 5	G6M-02-12X	8/1/2002	330	2U	2U	2U	1U	2U	-	-	-	5U	-	-	-	-	-	-	-	6.24	0.64	19	0.924	37.6	14.01
Area 5	G6M-02-12X	8/28/2002	520	6.5	2U	2U	1U	2U	-	-	-	5U	-	-	5U	54	-	-	-	6.15	0.19	156	0.868	2.96	14.12
Area 5	G6M-02-12X	10/29/2002	790	10	2U	2U	1U	2U	-	-	-	5U	1U	1,100	2.0J	40	0.10U	17	2.0U	6.14	0.27	68	0.927	2.08	14.83
Area 5	G6M-02-12X	2/3/2003	580	4	2U	2U	1U	2U	-	-	-	5U	1U	-	5U	52	-	-	-	6.04	-	78	0.947	5.06	12.49
Area 5	G6M-02-12X	7/14/2003	-	-	-	-	-	-	-	-	-	-	-	-	5U	-	-	-	-	-	-	-	-	-	11.03
Area 5	G6M-02-12X	9/22/2004	1,000	43	110	2U	1U	2U	0.005U	0.005U	2,900	5U	1U	450	1U	84	0.5U	13	2U	5.87	0.35	570.2	0.873	4.95	11.59
Area 5	G6M-02-12X	9/27/2005	1,100	38	250	1.4	1U	5.4	0.025U	1.1	14,000	5U	1U	690	3.5	106	0.05U	13J	1U	6.11	1.17	238.5	6.92	24.5	11.73
Area 5	G6M-02-12X	9/21/2006	190	88	64	23	1U	67	0.038	46	15,000	5U	0.37	3,200	7.6	170	0.2U	5.72	1U	6.23	0.17	78	0.799	60.6	11.65
Area 5	G6M-02-12X	9/12/2007	62	50	28	4.4	1U	18	0.4	8.4	11,000	20U	0.58	5,500	2.6J	180	0.2U	340	1.0	6.52	3.06	52.8	0.934	5.8	11.75
Area 5	G6M-02-12X	10/16/2008	0.37J	7.1	18	1.6	0.5U	4.8	1.2U	3.1	19,000	174	11.8	15,800	10U	310	0.10U	7U	0.03U	6.09	0.53	-67.4	1.091	10	11.66
Area 5	G6M-02-12X	10/14/2009	0.5U	0.3J	13	0.74	0.5U	1.6	1.3U	1.6U	6,900	540	24.4	11,000	4.6J	350	0.13U	7U	0.03U	6.27	1.27	-40.0	1.025	1.5	19.7
Area 5	G6M-02-12X	10/5/2010	0.5U	0.5U	5.6	0.27J	0.5U	1.5	1.2U	2	40,000	1,040	72.2	13,700	10U	810	0.050J	2.8J	0.03U	6.34	0.58	-88.1	1.217	1.11	17.11
Area 5	G6M-02-12X	10/4/2011	0.5U	0.5U	6.3	0.5U	0.5U	4.3	1.2U	1.5U	21,000	1,020	71.2	9,540	6.4J	440	0.13U	0.33J	0.03U	6.65	0.48	-89.1	0.807	1.9	13.11

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
Area	Well ID	Date	PCE (µg/L)	TCE (µg/L)	*cis* -1,2-DCE (µg/L)	*trans* -1,2-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Methane (µg/L)	Dissolved Arsenic (µg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (µg/L)	TOC (mg/L)	Alkalinity (mg/L)	Nitrate/ Nitrite (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	pH (SU)	DO (mg/L)	ORP (mV)	SpC (mS/cm)	Turbidity (NTUs)	Temp °C
Area 5	G6M-02-12X	10/10/2012	0.5U	0.5U	1.0	0.5U	0.5U	1.0	1.8	1.5U	14,000	865	65.8	5,010	4.0J	320	0.13U	0.59J	0.03U	6.76	0.7	-111.4	1.068	1.68	14.37
Area 5	G6M-02-12X	10/16/2013	0.5U	0.5U	0.7	0.21J	0.5U	0.54	10	1.5U	55,000	809	61.3	4,910	4.2J	83	0.13U	5.0U	0.03U	6.85	0.45	-127.7	1.01	1.87	21.32
Area 5	G6M-02-12X	10/29/2014	0.5U	0.5U	0.9	0.56	0.5U	0.79	9.2	1.5U	25,000	760	56J	4,870J	6.2J	330	0.13U	0.22J	0.03U	6.96	0.83	-103.4	0.995	2.48	15.51
Area 5	G6M-02-12X	10/15/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	11,300	714	42.6	8,540	6.4	243	0.11 U	10 U	2.0 U	7.26	1.07	-108.0	0.63	6.17	13.71
Area 5	G6M-02-12X	11/14/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.2	1.0 U	9,400	720	40.0	7,700	4.5	210	0.05 U	2	1.0 U	6.90	1.24	-131	0.53	13.9	11.88
Area 5	G6M-03-08X	5/14/2003	750	2U	2U	2U	1U	2U	-	-	-	5U	1U	-	-	-	-	-	-	-	-	-	-	-	13.25
Area 5	G6M-03-08X	9/22/2004	690	6.3	5.4	2U	1U	2U	0.005U	0.005U	1.8	5U	1U	15U	1U	16	8.3	13	1.5J	5.89	1.81	247.6	0.463	3.22	14.12
Area 5	G6M-03-08X	12/16/2004	1,100	11	9.6	2U	1U	2U	0.069	0.03	4.7	5U	1U	17	5U	20	5.7	13	2.9	5.93	0.7	135.7	0.495	8.98	13.25
Area 5	G6M-03-08X	3/31/2005	340	20U	9.6J	20U	20U	20U	0.011	0.45	14	5U	1U	15U	0.3J	12	2.3	17	2U	5.94	1.96	166.3	0.205	0.93	12.82
Area 5	G6M-03-08X	7/6/2005	780	8.2	15	2U	1U	2U	0.11	0.068	410	4U	1U	10U	5.5	28.6	1.8	14	1U	5.85	0.78	236.1	0.463	5.37	13.36
Area 5	G6M-03-08X	9/28/2005	620	4.8	14	1U	1U	1U	0.025U	0.009J	2,400M	5U	1U	15U	5U	28.3	1.6	12	1U	5.60	3.56	172.3	0.352	8.3	10.8
Area 5	G6M-03-08X	12/14/2005	700	8	17	2U	1U	2U	0.025U	0.025U	7,000	5U	1U	15UJ	5U	32	1.2	12	1U	6.16	0.54	153.8	0.404	3.7	11.48
Area 5	G6M-03-08X	3/22/2006	1,100	21J	34	2.6	1U	2U	0.025U	0.006J	12,000	5U	0.1U	15U	6.5	29	0.586	11.7	1U	6.28	5.43	394.2	0.299	9.75	10.71
Area 5	G6M-03-08X	6/21/2006	610	16	48	2U	1U	2U	0.004J	0.14	16,000	5U	1.8	42	5U	41J	0.33	10.2	1U	5.91	0.29	141.6	0.49	21.4	10.62
Area 5	G6M-03-08X	9/21/2006	660	47	110	2U	1U	5.2	0.023J	0.55	14,000	5U	0.10U	15U	3.2J	41	0.228	9.64	1U	6.00	2.36	122.5	0.325	17.1	11.03
Area 5	G6M-03-08X	12/12/2006	750	45	120	2U	1U	7.8	0.013	0.59	16,000	5U	.01U	15U	5U	-	-	-	-	5.98	0.22	145	0.350	7.0	11.9
Area 5	G6M-03-08X	3/29/2007	570	37	74	2U	1U	11	0.006J	0.72	14,000	5U	0.1U	15U	5U	-	-	-	-	5.79	0.07	21.3	0.392	1.41	11.59
Area 5	G6M-03-08X	6/12/2007	740	55	88	2U	1U	14	0.025U	0.7	15,000	5U	0.1U	15U	0.6J	-	-	-	-	5.93	0.25	135.2	0.413	41.3	10.18
Area 5	G6M-03-08X	9/10/2007	520	75	75	2U	1U	21	0.025U	1.7	14,000	2U	0.1U	15U	5U	42	0.2U	200	1U	5.92	2.55	154.2	0.385	9.7	11.35
Area 5	G6M-03-08X	12/11/2007	390	53	49	2U	1U	15	0.004J	1.6	15,000	5U	0.1U	20	5U	-	-	-	-	5.76	0.23	129.3	0.437	0.8	11.11
Area 5	G6M-03-08X	3/13/2008	390	5	10	2U	1U	2U	0.003J	0.051	2,800	5U	0.1U	20	5U	-	-	-	-	5.89	0.22	111.6	0.195	0.3	11.55
Area 5	G6M-03-08X	10/20/2008	290	61	140	5U	5U	26	1.3U	2.1	21,000	8U	0.2U	33.2	10U	110	0.13U	14	0.03U	6.42	1.58	68.9	0.548	2.0	12.1
Area 5	G6M-03-08X	5/6/2009	120	38	150	4.0U	4.0U	15	1.2U	1.6	37,000	3.1J	0.2U	144	10U	190J	0.13U	10	0.03U	5.93	0.32	100.8	0.701	1.5	13.18
Area 5	G6M-03-08X	10/14/2009	5U	20	120	5U	5U	11	1.3U	1.6U	7,300J	8.0U	0.139U	1,470	10U	240	0.13U	8.3	0.03U	5.91	0.33	152.3	0.643	2.11	-
Area 5	G6M-03-08X	4/20/2010	26J	9.9J	88J	2UJ	2UJ	1.5J	1.3U	1.6U	3,500	9.0	0.194U	6,520	10U	250	0.13U	7.8	0.03U	6.31	0.90	87.9	0.382	0.3	14.33
Area 5	G6M-03-08X	10/4/2010	8.2	5.2	80	2U	2U	3.5	1.2U	1.5U	890	3.4J	0.132U	11,300	10U	360	0.13U	5.5	0.03U	6.07	0.68	84.9	0.549	0.0	10.23
Area 5	G6M-03-08X	6/8/2011	-	-	-	-	-	-	-	-	-	14.1	0.266	16,100	-	-	-	-	-	6.28	0.21	49.5	0.686	0.5	11.28
Area 5	G6M-03-08X	10/3/2011	4.3	3.4	62	2.5U	2.5U	9.6	1.2U	1.5U	590	5.1J	0.194J	16,800	10U	360	0.13U	3.2J	0.03U	6.17	0.43	77.2	0.603	0.51	15.19
Area 5	G6M-03-08X	5/8/2012	-	-	-	-	-	-	-	-	-	5.0U	0.127U	17,700	-	-	-	-	-	6.58	1.87	39.7	0.618	0.55	13.06
Area 5	G6M-03-08X	10/9/2012	0.5U	0.78	9.8	0.76	0.5U	7.4	1.3U	3.6	110	5U	0.152	18,600	2.5J	380	0.13U	1.4J	0.03U	6.34	0.43	53.9	0.648	1.42	11.87
Area 5	G6M-03-08X	5/22/2013	-	-	-	-	-	-	-	-	-	3.1J	0.117U	12,500	-	-	-	-	-	6.56	1.4	36.5	0.591	0.14	11.9
Area 5	G6M-03-08X	10/15/2013	0.5U	0.87	2.8	1.2	0.5U	1.6	1.8	1.5U	360	5.2	0.121U	12,300	3.0J	450	0.13U	5.0U	0.03U	6.57	0.39	82.7	0.851	0.0	16.01
Area 5	G6M-03-08X	6/12/2014	-	-	-	-	-	-	-	-	-	4.3J	0.152	9,850	-	-	-	-	-	6.57	1.84	58.9	0.592	6.31	13.03
Area 5	G6M-03-08X	6/18/2015	0.50 U	0.51 J	0.50 U	0.50 U	0.50 U	0.50 U	5.0 U	5.0 U	5.0 U	2.5 J	0.05 U	2,320	5.40	83.2	0.11 U	8.4 J	1.0 U	6.32	1.11	113.0	0.273	8.42	13.18
Area 5	G6M-03-08X	10/14/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Area 5	G6M-03-08X	2/24/2016	1.0 U	1.0 U	3.0	1.0 U	1.0 U	1.0 U	10 U	10 U	90.7	8.2	1.03	4,710	1.8	155	0.10 U	3.1 J	2.0 U	6.79	1.03	-54.7	0.244	3.93	7.53
Area 5	G6M-03-08X	11/14/2016	1.0 U	0.96 J	0.84 J	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	170	12	0.18	4,200	1.3	140	0.053 J	9.8	1.0 U	7.03	1.19	-99.6	0.339	7.46	8.32
Area 5	G6M-03-09X	5/14/2003	2U	2U	2U	2U	1U	2U	-	-	-	5U	1U	-	-	-	-	-	-	-	-	-	-	-	13.34
Area 5	G6M-03-09X	9/23/2004	3.7	2U	2U	2U	1U	2U	0.005U	0.005U	1.9	5U	1U	15U	1U	23	19	15	2.2	6.23	8.67	176.2	0.13	4.57	13.22
Area 5	G6M-03-09X	12/14/2004	2U	2U	2U	2U	1U	2U	0.015	0.026	2	5U	1U	15U	5U	25	11	15	2U	6.08	8.17	417.6	0.106	12.1	12.43
Area 5	G6M-03-09X	3/29/2005	1.5J	2U	2U	2U	1U	2U	0.013	0.26	1.4	5U	1UM	15U	0.3J	18	1.5	13	2U	6.18	6	113.2	0.123	72.4	13.27
Area 5	G6M-03-09X	6/30/2005	5.8	2U	2U	2U	1U	2U	0.077	0.032	1.2	2U	1UJ	10U	15	25.1	1.3	13	1U	5.75	2.81	160.2	0.135	53.6	10.23
Area 5	G6M-03-09X	9/28/2005	2U	2U	2U	2U	1U	2U	0.006J	0.009J	29	5U	1U	15U	4J	38.2	3.7	13	1U	5.90	10.56	181	0.108	7.6	11.2
Area 5	G6M-03-09X	12/13/2005	2U	2U	2U	2U	1U	2U	0.005J	0.014J	790	5U	1U	15U	5U	53	0.05U	13	1U	6.21	3.06	259.3	172	4.9	10.62
Area 5	G6M-03-09X	3/22/2006	2U	2U	2U	2U	1U	2U	0.006J	0.016J	39	5U	0.1U	20	7.9	36	1.81	12.1	1U	6.40	3	415.5	0.102	10.83	10.99
Area 5	G6M-03-09X	6/23/2006	2U	2U	2U	2U	1U	2U	0.025U	0.042	390	5U	0.1U	15U	5U	39	2.65	13.2	1U	5.92	4.55	164.9	0.156	16.9	11.02
Area 5	G6M-03-09X	9/21/2006	2U	2U	2U	2U	1U	2U	0.014J	0.12	140	5U	0.10U	15U	0.8J	36	2.51	9.19	1UJ	6.71	2.24	127.6	0.212	4.56	13.75
Area 5	G6M-03-09X	12/13/2006	2U	2U	2U	2U	1U	2U	0.025U	0.019J	870	5U	0.10U	15U	5U	-	-	-	-	6.21	3.38	142.8	0.162	5.6	11.45
Area 5	G6M-03-09X	3/29/2007	2U	2U	2U	2U	1U	2U	0.006J	0.032	1,600	5U	0.1U	15U	1.8J	-	-	-	-	6.08	0.16	16.4	0.217	2.45	10.57
Area 5	G6M-03-09X	6/13/2007	3.8	2U	2U	2U	1U	2U	0.005J	0.011J	870	5U	0.1U	15U	0.5J	-	-	-	-	6.26	0.36	111	0.154	7.6	11.36
Area 5	G6M-03-09X	9/10/2007	2U	2U	2U	2U	1U	2U	0.025U	0.025U	18,000	6U	0.1U	15U	5U	53	2.01	20	1U	6.26	2.74	128	0.193	9.9	11.07

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	G6M-03-09X	12/11/2007	2U	2U	2U	2U	1U	2U	0.006J	0.022J	2,200	5U	0.1U	15U	5U*	-	-	-	-	6.03	0.11	110.3	0.19	2.1	11.41
Area 5	G6M-03-09X	3/12/2008	2U	2U	2U	2U	1U	2U	0.027	0.016J	5,200	5U	0.11	18	5U	-	-	-	-	6.33	0.24	24.6	0.159	0.5	11.51
Area 5	G6M-03-09X	10/20/2008	0.37J	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	1,600	8U	0.2U	50U	10U	48	0.84	19	0.03U	5.98	0.24	177.8	0.129	6.5	11.28
Area 5	G6M-03-09X	5/6/2009	0.78	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	340	8U	0.2U	50U	10U	52J	0.9	14	0.03U	5.99	0.33	104	0.171	1.0	11.35
Area 5	G6M-03-09X	10/14/2009	0.35J	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	230	8U	0.2U	50U	10U	53	0.32	13	0.03U	5.49	0.26	-89.9	0.161	0	-
Area 5	G6M-03-09X	4/20/2010	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	1.3U	1.6U	700	5U	0.1U	25U	10U	90	0.13U	12	0.03U	6.19	0.40	166	0.102	0.6	15.41
Area 5	G6M-03-09X	10/4/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	35J	5U	0.1U	25U	10U	44	0.86	12	0.03U	5.90	1.18	146.6	0.159	0.6	12.1
Area 5	G6M-03-09X	6/8/2011	-	-	-	-	-	-	-	-	-	5U	1.68	11.4J	-	-	-	-	-	5.99	0.42	122.8	0.154	0.4	11.09
Area 5	G6M-03-09X	10/3/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	230	20U	0.2U	50U	10U	35	0.39	11	0.03U	5.82	0.61	163.2	0.107	0.23	16.6
Area 5	G6M-03-09X	5/8/2012	-	-	-	-	-	-	-	-	-	5.0U	0.1U	25U	-	-	-	-	-	6.12	2.27	186.4	0.095	0.71	13.41
Area 5	G6M-03-09X	10/9/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	2.6	5U	0.1U	6.2 J	10U	25	2.8	8.9	0.03U	5.71	4.36	167.9	0.136	0.58	12.12
Area 5	G6M-03-09X	5/22/2013	-	-	-	-	-	-	-	-	-	5U	0.1U	25U	-	-	-	-	-	6.01	0.46	172.9	0.084	1.83	13.94
Area 5	G6M-03-09X	10/15/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	7,600	5U	0.1U	9.6J	10U	29	0.82	10	0.03U	6.08	1.16	150.3	0.144	0	15.96
Area 5	G6M-03-09X	6/12/2014	-	-	-	-	-	-	-	-	-	5U	0.0219U	7.4J	-	-	-	-	-	5.89	0.54	163.9	0.102	2.49	14.07
Area 5	G6M-03-09X	10/28/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.4	1.5U	20	2.5U	0.268J	13.4J	5U	35	1.6	11	0.03U	6.24	1.65	124.1	0.139	2.78	13.61
Area 5	G6M-03-09X	6/18/2015	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5.0 U	5.0 U	30	2.0 U	0.05 U	20	0.70 U	27.0	0.057 U	8.6 J	1.0 U	5.39	0.45	169.7	0.191	2.25	11.35
Area 5	G6M-03-09X	10/15/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1,090	4.0 U	0.10 U	57	1.0 U	27.8	0.11 U	11.4	2.0 U	6.06	0.22	123.1	0.144	0.81	15.66
Area 5	G6M-03-09X	2/19/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	14.1	6.4 J	270	4.0 U	0.10 U	99.5	1.0 U	36.9	0.19	10.5	2.0 U	8.64	2.29	513.6	0.100	3.99	9.63
Area 5	G6M-03-09X	6/16/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	8.8	3.0 U	0.05 U	81	0.78 J	43.0	0.05 U	16.0	1.0 U	6.02	1.8	131.6	0.22	3.32	11.76
Area 5	G6M-03-09X	11/14/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	0.58 U	3.0 U	0.05 U	90	0.78 J	31	1.5	8.4	1.0 U	6.23	1.27	8.0	0.119	4.19	9.4
Area 5	G6M-03-10X	5/14/2003	15	2U	2U	2U	1U	2U	-	-	-	5U	1.0U	-	-	-	-	-	-	-	-	-	-	-	14.23
Area 5	G6M-03-10X	9/22/2004	27	2U	2U	2U	1U	2U	0.05	0.68	680	5U	1U	340	1U	51	2.8	12	1.5J	6.28	1.28	-77.2	0.539	20.5	13.06
Area 5	G6M-03-10X	12/14/2004	19	2U	44	2U	1U	2U	0.02	0.025	1.9	5U	1U	880	5U	110	3.8	21	2U	6.52	0.94	62	0.801	1.57	13.92
Area 5	G6M-03-10X	3/29/2005	14	0.98J	68	1.2J	1U	2U	0.005U	0.38	2,600	5U	1UM	1,200	5.9	146	0.2U	12	2U	6.44	0.59	-14.5	0.869	6.77	11.8
Area 5	G6M-03-10X	6/30/2005	3.6	2U	2U	2U	1U	2U	0.026	0.021	8,600	2U	1UJ	1,900	19	199	0.1	11	1U	5.18	0.39	273.2	0.702	5.06	12.45
Area 5	G6M-03-10X	9/28/2005	6.7	2U	2U	2U	1U	2U	0.025U	0.020J	1,100	5U	1U	720	0.6J	140	0.2	16	1U	6.43	4.3	74.1	0.588	7.36	11.31
Area 5	G6M-03-10X	12/13/2005	3.4	2U	2U	2U	1U	2U	0.009J	0.027	12,000	6.9	1U	3,020	5U	250	0.48	8.4	1U	6.73	0.15	57.2	1.032	1.3	12.28
Area 5	G6M-03-10X	3/23/2006	9.9	2U	2U	2U	1U	2U	0.020J	0.052	7,000	5U	0.22	3,800	3.5J	170	0.2U	8.9	1U	6.64	0.67	36.6	0.663	5.39	12.15
Area 5	G6M-03-10X	6/22/2006	2.6	2U	2U	2U	1U	2U	0.004J	0.042	14,000	5U	0.74	7,300	5J	200	0.2U	4.44	1U	4.87	0.64	610.8	0.77	0.64	13.95
Area 5	G6M-03-10X	9/20/2006	2.2	2U	2U	2U	1U	2U	0.006J	0.14	14,000	5U	0.21	6,200	6	180	0.2U	6.95	1U	6.41	1.26	-140.2	0.856	3.9	12.27
Area 5	G6M-03-10X	12/13/2006	2.8	2U	3.4	2U	1U	2U	0.025U	0.025U	20,000	5U	0.27	8,500	2J	-	-	-	-	6.45	0.26	168.2	0.870	5.0	11.38
Area 5	G6M-03-10X	3/29/2007	2.2	2.1	4.2	2U	1U	2U	0.007J	0.16	24,000	8.6	0.3	9,100J	4.8J	-	-	-	-	6.20	0.32	-60.7	0.97	2.99	12.14
Area 5	G6M-03-10X	6/11/2007	2.5	2U	4.1	2U	1U	2U	0.025U	0.095	29,000	23	1	11,000	6.7	-	-	-	-	6.27	0.41	45.5	0.947	8.5	11.61
Area 5	G6M-03-10X	9/10/2007	2U	2U	3.8	2U	1U	2U	0.1	0.057	620	29	0.4	8,100	3.5J	150	0.2U	290	1U	6.28	0.24	61.3	0.859	13.6	12.27
Area 5	G6M-03-10X	12/12/2007	2U	2U	2.8	2U	1U	2U	0.025U	0.043	20,000	26	0.33	9,200	5.8	-	-	-	-	6.14	0.66	69.8	0.755	7.5	12.45
Area 5	G6M-03-10X	3/11/2008	16	8.7	16	2U	1U	4	0.04	59	28,000	91	15	9,200	5J	-	-	-	-	6.32	0.22	-62.9	1.029	7.3	11.74
Area 5	G6M-03-10X	10/20/2008	1.0	2.0	5.4	0.5U	0.5U	1.0	1.3U	1.6U	21,000	248	7.07	10,300	170	170	0.13U	8.3	0.03U	5.98	0.21	-10.9	0.781	8.2	18.11
Area 5	G6M-03-10X	5/6/2009	1.0	5.0	9.1	0.5U	0.5U	1.5	1.2U	1.5U	31,000	522	54.4	9,210	11	230J	0.0076J	9.3	0.03U	5.91	0.33	-64.0	1.04	0.5	18.59
Area 5	G6M-03-10X	10/14/2009	0.61	3.7	10	0.5U	0.5U	2.2	1.3U	1.6U	9,000J	518	57.8	7,410	7.4J	310	0.13U	21	0.03U	6.32	0.67	-62.2	0.896	1.2	19.1
Area 5	G6M-03-10X	4/20/2010	1.2	5.6	2.0	0.21J	0.5U	1.1	1.2U	1.5U	4,100	648	60.5J	4,910	4.7J	130	0.13U	6.5	0.03U	6.78	0.77	-101.1	0.799	1.4	16.25
Area 5	G6M-03-10X	10/4/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	6.2	20,000	475	58.1	5,650	10U	230	0.13U	5.9	0.03U	6.52	0.22	-115.6	0.729	0.5	11.33
Area 5	G6M-03-10X	6/9/2011	-	-	-	-	-	-	-	-	-	520	53.9	2,550	-	-	-	-	-	6.74	0.58	-118.8	0.704	4.62	12.12
Area 5	G6M-03-10X	10/3/2011	0.5U	2.7	1.2	0.5U	0.5U	0.53	1.2U	1.5U	9,800	528	54.5	3,980	3.0J	100	0.21	7.6	0.030U	6.75	0.10	-85.8	0.633	0.85	12.31
Area 5	G6M-03-10X	5/8/2012	-	-	-	-	-	-	-	-	-	480	56	4,070	-	-	-	-	-	7	0.15	-119.1	0.817	0.77	13.02
Area 5	G6M-03-10X	10/9/2012	0.5U	0.55	0.5U	0.5U	0.5U	0.5U	22	1.6U	13,000	456	47.5	2,280	10U	100	0.13U	8.4	0.03U	6.88	0.43	-109.6	0.94	0	12.11
Area 5	G6M-03-10X	5/22/2013	-	-	-	-	-	-	-	-	-	514	57.1	2,340	-	-	-	-	-	6.8	0.16	-137.6	1.111	0.4	12
Area 5	G6M-03-10X	10/15/2013	0.5U	0.68	0.52	0.5U	0.5U	0.5U	1.8	1.5U	23,000	452	50.6	2,770	10U	80	0.042U	9.2	0.03U	6.87	4.57	-122.7	1.018	0.19	12.22
Area 5	G6M-03-10X	6/12/2014	-	-	-	-	-	-	-	-	-	510	51.9	2,400	-	-	-	-	-	6.82	0.51	-88	0.857	Overrange	22.11
Area 5	G6M-03-10X	10/29/2014	0.5U	0.77	0.92	0.5U	0.5U	0.41J	1.2U	1.5U	14,000	418	42.9J	3,090J	5U	92	0.13U	8.6	0.03U	7.02	0.29	-122.4	0.787	4.94	19.6
Area 5	G6M-03-10X	9/10/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	8,910	453	68.1	2,020	1.50	-	0.080 J	10.8	2.0 U	6.56	0.51	-107.5	0.787	3.00	12.58
Area 5	G6M-03-10X	10/15/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	11,500	457	69.3	2,410	1.9	64.9	0.11 U	7.8 J	2.0 U	7.03	0.49	-128.0	1.206	1.74	19.32

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	G6M-03-10X	2/11/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	7,550	492	72	2,370	3.3	105	0.11	2.0 J	2.0 U	7.02	0.4	-131.1	1.345	0.1	9.96
Area 5	G6M-03-10X	6/16/2016	16	0.65 J	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	14,000	400	61	1,600	1.8	88	0.05 U	3.3	1.0 U	6.18	1.16	-86.0	1.407	8.39	13.13
Area 5	G6M-03-10X	11/14/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	8,000	430	68	2,700	1.6	110	0.05 U	3.7	1.0 U	7.11	11.66	-101.7	0.745	6.94	7.4
Area 5	G6M-04-05X	9/22/2004	140	2U	2U	2U	1U	2U	0.005U	0.0092	1.3	5U	1U	15U*	1U	14	4.9	14	2U	6.10	9.68	233.9	0.099	0.68	11.28
Area 5	G6M-04-05X	12/15/2004	17	2U	2U	2U	1U	2U	0.005U	0.016	1.4	5U	1U	15U	5U	14	7.5	13	2U	5.87	1.17	228.7	0.098	1.04	11.37
Area 5	G6M-04-05X	3/30/2005	130	10U	10U	10U	5U	10U	0.0074	0.028	15	5U	1U	15U	0.5J	14	1.2	10	2U	6.04	2.8	123.1	0.093	1.92	11.81
Area 5	G6M-04-05X	6/30/2005	200	2U	2U	2U	1U	2U	0.041	0.022	96	2U	1UJ	10U	2.4	15.9	0.87	8.9	1U	5.48	0.88	207.1	0.094	8.19	11.49
Area 5	G6M-04-05X	9/29/2005	110	2U	2U	2U	1U	2U	0.006J	0.012J	220	5U	1U	33	5U	3.3	0.98	14	1U	6.08	0.2	215.3	0.061	2.1	10.48
Area 5	G6M-04-05X	12/14/2005	36	2U	2U	2U	1U	2U	0.007J	0.016J	550	5U	1U	15U	5U	21	1.6	11	1U	6.10	0.23	179.3	0.091	0.3	11.31
Area 5	G6M-04-05X	3/22/2006	330	2U	2U	2U	1U	2U	0.025U	0.019J	2,200	5U	0.1U	15U	3.4J	13	1.11	9.33	1U	6.21	0.77	343.3	0.062	0.86	11.08
Area 5	G6M-04-05X	6/22/2006	38	2U	2U	2U	1U	2U	0.025U	0.082	33	5U	0.1U	15U	5U	22J	1.82	9.01	1U	4.40	2.55	760.6	0.083	0	11.56
Area 5	G6M-04-05X	9/22/2006	30	2U	2U	2U	1U	2U	0.009J	0.084	140	5U	0.10U	15U	5U	15	1.51	10.8	1U	5.78	1.48	-127.3	0.123	0.34	11.56
Area 5	G6M-04-05X	12/12/2006	8.7	2U	2U	2U	1U	2U	0.025U	0.010J	850	5U	0.1U	15U	5U	-	-	-	-	5.66	0.39	156.7	0.105	0	11.24
Area 5	G6M-04-05X	3/29/2007	16	2U	2U	2U	1U	2U	0.025U	0.022J	460	5U	0.12	15U	1.4J	-	-	-	-	5.79	0.13	57.9	0.185	0.01	-
Area 5	G6M-04-05X	6/12/2007	12	2U	2U	2U	1U	2U	0.005J	0.041	330	5U	0.1U	15U	0.4J	-	-	-	-	5.89	0.52	168.2	0.116	4.4	15.84
Area 5	G6M-04-05X	9/10/2007	43	2U	2U	2U	1U	2U	0.24	0.089	340	2U	0.1U	15U	5U	20	1.61	17	1U	5.89	2.6	142.8	0.103	3.9	12.77
Area 5	G6M-04-05X	12/11/2007	7.2	2U	2U	2U	1U	2U	0.025U	0.013J	1,900	5U	0.19	15U	5U	-	-	-	-	5.75	0.23	134.1	0.118	0.6	15.25
Area 5	G6M-04-05X	3/13/2008	2.5	2U	2U	2U	1U	2U	0.009J	0.020J	1,300	5U	0.1U	17	5U	-	-	-	-	5.9	0.18	121	0.129	0.2	17.23
Area 5	G6M-04-05X	10/20/2008	3.7	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	3,300	8U	0.2U	50U	10U	30	1.5	10	0.03U	5.92	0.73	80	0.152	0	15.18
Area 5	G6M-04-05X	5/6/2009	16	0.38J	0.84	0.5U	0.5U	0.27J	1.3U	1.6U	2,200	8U	0.2U	50U	10U	49J	0.37	17	0.03U	5.72	0.2	125.5	0.187	0	11.92
Area 5	G6M-04-05X	10/14/2009	8.2	0.5U	0.29J	0.5U	0.5U	0.5U	1.3U	1.6U	2,000J	8.0U	0.127U	60U	10U	29	0.39	15	0.03U	5.62	0.5	184	0.203	0	14.07
Area 5	G6M-04-05X	4/20/2010	2.3J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	1.2U	1.5U	3,200	5U	0.1U	25U	10U	80	0.30	15	0.03U	5.92	0.4	152.5	0.144	0.20	17.68
Area 5	G6M-04-05X	10/4/2010	0.28J	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	18	5U	0.1U	25U	10U	30	1.7	13	0.03U	5.67	1.51	145.5	0.131	0.8	15.25
Area 5	G6M-04-05X	6/8/2011	-	-	-	-	-	-	-	-	-	5U	0.1U	12.7J	-	-	-	-	-	5.78	0.12	134.1	0.193	1.0	13.15
Area 5	G6M-04-05X	10/3/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	2,000	20U	0.2U	11.4J	2.3J	39	0.47	19	0.03U	5.76	0.20	158.9	0.174	0.44	14.14
Area 5	G6M-04-05X	5/8/2012	-	-	-	-	-	-	-	-	-	5.0U	0.1U	10.9J	-	-	-	-	-	6.01	0.83	157.2	0.16	0.56	14.76
Area 5	G6M-04-05X	10/9/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	1,800	5U	0.1U	21.8 J	10U	32	0.063J	16	0.03U	5.76	0.27	108.4	0.171	0.84	14.36
Area 5	G6M-04-05X	5/22/2013	-	-	-	-	-	-	-	-	-	2.7J	0.1U	25U	-	-	-	-	-	5.9	0.25	134.1	0.156	1.75	13.2
Area 5	G6M-04-05X	10/15/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	28,000	5U	0.1U	15.4J	10U	60	0.13U	18	0.03U	6.01	0.47	145.8	0.199	0.00	14.17
Area 5	G6M-04-05X	6/12/2014	-	-	-	-	-	-	-	-	-	2.4J	0.195U	13.3J	-	-	-	-	-	6.09	0.41	86.2	0.193	0.68	12.29
Area 5	G6M-04-05X	10/28/2014	0.42J	0.5U	0.5U	0.5U	0.5U	0.5U	2.8	1.6	48	4.1J	0.029	12.2J	10U	39	0.31	13	0.03U	6.49	0.62	81.9	0.182	0.48	11.61
Area 5	G6M-04-05X	6/17/2015	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5.0 U	5.0 U	22.4 J	2.0 U	0.05 U	11.8 J	0.81 U	22.9	0.29	23.30	1.0 U	-	-	-	-	-	-
Area 5	G6M-04-05X	9/10/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	10 U	4.0 U	0.10 U	7.5 J	1.0 U	-	0.21	25.40	2.0 U	5.75	0.95	67.6	0.245	2.08	12.07
Area 5	G6M-04-05X	10/15/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	53	4.0 U	0.10 U	20	1.1	31.9	0.20	21.9	2.0 U	5.96	0.50	116.4	0.264	2.44	11.84
Area 5	G6M-04-05X	2/22/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	305	4.0 U	0.10 U	21.9	1.0 U	34.7	0.11 U	26.8	2.0 U	5.93	1.03	112.9	0.187	1.92	10.35
Area 5	G6M-04-05X	11/14/2016	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	15	3.0 U	0.05 U	20	0.75 J	36	0.19	24	1.0 U	6.33	1.22	23.9	0.176	4.16	9.56
Area 5	G6M-04-06X	9/22/2004	160	2U	2U	2U	1U	2U	0.056	0.005U	3.4	5U	1U	15U	1U	110	5.3	8.7	2U	11.01	9.17	-0.6	0.341	1.34	11.37
Area 5	G6M-04-06X	12/16/2004	24	2U	2U	2U	1U	2U	0.017	0.028	0.47	21	1U	15U	5U	54	7.9	10	2.9	10.89	9.42	106.9	0.254	2.26	13.13
Area 5	G6M-04-06X	3/30/2005	37	2U	2U	2U	1U	2U	0.0087	0.051	0.58	7.5	1U	15U	5U	37	2	12	2U	9.47	10.46	10.6	0.235	0.32	11.56
Area 5	G6M-04-06X	7/1/2005	140	2U	2U	2U	1U	2U	0.034	0.056	9.7	2U	1UJ	190	2.8J	10.3	1.5	25	1U	9.08	9.77	457.2	0.214	0.95	11.76
Area 5	G6M-04-06X	9/29/2005	32	2U	2U	2U	1U	2U	0.009J	0.018J	0.7	11	1U	15U	5.4	70.4	1.9	12	1U	9.32	9.43	390.6	0.192	1.99	11.46
Area 5	G6M-04-06X	12/15/2005	26	2U	2U	2U	1U	2U	0.009J	0.022J	3.3	80.9	1U	150	7.6	39	1.9	12	1U	9.74	10.17	151.2	0.226	0.3	14.61
Area 5	G6M-04-06X	3/23/2006	100	2U	2U	2U	1U	2U	0.006J	0.036	3.1	5U	0.1U	15U	5U	23	1.71	9.29	1U	8.94	9.46	452.5	0.188	1.72	10.34
Area 5	G6M-04-06X	6/23/2006	190	2U	2U	2U	1U	2U	0.012J	0.041	10	13J	0.1U	15U	5U	41	1.69	9.43	1U	8.66	9.75	165.3	0.254	3.55	12.76
Area 5	G6M-04-06X	9/21/2006	45	2U	2U	2U	1U	2U	0.016J	0.11	6.3	5U	0.10U	15U	1.9J	31	1.03	10.9	1U	9.46	9.75	66.6	0.347	1.45	17.93
Area 5	G6M-04-06X	12/11/2006	37	2U	2U	2U	1U	2U	0.010J	0.044	4.3	5U	0.1U	15U	5U	-	-	-	-	9.67	9.67	108	0.257	4.4	14.21
Area 5	G6M-04-06X	3/29/2007	18	2U	2U	2U	1U	2U	0.011J	0.021J	13	5U	0.1U	15U	5U*	-	-	-	-	8.99	14.57	150.7	0.137	11.1	11.92
Area 5	G6M-04-06X	6/12/2007	25	2U	3.5	2U	1U	2U	0.010J	0.061	19	5U	0.1U	15U	5U	-	-	-	-	8.82	10.12	118.1	0.272	4.9	13.9
Area 5	G6M-04-06X	9/10/2007	23	2U	3	2U	1U	2U	0.005J	0.007J	0.13	8U	0.1U	15U	5U	38	1.32	82	1U	8.14	6.73	50.1	0.248	9.9	16.14
Area 5	G6M-04-06X	12/12/2007	22	2U	6.3	2U	1U	2U	0.004J	0.025U	0.21	5U	0.1U	15U	5U	-	-	-	-	7.36	12.25	81.7	0.335	0.2	13.66
Area 5	G6M-04-06X	3/14/2008	14	2U	2.4	2U	1U	2U	0.005J	0.025U	2.8	5U	0.1U	15U	5U	-	-	-	-	7.29	10.89	186.9	0.224	0.3	13.13

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	G6M-04-06X	10/16/2008	24	0.68	2.2	0.5U	0.5U	0.5U	1.3U	1.6U	2	8.5	0.2U	11.5J	10U	34	1.47U	11	0.03U	7.69	9.11	209.6	0.198	1	13.01
Area 5	G6M-04-06X	5/6/2009	13	0.51	1.8	0.5U	0.5U	0.5U	1.3U	1.6U	1.6	6.9	0.2U	50U	10U	44	1.3	14	0.03U	7.35	9.41	9.2	0.209	1.9	15.25
Area 5	G6M-04-06X	10/14/2009	10	0.46J	1.8	0.5U	0.5U	0.5U	1.3U	1.6U	22J	7.4U	0.2U	50U	10U	44	1.3	11	0.03U	7.15	9.4	150	0.197	0	13.65
Area 5	G6M-04-06X	4/20/2010	3.0J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	1.2U	1.5U	150	7.3	0.1U	25U	10U	60	1.8	11	0.03U	6.75	2.86	27.1	0.147	0.0	12.92
Area 5	G6M-04-06X	10/4/2010	0.95	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	2,000	6.1	0.1U	25U	10U	57	1.8	9.1	0.03U	6.50	0.38	121.6	0.216	0.0	14.01
Area 5	G6M-04-06X	10/3/2011	4.0	0.5U	2.0	0.5U	0.5U	0.5U	1.2U	1.5U	9,200	4.7J	0.2U	10.7J	10U	71	0.74	11	0.03U	6.06	1.46	70.2	0.133	0.24	11.95
Area 5	G6M-04-06X	10/9/2012	3.7	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	14,000	5U	0.1U	21.2 J	10U	62	0.48	16	0.03U	6.05	0.31	135.7	0.239	0	11.64
Area 5	G6M-04-06X	10/15/2013	4.5	0.37J	0.55	0.5U	0.5U	0.5U	1.2U	1.5U	36,000	5U	0.1U	88.2	10U	140	0.13U	12	0.03U	6.09	1.07	171.1	0.242	0.04	10.6
Area 5	G6M-04-06X	10/28/2014	1.2	0.78	0.41J	0.5U	0.5U	0.5U	8.1J	1.5U	1,200	2.5U	0.0243U	157J	5U	70	0.29	15	0.03U	6.51	0.29	164.7	0.205	1.63	11.28
Area 5	G6M-04-06X	10/19/2015	1.7	0.70 J	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	10 U	4.0 U	0.10 U	74	1.0	59.7	0.11 U	13.0	2.0 U	-	-	-	-	-	-
Area 5	G6M-04-06X	11/14/2016	1.5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U	1.0 U	0.82	3.0 U	0.017 J	77	1.0	62	0.05 U	15	2.0	6.47	1.01	-8.6	0.189	5.87	9.97
Area 5	G6M-04-07X	9/22/2004	900	2.7	8.4	2U	1U	2U	0.061	0.12	3.1	5U	1U	260	1U	56	5.4	32	2U	7.10	3.42	110.1	0.243	9.28	11.98
Area 5	G6M-04-07X	12/17/2004	1,100	2	9.3	2U	1U	2U	0.11	2.2	2.1	28	1U	47	0.6J	43	6.4	14	2U	7.51	1.98	-38.9	0.246	74.7	11.89
Area 5	G6M-04-07X	3/29/2005	240	10U	10U	10U	5U	10U	0.031	0.64	1.9	12	1UM	27	0.5J	43.2	1.5	14	2U	6.88	4.19	22	0.229	4.2	10.79
Area 5	G6M-04-07X	7/5/2005	170	2U	2U	2U	1U	2U	0.07	0.042	1.8	4	1U	37	5U	41.1	1.7	14	1U	5.83	5.44	369.9	0.186	23.4	11.51
Area 5	G6M-04-07X	9/29/2005	470	3.0	8.3	2U	1U	2U	0.010J	0.010J	2.4	5U	1U	43	5U	1U	1.9	16	1U	6.19	0.86	478.3	0.277	6.62	11.28
Area 5	G6M-04-07X	12/14/2005	390	2U	2	2U	1U	2U	0.006	0.016	7.9	3.8	1U	17.9	6.1	40	1.6	13	1U	6.65	4.72	149.3	0.218	34.1	11.66
Area 5	G6M-04-07X	3/23/2006	260	2U	2U	2U	1U	2U	0.005J	0.029	250	5U	0.1U	15U	5U	36	1.57	13.3	1U	6.28	2.14	619.7	0.267	4.09	12.09
Area 5	G6M-04-07X	6/23/2006	150	2U	2U	2U	1U	2U	0.005J	0.022J	22	5U	0.1U	24	0.3J	30	1.28	12.5	1U	6.29	5.5	117.8	0.24	8.07	11.75
Area 5	G6M-04-07X	9/21/2006	110	2U	2U	2U	1U	2U	0.014J	0.088	2.4	5U	0.10U	19	3.4J	32	2.54	10	1U	6.34	4.43	99.8	0.197	2.63	14.46
Area 5	G6M-04-07X	12/11/2006	87	2U	2U	2U	1U	2U	0.007J	0.033	2.2	5U	0.10U	15	5U	-	-	-	-	6.65	6.99	116.4	0.134	10.52	17.2
Area 5	G6M-04-07X	3/29/2007	45	2U	2U	2U	1U	2U	0.006J	0.018J	5.2	5U	0.1U	17J	5U	-	-	-	-	6.55	10.3	143.7	0.123	3.71	15.42
Area 5	G6M-04-07X	6/12/2007	44	2U	2U	2U	1U	2U	0.010J	0.079	46	5U	0.67	18	1.2J	-	-	-	-	6.26	8.12	162.7	0.129	16.1	13.18
Area 5	G6M-04-07X	9/10/2007	25	2U	2U	2U	1U	2U	0.006J	0.006J	0.11	2U	0.1U	15U	5U	19	1.89	45	1U	6.20	8.68	117.7	0.13	31.2	14.72
Area 5	G6M-04-07X	12/12/2007	23	2U	2U	2U	1U	2U	0.004J	0.013J	0.48	5U	0.1U	15U	5U	-	-	-	-	6.48	10.14	140.2	0.134	3.0	10.24
Area 5	G6M-04-07X	3/13/2008	19	2U	2U	2U	1U	2U	0.003J	0.025U	1.6	5.2	0.1U	15U	5U	-	-	-	-	6.54	10.52	83.4	0.143	0.3	10.47
Area 5	G6M-04-07X	10/16/2008	11	0.5U	0.5U	0.5U	0.5U	0.5U	1.2U	1.5U	390	8.0U	0.2U	15.1J	10U	28	1.81U	10	0.03U	5.85	1.62	205	0.129	0.45	10.72
Area 5	G6M-04-07X	5/6/2009	2.2	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	660	2.9J	0.2U	50U	10U	41J	2.3	12	0.03U	5.90	0.7	119.2	0.103	1.25	13.18
Area 5	G6M-04-07X	10/14/2009	1.3	0.5U	0.5U	0.5U	0.5U	0.5U	1.3U	1.6U	2,500J	8U	0.2U	50U	10U	32	1.9	15	0.03U	6.00	0.35	141.6	0.104	0	10.81
Area 5	G6M-04-07X	4/20/2010	13J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	1.3U	1.6U	630	5U	0.1U	31.8U	10U	50	1.5	12	0.03U	5.90	1.11	24.2	0.167	0	10.3
Area 5	G6M-04-07X	10/4/2010	19	2.2	4.5	0.5U	0.5U	0.5U	1.2U	1.5U	5,100	5U	0.1U	25U	10U	43	1.1	10	0.03U	6.06	0.94	116.9	0.181	0.32	10.45
Area 5	G6M-04-07X	6/8/2011	-	-	-	-	-	-	-	-	-	5U	0.148	67.9	-	-	-	-	-	5.81	1.06	34.1	0.172	0	10.36
Area 5	G6M-04-07X	10/3/2011	8.7	1.2	2.2	0.5U	0.5U	0.5U	1.2U	1.5U	8,300	20U	0.2U	68.0	10U	53	0.59	12	0.03U	5.76	0.28	-57.7	0.105	0.96	10.69
Area 5	G6M-04-07X	5/8/2012	-	-	-	-	-	-	-	-	-	4.0J	0.1U	27.2	-	-	-	-	-	6.26	0.35	122	0.198	0.48	10.51
Area 5	G6M-04-07X	10/9/2012	31J	6.2	33J	0.5U	0.5U	0.97	1.2U	1.5U	6,400	5U	0.1U	35.4	10U	99	0.5	10	0.03U	6.05	0.41	138.9	0.264	0	10.25
Area 5	G6M-04-07X	5/22/2013	-	-	-	-	-	-	-	-	-	3.9J	0.1U	51.4	-	-	-	-	-	6.14	0.39	154.1	0.22	0	14.03
Area 5	G6M-04-07X	10/15/2013	26	5.7	16	0.5U	0.5U	0.5U	1.2U	1.5U	37,000	3.8J	0.1U	3,480	10U	110	0.30	11	0.03U	6.24	0.37	218.4	0.262	0.05	13.59
Area 5	G6M-04-07X	6/10/2014	-	-	-	-	-	-	-	-	-	3.0J	0.021UJ	6,710	-	-	-	-	-	6.01	0.32	210.9	0.257	5.18	8.84
Area 5	G6M-04-07X	10/28/2014	55	11	54	0.31J	0.5U	0.61	1.3U	1.6U	4,900	9.5	0.195J	4,370J	5U	130	0.13	9.6	0.03U	6.57	0.24	108	0.254	4.69	10.62
Area 5	G6M-04-07X	10/19/2015	59	12	1.0 U	1.0 U	1.0 U	1.00	10 U	10 U	3,120	14.1	564	4,590	0.98 J	143	0.11 U	11.0	2.0 U	6.35	0.05	23.3	0.324	1.68	10.67
Area 5	G6M-04-07X	11/14/2016	78	18	73	0.42 J	1.0 U	1.8	1.1 U	1.0 U	1,000	29	1.9	4,400	1.2	160	0.05 U	9.4	1.0 U	6.42	1.01	-28.3	0.278	6.77	10.19
Area 5	G6M-13-01X	1/30/2014	12	0.42 J	0.73	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	6.21	1.64	188.4	0.86	38	16.43
Area 5	G6M-13-01X	10/28/2014	150	2.8	7.80	0.5U	0.5U	0.5U	-	-	-	2.5U	0.025U	26.8J	-	-	-	-	-	6.25	1.77	100.3	0.495	9.14	12.81
Area 5	G6M-13-01X	6/22/2015	16	0.65 J	1.30	0.50 U	0.50 U	0.50 U				2.3 J	0.05 U	8.7 J						5.80	0.89	172.2	0.848	1.11	17.46
Area 5	G6M-13-01X	10/16/2015	26	1.10	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.0613 J	16	-	-	-	-	-	5.57	0.52	42.7	0.727	22.1	13.66
Area 5	G6M-13-01X	2/11/2016	10.3	0.69 J	1.6	1.0 U	1.0 U	1.0 U	10 U	10 U	126	4.0 U	0.10 U	10.3 J	1.0 U	31.5	0.31	16.7	2.0 U	6.05	0.57	38.8	0.880	1.02	10.34
Area 5	G6M-13-01X	6/15/2016	18	1.1	2.8	1.0 U	1.0 U	1.0 U	-	-	-	2.1 J	0.083	14	-	-	-	-	-	6.09	0.65	36.9	0.891	25.0	15.57
Area 5	G6M-13-01X	11/11/2016	27	3.5	6.5	1.0 U	1.0 U	2.8	-	-	-	3.5	1.2	29						5.63	1.11	83.3	0.638	22.1	12.35
Area 5	G6M-13-04X	1/30/2014	41	51	68	2.7	0.90 J	150	-	-	-	-	-	-	-	-	-	-	-	6.57	0.98	-36.4	1.414	4.6	12.6
Area 5	G6M-13-04X	6/10/2014	25	31	29	2.7	0.66	130	2.7J	12J	3,600J	360	49J	5,900	2.5J	280J	0.13U	9.3 B	0.030U	6.42	0.58	-49.4	1.212	12.9	-
Area 5	G6M-13-04X	10/29/2014	1.7	17	69	1.6	0.56	72	4.7	41	32,000	321	5.45J	6,170J	13	310	0.13U	3.5J	0.03U	6.65	0.42	-95.2	1.081	5.55	12.07

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
			PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	Ethane	Ethene	Methane	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	TOC	Alkalinity	Nitrate/ Nitrite	Sulfate	Sulfide	pH	DO	ORP	SpC	Turbidity	Temp
Area	Well ID	Date	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	G6M-13-04X	6/22/2015	0.50 U	1.80	2.20	0.50 U	0.50 U	1.40	5.0 U	5.0 U	719	360	29	3,840 J	3.20	129	0.11 U	30.5 J	1.0 U	6.95	0.7	-156.6	0.800	0.8	17.28
Area 5	G6M-13-04X	10/15/2015	19	19	52	0.76 J	1.0 U	32.7	10 U	18.6	9,470	388	33	7,930	2.8	269	0.16	5.8 J	2.0 U	6.6	0.29	-69.4	1.595	7.5	12.33
Area 5	G6M-13-04X	2/11/2016	0.70 J	5.9	15	1.5	1.0 U	50.9	10 U	18.9	5,690	392	33.9	7,390	3.2	261	0.099 J	6.1 J	2.0 U	6.66	1.23	-2.9	1.086	9.5	8.53
Area 5	G6M-13-04X	6/15/2016	12	18	19	1.2	0.73 J	55.0	2.80	20 J	9,300	340	27	6,800	1.7	280	0.05 U	3.6	1.0 U	6.69	0.59	-54.2	1.669	11.54	14.90
Area 5	G6M-13-04X	11/11/2016	4.9	17	17	0.86 J	0.62 J	36	2.2	12	7,000	340	28	7,600	1.6	250	0.05 U	4.0	1.0 U	7.21	0.88	-80.4	1.175	24.1	12.73
Area 5	G6M-97-05B	10/3/2011	5.7	0.58	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	6.21	3.91	166.4	0.357	1.48	12.4
Area 5	G6M-97-05B	10/12/2012	13	0.73	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	0.0194 J	25U	-	-	-	-	-	6.19	4.13	132	0.649	0.41	14.61
Area 5	G6M-97-05B	10/16/2013	26	0.70	0.63	0.5U	0.5U	0.5U	-	-	-	5U	0.1U	25U	-	-	-	-	-	6.15	3.88	123.8	0.513	3.86	13.76
Area 5	G6M-97-05B	10/28/2014	83	1.8	1.7	0.5U	0.5U	0.5U	-	-	-	2.5U	0.0293U	25UJ	-	-	-	-	-	6.21	3.38	112.1	0.499	2.78	11.07
Area 5	G6M-97-05B	6/19/2015	89	4.8	2.3	0.50 U	0.50 U	0.50 U	5.0 U	5.0 U	5.0 U	3.1 J	0.05 U	7.5 U	-	27.0	1.00	7.8 J	1.0 U	6.26	2.73	106.3	0.63	1.72	17.20
Area 5	G6M-97-05B	10/15/2015	117	6.90	3.40	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.0615 J	19	-	-	-	-	-	5.43	3.41	86.9	0.687	1.05	18.92
Area 5	G6M-97-05B	2/11/2016	97	11	3.8	1.0 U	1.0 U	1.0 U	10 U	10 U	10 U	4.0 U	0.10 U	15 U	1.0 U	29.3	1.0	7.8 J	2.0 U	6.33	4.72	131.7	0.43	16.7	7.32
Area 5	G6M-97-05B	6/15/2016	87	13	4.2	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.05 U	3.0 U	-	-	-	-	-	6.26	2.75	81.7	669	1.15	15.93
Area 5	G6M-97-05B	11/15/2016	140	13	4.2	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.021 J	2.4 J	-	-	-	-	-	6.39	3.37	129.4	0.469	0.87	11.73
Area 5	MW-3	10/17/2001	4,300	1,500	540	20U	10U	20U	-	-	-	-	-	-	-	-	-	-	-	5.70	0.9	-127	1.4	3.1	13.73
Area 5	MW-3	12/19/2001	26	4,000	2,200	20U	6.5J	20U	-	-	-	-	-	-	92	-	-	0.43J	-	6.28	0.43	-46	0.912	7.28	12.98
Area 5	MW-3	1/3/2002	-	-	-	-	-	-	0.063	0.21	18	180	30	-	44	-	-	-	-	4.77	1.33	-48	2.795	4.4	11.19
Area 5	MW-3	1/31/2002	-	-	-	-	-	-	-	-	-	-	-	-	38	-	-	-	-	6.64	0	-293	0.999	-	12.17
Area 5	MW-3	2/13/2002	4,400	1,700	1,600	1.6J	3.7	2U	0.079	0.29	53	190	20	8,300	15	-	0.10U	14	1.0J	6.65	0.75	-71	0.893	1.3	13.54
Area 5	MW-3	3/13/2002	5,200	640	1,400	1.4J	2.8	2U	0.093	0.37	66	180	16	8,400	7.3	-	0.10U	15	2.0U	6.72	0.25	-75	0.795	1.04	12.21
Area 5	MW-3	4/2/2002	3,100	1,000	1,700	2.2	4	2U	-	-	-	-	-	-	3.3J	-	-	-	-	6.74	4.28	-120	0.634	2.08	13.17
Area 5	MW-3	4/17/2002	1,200	1,300	1,600	1.2J	3.4	2U	0.025	0.087	54	240	37	17,000	6.1	-	3	7.9J	1.6J	6.60	4.39	-102	0.771	0.81	12.69
Area 5	MW-3	5/15/2002	31	23	2,600	3.5	6.7	2U	0.052	0.24	560	260	42	19,000	96	-	0.10U	3.9	1.6J	6.66	0.31	-124	1.46	1.68	14.23
Area 5	MW-3	6/27/2002	200U	200UJ	1,800	200UJ	100UJ	200UJ	0.021	0.082	3,900	490J	140	37,000J	270	-	14	4.4J	2.0U	6.70	1.64	-107	3.804	2.9	13.8
Area 5	MW-3	7/31/2002	-	-	-	-	-	-	-	-	-	-	-	-	31	-	-	-	-	6.76	0.15	-225	1.606	-	13.9
Area 5	MW-3	8/26/2002	990	640	580	2.1	4.4	2U	0.053	0.16	14,000	270	-	-	30	320	-	-	-	6.83	0.15	-138	1.285	6.5	18.8
Area 5	MW-3	10/28/2002	1,900	820	1,700	3.9	4.2	2U	0.3	0.23	6,300	330	39	9,700	6.3	190	0.10U	10	2.0U	6.70	0.4	-129	1.129	5.01	15.7
Area 5	MW-3	2/3/2003	3.0	2U	2,900	2U	7.1	2U	0.005U	0.26	28,000	330	120	-	180	580	-	1.0U		6.84	0.3	-159	1.322	6.7	18.2
Area 5	MW-3	7/16/2003	2.4	2U	2,700	2U	7.5	2.5	0.005U	0.1	23,000	520	170	-	17	450	-	4.0UB	2.0U	7.02	1.09	-138	1.464	39.2	16.1
Area 5	MW-3	9/24/2003	670	1,100	1,900	2.4	6.9	2U	0.005U	0.012	22,000	460	89	7,900	5.9	-	-	-	-	6.10	9.17	-138	1.222	18.9	15.3
Area 5	MW-3	1/9/2004	9.7	64	2,000	2U	5.6	2U	0.005U	0.005U	45,000	530	200J	15,000	130	500J	-	1.0U	2.0U	6.73	0.4	-195	1.347	14.6	-
Area 5	MW-3	3/11/2004	680	620	4,700	2U	7.6	2U	0.005U	0.005U	27,000	420	11	8,400	6.1	200	-	4.4	2U	6.58	0.62	-161	0.972	4.3	13.9
Area 5	MW-3	6/2/2004	2U	2U	1,800	2U	4.5	2U	0.005U	0.014	31,000	670MSA	150	23,000	290	810	-	0.98J	2U	6.95	0.1	-149	1.905	38.7	15.7
Area 5	MW-3	9/21/2004	210	250	1,900	2U	5.2	3.5	0.086	0.005U	28,000	660	200J	7,200	17	310	1J	4.3J	2U	6.66	0.95	-153.6	0.725	2.27	11.1
Area 5	MW-3	12/13/2004	2U	2U	750	2U	1U	610	0.092	3.5	17,000	510	160	5,400	8	210	1.1	1.4M	2U	6.62	1.6	-103.3	1.009	15.1	13.9
Area 5	MW-3	3/28/2005	23J	16J	1,000	50U	50U	280	0.005U	5.1	25,000	670	150	7,300	21	405	0.2U	1U	7.5J	6.49	0.34	-134.9	1.26	2.37	14.44
Area 5	MW-3	8/10/2005	440	80	120	2U	5.1	760	0.061J	13	22,000	680	180	4,400	43	338	0.05U	2U	8	11.13	0.71	-118.5	1.401	28.9	15.67
Area 5	MW-3	9/27/2005	1,100	240	180	1.8	9.1	360	0.020J	40	22,000	480	71J	2,500	5.6	96.8	0.05U	9.9J	3.4	6.36	0.21	-91.2	0.66	2.8	14.5
Area 5	MW-3	12/12/2005	37	67	52	20U	10U	480	0.055	100	26,000	566	100	-	18	180	0.083J	2U	5.6	6.66	0.11	-152.7	1.087	8	15.7
Area 5	MW-3	3/20/2006	620	350	120	3.1	3.9	220	0.025U	130	25,000	440	85	3,600	13	110	0.2U	6.31	1U	6.95	0.77	-106.2	0.871	3.71	14.88
Area 5	MW-3	6/22/2006	2U	2U	4	7.6	1U	6.1	0.023J	180	20,000	520	87	3,300	4J	98	0.2U	1U	1U	6.40	0.22	-127	1.012	4.18	12.97
Area 5	MW-3	9/20/2006	360	420	130	12	5.6	200	0.015J	95	17,000	580	70	3,300	9.6	70	0.2U	7.88	1.4	6.52	0.28	-108.5	0.729	3.56	13.28
Area 5	MW-3	12/12/2006	2U	3.1	3.1	16	1U	7.1	0.032	170	24,000	490	92	3,700	7.8	-	-	1U	1U	6.60	0.17	-116	0.99	4.36	12.34
Area 5	MW-3	3/27/2007	2U	31	19	12	1U	27	0.025U	130	18,000	560	110	3,300J	5.2	-	-	3.18	1U	6.28	0.19	21	0.944	2.64	13.6
Area 5	MW-3	6/11/2007	2U	5	5.4	15	1U	8	0.038	150	32,000	570	190	5,000	67	-	-	12.1	2.2	6.56	0.58	-124.7	1.405	17.3	12.26
Area 5	MW-3	9/11/2007	610	470	100	6.4	2.6	97	-	-	-	530	100	3,600	-	150	0.2U	400	1U	6.76	0.23	-130	1.016	6.8	13.48
Area 5	MW-3	10/12/2007	-	-	-	-	-	-	0.025U	120	34,000	-	-	-	3.8J	-	-	-	-	-	-	-	-	-	12.51
Area 5	MW-3	12/13/2007	250	180	59	8.8	2.4	78	0.016J	130	30,000	420	91	4,400	4.1J	-	-	10	1U	6.6	0.27	-159.8	1.04	15.7	19.2
Area 5	MW-3	3/10/2008	2U	2U	2U	8.3	1U	2U	18	35	29,000	530	140	3,300	16	-	-	5U	2.4	6.46	0.12	-113	1.402	5.5	14.26
Area 5	MW-3	10/6/2008	5U	5U	5U	11	5U	5U	1.3U	72	28,000	482	112	3,720	10U	210	0.13U	7.0U	0.03UJ	6.49	0.24	-158.6	1.070	9.3	21.5
Area 5	MW-3	1/21/2009	1.4U	2.3U	1.6J	9.2	1.2U	1.9	3.2	58	40,000	556	114J	3,350	10UJ	160	0.13U	7.0U	0.03U	6.69	0.5	-79.9	1.044	4.01	15.5

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
Area	Well ID	Date	PCE (µg/L)	TCE (µg/L)	*cis* -1,2-DCE (µg/L)	*trans* -1,2-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Methane (µg/L)	Dissolved Arsenic (µg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (µg/L)	TOC (mg/L)	Alkalinity (mg/L)	Nitrate/ Nitrite (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	pH (SU)	DO (mg/L)	ORP (mV)	SpC (mS/cm)	Turbidity (NTUs)	Temp °C
Area 5	MW-3	5/7/2009	2.0U	59	48	17	2.0U	66	1.3	70	47,000	519	115	3,630	7.0J	360J	0.13U	22	0.03U	6.26	1.03	-89.9	1.205	4.54	18.86
Area 5	MW-3	10/19/2009	2U	35	25	9.4	2U	40	1.2U	36	25,000	551	120	5,330	6.7J	490	0.13U	28	0.03UJ	6.24	0.6	-62.6	1.494	25.6	15.54
Area 5	MW-3	4/20/2010	0.5UJ	0.48J	0.47J	4.7J	0.5UJ	2.5J	10	19	47,000	526	136J	3,200	9.0J	440	0.13U	3.4J	0.03U	6.33	0.16	5.4	1.445	0.09	11.12
Area 5	MW-3	10/5/2010	0.5U	4.8	3.4	7.5	0.5U	20	1.2U	69	32,000	444	76	3,560	10U	750	0.13U	4.5J	0.03U	6.20	0.20	-85.9	1.799	0.58	11.94
Area 5	MW-3	6/8/2011	0.5U	0.66	0.93	4.4	0.5U	17	4.5	18	100,000	374	53.6	2,570	12	690	0.13U	1.7J	0.03U	6.34	0.30	-91.1	1.232	3.56	11.96
Area 5	MW-3	10/3/2011	0.5U	0.5U	0.52	1.7	0.5U	1.0	1.2U	1.5U	40,000	385	45.8	2,760	10	730	0.13U	0.74J	0.03U	6.47	0.13	-88.1	1.544	0.9	12.14
Area 5	MW-3	5/8/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	51	110	66,000	276	27	3,140	7.5J	600	0.13U	0.82J	0.03U	6.77	0.08	-107.2	1.856	4.6	12.24
Area 5	MW-3	10/10/2012	0.5U	0.5U	0.5U	0.54	0.5U	1.2	61	100	36,000	267	25.7	4,810	5.6J	520	0.13U	1.4J	0.03U	6.45	0.51	-87.6	1.738	0.92	12.1
Area 5	MW-3	5/21/2013	0.5U	0.5U	0.30J	0.39J	0.5U	0.75	1.2U	1.5U	10,000	281	24.7	6,460	4.3J	530J	0.13UJ	0.64J	0.03UJ	6.76	0.12	-105.2	1.277	2.75	11.48
Area 5	MW-3	10/16/2013	0.5U	0.21J	0.36J	0.32J	0.5U	0.94	12	11	38,000	298	26.6	7,970	5.2J	510	0.13U	1.9J	0.03U	6.75	0.40	-87.4	1.437	0	11.96
Area 5	MW-3	6/11/2014	0.5U	0.5U	0.5U	0.37J	0.5U	0.83	2.9J	1.6UJ	5,100J	354	34.3J	11,100	8.3J	330J	0.13U	1.2U	0.03U	6.70	0.51	-67.6	1.062	6.18	11.84
Area 5	MW-3	10/29/2014	0.5U	0.27J	0.68	0.38J	0.5U	0.53	3.8	1.5U	13,000	334	30.1J	10,500J	5.2J	370	0.13U	2.4J	0.03U	6.8	0.34	-110.1	0.756	3.79	11.95
Area 5	MW-3	6/23/2015	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5.0 U	5.0 U	4,830	409	37.1	11,000	5.00	366	0.11 U	5.1 J	1.0 U	6.34	1.07	-89.4	1.262	5.85	14.23
Area 5	MW-3	10/15/2015	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.54 J	10 U	10 U	4,570	420	41.9	12,600	4.9	349	0.071	10 U	2.0 U	6.97	0.48	-112.1	1.215	1.38	13.86
Area 5	MW-3	2/10/2016	1.0 U	1.0 U	1.0	1.0 U	1.0 U	0.88 J	10 U	10 U	7,260	423	49	12,000	5.4	341	0.094 J	10 U	2.0 U	6.72	1.12	-109.7	0.851	10.5	9.14
Area 5	MW-3	6/16/2016	1.0 U	1.0 U	1.5	1.0 U	1.0 U	0.89 J	3.0	1.0 U	20,000	410	45	9,800	6.1	350	0.05 UJ	1.3	1.0 U	6.81	0.66	-77.4	1.36	4.93	14.27
Area 5	MW-3	11/11/2016	1.0 U	0.96 J	1.7	1.0 U	1.0 U	1.6	2.9	1.0 U	7,000	410	47	9,500	6.4	370	0.05 U	1.4	1.0 U	7.22	0.83	-97.8	0.871	7.77	12.73
Area 5	MW-7	2/14/2002	5,900	4.5	2U	2U	1U	2U	0.12	0.08	8.4	5U	1U	170J	-	-	-	20	0.6J	6.12	1.58	104	0.787	90	18.84
Area 5	MW-7	3/14/2002	5,700	4.2	2U	2U	1U	2U	0.094	0.18	5.9J	5U	1U	1,000U	2.0J	-	4.1	22J	2.0U	6.12	2.29	203	0.808	8.85	12.76
Area 5	MW-7	4/17/2002	4,200	2.9	2U	2U	1U	2U	0.072	0.2	6	2.3J	1U	1,000U	5U	-	4.2	18J	1.6J	6.11	0.5	145	0.656	19.5	-
Area 5	MW-7	5/16/2002	5,700	4.3	2U	2U	1U	2U	0.097	0.2	9	5U	1U	1,000U	5U	-	4.3	18J	2.0UJ	6.05	0.21	185	0.759	23.9	10.92
Area 5	MW-7	6/27/2002	5,300	3.8J	2UH	2UH	10H	2UH	-	-	-	5U	1U	170UJ	5U	-	4.2	19J	2.0U	6.13	0.73	163	1.198	100	11.12
Area 5	MW-7	8/27/2002	4,700	3.5	2U	2U	1U	2U	-	-	-	5U	-	-	5U	29	-	-	-	6.13	0.29	136	0.632	1.86	12.02
Area 5	MW-7	10/30/2002	5,400	2.7	2U	2U	1U	2U	0.047	0.18	20	5U	1U	200J	5U	23	4.9	16	2.0U	6.05	0.37	66	0.779	3.63	11.85
Area 5	MW-7	12/14/2002	-	-	-	-	-	-	-	-	-	-	-	-	5U	-	-	-	-	-	-	-	-	-	12.04
Area 5	MW-7	1/30/2003	4,700	3.1	2U	2U	1U	2U	0.044	0.075	23	5U	1U	-	5U	19	-	16	-	5.80	2.2	171	0.773	1.08	13.43
Area 5	MW-7	9/24/2003	4,200	3.3	2U	2U	1U	2U	0.015	0.027	58	5U	1U	140	5U	-	-	-	-	3.40	1.43	522	0.691	0.3	-
Area 5	MW-7	1/8/2004	4,300	2.8	2U	2U	1U	2U	0.011	0.026	25	5U	1U	130	5U	27	-	14J	2.0U	6.02	0	198	0.481	15	11.59
Area 5	MW-7	3/12/2004	3,100	2.7	2U	2U	1U	2U	0.02	0.28	6.3	5U	1U	120	1U	24	-	15M	2U	6.04	0.47	162	0.556	1.0	13.99
Area 5	MW-7	6/3/2004	2,900	2.6	2U	2U	1U	2U	0.012	0.034	34	5U	1U	110	1.5J	24	-	15M	2U	5.96	0.31	205.2	0.58	1.92	
Area 5	MW-7	9/21/2004	2,900	3.4	3.1	2U	1U	2U	-	-	-	5U	1U	110	-	-	-	-	-	5.98	0.21	240.4	0.58	0	11.09
Area 5	MW-7	9/27/2005	1,600	3.7	5.8	2.5U	2.5U	2.5U	-	-	-	5U	0.2J	110	-	-	-	-	-	4.49	0.93	304.1	0.593	3.39	11.86
Area 5	MW-7	9/22/2006	4,400	9.8	7.7	2U	1U	2U	-	-	-	5U	0.10U	100	-	-	-	-	-	5.99	1.19	140.9	0.503	3.01	12.70
Area 5	MW-7	9/11/2007	1,200	11	22	2U	1U	2U	-	-	-	6U	0.1U	110	-	-	-	-	-	5.98	0.32	139.9	0.691	5.9	-
Area 5	MW-7	10/20/2008	600	40	150	20U	20U	20U	-	-	-	8U	0.2U	166	-	-	-	-	-	5.97	1.39	71.9	0.804	2.0	14.72
Area 5	MW-7	10/19/2009	97	33	270	10U	10U	10U	-	-	-	4.2J	1.7	2,170	-	-	-	-	-	6.03	0.47	76.7	1.686	1.91	14.58
Area 5	MW-7	10/6/2010	45	9.5	120	2.5U	2.5U	3.1	-	-	-	5.7	1.46	2,090	-	-	-	-	-	6.53	0.21	-21.6	2.072	4.81	11.46
Area 5	MW-7	10/6/2011	1.6	3.7	20	0.5U	0.5U	6.8	-	-	-	52.9	5.44	5,070	-	-	-	-	-	6.6	0.49	-48.8	1.717	3.0	-
Area 5	MW-7	10/12/2012	2.3	2.3	9.9	0.70	0.5U	11	-	-	-	140	20.5	9,900	-	-	-	-	-	6.38	0.65	-65	1.253	0	-
Area 5	MW-7	10/17/2013	1.5	6.9	13	0.24J	0.5U	2.2	-	-	-	156	20.9	9,360	-	-	-	-	-	6.72	0.58	-68.2	1.152	0	10.50
Area 5	MW-7	11/3/2014	1.7	8.4	13	0.27J	0.5U	1.5	-	-	-	205	29.9	15,300	-	-	-	-	-	6.62	0.41	-74.2	0.878	1.94	10.28
Area 5	MW-7	10/15/2015	1.0 U	1.70	12.4	1.0 U	1.0 U	1.10	-	-	-	198	30.2	15,100	-	-	-	-	-	6.83	0.84	-68.2	0.926	1.50	11.26
Area 5	MW-7	11/14/2016	1.0 U	1.4	22	1.0 U	1.0 U	37	-	-	-	110	19	13,000	-	-	-	-	-	6.01	1.24	-63.5	0.77	7.42	13.2
Area 5	XSA-12-95X	10/12/2012	290	36	66	5.0U	5.0U	10	-	-	-	4.6J	9.53	11,800	-	-	-	-	-	6.53	2.04	-63.9	1.247	45	12.77
Area 5	XSA-12-95X	10/15/2013	160	51	100	4.7J	5.0U	6.5	-	-	-	12.8	5.17	9,890	-	-	-	-	-	6.59	0.3	-254.4	1.411	24.4	13.11
Area 5	XSA-12-95X	10/28/2014	110	39	94	5.0	0.47J	9.0	-	-	-	8.3	4.47J	9,310J	-	-	-	-	-	6.9	0.18	-315.7	0.906	20.2	14.23
Area 5	XSA-12-95X	10/19/2015	27	20	1.0 U	1.0 U	6.70	7.20	-	-	-	4.0 U	4.77	10,600	-	-	-	-	-	7.97	1.77	-103.6	1.385	15.3	-
Area 5	XSA-12-95X	11/14/2016	23	9.8	78	4.3	1.0 U	7.4	-	-	-	3.0 U	1.9	8,400	-	-	-	-	-	6.58	1.21	-59.7	1.048	28.1	12.69
Area 5	XSA-12-96X	10/10/2012	120	4.4	14	2.0U	2.0U	2.0U	-	-	-	5U	3.13	96.8	-	-	-	-	-	6.52	0.72	-87.1	0.782	3.9	12.33
Area 5	XSA-12-96X	10/15/2013	100	11	17	2.5U	2.5U	3.7	-	-	-	3.7J	0.94	2,840	-	-	-	-	-	6.46	0.27	-271.6	0.824	0.90	15.90
Area 5	XSA-12-96X	10/28/2014	84	14	22	2.3	0.36J	6.0	-	-	-	3.2J	0.925J	5,720J	-	-	-	-	-	6.73	0.14	-300.6	0.625	4.83	12.11

Table 2
Historical Groundwater Concentrations AOC50
AOC 50, Former Fort Devens Army Installation
Devens, MA

			Laboratory Parameters																	Field Parameters					
Area	Well ID	Date	PCE (µg/L)	TCE (µg/L)	*cis* -1,2-DCE (µg/L)	*trans* -1,2-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Methane (µg/L)	Dissolved Arsenic (µg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (µg/L)	TOC (mg/L)	Alkalinity (mg/L)	Nitrate/ Nitrite (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	pH (SU)	DO (mg/L)	ORP (mV)	SpC (mS/cm)	Turbidity (NTUs)	Temp °C
Area 5	XSA-12-96X	10/26/2015	30	14	1.0 U	1.0 U	3.40	10.2	-	-	-	4.0 U	2.19	7,340	-	-	-	-	-	6.34	0.66	-77.9	0.787	9.41	12.98
Area 5	XSA-12-96X	11/14/2016	29	19	20	4.9	0.59 J	11	-	-	-	3.0 U	1.2	6,300	-	-	-	-	-	5.63	0.66	-25.5	0.733	9.26	11.67
Area 5	XSA-12-97X	10/9/2012	2.1	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	1.430 J	44.4	-	-	-	-	-	6.66	1.3	-11.9	0.673	33.8	11.73
Area 5	XSA-12-97X	10/16/2013	2.9	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	5U	2.25	29.3	-	-	-	-	-	6.74	1.74	-21.9	0.721	19.6	12.06
Area 5	XSA-12-97X	10/30/2014	5.6	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	2.5U	0.435	9.1J	-	-	-	-	-	6.51	1.52	51.8	0.522	17.5	17.21
Area 5	XSA-12-97X	10/19/2015	7.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.771	15	-	-	-	-	-	6.62	1.39	31.9	0.614	13.9	10.02
Area 5	XSA-12-97X	11/14/2016	10	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.77	12	-	-	-	-	-	7.62	1.68	-57.9	0.526	18.4	11.61
Area 5	XSA-12-98X	10/11/2012	10	0.59	0.50	0.5U	0.5U	0.5U	-	-	-	5U	1.420	18.4 J	-	-	-	-	-	7.75	0.76	-60.1	0.308	8.89	13.14
Area 5	XSA-12-98X	10/16/2013	5.2	0.34J	0.47J	0.5U	0.5U	0.5U	-	-	-	3.1J	0.1U	6.6J	-	-	-	-	-	7.89	0.51	-39.8	0.413	51	10.53
Area 5	XSA-12-98X	10/29/2014	5.5	0.37J	0.76	0.5U	0.5U	0.5U	-	-	-	2.5U	0.313	5.6J	-	-	-	-	-	8	0.46	-293.1	0.258	44.8	10.63
Area 5	XSA-12-98X	10/19/2015	6.3	0.66 J	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	4.0 U	0.174	15 U	-	-	-	-	-	8.04	0.42	-194.4	0.31	3.62	10.70
Area 5	XSA-12-98X	11/11/2016	5.6	0.69 J	0.81 J	1.0 U	1.0 U	1.0 U	-	-	-	3.0 U	0.095	3.1 J	-	-	-	-	-	7.98	0.52	-140.7	0.233	16.1	9.67
Nashua River	G6M-04-14X	11/16/2004	12	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3
Nashua River	G6M-04-14X	9/27/2005	6.9	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.88	1.6	333	0.263	18	13.22
Nashua River	G6M-04-14X	9/21/2006	9.4	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.98	3	26.1	0.211	15.7	11.11
Nashua River	G6M-04-14X	10/1/2007	7.1	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	7.69	2.56	80.4	0.363	13.9	10.71
Nashua River	G6M-04-14X	10/21/2008	7.1J	0.21J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	-	-	-	-	-	-	-	-	-	-	-	7.78	2.51	138.8	0.237	45	12.98
Nashua River	G6M-04-14X	10/15/2009	4.5J	250	10U	10U	10U	10U	-	-	-	-	-	-	-	-	-	-	-	7.56	3.6	-69.7	0.25	4.58	11.54
Nashua River	G6M-04-14X	1/15/2010	4.5	0.22J	0.5U	0.75U	0.75U	1.0U	-	-	-	-	-	-	-	-	-	-	-	7.73	25.3	166.2	0.293	12.5	11.64
Nashua River	G6M-04-14X	10/8/2010	2.4	0.25J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	7.55	1.92	72.7	0.307	100.4	12.54
Nashua River	G6M-04-14X	10/5/2011	2.2	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	6.8	0.1U	25U	-	-	-	-	-	7.68	2.62	99.9	0.172	20.4	11.07
Nashua River	G6M-04-14X	10/15/2012	3.3	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	9.6	0.194	7.7J	-	-	-	-	-	7.71	2.58	-10.9	0.297	21.7	16.33
Nashua River	G6M-04-14X	10/18/2013	1.7	0.34J	0.5U	0.5U	0.5U	0.5U	-	-	-	8.2	0.1U	7.5U	-	-	-	-	-	7.89	1.25	94	0.479	27.1	15.03
Nashua River	G6M-04-14X	10/31/2014	1.8	0.40J	0.5U	0.5U	0.5U	0.5U	-	-	-	2.5U	0.0507U	7.5U	-	-	-	-	-	7.93	0.4	54.4	0.423	8.26	15.56
Nashua River	G6M-04-14X	10/26/2015	1.7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-	-	9.8	0.0731 J	15 U	-	-	-	-	-	7.89	1.44	79.2	0.482	18.9	13.11
Nashua River	G6M-04-14X	11/11/2016	2.5	1.4	1.2	1.0 U	1.0 U	1.0 U	-	-	-	8.3	0.05 U	2.1 J						7.48	0.84	-106.7	0.35	10.14	10.53
Area 5	IW-39	1/30/2014	180	4.4	15	4U	4U	4U	-	-	-	-	-	-	-	-	-	-	-	6.56	0.91	44.9	0.78	3.68	12.31

µg/L = micrograms per liter
mg/L = milligrams per liter
U/UJ = not detected
J = estimated
FDSA = Former Drum Storage Area

Table 3
Monitoring Wells Selected for Water Level Measurement
AOC 50, Former Fort Devens Army Installation
Devens, MA

Well ID	Well Screen Interval (ft bgs)	Well Screen Elevation (ft amsl)
G6M-02-01X	80-95	183.8-168.8
G6M-02-04X	90-105	173.6-158.6
G6M-02-06X	55-65	153.5-143.5
G6M-02-07X	30-40	179.5-169.5
G6M-02-08X	60-70	163.2-153.2
G6M-02-11X	125-135	140-130
G6M-02-13X	110-120	154.8-144.8
G6M-03-07X	80-90	183.6-173.6
G6M-03-10X	120-135	144.2-129.2
G6M-04-01X	82-92	180.49-170.49
G6M-04-02X	80-90	184.49-174.98
G6M-04-03X	85-95	180.61 - 170.61
G6M-04-04X	94-104	169.67-159.67
G6M-04-05X	100-110	157.33-147.33
G6M-04-07X	120-130	142.68-132.68
G6M-04-09X	55-65	188.46-178.46
G6M-04-10X	52-62	170.92-160.92
G6M-04-11X	35-45	193.42-183.42
G6M-04-13X	30-40	194.71-184.71
G6M-04-14X	80-90	131.56-121.56
G6M-04-15X	70-80	182.45-172.45
G6M-04-22X	74-84	180.75-170.75
G6M-04-31X	68-78	186.83-176.83
G6M-07-02X	22.5-27.5	201.13-196.13
G6M-13-01X	125-135	140.15-130.15
G6M-13-02X	115-125	149.62-139.62
G6M-13-03X	80-90	185-17-175.17
G6M-13-04X	125-135	139.61-129.61
G6M-13-05X	45-55	178.3-168.3
G6M-13-06X	60-70	172.67-162.67
G6M-95-19X	48-58	174.8-164.8
G6M-95-20X	18-23	205.0-200
G6M-97-05B	130-135	147.44-137.44
G6M-97-28X	100-105	163.9-158.9
MW-7	125-135	139.7-129.7
Well A	to be determined	to be determined
Well B	to be determined	to be determined
XSA-12-95X	120-130	147.43-137.43
XSA-12-96X	120-130	147.82-137.82
XSA-12-97X	119.75-129.75	148.96-138.96
XSA-12-98X	60-70	147.44-137.44

amsl = above mean sea level
bgs = below ground surface
ft = feet

Table 4
Monitoring Wells Selected for Long-Term Monitoring
AOC 50, Former Fort Devens Army Installation
Devens, MA

Location	Well ID	Sampling Rationale	Well Screen Interval (ft bgs)	Well Screen Elevation (ft amsl)	Sample Parameters	Sample Frequency
Area 1/FDSA	G6M-07-02X	Monitor COC trends and geochemistry.	22.5-27.5	201.13-196.13	Full Suite	Semi-annual
	G6M-04-10A		30-40	193.02-183.02	Full Suite	Semi-annual
	G6M-04-10X	Monitor plume extent.	52-62	170.92-160.92	VOCs	Annual
	G6M-04-13X		30-40	194.71-184.71		
Area 1	G6M-13-05X	Monitor COC trends and geochemistry.	45-55	178.3-168.3	Full Suite	Semi-annual
	G6M-02-08X	Monitor plume extent and geochemistry.	60-70	163.2-153.2	Full Suite	Annual
	G6M-13-06X		60-70	172.67-162.67		
	G6M-04-09X	Monitor plume extent and metals.	55-65	188.46-178.46	VOCs and Metals	Annual
	G6M-04-15X		70-80	182.45-172.45		
	G6M-95-19X	Monitor plume extent.	48-58	174.8-164.8	VOCs	Annual
	G6M-95-20X	Monitor plume extent and metals.	18-23	205.0-200	VOCs and Metals	Annual
	G6M-04-11X	Monitor plume extent.	35-45	193.42-183.42	VOCs and Metals	Biennial
	G6M-04-31X	Monitor plume extent and metals.	68-78	186.83-176.83		
	G6M-04-22X		74-84	180.75-170.75		
Area 2	G6M-02-01X	Monitor COCs and metals where COC cleanup levels were achieved.	80-95	183.8-168.8	VOCs and Metals	Annual
	G6M-04-01X		82-92	180.49-170.49		
	G6M-04-03X		85-95	180.61 - 170.61		
Area 3	G6M-03-07X	Monitor COC trends and geochemistry.	80-90	183.6-173.6	Full Suite	Annual
	G6M-04-02X		80-90	184.49-174.98	Full Suite	Semi-Annual
	G6M-13-03X	Monitor plume extent.	80-90	185-17-175.17	VOCs	Biennial
	G6M-04-04X	Monitor COCs and metals where COC cleanup levels were achieved.	94-104	159.67-169.67	VOCs and Metals	Annual
Area 4	G6M-13-02X	Monitor COC trends and geochemistry.	115-125	149.62-139.62	Full Suite	Semi-Annual
	G6M-02-13X	Monitor COCs and metals where COC cleanup levels were achieved.	110-120	154.8-144.8	VOCs and Metals	Annual
	G6M-02-04X		90-105	173.6-158.6		
	G6M-97-28X	Monitor metals.	100-105	163.9-158.9	Metals	Annual
Area 5	G6M-97-05B	Monitor COC trends and geochemistry.	130-135	147.44-137.44	Full Suite	Semi-annual
	G6M-13-01X		125-135	140.15-130.15		
	MW-7	Monitor COCs and metals where COC cleanup levels were achieved.	125-135	139.7-129.7	VOCs and Metals	Annual
	MW-3		126-136	138.7-128.7		
	G6M-02-11X		125-135	140-130		
	G6M-02-12X		125-135	138.4-128.4		Biennial
	G6M-03-08X		125-140	132.2-117.2		
Area 5	G6M-02-07X	Monitor COCs and metals within the downgradient portion of the plume.	30-40	179.5-169.5	VOCs and Metals	Annual
	G6M-04-06X		95-105	168.07-158.07		
	G6M-04-07X		120-130	142.68-132.68		Semi-annual
	XSA-12-95X		120-130	147.43-137.43		Annual
	XSA-12-96X		120-130	147.82-137.82		Semi-annual
	XSA-12-97X		119.75-129.75	148.96-138.96		Annual
	XSA-12-98X		60-70	147.44-137.44		
	G6M-13-04X	Monitor plume and metals.	125-135	139.61-129.61	VOCs and Metals	Annual
	G6M-03-10X		120-135	144.2-129.2		
	Well A		to be determined	to be determined	VOCs and Metals	Annual
	Well B		to be determined	to be determined		
	G6M-04-05X	Monitor plume extent.	100-110	157.33-147.33	VOCs	Biennial

Table 4
Monitoring Wells Selected for Long-Term Monitoring
AOC 50, Former Fort Devens Army Installation
Devens, MA

Location	Well ID	Sampling Rationale	Well Screen Interval (ft bgs)	Well Screen Elevation (ft amsl)	Sample Parameters	Sample Frequency
Nashua River	G6M-02-06X	Monitor COCs and metals downgradient of the plume.	55-65	153.5-143.5	VOCs and Metals	Annual
	G6M-04-14X		80-90	131.56-121.56		

Notes:

Metals - dissolved arsenic, iron, and manganese.

Full Suite- VOCs, metals, nitrate, sulfate/sulfide, alkalinity (fall only), methane, ethane, ethene, and total organic carbon.

Field parameters to be measured include: pH, dissolved oxygen, oxidation/reduction potential, specific conductivity, turbidty, and temperature.

Table 5
Monitoring Well Construction Details
AOC 50, Former Fort Devens Army Installation
Devens, MA

Well ID	Soil Drilling Method	Media Screened	Well Construction Material	Completion Depth (ft bgs)	Well Screen Interval (ft bgs)	Well Screen Elevation (ft amsl)	Measuring Point Elevation[1] (ft amsl)
Monitoring Wells							
G6M-92-02X	Hollow-Stem Auger	Soil	4" ID PVC	73	63-72.6	205.6-196	271.09
G6M-92-10X	Hollow-Stem Auger	Soil	4" ID PVC	20	9-19	218.2-208.2	225.88
G6M-92-11X	Hollow-Stem Auger	Soil	4" ID PVC	20	8.5-18.5	214.7-204.7	225.69
G6M-93-13X	Hollow-Stem Auger	Soil	4" ID PVC	20	9-19	214.7-204.7	225.63
G6M-94-15A	Hollow-Stem Auger	Soil	4" ID PVC	44	33-43	218.5-208.5	253.68
G6M-95-19X	Hollow-Stem Auger/ Drive & Wash	Soil	2" ID PVC	87	48-58	174.8-164.8	224.69
G6M-95-20X	Hollow-Stem Auger/ Drive & Wash	Soil	2" ID PVC	89	18-23	205.0-200.0	225.41
G6M-96-13B	Drive & Wash	Soil	2" ID PVC	62.5	52.3-62.3	171.5-161.5	225.78
G6M-96-22A	Drive & Wash	Soil	2" ID PVC	50.5	40-50	176.3-166.3	218.39
G6M-96-22B	Drive & Wash	Soil	2" ID PVC	70.8	65.5-70.5	150.9-145.9	218.36
G6M-96-24B	Drive & Wash	Soil	2" ID PVC	62	56.7-61.7	159.1-154.1	217.96
G6M-96-25A	Hollow-Stem Auger	Soil	2" ID PVC	19	9-18.7	215.1-205.4	226.32
G6M-96-25B	Drive & Wash	Soil	2" ID PVC	90	48-58	176-166	226.44
G6M-96-26A	Hollow-Stem Auger	Soil	2" ID PVC	18	8-18	215.7-205.7	225.36
G6M-96-26B	Hollow-Stem Auger	Soil	2" ID PVC	78.3	68-78	155.3-145.3	225.20
G6M-97-05B	Drive & Wash	Soil	2" ID PVC	206.5	130-135	136.4-131.4	268.88
G6M-97-08B	Drive & Wash	Soil	2" ID PVC	108.7	89.5-94.5	174.7-169.7	263.85
G6M-97-09B	Drive & Wash	Soil	2" ID PVC	92.6	71.5-81.5	186.6-176.6	260.85
G6M-97-27X	Drive & Wash	Soil	2" ID PVC	31	25-30	197.8-192.8	225.30
G6M-97-28X	Drive & Wash	Soil	2" ID PVC	149.4	100-105	163.9-158.9	266.49
G6M-97-29X	Drive & Wash	Soil	2" ID PVC	204	179-189	85.9-75.9	266.95
G6M-98-30X	Drive & Wash	Soil	2" ID PVC	71	60-65	161-156	223.54
G6M-98-32X	Drive & Wash	Soil	2" ID PVC	135	130-135	135-130	267.21
G6M-01-01X	Hollow-Stem Auger	Soil	2" ID PVC	150	130-150	134.1-114.1	266.47
G6M-02-01X	Hollow-Stem Auger	Soil	2" ID PVC	95	80-95	183.8-168.8	263.24
G6M-02-02X	Hollow-Stem Auger	Soil	2" ID PVC	95	80-95	184.1-169.1	263.78
G6M-02-03X	Hollow-Stem Auger	Soil	2" ID PVC	105	90-105	174.4-159.4	263.83
G6M-02-04X	Hollow-Stem Auger	Soil	2" ID PVC	105	90-105	173.6-158.6	265.72
G6M-02-05X	Hollow-Stem Auger	Soil	2" ID PVC	135	120-135	145.4-130.4	266.50
G6M-02-06X	Hollow-Stem Auger	Soil	2" ID PVC	65	55-65	153.5-143.5	210.53
G6M-02-07X	Hollow-Stem Auger	Soil	2" ID PVC	40	30-40	179.5-169.5	211.52
G6M-02-08X	Hollow-Stem Auger	Soil	2" ID PVC	70	60-70	163.2-153.2	225.03
G6M-02-09X	Hollow-Stem Auger	Soil	2" ID PVC	105	90-105	175.6-160.6	264.90
G6M-02-10X	Hollow-Stem Auger	Soil	2" ID PVC	135	125-135	152.2-142.2	266.57
G6M-02-11X	Hollow-Stem Auger	Soil	2" ID PVC	135	125-135	140-130	264.73
G6M-02-12X	Hollow-Stem Auger	Soil	2" ID PVC	135	125-135	138.4-128.4	263.26
G6M-02-13X	Hollow-Stem Auger	Soil	2" ID PVC	120	110-120	154.8-144.8	264.41
G6M-02-31BR	Hollow-Stem Auger	Soil	2" ID PVC	95	85-95	179.1-169.1	256.51
G6M-03-01X	Drive & Wash	Soil	2" ID PVC	70	50-70	173.3-153.3	225.89
G6M-03-02X	Drive & Wash	Soil	2" ID PVC	43	28-43	173.2-158.2	225.11
G6M-03-04X	Drive & Wash	Soil	2" ID PVC	30	15-30	208.3-193.3	226.00
G6M-03-07X	Drive & Wash	Soil	2" ID PVC	90	80-90	183.6-173.6	263.46
G6M-03-08X	Drive & Wash	Soil	2" ID PVC	140	125-140	132.2-117.2	259.40
G6M-03-09X	Drive & Wash	Soil	2" ID PVC	140	125-140	132.4-117.4	259.69
G6M-03-10X	Drive & Wash	Soil	2" ID PVC	135	120-135	144.2-129.2	266.61
G6M-03-11X	Hollow-Stem Auger	Soil	2" ID PVC	147	115-130	149.5-134.5	266.42
G6M-04-01X	Hollow-Stem Auger	Soil	2" ID PVC	92	82-92	180.49-170.49	261.95
G6M-04-02X	Hollow-Stem Auger	Soil	2" ID PVC	90	80-90	184.49-174.98	267.35
G6M-04-03X	Hollow-Stem Auger	Soil	2" ID PVC	95	85-95	180.61-170.61	265.09
G6M-04-04X	Hollow-Stem Auger	Soil	2" ID PVC	104	94-104	159.67-169.67	263.46
G6M-04-05X	Hollow-Stem Auger	Soil	2" ID PVC	110	100-110	157.33-147.33	258.93
G6M-04-06X	Hollow-Stem Auger	Soil	2" ID PVC	105	95-105	168.07-158.07	264.77
G6M-04-07X	Hollow-Stem Auger	Soil	2" ID PVC	130	120-130	142.68-132.68	264.62
G6M-04-08X	Hollow-Stem Auger	Soil	2" ID PVC	90	80-90	130.7-120.7	210.35
G6M-04-09X	Hollow-Stem Auger	Soil	2" ID PVC	65	55-65	188.46-178.46	243.46
G6M-04-10X	Hollow-Stem Auger	Soil	2" ID PVC	62	52-62	170.92-160.92	225.02
G6M-04-10A	Hollow-Stem Auger	Soil	2" ID PVC	40	30-40	193.02-183.02	224.82
G6M-04-11X	Hollow-Stem Auger	Soil	2" ID PVC	45	35-45	193.42-183.42	230.27
G6M-04-12X	Hollow-Stem Auger	Soil	2" ID PVC	64	54-64	170.66-160.66	226.41

Table 5
Monitoring Well Construction Details
AOC 50, Former Fort Devens Army Installation
Devens, MA

Well ID	Soil Drilling Method	Media Screened	Well Construction Material	Completion Depth (ft bgs)	Well Screen Interval (ft bgs)	Well Screen Elevation (ft amsl)	Measuring Point Elevation[1] (ft amsl)
G6M-04-13X	Hollow-Stem Auger	Soil	2" ID PVC	40	30-40	194.71-184.71	226.68
G6M-04-14X	Hollow-Stem Auger	Soil	2" ID PVC	90	80-90	131.56-121.56	211.41
G6M-04-15X	Hollow-Stem Auger	Soil	2" ID PVC	80	70-80	182.45-172.45	254.03
G6M-04-22X	Hollow-Stem Auger	Soil	2" ID PVC	84	74-84	180.75-170.75	256.69
G6M-04-31X	Hollow-Stem Auger	Soil	2" ID PVC	78	68-78	186.83-176.83	256.71
G6M-05-02X	Drive & Wash	Soil	2" ID PVC	129	109-129	Not surveyed	Not surveyed
G6M-06-01X	Drive & Wash	Soil	2" ID PVC	131	106-126	158.54-138.54	264.54
G6M-07-01X	Hollow-Stem Auger	Soil	2" ID PVC	99	78-98	184.9-164.9	262.9
G6M-07-02X	Hollow-Stem Auger	Soil	2" ID PVC	28	22.5-27.5	201.13-196.13	225.83
MW-1	Hollow-Stem Auger	Soil	2" ID PVC	136	126-136	138.9-128.9	267.10
MW-2	Hollow-Stem Auger	Soil	2" ID PVC	136	126-136	140.9-130.9	266.92
MW-3	Hollow-Stem Auger	Soil	2" ID PVC	136	126-137	138.7-128.7	266.55
MW-4	Hollow-Stem Auger	Soil	2" ID PVC	136	126-136	139.0-129.0	266.99
MW-5	Hollow-Stem Auger	Soil	2" ID PVC	136	126-136	138.2-128.2	266.46
MW-6	Hollow-Stem Auger	Soil	2" ID PVC	135	125-135	129.6-119.6	266.00
MW-7	Hollow-Stem Auger	Soil	2" ID PVC	135	125-135	139.7-129.7	265.77
G6M-13-01X2	Rotosonic	Soil	2" ID PVC	135	125-135	140.15-130.15	267.65
G6M-13-02X2	Rotosonic	Soil	2" ID PVC	125	115-125	149.62-139.62	264.62
G6M-13-03X2	Rotosonic	Soil	2" ID PVC	90	80-90	185.19-175.17	265.17
G6M-13-04X2	Rotosonic	Soil	2" ID PVC	135	125-135	139.61-129.61	267.11
G6M-13-05X2	Rotosonic	Soil	2" ID PVC	55	45-55	178.30-168.30	225.8
G6M-13-06X2	Rotosonic	Soil	2" ID PVC	60	50-60	172.67-162.67	225.17
New well	TBD	Water	TBD	TBD	TBD	TBD	TBD
New well	TBD	Water	TBD	TBD	TBD	TBD	TBD
Microwells							
XSA-97-59X	VD 100	Water	0.62" ID Steel	151	145-150	123.58-118.58	270.54
XSA-00-88X	VD 100	Water	0.62" ID Steel	145.5	139.5-144.5	128.52-123.52	270.02
XSA-00-89X	VD 100	Water	0.62" ID Steel	133.00	127-132	140.47-135.47	269.47
XSA-00-90X	VD 100	Water	0.62" ID Steel	161.90	155.9-160.9	108.92-103.92	267.04
XSA-12-95X	VD HG41	Water	1.05" ID Steel	130.5	120 - 130	147.43-137.43	270.43
XSA-12-96X	VD HG41	Water	1.05" ID Steel	130.5	120 - 130	147.82-137.82	270.79
XSA-12-97X	VD HG41	Water	1.05" ID Steel	130.5	119.75-129.75	148.96-138.96	271.58
XSA-12-98X	KANGO 950S	Water	0.62" ID Steel	70.25	60 - 70	147.44-137.44	210.41

Notes:
1 Reference point is top of casing
TBD = to be determined

Table 6
Sample Preparation and Analytical Methods, Containers, Holding Times, and Preservation
AOC 50, Former Fort Devens Army Installation, Massachusetts
Devens, MA

Parameter	Analytical Method	Contaminant of Concern	Sample Container	Preservative	Holding Times
ORGANIC					
VOCs	SW8260B	TCL	3 x 40-ml vials with teflon septa screw caps; no headspace	HCl to pH < 2; 4°+/- 2°C	14 Days
Dissolved Gases	RSK-175	MEE	3 x 40-mL VOA vials	HCl to pH < 2; 4°+/- 2°C	14 Days
METALS					
Dissolved Metals (field filtered)	SW6010B/ 6020A (As)	As, Fe, Mn	1 x 250-mL Polyethylene	HNO_3 to pH < 2; 4°+/- 2°C	180 Days
WET CHEMISTRY					
Alkalinity	SM2320B	None	1 x 250-mL Polyethylene	Store at 4°+/-2°C	14 Days
Nitrate/nitrite	E353.2	Nitrate/Nitrite (as N)	1 x 500-mL Amber Glass	H_2SO_4 to pH < 2; 4°+/- 2°C	28 Days
Sulfate	SW9056A	Sulfate	1 x 500-mL Polyethylene	Store at 4°+/-2°C	28 Days
Sulfide	SW9034	Sulfide	1 x 250-mL Polyethylene	Zinc acetate +NaOH to pH >9, 4 °C	7 Days
Total Organic Carbon	SW9060A	TOC	1 x 250-mL Amber Glass	H_2SO_4 to pH < 2; 4°+/- 2°C	28 Days

Notes:
TCL = Target Compound List
MEE = Methane, ethane, and ethene
As, Fe, Mn = arsenic, iron, manganese
TOC = Total Organic Carbon
HCL = hydrochloric acid
HNO_3 = nitric acid
H_2SO_4 = sulfuric acid
NaOH = sodium hydroxide

APPENDIX A
MONITORING WELL LOW FLOW SAMPLING FORM

Federal Projects EPA SOP
Low Flow Sampling Log
v.24 Sept 2014

FEDERAL SOP MONITORING WELL LOW FLOW SAMPLING LOG

Project Name: ______________ Date: ______
Project Location: ______________ Project #: ______
Personnel: ______________ ______________

WELL IDENTIFICATION: ______________

Headspace (PID) ______

WELL INTEGRITY

	YES	NO	N/A
Protective Casing Secure			
Concrete Pad Intact			
PVC Casing Intact			
Well Gripper Present			
Bolts Present (Pad Wells)			
Locked (Stickup Wells)			

Photograph

Well Information

Diameter: ______ Depth to Water: ______
Material: ______ Depth to Bottom: ______
Screen Interval: ______

SAMPLING TYPE, TUBING DETAILS

Purging Method: ______ 1 Well Volume (gal): ______ Tubing Type ______ Pump S/N ______
Purge Start Time: ______ Air Source: ______ Tubing Diameter ______

STABILIZATION PARAMETERS

TIME	FLOW RATE (mL/min)	DEPTH TO WATER (feet)	TEMP (°C)	SPECIFIC COND (µS/cm)	DISSOLVED OXYGEN (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	COLOR/ CLARITY
(min)*	(100-500 mL/min)**	(+/- 0.3')**	(+/- 3%)**	(+/- 3%)**	(+/- 10%)or <0.5**	(+/- 0.1)**	(+/- 10mV)**	(+/- 10%)or <5**	-

* every 5 to 10 minutes, depending on volume of flow-through cell, from EPA Region 1 Low-Flow SOP version 3: 1-19-2010

SAMPLING DETAILS

FIELD-FILTERED: Y N **DUPLICATE:** Y N **MS/MSD:** Y N

FILTER SIZE: ______ µm

SAMPLED BY (PRINT):	SAMPLER(S) SIGNATURES:	SAMPLING START TIME:	SAMPLING END TIME:

NOTES:

APPENDIX B
USEPA LOW STRESS (LOW FLOW) PURGING AND SAMPLING PROCEDURE (2010)

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

LOW STRESS (low flow) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUNDWATER SAMPLES FROM MONITORING WELLS

Quality Assurance Unit
U.S. Environmental Protection Agency – Region 1
11 Technology Drive
North Chelmsford, MA 01863

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Prepared by: Charles Porfert 1/19/10
(Charles Porfert, Quality Assurance Unit) Date

Approved by: Gerard Sotolongo 1-19-10
(Gerard Sotolongo, Quality Assurance Unit) Date

Revision Page

Date	Rev #	Summary of changes	Sections
7/30/96	2	Finalized	
01/19/10	3	Updated	All sections

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USE OF TERMS

Equipment blank: The equipment blank shall include the pump and the pump's tubing. If tubing is dedicated to the well, the equipment blank needs only to include the pump in subsequent sampling rounds. If the pump and tubing are dedicated to the well, the equipment blank is collected prior to its placement in the well. If the pump and tubing will be used to sample multiple wells, the equipment blank is normally collected after sampling from contaminated wells and not after background wells.

Field duplicates: Field duplicates are collected to determine precision of the sampling procedure. For this procedure, collect duplicate for each analyte group in consecutive order (VOC original, VOC duplicate, SVOC original, SVOC duplicate, etc.).

Indicator field parameters: This SOP uses field measurements of turbidity, dissolved oxygen, specific conductance, temperature, pH, and oxidation/reduction potential (ORP) as indicators of when purging operations are sufficient and sample collection may begin.

Matrix Spike/Matrix Spike Duplicates: Used by the laboratory in its quality assurance program. Consult the laboratory for the sample volume to be collected.

Poteniometric Surface: The level to which water rises in a tightly cased well constructed in a confined aquifer. In an unconfined aquifer, the potentiometric surface is the water table.

QAPP: Quality Assurance Project Plan

SAP: Sampling and Analysis Plan

SOP: Standard operating procedure

Stabilization: A condition that is achieved when all indicator field parameter measurements are sufficiently stable (as described in the "Monitoring Indicator Field Parameters" section) to allow sample collection to begin.

Temperature blank: A temperature blank is added to each sample cooler. The blank is measured upon receipt at the laboratory to assess whether the samples were properly cooled during transit.

Trip blank (VOCs): Trip blank is a sample of analyte-free water taken to the sampling site and returned to the laboratory. The trip blanks (one pair) are added to each sample cooler that contains VOC samples.

SCOPE & APPLICATION

The goal of this groundwater sampling procedure is to collect water samples that reflect the total mobile organic and inorganic loads (dissolved and colloidal sized fractions) transported through the subsurface under ambient flow conditions, with minimal physical and chemical alterations from sampling operations. This standard operating procedure (SOP) for collecting groundwater samples will help ensure that the project's data quality objectives (DQOs) are met under certain low-flow conditions.

The SOP emphasizes the need to minimize hydraulic stress at the well-aquifer interface by maintaining low water-level drawdowns, and by using low pumping rates during purging and sampling operations. Indicator field parameters (e.g., dissolved oxygen, pH, etc.) are monitored during purging in order to determine when sample collection may begin. Samples properly collected using this SOP are suitable for analysis of groundwater contaminants (volatile and semi-volatile organic analytes, dissolved gases, pesticides, PCBs, metals and other inorganics), or naturally occurring analytes. This SOP is based on Puls, and Barcelona (1996).

This procedure is designed for monitoring wells with an inside diameter (1.5-inches or greater) that can accommodate a positive lift pump with a screen length or open interval ten feet or less and with a water level above the top of the screen or open interval (Hereafter, the "screen or open interval" will be referred to only as "screen interval"). This SOP is not applicable to other well-sampling conditions.

While the use of dedicated sampling equipment is not mandatory, dedicated pumps and tubing can reduce sampling costs significantly by streamlining sampling activities and thereby reducing the overall field costs.

The goal of this procedure is to emphasize the need for consistency in deploying and operating equipment while purging and sampling monitoring wells during each sampling event. This will help to minimize sampling variability.

This procedure describes a general framework for groundwater sampling. Other site specific information (hydrogeological context, conceptual site model (CSM), DQOs, etc.) coupled with systematic planning must be added to the procedure in order to develop an appropriate site specific SAP/QAPP. In addition, the site specific SAP/QAPP must identify the specific equipment that will be used to collect the groundwater samples.

This procedure does not address the collection of water or free product samples from wells containing free phase LNAPLs and/or DNAPLs (light or dense non-aqueous phase liquids). For this type of situation, the reader may wish to check: Cohen, and Mercer (1993) or other pertinent documents.

This SOP is to be used when collecting groundwater samples from monitoring wells at all Superfund, Federal Facility and RCRA sites in Region 1 under the conditions described herein. Request for modification of this SOP, in order to better address specific situations at individual wells, must include adequate technical justification for proposed changes. All changes and modifications must be approved and included in a revised SAP/QAPP before implementation in field.

BACKGROUND FOR IMPLEMENTATION

It is expected that the monitoring well screen has been properly located (both laterally and vertically) to intercept existing contaminant plume(s) or along flow paths of potential contaminant migration. Problems with inappropriate monitoring well placement or faulty/improper well installation cannot be overcome by even the best water sampling procedures. This SOP presumes that the analytes of interest are moving (or will potentially move) primarily through the more permeable zones intercepted by the screen interval.

Proper well construction, development, and operation and maintenance cannot be overemphasized. The use of installation techniques that are appropriate to the hydrogeologic setting of the site often prevent "problem well" situations from occurring. During well development, or redevelopment, tests should be conducted to determine the hydraulic characteristics of the monitoring well. The data can then be used to set the purging/sampling rate, and provide a baseline for evaluating changes in well performance and the potential need for well rehabilitation. Note: if this installation data or well history (construction and sampling) is not available or discoverable, for all wells to be sampled, efforts to build a sampling history should commence with the next sampling event.

The pump intake should be located within the screen interval and at a depth that will remain under water at all times. It is recommended that the intake depth and pumping rate remain the same for all sampling events. The mid-point or the lowest historical midpoint of the saturated screen length is often used as the location of the pump intake. For new wells, or for wells without pump intake depth information, the site's SAP/QAPP must provide clear reasons and instructions on how the pump intake depth(s) will be selected, and reason(s) for the depth(s) selected. If the depths to top and bottom of the well screen are not known, the SAP/QAPP will need to describe how the sampling depth will be determined and how the data can be used.

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. Sample collection may still take place provided the indicator field parameter criteria in this procedure are met. If after 2 hours of purging indicator field parameters have not stabilized, one of three optional courses of action may be taken: a) continue purging until stabilization is achieved, b) discontinue purging, do not collect any samples, and record in log book that stabilization could not be achieved (documentation must describe attempts to achieve stabilization), c) discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization (note: there is a risk that the analytical data obtained, especially metals and strongly hydrophobic organic analytes, may reflect a sampling bias and therefore, the data may not meet the data quality objectives of the sampling event).

It is recommended that low-flow sampling be conducted when the air temperature is above 32°F (0°C). If the procedure is used below 32°F, special precautions will need to be taken to prevent the groundwater from freezing in the equipment. Because sampling during freezing temperatures may adversely impact the data quality objectives, the need for water sample collection during months when these conditions are likely to occur should be evaluated during site planning and special sampling measures may need to be developed. Ice formation in the flow-through-cell will cause the monitoring probes to act erratically. A transparent flow-through-cell needs to be used to observe if ice is forming in the cell. If ice starts to form on the other pieces of the sampling equipment, additional problems may occur.

HEALTH & SAFETY

When working on-site, comply with all applicable OSHA requirements and the site's health/safety procedures. All proper personal protection clothing and equipment are to be worn. Some samples may contain biological and chemical hazards. These samples should be handled with suitable protection to skin, eyes, etc.

CAUTIONS

The following cautions need to be considered when planning to collect groundwater samples when the below conditions occur.

If the groundwater degasses during purging of the monitoring well, dissolved gases and VOCs will be lost. When this happens, the groundwater data for dissolved gases (e.g., methane, ethene, ethane, dissolved oxygen, etc.) and VOCs will need to be qualified. Some conditions that can promote degassing are the use of a vacuum pump (e.g., peristaltic pumps), changes in aperture along the sampling tubing, and squeezing/pinching the pump's tubing which results in a pressure change.

When collecting the samples for dissolved gases and VOCs analyses, avoid aerating the groundwater in the pump's tubing. This can cause loss of the dissolved gases and VOCs in the groundwater. Having the pump's tubing completely filled prior to sampling will avoid this problem when using a centrifugal pump or peristaltic pump.

Direct sun light and hot ambient air temperatures may cause the groundwater in the tubing and flow-through-cell to heat up. This may cause the groundwater to degas which will result in loss of VOCs and dissolved gases. When sampling under these conditions, the sampler will need to shade the equipment from the sunlight (e.g., umbrella, tent, etc.). If possible, sampling on hot days, or during the hottest time of the day, should be avoided. The tubing exiting the monitoring well should be kept as short as possible to avoid the sun light or ambient air from heating up the groundwater.

Thermal currents in the monitoring well may cause vertical mixing of water in the well bore. When the air temperature is colder than the groundwater temperature, it can cool the top of the water column. Colder water which is denser than warm water sinks to the bottom of the well and the warmer water at the bottom of the well rises, setting up a convention cell. "During low-flow sampling, the pumped water may be a mixture of convecting water from within the well casing and aquifer water moving inward through the screen. This mixing of water during low-flow sampling can substantially increase equilibration times, can cause false stabilization of indicator parameters, can give false indication of redox state, and can provide biological data that are not representative of the aquifer conditions" (Vroblesky 2007).

Failure to calibrate or perform proper maintenance on the sampling equipment and measurement instruments (e.g., dissolved oxygen meter, etc.) can result in faulty data being collected.

Interferences may result from using contaminated equipment, cleaning materials, sample containers, or uncontrolled ambient/surrounding air conditions (e.g., truck/vehicle exhaust nearby).

Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment and/or proper planning to avoid ambient air interferences. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

Clean and decontaminate all sampling equipment prior to use. All sampling equipment needs to be routinely checked to be free from contaminants and equipment blanks collected to ensure that the equipment is free of contaminants. Check the previous equipment blank data for the site (if they exist) to determine if the previous cleaning procedure removed the contaminants. If contaminants were detected and they are a concern, then a more vigorous cleaning procedure will be needed.

PERSONNEL QUALIFICATIONS

All field samplers working at sites containing hazardous waste must meet the requirements of the OSHA regulations. OSHA regulations may require the sampler to take the 40 hour OSHA health and safety training course and a refresher course prior to engaging in any field activities, depending upon the site and field conditions.

The field samplers must be trained prior to the use of the sampling equipment, field instruments, and procedures. Training is to be conducted by an experienced sampler before initiating any sampling procedure.

The entire sampling team needs to read, and be familiar with, the site Health and Safety Plan, all relevant SOPs, and SAP/QAPP (and the most recent amendments) before going onsite for the sampling event. It is recommended that the field sampling leader attest to the understanding of these site documents and that it is recorded.

EQUIPMENT AND SUPPLIES

A. Informational materials for sampling event

A copy of the current Health and Safety Plan, SAP/QAPP, monitoring well construction data, location map(s), field data from last sampling event, manuals for sampling, and the monitoring instruments' operation, maintenance, and calibration manuals should be brought to the site.

B. Well keys.

C. Extraction device

Adjustable rate, submersible pumps (e.g., centrifugal, bladder, etc.) which are constructed of stainless steel or Teflon are preferred. Note: if extraction devices constructed of other materials are to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

If bladder pumps are selected for the collection of VOCs and dissolved gases, the pump setting should be set so that one pulse will deliver a water volume that is sufficient to fill a 40 mL VOC vial. This is not mandatory, but is considered a "best practice". For the proper operation, the bladder pump will need a minimum amount of water above the pump; consult the manufacturer for the recommended submergence. The pump's recommended submergence value should be determined during the planning stage, since it may influence well construction and placement of dedicated pumps where water-level fluctuations are significant.

Adjustable rate, peristaltic pumps (suction) are to be used with caution when collecting samples for VOCs and dissolved gases (e.g., methane, carbon dioxide, etc.) analyses. Additional information on the use of peristaltic pumps can be found in Appendix A. If peristaltic pumps are used, the inside diameter of the rotor head tubing needs to match the inside diameter of the tubing installed in the monitoring well.

Inertial pumping devices (motor driven or manual) are not recommended. These devices frequently cause greater disturbance during purging and sampling, and are less easily controlled than submersible pumps (potentially increasing turbidity and sampling variability, etc.). This can lead to sampling results that are adversely affected by purging and sampling operations, and a higher degree of data variability.

D. Tubing

Teflon or Teflon-lined polyethylene tubing are preferred when sampling is to include VOCs, SVOCs, pesticides, PCBs and inorganics. Note: if tubing constructed of other materials is to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

PVC, polypropylene or polyethylene tubing may be used when collecting samples for metal and other inorganics analyses.

The use of 1/4 inch or 3/8 inch (inside diameter) tubing is recommended. This will help ensure that the tubing remains liquid filled when operating at very low pumping rates when using centrifugal and peristaltic pumps.

Silastic tubing should be used for the section around the rotor head of a peristaltic pump. It should be less than a foot in length. The inside diameter of the tubing used at the pump rotor head must be the same as the inside diameter of tubing placed in the well. A tubing connector is used to connect the pump rotor head tubing to the well tubing. Alternatively, the two pieces of tubing can be connected to each other by placing the one end of the tubing inside the end of the other tubing. The tubing must not be reused.

E. The water level measuring device

Electronic "tape", pressure transducer, water level sounder/level indicator, etc. should be capable of measuring to 0.01 foot accuracy. Recording pressure transducers, mounted above the pump, are especially helpful in tracking water levels during pumping operations, but their use must include check measurements with a water level "tape" at the start and end of each sampling event.

F. Flow measurement supplies

Graduated cylinder (size according to flow rate) and stopwatch usually will suffice.

Large graduated bucket used to record total water purged from the well.

G. Interface probe

To be used to check on the presence of free phase liquids (LNAPL, or DNAPL) before purging begins (as needed).

H. Power source (generator, nitrogen tank, battery, etc.)

When a gasoline generator is used, locate it downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate samples.

I. Indicator field parameter monitoring instruments

Use of a multi-parameter instrument capable of measuring pH, oxidation/reduction potential (ORP), dissolved oxygen (DO), specific conductance, temperature, and coupled with a flow-through-cell is required when measuring all indicator field parameters, except turbidity. Turbidity is collected using a separate instrument. Record equipment/instrument identification (manufacturer, and model number).

Transparent, small volume flow-through-cells (e.g., 250 mLs or less) are preferred. This allows observation of air bubbles and sediment buildup in the cell, which can interfere with the operation of the monitoring instrument probes, to be easily detected. A small volume cell facilitates rapid turnover of water in the cell between measurements of the indicator field parameters.

It is recommended to use a flow-through-cell and monitoring probes from the same manufacturer and model to avoid incompatibility between the probes and flow-through-cell.

Turbidity samples are collected before the flow-through-cell. A "T" connector coupled with a valve is connected between the pump's tubing and flow-through-cell. When a turbidity measurement is required, the valve is opened to allow the groundwater to flow into a container. The valve is closed and the container sample is then placed in the turbidimeter.

Standards are necessary to perform field calibration of instruments. A minimum of two standards are needed to bracket the instrument measurement range for all parameters except ORP which use a Zobell solution as a standard. For dissolved oxygen, a wet sponge used for the 100% saturation and a zero dissolved oxygen solution are used for the calibration.

Barometer (used in the calibration of the Dissolved Oxygen probe) and the conversion formula to convert the barometric pressure into the units of measure used by the Dissolved Oxygen meter are needed.

J. Decontamination supplies

Includes (for example) non-phosphate detergent, distilled/deionized water, isopropyl alcohol, etc.

K. Record keeping supplies

Logbook(s), well purging forms, chain-of-custody forms, field instrument calibration forms, etc.

L. Sample bottles

M. Sample preservation supplies (as required by the analytical methods)

N. Sample tags or labels

O. PID or FID instrument

If appropriate, to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

P. Miscellaneous Equipment

Equipment to keep the sampling apparatus shaded in the summer (e.g., umbrella) and from freezing in the winter. If the pump's tubing is allowed to heat up in the warm weather, the cold groundwater may degas as it is warmed in the tubing.

EQUIPMENT/INSTRUMENT CALIBRATION

Prior to the sampling event, perform maintenance checks on the equipment and instruments according to the manufacturer's manual and/or applicable SOP. This will ensure that the equipment/instruments are working properly before they are used in the field.

Prior to sampling, the monitoring instruments must be calibrated and the calibration documented. The instruments are calibrated using U.S Environmental Protection Agency Region 1 *Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction [ORP], and turbidity),* January 19, 2010, or latest version or from one of the methods listed in 40CFR136, 40CFR141 and SW-846.

The instruments shall be calibrated at the beginning of each day. If the field measurement falls outside the calibration range, the instrument must be re-calibrated so that all measurements fall within the calibration range. At the end of each day, a calibration check is performed to verify that instruments remained in calibration throughout the day. This check is performed while the instrument is in measurement mode, not calibration mode. If the field instruments are being used to monitor the natural attenuation parameters, then a calibration check at mid-day is highly recommended to ensure that the instruments did not drift out of calibration. Note: during the day if the instrument reads zero or a negative number for dissolved oxygen, pH, specific conductance, or turbidity (negative value only), this indicates that the instrument drifted out of calibration or the instrument is malfunctioning. If this situation occurs the data from this instrument will need to be qualified or rejected.

PRELIMINARY SITE ACTIVITIES (as applicable)

Check the well for security (damage, evidence of tampering, missing lock, etc.) and record pertinent observations (include photograph as warranted).

If needed lay out sheet of clean polyethylene for monitoring and sampling equipment, unless equipment is elevated above the ground (e.g., on a table, etc.).

Remove well cap and if appropriate measure VOCs at the rim of the well with a PID or FID instrument and record reading in field logbook or on the well purge form.

If the well casing does not have an established reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the logbook (consider a photographic record as well). All water level measurements must be recorded relative to this reference point (and the altitude of this point should be determined using techniques that are appropriate to site's DQOs.

If water-table or potentiometric surface map(s) are to be constructed for the sampling event, perform synoptic water level measurement round (in the shortest possible time) before any purging and sampling activities begin. If possible, measure water level depth (to 0.01 ft.) and total well depth (to 0.1 ft.) the day before sampling begins, in order to allow for re-settlement of any particulates in the water column. This is especially important for those wells that have not been recently sampled because sediment buildup in the well may require the well to be redeveloped. If measurement of total well depth is not made the day before, it should be measured after sampling of the well is complete. All measurements must be taken from the established referenced point. Care should be taken to minimize water column disturbance.

Check newly constructed wells for the presence of LNAPLs or DNAPLs before the initial sampling round. If none are encountered, subsequent check measurements with an interface probe may not be necessary unless analytical data or field analysis signal a worsening situation. This SOP cannot be used in the presence of LNAPLs or DNAPLs. If NAPLs are present, the project team must decide upon an alternate sampling method. All project modifications must be approved and documented prior to implementation.

If available check intake depth and drawdown information from previous sampling event(s) for each well. Duplicate, to the extent practicable, the intake depth and extraction rate (use final pump dial setting information) from previous event(s). If changes are made in the intake depth or extraction rate(s) used during previous sampling event(s), for either portable or dedicated extraction devices, record new values, and explain reasons for the changes in the field logbook.

PURGING AND SAMPLING PROCEDURE

Purging and sampling wells in order of increasing chemical concentrations (known or anticipated) are preferred.

The use of dedicated pumps is recommended to minimize artificial mobilization and entrainment of particulates each time the well is sampled. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

A. Initial Water Level

Measure the water level in the well before installing the pump if a non-dedicated pump is being used. The initial water level is recorded on the purge form or in the field logbook.

B. Install Pump

Lower pump, safety cable, tubing and electrical lines slowly (to minimize disturbance) into the well to the appropriate depth (may not be the mid-point of the screen/open interval). The Sampling and Analysis Plan/Quality Assurance Project Plan should specify the sampling depth (used previously), or provide criteria for selection of intake depth for each new well. If possible keep the pump intake at least two feet above the bottom of the well, to minimize mobilization of particulates present in the bottom of the well.

Pump tubing lengths, above the top of well casing should be kept as short as possible to minimize heating the groundwater in the tubing by exposure to sun light and ambient air temperatures. Heating may cause the groundwater to degas, which is unacceptable for the collection of samples for VOC and dissolved gases analyses.

C. Measure Water Level

Before starting pump, measure water level. Install recording pressure transducer, if used to track drawdowns, to initialize starting condition.

D. Purge Well

From the time the pump starts purging and until the time the samples are collected, the purged water is discharged into a graduated bucket to determine the total volume of groundwater purged. This information is recorded on the purge form or in the field logbook.

Start the pump at low speed and slowly increase the speed until discharge occurs. Check water level. Check equipment for water leaks and if present fix or replace the affected equipment. Try to match pumping rate used during previous sampling event(s). Otherwise, adjust pump speed until there is little or no water level drawdown. If the minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging.

Monitor and record the water level and pumping rate every five minutes (or as appropriate) during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should, as needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. During pump start-up, drawdown may exceed the 0.3 feet target and then "recover" somewhat as pump flow adjustments are made. Purge volume calculations should utilize stabilized drawdown value, not the initial drawdown. If the initial water level is above the top of the screen do not allow the water level to fall into the well screen. The final purge volume must be greater than the stabilized drawdown volume plus the pump's tubing volume. If the drawdown has exceeded 0.3 feet and stabilizes, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are collected.

Avoid the use of constriction devices on the tubing to decrease the flow rate because the constrictor will cause a pressure difference in the water column. This will cause the groundwater to degas and result in a loss of VOCs and dissolved gasses in the groundwater samples.

Note: the flow rate used to achieve a stable pumping level should remain constant while monitoring the indicator parameters for stabilization and while collecting the samples.

Wells with low recharge rates may require the use of special pumps capable of attaining very low pumping rates (e.g., bladder, peristaltic), and/or the use of dedicated equipment. For new monitoring wells, or wells where the following situation has not occurred before, if the recovery rate to the well is less than 50 mL/min., or the well is being essentially dewatered during purging, the well should be sampled as soon as the water level has recovered sufficiently to collect the volume needed for all anticipated samples. The project manager or field team leader will need to make the decision when samples should be collected, how the sample is to be collected, and the reasons recorded on the purge form or in the field logbook. A water level measurement needs to be performed and recorded before samples are collected. If the project manager decides to collect the samples using the pump, it is best during this recovery period that the pump intake tubing not be removed, since this will aggravate any turbidity problems. Samples in this specific situation may be collected without stabilization of indicator field parameters. Note that field conditions and efforts to overcome problematic situations must be recorded in order to support field decisions to deviate from normal procedures described in this SOP. If this type of problematic situation persists in a well, then water sample collection should be changed to a passive or no-purge method, if consistent with the site's DQOs, or have a new well installed.

E. Monitor Indicator Field Parameters

After the water level has stabilized, connect the "T" connector with a valve and the flow-through-cell to monitor the indicator field parameters. If excessive turbidity is anticipated or encountered with the pump startup, the well may be purged for a while without connecting up the flow-through-cell, in order to minimize particulate buildup in the cell (This is a judgment call made by the sampler). Water level drawdown measurements should be made as usual. If possible, the pump may be installed the day before purging to allow particulates that were disturbed during pump insertion to settle.

During well purging, monitor indicator field parameters (turbidity, temperature, specific conductance, pH, ORP, DO) at a frequency of five minute intervals or greater. The pump's flow rate must be able to "turn over" at least one flow-through-cell volume between measurements (for a 250 mL flow-through-cell with a flow rate of 50 mLs/min., the monitoring frequency would be every five minutes; for a 500 mL flow-through-cell it would be every ten minutes). If the cell volume cannot be replaced in the five minute interval, then the time between measurements must be increased accordingly. Note: during the early phase of purging emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments followed by stabilization of indicator parameters. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings are within the following limits:

Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

All measurements, except turbidity, must be obtained using a flow-through-cell. Samples for turbidity measurements are obtained before water enters the flow-through-cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell. If the cell needs to be cleaned during purging operations, continue pumping and disconnect cell for cleaning, then reconnect after cleaning and continue monitoring activities. Record start and stop times and give a brief description of cleaning activities.

The flow-through-cell must be designed in a way that prevents gas bubble entrapment in the cell. Placing the flow-through-cell at a 45 degree angle with the port facing upward can help remove bubbles from the flow-through-cell (see Appendix B Low-Flow Setup Diagram). All during the measurement process, the flow-through-cell must remain free of any gas bubbles. Otherwise, the monitoring probes may act erratically. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must remain submerged in water at all times.

F. Collect Water Samples

When samples are collected for laboratory analyses, the pump's tubing is disconnected from the "T" connector with a valve and the flow-through-cell. The samples are collected directly from the pump's tubing. Samples must not be collected from the flow-through-cell or from the "T" connector with a valve.

VOC samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

If the pump's flow rate is too high to collect the VOC/dissolved gases samples, collect the other samples first. Lower the pump's flow rate to a reasonable rate and collect the VOC/dissolved gases samples and record the new flow rate.

During purging and sampling, the centrifugal/peristaltic pump tubing must remain filled with water to avoid aeration of the groundwater. It is recommended that 1/4 inch or 3/8 inch (inside diameter) tubing be used to help insure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, use the following procedure to collect samples: collect non-VOC/dissolved gases samples first, then increase flow rate slightly until the water completely fills the tubing, collect the VOC/dissolved gases samples, and record new drawdown depth and flow rate.

For bladder pumps that will be used to collect VOC or dissolved gas samples, it is recommended that the pump be set to deliver long pulses of water so that one pulse will fill a 40 mL VOC vial.

Use pre-preserved sample containers or add preservative, as required by analytical methods, to the samples immediately after they are collected. Check the analytical methods (e.g. EPA SW-846, 40 CFR 136, water supply, etc.) for additional information on preservation.

If determination of filtered metal concentrations is a sampling objective, collect filtered water samples using the same low flow procedures. The use of an in-line filter (transparent housing preferred) is required, and the filter size (0.45 μm is commonly used) should be based on the sampling objective. Pre-rinse the filter with groundwater prior to sample collection. Make sure the filter is free of air bubbles before samples are collected. Preserve the filtered water sample immediately. Note: filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain chemical concentrations of total mobile contaminants in groundwater for human health or ecological risk calculations.

Label each sample as collected. Samples requiring cooling will be placed into a cooler with ice or refrigerant for delivery to the laboratory. Metal samples after acidification to a pH less than 2 do not need to be cooled.

G. Post Sampling Activities

If a recording pressure transducer is used to track drawdown, re-measure water level with tape.

After collection of samples, the pump tubing may be dedicated to the well for re-sampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

Before securing the well, measure and record the well depth (to 0.1 ft.), if not measured the day before purging began. Note: measurement of total well depth annually is usually sufficient after the initial low stress sampling event. However, a greater frequency may be needed if the well has a "silting" problem or if confirmation of well identity is needed.

Secure the well.

DECONTAMINATION

Decontaminate sampling equipment prior to use in the first well and then following sampling of each well. Pumps should not be removed between purging and sampling operations. The pump, tubing, support cable and electrical wires which were in contact with the well should be decontaminated by one of the procedures listed below.

The use of dedicated pumps and tubing will reduce the amount of time spent on decontamination of the equipment. If dedicated pumps and tubing are used, only the initial sampling event will require decontamination of the pump and tubing.

Note if the previous equipment blank data showed that contaminant(s) were present after using the below procedure or the one described in the SAP/QAPP, a more vigorous procedure may be needed.

Procedure 1

Decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump and tubing. The pump may be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

Flush the equipment/pump with potable water.

Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

Optional - flush with isopropyl alcohol (pesticide grade; must be free of ketones {e.g., acetone}) or with methanol. This step may be required if the well is highly contaminated or if the equipment blank data from the previous sampling event show that the level of contaminants is significant.

Flush with distilled/deionized water. This step must remove all traces of alcohol (if used) from the equipment. The final water rinse must not be recycled.

Procedure 2

Steam clean the outside of the submersible pump.

Pump hot potable water from the steam cleaner through the inside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with end cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.

Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the groundwater samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. Quality control samples include field duplicates, equipment blanks, matrix spike/matrix spike duplicates, trip blanks (VOCs), and temperature blanks.

FIELD LOGBOOK

A field log shall be kept to document all groundwater field monitoring activities (see Appendix C, example table), and record the following for each well:

Site name, municipality, state.

Well identifier, latitude-longitude or state grid coordinates.

Measuring point description (e.g., north side of PVC pipe).

Well depth, and measurement technique.

Well screen length.

Pump depth.

Static water level depth, date, time and measurement technique.

Presence and thickness of immiscible liquid (NAPL) layers and detection method.

Pumping rate, drawdown, indicator parameters values, calculated or measured total volume pumped, and clock time of each set of measurements.

Type of tubing used and its length.

Type of pump used.

Clock time of start and end of purging and sampling activity.

Types of sample bottles used and sample identification numbers.

Preservatives used.

Parameters requested for analyses.

Field observations during sampling event.

Name of sample collector(s).

Weather conditions, including approximate ambient air temperature.

QA/QC data for field instruments.

Any problems encountered should be highlighted.

Description of all sampling/monitoring equipment used, including trade names, model number, instrument identification number, diameters, material composition, etc.

DATA REPORT

Data reports are to include laboratory analytical results, QA/QC information, field indicator parameters measured during purging, field instrument calibration information, and whatever other field logbook information is needed to allow for a full evaluation of data usability.

Note: the use of trade, product, or firm names in this sampling procedure is for descriptive purposes only and does not constitute endorsement by the U.S. EPA.

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Cohen, R.M. and J.W. Mercer, 1993, *DNAPL Site Evaluation*; C.K. Smoley (CRC Press), Boca Raton, Florida.

Robert W. Puls and Michael J. Barcelona, *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*, April 1996 (EPA/540/S-95/504).

U.S. Environmental Protection Agency, 1992, *RCRA Ground-Water Monitoring: Draft Technical Guidance*; Washington, DC (EPA/530-R-93-001).

U.S. Environmental Protection Agency, 1987, *A Compendium of Superfund Field Operations Methods*; Washington, DC (EPA/540/P-87/001).

U.S Environmental Protection Agency, Region 1, *Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction [ORP], and turbidity),* January 19, 2010 or latest version.

U.S Environmental Protection Agency, EPA SW-846.

U.S Environmental Protection Agency, 40 CFR 136.

U.S Environmental Protection Agency, 40 CFR 141.

Vroblesky, Don A., Clifton C. Casey, and Mark A. Lowery, Summer 2007, Influence of Dissolved Oxygen Convection on Well Sampling, *Ground Water Monitoring & Remediation* 27, no. 3: 49-58.

APPENDIX A
PERISTALTIC PUMPS

Before selecting a peristaltic pump to collect groundwater samples for VOCs and/or dissolved gases (e.g., methane, carbon dioxide, etc.) consideration should be given to the following:

- The decision of whether or not to use a peristaltic pump is dependent on the intended use of the data.
- If the additional sampling error that may be introduced by this device is NOT of concern for the VOC/dissolved gases data's intended use, then this device may be acceptable.
- If minor differences in the groundwater concentrations could effect the decision, such as to continue or terminate groundwater cleanup or whether the cleanup goals have been reached, then this device should NOT be used for VOC/dissolved gases sampling. In these cases, centrifugal or bladder pumps are a better choice for more accurate results.

EPA and USGS have documented their concerns with the use of the peristaltic pumps to collect water sample in the below documents.

- "Suction Pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds" *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, December 1987.
- "The agency does not recommend the use of peristaltic pumps to sample ground water particularly for volatile organic analytes" *RCRA Ground-Water Monitoring Draft Technical Guidance*, EPA Office of Solid Waste, November 1992.
- "The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and volatiles loss", *Low-flow (Minimal drawdown) Ground-Water Sampling Procedures*, by Robert Puls & Michael Barcelona, April 1996, EPA/540/S-95/504.
- "Suction-lift pumps, such as peristaltic pumps, can operate at a very low pumping rate; however, using negative pressure to lift the sample can result in the loss of volatile analytes", USGS Book 9 Techniques of Water-Resources Investigation, Chapter A4. (Version 2.0, 9/2006).

APPENDIX B

SUMMARY OF SAMPLING INSTRUCTIONS

These instructions are for using an adjustable rate, submersible pump or a peristaltic pump with the pump's intake placed at the midpoint of a 10 foot or less well screen or an open interval. The water level in the monitoring well is above the top of the well screen or open interval, the ambient temperature is above 32°F, and the equipment is not dedicated. Field instruments are already calibrated. The equipment is setup according to the diagram at the end of these instructions.

1. Review well installation information. Record well depth, length of screen or open interval, and depth to top of the well screen. Determine the pump's intake depth (e.g., mid-point of screen/open interval).

2. On the day of sampling, check security of the well casing, perform any safety checks needed for the site, lay out a sheet of polyethylene around the well (if necessary), and setup the equipment. If necessary a canopy or an equivalent item can be setup to shade the pump's tubing and flow-through-cell from the sun light to prevent the sun light from heating the groundwater.

3. Check well casing for a reference mark. If missing, make a reference mark. Measure the water level (initial) to 0.01 ft. and record this information.

4. Install the pump's intake to the appropriate depth (e.g., midpoint) of the well screen or open interval. Do not turn-on the pump at this time.

5. Measure water level and record this information.

6. Turn-on the pump and discharge the groundwater into a graduated waste bucket. Slowly increase the flow rate until the water level starts to drop. Reduce the flow rate slightly so the water level stabilizes. Record the pump's settings. Calculate the flow rate using a graduated container and a stop watch. Record the flow rate. Do not let the water level drop below the top of the well screen.

If the groundwater is highly turbid or colored, continue to discharge the water into the bucket until the water clears (visual observation); this usually takes a few minutes. The turbid or colored water is usually from the well being disturbed during the pump installation. If the water does not clear, then you need to make a choice whether to continue purging the well (hoping that it will clear after a reasonable time) or continue to the next step. Note, it is sometimes helpful to install the pump the day before the sampling event so that the disturbed materials in the well can settle out.

If the water level drops to the top of the well screen during the purging of the well, stop purging the well, and do the following:

> Wait for the well to recharge to a sufficient volume so samples can be collected. This may take awhile (pump maybe removed from well, if turbidity is not a problem). The project manager will need to make the decision when samples should be collected and the reasons recorded in the site's log book. A water level measurement needs to be performed and recorded before samples are collected. When samples are being collected, the water level must not drop below the top of the screen or open interval. Collect the samples from the pump's tubing. Always collect the VOCs and dissolved gases samples first. Normally, the samples requiring a small volume are collected before the large volume samples are collected just in case there is not sufficient water in the well to fill all the sample containers. All samples must be collected, preserved, and stored according to the analytical method. Remove the pump from the well and decontaminate the sampling equipment.

If the water level has dropped 0.3 feet or less from the initial water level (water level measure before the pump was installed); proceed to Step 7. If the water level has dropped more than 0.3 feet, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are be collected.

7. Attach the pump's tubing to the "T" connector with a valve (or a three-way stop cock). The pump's tubing from the well casing to the "T" connector must be as short as possible to prevent the groundwater in the tubing from heating up from the sun light or from the ambient air. Attach a short piece of tubing to the other end of the end of the "T" connector to serve as a sampling port for the turbidity samples. Attach the remaining end of the "T" connector to a short piece of tubing and connect the tubing to the flow-through-cell bottom port. To the top port, attach a small piece of tubing to direct the water into a calibrated waste bucket. Fill the cell with the groundwater and remove all gas bubbles from the cell. Position the flow-through-cell in such a way that if gas bubbles enter the cell they can easily exit the cell. If the ports are on the same side of the cell and the cell is cylindrical shape, the cell can be placed at a 45-degree angle with the ports facing upwards; this position should keep any gas bubbles entering the cell away from the monitoring probes and allow the gas bubbles to exit the cell easily (see Low-Flow Setup Diagram). Note,

make sure there are no gas bubbles caught in the probes' protective guard; you may need to shake the cell to remove these bubbles.

8. Turn-on the monitoring probes and turbidity meter.

9. Record the temperature, pH, dissolved oxygen, specific conductance, and oxidation/reduction potential measurements. Open the valve on the "T" connector to collect a sample for the turbidity measurement, close the valve, do the measurement, and record this measurement. Calculate the pump's flow rate from the water exiting the flow-through-cell using a graduated container and a stop watch, and record the measurement. Measure and record the water level. Check flow-through-cell for gas bubbles and sediment; if present, remove them.

10. Repeat Step 9 every 5 minutes or as appropriate until monitoring parameters stabilized. Note at least one flow-through-cell volume must be exchanged between readings. If not, the time interval between readings will need to be increased. Stabilization is achieved when three consecutive measurements are within the following limits:

Turbidity (10% for values greater than 5 NTUs; if three Turbidity values are less than 5 NTUs, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

If these stabilization requirements do not stabilize in a reasonable time, the probes may have been coated from the materials in the groundwater, from a buildup of sediment in the flow-through-cell, or a gas bubble is lodged in the probe. The cell and the probes will need to be cleaned. Turn-off the probes (not the pump), disconnect the cell from the "T" connector and continue to purge the well. Disassemble the cell, remove the sediment, and clean the probes according to the manufacturer's instructions. Reassemble the cell and connect the cell to the "T" connector. Remove all gas bubbles from the cell, turn-on the probes, and continue the measurements. Record that the time the cell was cleaned.

11. When it is time to collect the groundwater samples, turn-off the monitoring probes, and disconnect the pump's tubing from the "T" connector. If you are using a centrifugal or peristaltic pump check the pump's tubing to determine if the tubing is completely filled with water (no air space).

All samples must be collected and preserved according to the analytical method. VOCs and dissolved gases samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

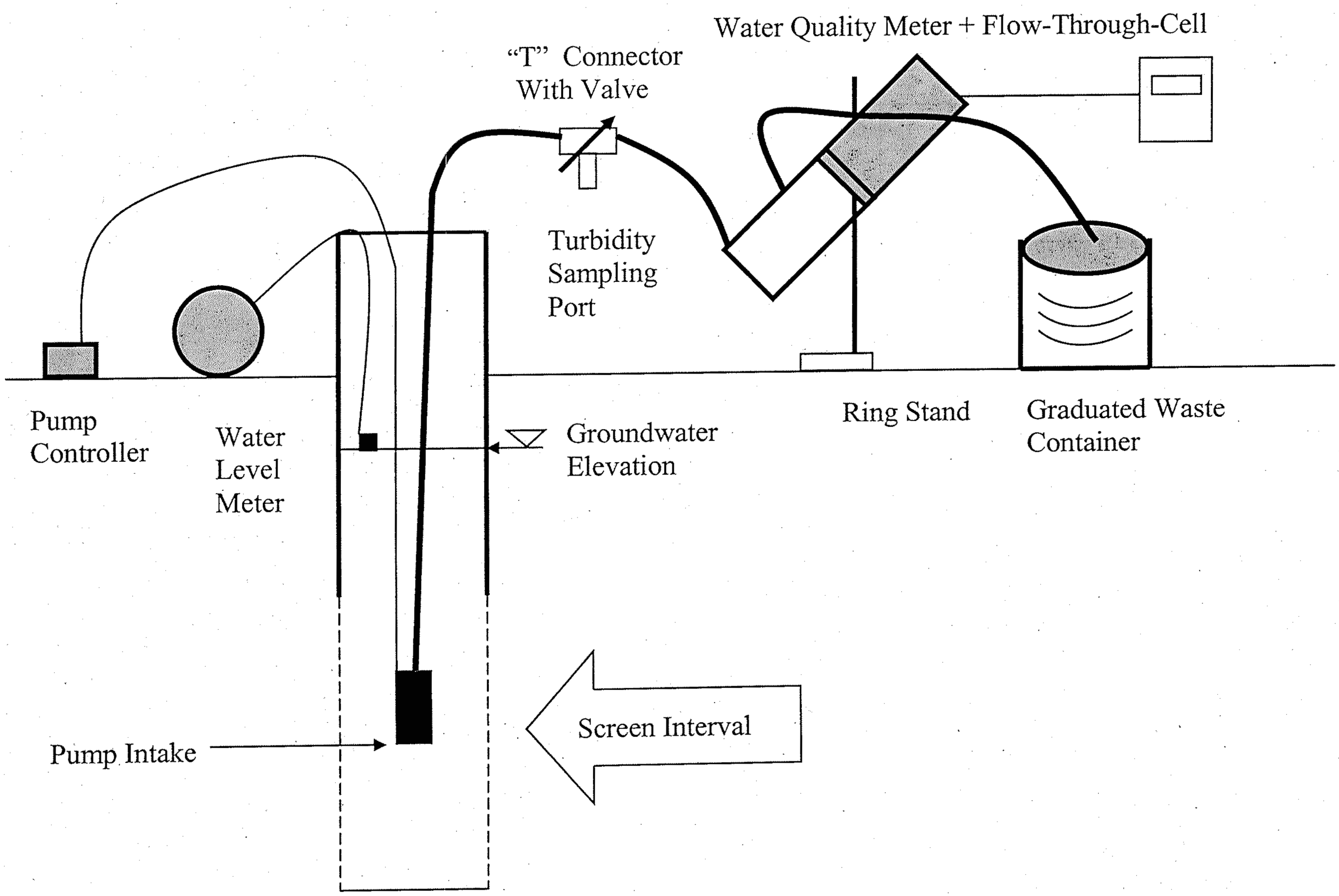
If the pump's tubing is not completely filled with water and the samples are being collected for VOCs and/or dissolved gases analyses using a centrifugal or peristaltic pump, do the following:

> All samples must be collected and preserved according to the analytical method. The VOCs and the dissolved gases (e.g., methane, ethane, ethene, and carbon dioxide) samples are collected last. When it becomes time to collect these samples increase the pump's flow rate until the tubing is completely filled. Collect the samples and record the new flow rate.

12. Store the samples according to the analytical method.

13. Record the total purged volume (graduated waste bucket). Remove the pump from the well and decontaminate the sampling equipment.

Low-Flow Setup Diagram



APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name)____________________________

Well Number____________________ Date____________________

Field Personnel____________________________

Sampling Organization____________________________

Identify MP____________________________

Depth to ________/________ of screen
(below MP) top bottom

Pump Intake at (ft. below MP)________

Purging Device; (pump type)________

Total Volume Purged ________

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged liters	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Turb-idity NTU	Comments
Stabilization Criteria					3%	3%	±0.1	± 10 mv	10%	10%	

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

APPENDIX C
PRODUCT SUBSTRATE INFORMATION

Anaerobic BioChem (ABC®)
The "Green" Substrate

In 2003, Redox Tech introduced its proprietary formulation for anaerobic biodegradation of halogenated solvents in groundwater. The product, Anaerobic Biochem ABC®, is a patented mixture of lactates, fatty acids, alcohols and a phosphate buffer. ABC® contains soluble lactic acid as well as slow- and long-term releasing components. Redox Tech was one of the first companies to recognize the importance of maintaining optimum pH, and for that reason, ABC has always had a phosphate buffer and other alkaline materials, when necessary, to maintain the optimal pH. The phosphate buffer provides phosphates, which are a micronutrient for bioremediation. In addition, the buffer helps to maintain the pH in a range that is best suited for microbial growth.

Since ABC's introduction, millions of pounds of ABC have been used on hundreds of sites throughout the United States and even Europe. Over time, the "essential ingredients" have been slightly modified, but to our knowledge, ABC remains the only carbon substrate on the crowded market that is formulated specifically for each site's own unique geochemistry, biology, and hydrogeology.

"Green" Before Green was Cool

Redox Tech is a niche environmental remediation contractor. Therefore, we have always felt obligated to be environmentally conscious. Before "green" was all the rave, Redox Tech utilized waste streams from green energy processes, such as ethanol and biodiesel production to formulate ABC. Only a small percentage of the components are "virgin" chemicals. The phosphate buffer provides phosphates, which are a micronutrient for bioremediation. In addition, the buffer helps to maintain the pH in a range that is best suited for microbial growth.

ABC® Advantages

- WATER SOLUBLE - the biggest advantage with ABC is that it is completely soluble in water, even the long-lasting carbon. There is no need to emulsify our product, and thus no worry about an emulsion breaking. Also, because it is a water soluble product, the need for large volumes of "chase" water is eliminated. ABC is typically injected at about 15 to 25 weight percent mixed into about 100 to 200 gallons of water.
- LONG LASTING – ABC has C14 to C18 fatty acids that have been shown in the field to last over two years. Emulsified oils break down into C18 fatty acids through hydrolysis, so we are essentially using the same long-lived components of emulsified oils without having to emulsify or wait for hydrolysis to occur.
- NATURAL CO-SOLVENT – ABC, through a license with Oregon State University, adds ethyl lactate which is a "green" co-solvent. This helps dissolve the fatty acids, and it also serves as a solvent for sites that may have DNAPL, because the ethyl lactate solvates the DNAPL and promotes rapid treatment.
- GREEN – ABC is formulated with byproducts from "green" energy processes, so it is better for the environment.
- COST-COMPETITIVE – carbon substrates are becoming commodities, and ABC is priced accordingly. When all factors are considered, ABC is a great value.

REDOX TECH, LLC

Providing Innovative In Situ Soil & Groundwater Treatment

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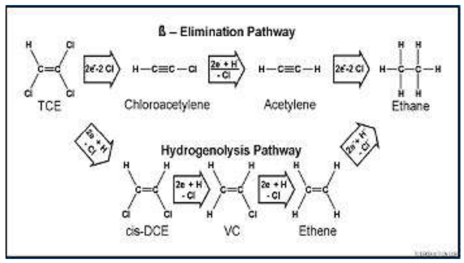

ANAEROBIC BIOCHEM (ABC®) - THE "GREEN" SUBSTRATE

In 2003, Redox Tech introduced its proprietary formulation for anaerobic biodegradation of halogenated solvents in groundwater. The product, Anaerobic Biochem or ABC®, is a patented mixture of lactates, fatty acids, alcohols and a phosphate buffer. ABC® contains soluble lactic acid as well as slow- and long-term releasing components. Redox Tech was one of the first companies to recognize the importance of maintaining optimum pH for bacterial growth, and for that reason, ABC® has always had a phosphate buffer and other alkaline materials, when necessary, to help maintain optimal pH. The phosphates phosphate buffer, also serves as a micronutrient for bioremediation

Since ABC's introduction, millions of pounds of ABC® have been used on hundreds of sites throughout the United States and even Europe. Over time, the "essential ingredients" have been slightly modified, but to our knowledge, ABC® remains the only carbon substrate on the crowded market that is formulated specifically for each site's unique geochemistry, biology, and hydrogeology

"GREEN" BEFORE GREEN WAS COOL

Redox Tech is a niche environmental remediation contractor. Therefore, we have always felt obligated to be environmentally conscious. Before "green" was all the rave, Redox Tech refined waste streams from green energy processes, such as ethanol and biodiesel production to formulate ABC®. Only a small percentage of the components are "virgin" chemicals.

ABC® ADVANTAGES

- WATER SOLUBLE - the biggest advantage with ABC® is that it is completely soluble in water, even the long-lasting carbon component. There is no need to emulsify our product, and thus no worry about an emulsion breaking. Also, because it is a water soluble product, the need for large volumes of "chase" water is eliminated.
- LONG LASTING – ABC® has C14 to C18 fatty acids that have been shown in the field to last for over two years. Emulsified oils eventually break down into bioavailable C18 fatty acids through hydrolysis, so we are essentially using the same long-lived components of emulsified oils without having to emulsify or wait for hydrolysis to occur.
- NATURAL CO-SOLVENT – ABC®, through a license with Oregon State University, adds ethyl lactate which is a "green" co-solvent. This helps dissolve fatty acids, and it also serves as a solvent for sites that may have DNAPL, because the ethyl lactate solvates the DNAPL and promotes rapid treatment.
- GREEN – ABC® is formulated with byproducts from "green" energy processes, so it is better for the environment.
- COST-COMPETITIVE – carbon substrates are becoming commodities, and ABC® is priced accordingly. When all factors are considered, ABC® is a great value.

Let Redox Tech help formulate an enhanced anaerobic program for your site today. For more information contact our Main Office.

ADDITIONAL INFO

BROCHURES & PRESENTATIONS	ABC Product Brochure (55.95 kB)

SUB MENU

- **ABC®**
- ABC+
- ABC-OLÉ
- OBC™
- SBC
- NUBUFF
- ZVI
- RTB-1

ANAEROBIC BIOCHEM

Anaerobic Biochem (ABC®), is a patented mixture of lactates, fatty acids, and a phosphate buffer that promotes anaerobic biodegradation of halogenated solvents in groundwater.

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ABC® BROCHURE
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- Redox Tech Introduces NuBuff
- Redox Tech, LLC Renews Comarketing Relationship with Carus Corporation
- New Soil Blender Debuts in Cambridge, Mass
- ABC® and ABC+ Applied at Over 350 Sites
- Anaerobic BioChem (ABC®), The "Green" Substrate

CASE STUDIES	ABC Case Study #1 (107.57 kB) ABC Case Study #2 (177.09 kB) ABC Case Study #3 (101.76 kB)
OTHER DOCUMENTS	ABC versus Emulsified Oils (55.99 kB) Site Profile for Cost Estimate (27.11 kB) Florida Remediation Conference (2.23 MB) Lactate (webpage)

[1]ABC® is protected by US Patent 6,001,252.

REDOX TECH, LLC
Providing Innovative In Situ Soil & Groundwater Treatment

ABC-OLÉ

EMULSIFIED FATTY ACIDS ESTERS

ABC-Olé is an emulsified fatty acid ester product for anaerobic bioremediation sites where emulsified vegetable oil (EVO) products are being considered. ABC-Olé is a modified blend of ABC® which contains emulsified fatty acid esters up to 60 percent. ABC-Olé also contains a quickly metabolized carbon substrate at up to 5 weight percent to initiate the bioremediation process. Just like ABC, ABC-Olé contains a phosphate buffer to maintain the pH in the optimal range for complete biodegradation.

ABC® was always designed uniquely for each site. Greater amounts of buffer are added for low pH or high solvent sites. For high flowing aquifer systems, we typically added greater amounts of fatty acids because the fatty acids are more likely to sorb to the soil and not be washed out. Ultimately, the goal is to bring the oxidation-reduction potential of the aquifer to around sulfate reducing conditions (ORP of -175 mV). If the carbon substrate is not fermented at a rate sufficient to overcome the flow of oxygen (and other electron acceptors) into the system, the ORP may never become sufficiently reducing. That is one instance where insufficient short-lived substrate can be a problem, and a sign of this problem is cis-DCE stall. On the other hand, a substrate mix with too much short-lived material maybe expended (or washed out) prior to the subsurface being completely remediated and a sign of this can be cis-stall or large amounts of methane formation.

LET'S TALK ABOUT VEGETABLE OIL HYDROLYSIS

Vegetable oil is an example of a triglyceride. All triglycerides react with water to form glycerin and three long-chain fatty acids. Most oils react with water to produce fatty acids with 18 carbons atoms (thus C18), but other fatty acids such as C14 and C16 can be produced. When emulsified oil is used for bioremediation, it is actually the fatty acids that are the slow-release substrate.

Vegetable Oil + water →slow→ Glycerin + 3 Fatty Acids (typically Oleic)

ABC® is formulated to site-specific conditions and historically has contained 5 to 15% dissolved fatty acids. The fatty acids are typically dissolved into ethyl lactate versus being emulsified. ABC-Olé can contain up to 85% emulsified Oleic Acid (fatty acid). Fatty acid is used rather than oil because the need for the water reaction is eliminated. There are pros and cons associated with using a product that predominantly contains long-chained fatty acids. Redox Tech still feels that there is a balance to be struck between short-lived and long-lived carbon substrates. Our emulsified oil competitors typically add glycerin (or lactate) to their EVO to provide a short-lived component.

PROS AND CONS

ABC-Olé is a mixture of emulsified fatty acid esters, fast-acting organic substrate, and pH buffers, all in one product. In most applications, there is no need to purchase and mix additional amendments.

- Unlike emulsified vegetable oil (EVO), with fatty acid esters there is no waiting for hydrolysis to occur and subsequent conversion to glycerin and fatty acids
- Emulsified fatty acid esters are pH neutral, so less buffering is required to maintain optimal pH conditions
- Unlike fatty acids and EVO, fatty acid esters don't react with pH buffers and bases to form soaps, which can causing foaming in wells and tanks
- Fatty acid esters have lower viscosity and lower surface tension than vegetable oils, allowing better distribution when injected into the subsurface
- No chase water is required
- Emulsified fatty acid esters are comparable in price to EVO

ANAEROBIC BIOCHEM

Anaerobic Biochem (ABC®), is a patented mixture of lactates, fatty acids, and a phosphate buffer that promotes anaerobic biodegradation of halogenated solvents in groundwater.

ABC® BROCHURE
Adobe PDF File
Click here

LATEST NEWS

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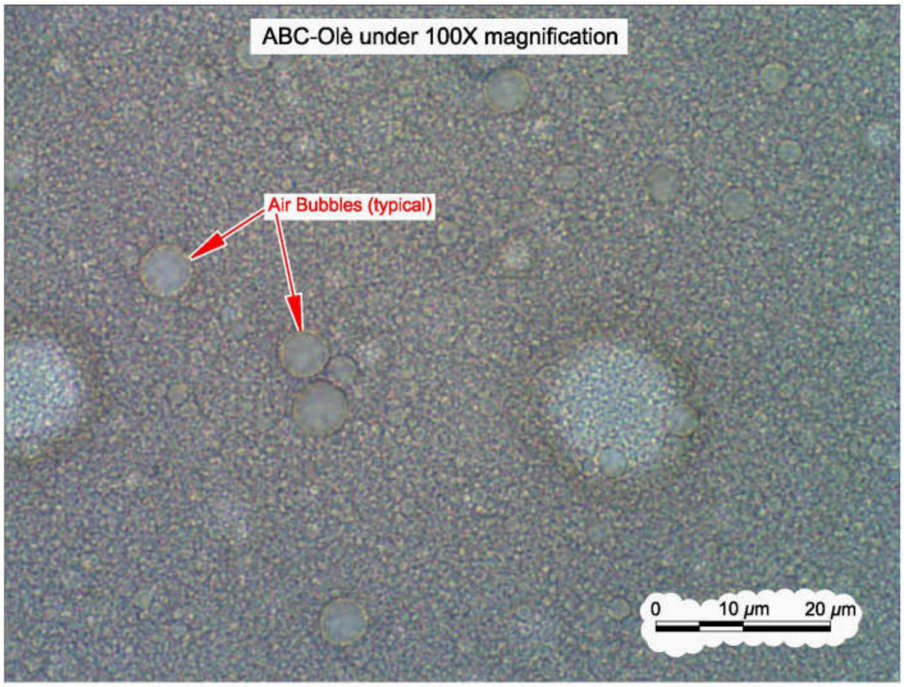

Let Redox Tech help formulate a remedial program for your site today. For more information contact our Main Office.

ADDITIONAL INFO

BROCHURES & PRESENTATIONS	ABC-Olé Announcement
CASE STUDIES	Blackstone, VA Case Study
OTHER DOCUMENTS	ABC versus Emulsified Oils (55.99 kB)

[1]ABC® is protected by US Patent 6,001,252.

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Web Design by Trig Web Design

SAFETY DATA SHEET
Anaerobic BioChem (ABC)
ABC-Ole'

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ABC-Ole`**
GENERAL USE: **Bioremediation of halogenated organics and metals**

MANUFACTURER:

Redox Tech, LLC
200 Quade Drive
Cary, NC 27513
919-678-0140

EMERGENCY TELEPHONE:

Within USA and Canada: 1-800-424-9300
+1 703-527-3887 (collect calls accepted)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Product is generally recognized as safe. May cause irritation exposure to eyes. Long term contact to skin may cause some drying and minor irritation.

3. COMPOSITION INFORMATION ON INGREDIENTS

Proprietary mixture of fatty acids, glycerol, vegetable oil and emulsifying agent.

4. FIRST AID MEASURES

EYES: Immediately flush with water for up to 15 minutes. If irritation persists, seek medical attention.

SKIN: Rinse with water. Irritation is unlikely, but if irritation occurs or persists, seek medical attention.

INGESTION: Generally safe to ingest but not recommended.

INHALATION: No first aid required.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Deluge with water

FIRE/EXPLOSION HAZARDS: Product is combustible only at temperatures above 600C

FIRE FIGHTING PROCEDURES: Use flooding with plenty of water, carbon dioxide or other inert gasses. Wear full protective clothing and self-contained breathing apparatus. Deluging with water is the best method to control combustion of the product.

FLAMMABILITY LIMITS: non-combustible

SENSITIVITY TO IMPACT: non-sensitive

SENSITIVITY TO STATIC DISCHARGE: non-senstive

6. ACCIDENTAL RELEASE MEASURES

Confine and collect spill. Transfer to an approved DOT container and properly dispose. Do not dispose of or rinse material into sewer, stormwater or surface water. Discharge of product to surface water could result in depressed dissolved oxygen levels and subsequent biological impacts.

7. HANDLING AND STORAGE

HANDLING: Protective gloves and safety glasses are recommended.

STORAGE: Keep dry. Use first in, first out storage system. Keep container tightly closed when not in use. Avoid contamination of opened product. Avoid contact with reducing agents.

8. EXPOSURE CONTROLS – PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
ABC	**NA**	**NA**	**NA**

ENGINEERING CONTROLS: None are required

PERSONAL PROTECTIVE EQUIPMENT

EYES and FACE: Safety glasses recommended
RESPIRATOR: none necessary
PROTECTIVE CLOTHING: None necessary
GLOVES: rubber, latex or neoprene recommended but not required

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor:	none to mild pleasant organic odor
Appearance:	milky
Auto-ignition Temperature	Non-combustible
Boiling Point	>600 C

Melting Point	NA
Density	0.90 gram/cc
Solubility	infinite
pH	7-9

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Do not contact with strong oxidizers
STABILITY: product is stable
POLYMERIZATION: will not occur
INCOMPATIBLE MATERIALS: strong oxidizers
HAZARDOUS DECOMPOSITION PRODUCTS:

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
A: General Product Information
Acute exposure may cause mild skin and eye irritation.
B: Component Analysis - LD50/LC50

No information available.

B: Component Analysis - TDLo/LDLo
TDLo (Oral-Man) none

Carcinogenicity
A: General Product Information
No information available.
B: Component Carcinogenicity
Product is not listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Epidemiology
No information available.

Neurotoxicity
No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity
Discharge to water may cause depressed dissolved oxygen and subsequent ecological stresses
Environmental Fate
No potential for food chain concentration

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Material is not considered hazardous, but consult with local, state and federal agencies prior to disposal to ensure all applicable laws are met.

14. TRANSPORT INFORMATION

NOTE: The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subjectto change with changes in package size. Consult shipperrequirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

US DOT Information
Shipping Name: Not Regulated
Hazard Class: Not Classified
UN/NA #: Not Classified
Packing Group:None
Required Label(s):None

50^{th}Edition International Air Transport Association (IATA):
Not hazardous and not regulated

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

Material is not regulated under IMDG

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III

SECTION 311 No Hazard for Immediate health Hazard
SECTION 312 No Threshold Quanitity
SECTION 313 Not listed

CERCLA NOT REGULATED UNDER CERCLA

TSCA NOT REGULATED UNDER TSCA

CANADA (WHIMS): NOT REGULATED

16. OTHER INFORMATION

HMIS:

Health	0
Flammability	0
Physical Hazard	0
Personal Protection	E

E: Safety Glasses, gloves

REDOX TECH, LLC

Providing Innovative In Situ Soil & Groundwater Treatment

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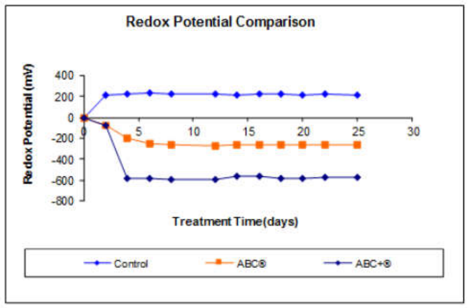
Home Products ABC+ FRIDAY, 12 MAY 2017

ABC+



ANAEROBIC BIOCHEM PLUS (ABC®+)

ABC+ an enhanced version of our industry proven Anaerobic Biochem (ABC®) formula, promoting both anaerobic biodegradation and reductive dechlorination of halogenated solvents in groundwater. This product, Anaerobic Biochem Plus (ABC+), is a mixture of our ABC® formula and Zero Valent Iron (ZVI). Formulated and mixed on a site-by-site basis, up to fifty percent (50%) by weight of ZVI can be added. ZVI has been proven and widely accepted as an effective in situ remediation technology of chlorinated solvents such as TCA, PCE, TCE, and daughter products. The degradation process using ZVI is an abiotic reductive dechlorination process occurring on the surface of the granular iron, with the iron acting as an electron donor.

The addition of ZVI to the ABC® mixture provides a number of advantages for enhanced reductive dechlorination (ERD). The ZVI will provide an immediate reduction. The ABC® will provide short-term and long-term nutrients to anaerobic growth, which also assists to create a reducing environment. ABC® contains soluble lactic acid and a phosphate buffer that provides phosphates, which are a micronutrient for bioremediation, and maintains the pH in a range that is best suited for microbial growth. In addition, the corrosion of iron metal yields ferrous iron and hydrogen, both of which are possible reducing agents. The hydrogen gas produced is also an excellent energy source for a wide variety of anaerobic bacteria.

The ABC® and ZVI are mixed with potable water and emplaced in the subsurface simultaneously. The dilution factor (i.e. water content) can be adjusted to achieve optimal dispersion and distribution based on site-specific parameters such as well spacing, permeability of the formation, and contaminant concentrations. The solution can be emplaced by a variety of techniques, including injection through wells or drill rods (for permeable geologic environments such as sands and fractured rock), hydraulic fracturing (for lower permeable environments such as silt and clay), and through soil blending (for all unconsolidated shallow depth applications less than 20 ft bgs). All of these techniques are part of Redox Tech's service offerings.

Benefits of ABC+ include:

- The presence of ZVI allows for the rapid and complete dechlorination of target compounds. Degradation rates using ZVI are several orders of magnitude greater than under natural conditions. As a consequence, the process does not result in the formation of daughter products other than ethane, ethane, and methane.
- ABC® will last up to 12-24 months in the subsurface environment due to slow releasing compounds, allowing for long-term anaerobic biodegradation
- By creating a reducing environment, ABC+ has the ability to provide long term immobilization of heavy metals (e.g. Ni, Zn, Hg, As)
- Does not require direct contact to act on target constituents.
- Does not divert groundwater flow. ABC is typically mixed at a 15% by weight solution with water. The viscosity of the solution is similar to sugar water and therefore does not measurably influence groundwater flow paths. Due to the relatively low volume of ZVI used, it does not measurably lower the bulk permeability of the formation
- Does not divert groundwater flow. ABC is typically mixed at a 15% by weight solution with water. The viscosity of the solution is similar to sugar water and therefore does not measurably influence groundwater flow paths. Due to the relatively low volume of ZVI used, it does not measurably lower the bulk permeability of the formation
- Patent protection: Redox Tech is licensed under Envirometal Technologies, Inc. (an Adventus Company) who is the current holder of patents pertaining to remediation using ZVI. Therefore, Redox Tech is able to market, sell, and emplace our ABC+ product. There is no patent infringement risk to the client in selecting the ABC+ approach.
- Price advantage. The cost of the ABC+ formula is an extremely competitive approach in relation to other ERD products on the market.

SUB MENU

- ABC®
- **ABC+**
- ABC-OLÉ
- OBC™
- SBC
- NUBUFF
- ZVI
- RTB-1

ANAEROBIC BIOCHEM

Anaerobic Biochem (ABC®), is a patented mixture of lactates, fatty acids, and a phosphate buffer that promotes anaerobic biodegradation of halogenated solvents in groundwater.

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- ABC® and ABC+ Applied at Over 350 Sites
- Anaerobic BioChem (ABC®), The "Green" Substrate

- ABC+ produces a significantly lower redox potential of approximately –600 mV

Let Redox Tech help formulate an enhanced anaerobic program for your site today. For more information contact our Main Office.

ADDITIONAL INFO

BROCHURES & PRESENTATIONS	ABC+ Presentation (713.91 kB) ABC+ Presentation (58.6 kB)
CASE STUDIES	ABC+ TCA Case Study (101.76 kB)
OTHER DOCUMENTS	ABC versus Emulsified Oils (55.99 kB) Site Profile for Cost Estimate (27.11 kB) Florida Remediation Conference (2.23 MB) Lactate (webpage)

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Material Safety Data Sheet

ATOMET

21S/24/25/28/29/30/50/55/59/669/67/[redacted]/70/75/[redacted]/95/95SP/414/SURV95

Section 1. Chemical product and company identification

Common name : **ATOMET 21S, ATOMET 24, ATOMET 25, ATOMET 28, ATOMET 29, ATOMET 30, ATOMET 50, ATOMET 55, ATOMET 59, ATOMET 669, ATOMET 67, ATOMET 68, ATOMET 70, ATOMET 75, ATOMET 86, ATOMET 95, ATOMET 95SP, ATOMET 414, ATOMET SURV95**

Material uses : Powdered metallurgy.

Supplier/Manufacturer :

Quebec Metal Powders Ltd. 1655 Marie-Victorin Sorel-Tracy, Québec Canada, J3R 4R4 Tel : 450-746-5050	QMP Metal Powders (Suzhou) D-008, No. 1 Su Hua road Suzhou Industrial Park Suzhou, China, 215021 Tel: 86-512-67613161	QMP METAL POWDERS GmbH Postfach 100253 D-41002 Mönchengladbac Germany Tel: 49-2161-352-800 Fax: 49-2161-352-8017

In case of emergency : America : +1-450-746-5050
Europe : +49-2161-352-800
Asia: +86-512-67613161

Section 2. Hazards identification

Physical state : Solid. (Powder.)

Emergency overview : No specific hazard.
USE WITH CARE.
Follow good industrial hygiene practice.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

- **Eyes** : May cause eye irritation.
- **Skin** : No known significant effects or critical hazards.
- **Inhalation** : May cause respiratory tract irritation.
- **Ingestion** : No known significant effects or critical hazards.

Potential chronic health effects : Carcinogenic effects: Not classified or listed by IARC, NTP, OSHA, EU and ACGIH.
Mutagenic effects: Not available.
Teratogenic effects: Not available.

Medical conditions aggravated by over-exposure : Repeated exposure of the eyes to a low level of dust can produce eye irritation.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

Ingredient name

North America	UN number	IDLH	H	F	R	Special	CAS number	% by weight
Iron	Not regulated.	-	0	0	1		7439-89-6	> 90

(H, F, R and Special under the heading "Classification")

Europe	Classification	EC number
Iron	Not classified.	231-096-4

See section 16 for the full text of the R-phrases declared above

This material is classified as not hazardous under OSHA regulations in the United States, the WHMIS in Canada, the NOM-018-STPS-2000 in Mexico, Brazil NBR 14725:2001, the European Directives and in any other country in Asia/Pacific, Africa or the Middle-East.

See Sections 8, 11 and 14 for details.

Section 4. First aid measures

Eye contact : Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 20 minutes. Get medical attention if irritation occurs.

Skin contact : Wash with soap and water. Get medical attention if irritation occurs.

Inhalation : Move person to fresh air. Get medical attention if breathing difficulty persists.

Ingestion : Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention if symptoms appear.

Notes to physician : No specific antidote.

Section 5. Fire fighting measures

Flammability of the product : Non-flammable.

Fire-fighting media and instructions : Use a fog nozzle to spray water. SEE SPECIAL REMARKS ON FIRE HAZARDS.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment.

Special remarks on fire hazards : As with any finely granulated product, (i.e flour) a risk of fire is present should the material be dispersed in air and exposed to a source of ignition. Fine powder forms flammable and explosive mixtures in air.

Section 6. Accidental release measures

In case of a major spill

Personal precautions : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8).

Environmental precautions: Avoid dispersal of spilled material, runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : If emergency personnel are unavailable, vacuum or carefully scoop up spilled material and place in an appropriate container for disposal. Avoid creating dusty conditions and prevent wind dispersal.

Section 7. Handling and storage

Handling : Avoid breathing dusts. Avoid prolonged contact with eyes, skin and clothing. Wash thoroughly after handling. Keep container in a ventilated area.

Storage : Keep container closed. Keep container in a ventilated area.

Section 8. Exposure controls, personal protection

Engineering controls : Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fumes or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

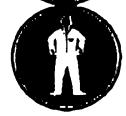
Personal protection

Eyes : Safety eyewear complying with an approved standard should be used and selected based on the task being performed and the risks involved (avoid exposure to liquid splashes, mists, gases or dusts).
Where there is a risk of exposure to high velocity particles safety glasses or face shield complying with an approved standard should be used to protect against impact. Where there is a risks of exposure to dusts, goggles should be used.
Recommended: Safety glasses.

Respiratory : Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Recommended: Leather gloves.

Skin/Body : Personal protective equipment for the body should be selected based on the task being performed and the risks involved.
Recommended: Overall.



Personal protection in case of a large spill : Safety glasses and or goggles and or face shield should be used depending on the task being performed. Leather gloves. Overall. Boots. Wear MSHA/NIOSH approved respiratory apparatus or equivalent if required.

Product name	**Exposure limits**
Iron	**ACGIH TLV (United States).** TWA: 10 mg/m³ 8 hour(s). Form: Inhalable particle.

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Physical state	: Solid. (Powder.)
Color	: Gray.
Melting/freezing point	: 1535°C (2795°F)
Specific gravity	: 7.86
Bulk density	: 2.4 to 3.2 g/cm^3
Dispersibility properties	: Not dispersible in cold water, hot water.
Solubility	: Insoluble in cold water, hot water.

Section 10. Stability and reactivity

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Reactive with oxidizing agents and reducing agents.
Hazardous polymerization	: Will not occur.

Section 11. Toxicological information

Acute Effects

Eyes	: May cause eye irritation.
Skin	: No known significant effects or critical hazards.
Inhalation	: May cause respiratory tract irritation.
Ingestion	: No known significant effects or critical hazards.
Potential chronic health effects	: Carcinogenic effects: Not classified or listed by IARC, NTP, OSHA, EU and ACGIH. Mutagenic effects: Not available. Teratogenic effects: Not available.

Section 12. Ecological information

Products of degradation : Some metallic oxides.

Section 13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material, runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional and local authority requirements.

Consult your local or regional authorities.

Section 14. Transport information

Classification

ADN / ADR / TDG / DOT/ IMDG/ IATA: Not regulated.

Label

Not applicable.

Additional information

Not applicable.

Section 15. Regulatory information

United States

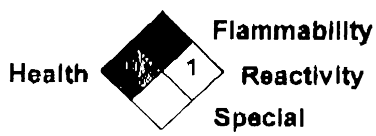
HCS Classification	: Not regulated.
U.S. Federal regulations	: TSCA : All components listed. SARA 302/304/311/312 extremely hazardous substances: No products were found. SARA 302/304 emergency planning and notification: No products were found. SARA 302/304/311/312 hazardous chemicals: No products were found. SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found. Clean Water Act (CWA) 307: No products were found. Clean Water Act (CWA) 311: No products were found. Clean Air Act (CAA) 112 accidental release prevention: No products were found. Clean Air Act (CAA) 112 regulated flammable substances: No products were found. Clean Air Act (CAA) 112 regulated toxic substances: No products were found.
State regulations	: Pennsylvania RTK Sulfur alloyed: (generic environmental hazard) Massachusetts RTK: Sulfur alloyed New Jersey: Sulfur alloyed No products were found.

Canada

WHMIS (Canada)	: Not regulated. DSL : All components listed.

Mexico

Classification :



EU regulations

Product use	: Classification and labeling have been performed according to EU Directives 67/548/EEC and 1999/45/EC (including amendments) and the intended use. - Industrial applications.

International regulations

International lists	: This product is not listed on major international inventories or exempted from being listed in Australia (AICS), Europe (EINECS/ELINCS), Korea (TCCL), Japan (METI/MOL), Philippines (RA6969).

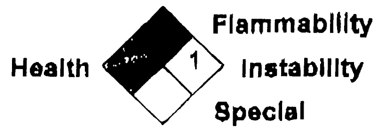
Section 16. Other information

Label requirements : USE WITH CARE.

Hazardous Material Information System (U.S.A.) :

Health	0
Fire hazard	3
Reactivity	1
Personal protection	C

National Fire Protection Association (U.S.A.) :



Full text of R-phrases referred to in sections 2 and 3 - Europe : Not applicable.

Full text of classifications referred to in sections 2 and 3 - Europe : Not applicable.

References : ANSI Z400.1, MSDS Standard, 2004. - Manufacturer's Material Safety Data Sheet. - 29CFR Part1910.1200 OSHA MSDS Requirements. - 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG. - Canada Gazette Part II, Vol. 122, No. 2. Registration SOR/88-64, 31 December 1987. Hazardous Products Act "Ingredient Disclosure List" - Canadian Transport of Dangerous Goods, Regulations and Schedules, Clear Language version 2005. - Official Mexican Standards NOM-018-STPS-2000 and NOM-004-SCT2-1994. Brazil NBR 14725:2001.

Date of issue : 03/30/2006
Date of previous issue : 10/30/2005
Version : 2

<u>Notice to reader</u>

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