2015
FIVE-YEAR REVIEW REPORT

for
Former Fort Devens Army Installation
BRAC Legacy Sites
Devens, Massachusetts

Contract No.: W912WJ-15-C-0002

Prepared for:

Army Base Realignment and Closure Division

U. S. Army Garrison Fort Devens

U.S. Army Corps of Engineers

New England District

Concord, Massachusetts

September 2015

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Prepared by

H&S Environmental, Inc.
160 East Main Street, Suite 2F
Westborough, MA 01581

Robert J. Simeone
BRAC Environmental Coordinator – Devens
Army Base Realignment and Closure Division

Date

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ABBREVIATIONS AND ACRONYMS

AAFES	Army Air Force Exchange Service
ABB-ES	ABB Environmental Services, Inc.
ABC®	Anaerobic BioChem
ACO	Administrative Consent Order
ADAF	Age-dependent adjustment factors
AFCEE	Air Force Center for Engineering and the Environment
AFRC	Air Forces Reserve Center
AMSA	Area Maintenance Support Activity
AOC	area of contamination
ARAR	Applicable or Relevant and Appropriate Requirements
AREE	Areas Requiring Environmental Evaluation
Army	U.S. Army
AAFES	Army Air Force Exchange Service
ATP	Arsenic Treatment Plant
AWQC	Ambient Water Quality Criteria
BCT	BRAC Cleanup Team
bgs	below ground surface
BOH	Board of Health
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAAA	Corrective Action Alternatives Analysis
CAC	Citizen's Advisory Committee
CCC	Criteria Continuous Concentrations
CDR	Covenant Deferral Request
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
CMC	Criteria Maximum Concentrations
CMR	Code of Massachusetts Regulations
COC	contaminants of concern
COD	chemical oxygen demand
Conti	Conti Environmental, Inc.
COPC	contaminants of potential concern
CSA	Comprehensive Site Assessment
CSF	cancer slope factor
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
cy	cubic yards

1,2-DCB	1,2-dichlorobenzene
1,3-DCB	1,3-dichlorobenzene
1,4-DCB	1,4-dichlorobenzene
1,1-DCE	1,1-dichloroethene
DCL	Devens Consolidation Landfill
DDD	dichloro-diphenyl-dichloroethane
DDE	dichloro-diphenyl-dichloroethylene
DDT	dichloro-diphenyl-trichloroethane
DGA	data gap analysis
DO	dissolved oxygen
DoD	Department of Defense
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
EBS	Environmental Baseline Survey
EOD	explosives ordnance discharge
EPH	extractable petroleum hydrocarbons
EPP	Environmental Protection Plan
ERA	Ecological Risk Assessment
ERD	enhanced reductive dechlorination
ESD	Explanation of Significant Differences
ESMA	Excavated Soils Management Area
ºF	degrees Fahrenheit
FFA	Federal Facility Agreement
FFS	focused feasibility study
FORSCOM	United States Army Forces Command
Fort Devens	Former Fort Devens Army Installation
FOSET	Findings of Suitability of Early Transfer
FOST	Findings of Suitability to Transfer
FR	Federal Register
FS	feasibility study
ft	feet
ft/day	feet per day
µg/g	micrograms per gram
GERE	Grant of Environmental Restriction and Easement
gpm	gallons per minute
GW-1	Groundwater Classification 1
GW-3	Groundwater Classification 3
HASP	Health and Safety Plan
Hg	mercury
HGL	HydroGeoLogic, Inc.
HHRA	Human Health Risk Assessment

HI	hazard index
HLA	Harding Lawson Associates
HMX	cyclotetramethylenetetranitramine
H&S	H&S Environmental, Inc.
IC	institutional controls
IDW	investigation-derived waste
IMP	Installation Master Plan
INRMP	Integrated Natural Resources Management Plan
IRA	Intrinsic Bioremediation Assessment
IRIS	Integrated Risk Information System
ISCO	in situ chemical oxidation
IUR	inhalation unit risk
IWS	In Well Stripping
LEL	lower explosive limit
LGP	landfill gas probe
LIFOC	Lease in Furtherance of Conveyance
LTM	long-term monitoring
LTMP	Long-Term Monitoring Plan
LTMMP	Long-Term Monitoring and Maintenance Plan
LUC	land-use control
LUCIP	land use control implementation plan
µg/L	micrograms per liter
MAAF	Moore Army Airfield
MANG	Massachusetts Army National Guard
MassDEP	Massachusetts Department of Environmental Protection
MassDevelopment	Massachusetts Development and Finance Agency
MCL	maximum contaminant level
MCP	Massachusetts Contingency Plan
mg/L	milligrams per liter
MiHPT	Membrane Interface Probe Hydraulic Profiling Tool
MIP	Membrane Interface Probe
MMCL	Massachusetts Maximum Contaminant Level
MNA	monitored natural attenuation
MNAA	Monitored Natural Attenuation Assessment
MOGAS	motor vehicle gasoline
msl	mean sea level
mV	millivolt
NAE	North Atlantic Division, New England District
NCP	National Oil and Hazardous Substances Contingency Plan
NFA	No Further Action
NIA	Northern Impact Area
Nobis	Nobis Engineering, Inc.

NPL	National Priorities List
NWR	National Wildlife Reserve
O&M	operations and maintenance
OMS	Organizational Maintenance Shop
ORP	oxidation-reduction potential
%	percent
PACE	People of Ayer Concerned about the Environment
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
POL	petroleum, oils, and lubricants
POTW	Publicly Owned Treatment Works
PP	Proposed Plan
ppb	parts per billion
ppm	parts per million
ppmv	parts per million by volume
PRE	Preliminary Risk Evaluation
PRG	preliminary remediation goals
PVC	polyvinyl chloride
RAB	Restoration Advisory Board
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objectives
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
RfC	reference concentration
RfD	reference dose
RG	remedial goal
RI	remedial investigation
ROD	Record of Decision
RPMP	Real Property Master Plan
SA	study area
SAP	Sampling Analysis Plan
SARA	Superfund Amendment and Reauthorization Act
SG & LCA	Supplemental Groundwater and Landfill Cap Assessment
SHL	Shepley's Hill Landfill
SI	Site Investigation
SPIA	South Post Impact Area
SPM	South Post Monitoring
SSI	Supplemental Site Investigation
SVE	soil vapor extraction
SVOC	semi-volatile organic compound

SWETS	Stone and Webster Environmental Technology & Services
TAL	target analyte list
TBC	To Be Considered
TCE	trichloroethene
TCL	Target Compound List
TCLP	toxicity characteristic leaching procedure
TDA	Table of Distributions and Allowances
TNT	total organic compound
TPH	total petroleum hydrocarbons
TPHC	total petroleum hydrocarbon compounds
TRC	Technical Review Committee
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Command
USAR	U.S. Army Reserve
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Services
USMCR	U.S. Marine Corps Reserve
UST	underground storage tank
UU/UE	unlimited use/unrestricted exposure
VC	vinyl chloride
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons
WHRP	Wetland and Upland Habitat Restoration and Long-Term Adaptive Monitoring and Maintenance Program
XSD	halogen specific detector

EXECUTIVE SUMMARY

H&S Environmental, Inc. (H&S) has prepared this comprehensive Five-Year Review of the remedial actions for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites at the former Fort Devens Army Installation (Devens). This review, completed in accordance with the U.S. Environmental Protection Agency (USEPA) Comprehensive Five-Year Review Guidance, dated June 2001, was performed from February 2015 through June 2015. This is the fourth comprehensive Five-Year Review performed for the former Fort Devens Army Installation. The previous Five-Year Review was completed in September 2010.

The purpose of Five-Year Reviews is to evaluate the implementation and performance of a remedy to determine if the remedy continues to, or will meet, the remedial action objectives specified in the ROD and are, or will be, protective of human health and the environment. In addition, Five-Year Review reports identify deficiencies, if any, found during the review, and identify recommendations to address them.

This review is required by statute and is being implemented consistent with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Five-Year Reviews should be conducted by statute if both of the following conditions are true:

- Upon completion of the remedial action, hazardous substances, pollutants, or contaminants will remain on site; and
- The Record of Decision (ROD) for the site (or sites for a multiple site Five-Year Review) was signed on or after October 17, 1986 [the effective date of the Superfund Amendment and Reauthorization Act (SARA)] and the remedial action was selected under CERCLA Section 121.

The sites are designated in the Army Administrative Record as Areas of Concerns and for purposed of the report will be referred to as such. EPA in their CERCLIS database refers to the sites as operable units. The following sites are included in this 2015 comprehensive Five-Year Review:

- Shepley's Hill Landfill (SHL) [Area of Concern (AOCs) 4, 5, and 18] - Operable Unit 1;
- Devens Consolidation Landfill (DCL) [AOCs 9, 40, and Study Area (SA) 13] – Operable Unit 2.
- South Post Impact Area (SPIA), [AOCs 25, 26, 27, and 41(groundwater)}- Operable Unit 3;
- Barnum Road Maintenance Yards (AOC 44 and 52) – Operable Unit 4;
- Defense Reutilization and Marketing Office (DRMO) Yard (AOCs 32 and 43A) Operable Unit 5;
- Historic Gas Station (AOCs 43G and 43J) – Operable Unit 6;
- Former Elementary School Spill Site (AOC 69W) – Operable Unit 7;
- Former Moore Army Airfield (AOC 50) – Operable Unit 8; and,
- Building 3713 Fuel Oil Spill Site (AOC 57) – Operable Unit 9.

A brief description of each site where a ROD has been executed along with a summary of findings of the Five-Year Review is provided below.

Shepley's Hill (AOCs 4, 5, and 18): SHL encompasses approximately 84 acres in the northeast corner of the main post of the former Fort Devens, Massachusetts. Landfill operations at SHL began at least as early as 1917, and ceased operation on July 1, 1992. Landfill capping was complete in May 1993. Remedial Investigation (RI) and RI Addendum investigations were performed between 1991 and 1993 and concluded potential human exposure to arsenic in groundwater is the primary risk at the site. A Feasibility Study (FS) was completed in 1995 to evaluate alternatives to reduce potential exposure risks, and in September 1995, the ROD was signed. The selected remedy consists of landfill closure, landfill maintenance, long-term groundwater and landfill gas monitoring, and institutional controls (IC).

The Fort Devens Reuse Plan specifies that Army land bordering Plow Shop Pond is zoned for open space and rail-related uses. The SHL property remains in Army ownership and is under a Lease in Furtherance of Conveyance (LIFOC) Agreement with the LRA, pursuant to BRAC policy requirements. A Finding of Suitability to Transfer (FOST) has not been executed by the Army for this lease premise known as Parcel A.1 (SHL) since the SHL remedy has not been determined to be Operating Properly and Successfully (OPS). The SHL ROD requirement for the ICs to "*protect potential human receptors from risks resulting from exposure to contaminated groundwater*" is implemented and enforced by the Army through the LIFOC agreement. Specifically, Article 16.05 states "*No groundwater will be extracted for any purpose*." The Army long-term monitoring and periodic inspections of the SHL and surrounding Army property ensure that this use restriction is in compliance per the LIFOC agreement.

The Army has performed additional investigations and activities to address recommendations from the previous 2010 five-year review. These included three follow up actions including implementation of Institutional Controls (ICs) in the Northern Impact Area (NIA), installation of a barrier wall for Plow Shop Pond (PSP) discharge and the development of remedial alternative via Focused Feasibility Study (FFS).

In 2010-2011, the *Supplemental Groundwater and Landfill Cap Assessment –Addendum Report (Sovereign, August 2011)* evaluated hydrogeologic conditions and the fate and transport of As from anthropogenic and naturally-occurring sources. The Report concluded that the primary source of arsenic in groundwater appears to be aquifer sands rich in amorphous iron hydroxide solids with other sources of arsenic including landfill waste, peat, and bedrock/till. Arsenic solubility is controlled by desorption from the iron solids and by reductive dissolution of the iron (III) solids created by biodegradation of landfill waste and peat within the landfill and the NIA. The time to return the aquifer to "pre-landfill" conditions was estimated at 270 years. Based on this information, the Army has concluded that the dominant SHL Groundwater Conceptual Site Model is reductive dissolution of naturally occurring Arsenic and that the restoration potential to achieve groundwater MCLs is LOW.

A vertical barrier wall was installed in 2012 along the eastern portion of the landfill to mitigate the arsenic in groundwater from SHL to Red Cove/Plow Shop Pond.

In October 2012, *Explanation of Significant Differences (ESD)* (*Sovereign 2013*) outlined the Land Use Controls (LUC) needed to address the RAO protecting potential off-site residential receptors in the NIA from migrating landfill groundwater. The LUCs included restricting groundwater use in the NIA. A Land Use Control Implementation Plan (LUCIP) was submitted in August 2014 and residences were notified in November to December 2014.

ROD ICs are in place and functioning properly. As documented in the *t Shepley's Hill Landfill 2014 Annual Report (Sovereign/HGL, 2014)* all properties are connected to municipal water, and there were no undocumented private/irrigation wells present (M2S JV, 2015).

The landfill cover is functioning as designed as continued landfill inspections and maintenance indicate the landfill cap is in good condition

The SHL Annual Reports (2011 – 2014) evaluate the contingency pump & treat remedy performance as per *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems* (USEPA, 2008) and have concluded that the system is effectively controlling the migration of arsenic impacted groundwater at the north end of SHL. Despite apparent minor seasonal fluctuations and brief system operational shutdowns, the extraction wells are effective in maintaining a capture zone across the toe of the landfill as designed. However, due to site conditions specified in the CSM, the current SHL remedy (i.e., extraction and treatment of arsenic contaminated groundwater) is unlikely to achieve the groundwater cleanup levels within a reasonable timeframe as set forth in the 1995 SHL ROD.

The current remedy (landfill cap, contingency pump and treat system, barrier wall, and IC's) at SHL is considered protective in the short-term. Long-term protectiveness will be accomplished through continued performance of operation, maintenance, and monitoring activities and the eventual restoration of the groundwater to cleanup goals or background conditions.

Devens Consolidation Landfill (DCL) and Contributor Sites: In addition to the Consolidation Landfill, the DCL includes the seven contributor sites that were small former landfills and debris disposal areas and a former housing area at the former Fort Devens. The seven DCL contributor sites include:

- SA 12: A half-acre location where construction debris and yard waste were deposited (approximately 8,700 cubic yards [cy];
- SA 13: A one-acre area used from 1965 to the mid-1990s for yard-waste (approximately 10,000 cy);
- AOC 9: An area used for storing wood, concrete, asphalt, metal, brick, glass, and tree stumps (approximately 121,000 cy);
- AOC 11: A former landfill used from 1975 to 1980 for disposal of wood-frame hospital demolition debris (approximately 35,000 cy);
- AOC 40: Four acres used for construction debris, ash, stumps, and logs (approximately 125,400 cy);
- AOC 41: A one quarter-acre landfill in the SPIA that was used up to the 1950s for disposal of non-explosive material and household debris (approximately 1,500 cy); and
- Housing areas Grant, Locust, and Cavite: Soils contaminated with volatile organics or pesticides and walling material contaminated with volatiles or pesticides (approximately 2,290 tons of soil and approximately 1,240 tons of concrete).

The USEPA approved the ROD for landfill remediation of the first six areas in July 1999. The selected remedies included provisions for either on-site or off-site disposal options. The approved remedial alternative documented in the 1999 ROD called for limited removal at SA12 and AOC41 and full excavation of AOCs 9, 11, 40 and SA13. The on-site landfill construction alternative was selected as

the preferred alternative. Construction of the DCL commenced in September 2000 and was completed in November 2002. The Remedial Action Closure Report, prepared by Shaw Environmental (formerly Stone & Webster, Inc. [SWETS]) in September 2003, was accepted by EPA and DEP, certifying that the DCL was constructed and capped in accordance with the ROD, and met the performance standards and/or response objectives in the ROD.

Construction activities at the associated contribution sites (AOC 9 AOC 40, and SA 13) are complete and remedial action objectives (RAOs), as defined by the ROD, have been achieved. Long-term protectiveness of the remedial action will be verified by continued operation and maintenance (O&M) and long term groundwater monitoring (LTM) at the DCL. Current O&M and LTM data indicate that the remedy is functioning as required.

Operations and Maintenance (O&M) at the DCL includes monthly inspections of the landfill system, annual leachate sampling, semi-annual groundwater sampling and well gauging. LTM samples are collected and submitted for VPH, EPH, pesticides and metals analyses. DCL leachate effluent samples are collected annually and submitted for analyses per the discharge permit No.17.

The remedy in place at the DCL is functioning as intended and continues to be protective of human health and the environment. Exposure pathways from the contributor sites have been removed.

Under the CERCLA Five Year guidance, the DCL contributor sites meet the ROD remediation goals for unlimited use/unrestricted exposure (UU/UE). As a result a technical assessment is not required. It is recommended the DCL contributor sites AOC 9, 40 and SA13 be removed from the five year review process.

South Post Impact Area (SPIA) (AOCs 25, 26, 27, and 41-groundwater): The SPIA is located within the 4,800-acre area known as the South Post of Fort Devens. The SPIA is a 964-acre area that includes four AOCs: 25, 26, 27, and 41. The Explosive Ordnance Disposal Range, AOC 25, is operating under a Resource Conservation and Recovery Act emergency permit and is used periodically for disposal of waste ordnance. AOC 26 is known as the Zulu Ranges and includes the Zulu 1 (Light Demo) and Zulu 2 (Hand Grenade Familiarization) ranges; AOC 27 is known as the Hotel Range; and AOC 41 includes the Unauthorized Dumping Area Site A. Each range is active and has a unique ordnance use: AOC 25 is used for emergency explosive ordnance disposal (EOD) and unexploded ordnance (UXO) detonation; AOC 26 is used for EOD training (Zulu I) and grenade training (Zulu II); AOC 27 is used for small arms training such as M-16s and other small caliber weapons, smoke grenades, and pyrotechnics; and, AOC 41 was used as a landfill consisting of non-explosive military and household debris. The SPIA is currently used by the Army, the U.S. Army Reserve Command, the National Guard, and local, state, and federal law enforcement agencies.

A ROD for the four AOCs (AOCs 25, 26, 27, and 41), collectively referred to as the SPIA monitored area, was issued in July 1996. The ROD documented the "No Action" remedy for the SPIA monitored area groundwater, surface water, soil, and sediment. The following components were included as part of the selected No Action Remedy: groundwater monitoring for potential contaminant migration out of the SPIA monitored area, groundwater monitoring at the individual AOCs, sampling of Well D-1 (classified as a transient non-community supply well), developing a LTMP and Integrated Natural Resources Management Plan (INRMP), restricting development of new drinking water sources within the SPIA monitored area, and submitting annual reports.

The LTM activities include annual sampling of monitoring wells and a nearby drinking water well (D1).

Samples are submitted for VOCs, explosives and metals analyses. Perchlorate was added as a COC in 2006. An investigation was conducted in 2014 to better define the perchlorate and explosives plumes at AOC26.

The remedy at SPIA currently protects human health and the environment through continued annual LTM sampling.

Barnum Road Maintenance Yards (AOCs 44 and 52): AOCs 44 and 52 comprise the Barnum Road Maintenance Yards at the former Fort Devens and are located in the northeast corner of the former Main Post, near Barnum Gate. The site consists of four former vehicle maintenance yards with a history of vehicle storage and repair. Contamination at the site was primarily attributed to petroleum and oil releases associated with maintenance activity. The ROD describing the selected cleanup remedy was signed in March 1995. Remedial actions consisting of soil excavation, asphalt batching of contaminated soil, repaving, and installation of a stormwater collection system were completed in April 1996. The Remedial Action Completion Report for AOCs 44 and 52 was issued in June 1996 (Weston, 1996). The remedial action at AOCs 44 and 52 is considered complete. The U.S. Army (Army) has no plans to transfer the property.

Construction activities completed in 2010 included construction of the Armed Forces Reserve Center (AFRC) complex which includes a large training building, located at the former vehicle maintenance shop, and a U.S. Army Reserve (USAR) and U.S. Marine Corps Reserve (USMCR) Organizational Maintenance Shop (OMS)/Area Maintenance Support Activities (AMSA) building. The OMS/AMSA building footprint overlays a portion of the former AOC 44 and 52 remediation areas. Construction activities were performed in accordance with an Environmental Protection Plan (EPP) that incorporated the provisions of the 1995 ROD. As-builds are also available verifying compliance with the ROD.

The remedy at AOCs 44 and 52 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. The asphalt batching of contaminated soils conducted in 1995 and 1996 remains effective at immobilizing the petroleum related contaminants and has met the objectives of the remedial action. The cover over the untreated subsurface soils remains in place and recent on-site construction activities have complied with the provisions of the ROD concerning construction activity soil management practices. Previous groundwater monitoring has confirmed that migration of surface soil contaminants to the aquifer following the historic releases at the site, or because of remedial activities, has not occurred.

DRMO Yards (**AOCs 32 and 43A):** AOC 32 was an active materials storage facility from approximately 1964 to 1995. It consisted of three fenced areas where various materials were processed and stored, and contained a former waste oil UST (UST #13). The tank was removed in 1992; and contaminated soils were excavated and disposed off site. Monitored natural attenuation (MNA) was the selected remedy in the 1998 ROD for addressing the groundwater contamination.

AOC 43A, known as the POL (petroleum, oil and lubricants) Storage Area served as the central distribution point for all gasoline stations at Fort Devens during the 1940s and 1950s, and was subsequently used to store fuels for various purposes. The distribution facility consisted of a main gasoline station, a pump house, four 12,000-gallon USTs, one 10,000-gallon UST, two 12,000-gallon above-ground storage tanks (AST), and two 8,000-gallon ASTs. Gasoline was delivered by rail car and transferred to the tanks. The POL Storage Area consisted of a fenced lot within a developed industrial area of buildings, roads, and grass lots. Monitored natural attenuation was chosen as the selected remedy

for groundwater and incorporated into the sites' 1998 ROD.

Remedial actions at AOC 32 included excavation and disposal of contaminated soils and debris. Removal actions were completed in 1998. An MNA assessment was conducted in 2000 and LTM was recommended as an effective remedial action at ACOs 32 and 43A. COCs identified in the 1998 ROD and 2000 MNAA included: VOCs, VPH, EPH and arsenic and manganese.

The excavation and off-site disposal of contaminated soils have been effective at removing any contaminant source soils and has met the objectives of the remedial actions. Analysis of groundwater data to date has indicated that off-site migration is not occurring. While a slight rebound was observed in 32M-01-18XBR during the 2014 LTM event, the current groundwater analytical data for well 32M-01-18XBR indicates significantly diminished COC concentrations as a result of the February 2009 persulfate injection event.

The remedy at AOC 32 and AOC 43A is protective of human health and the environment because ICs are incorporated into the deed that prohibit the use of groundwater from the site, and contaminants are not migrating offsite.

Historic Gas Stations (**AOC 43G and 43J):** AOCs 43G and 43J is located in the central portion of the former Main Post of Fort Devens. AOC 43G consists of the former Army Air Force Exchange Service (AAFES) gas station and historic Gas Station G. The historic gas station was used as a motor pool to support military operations during World War II. Contamination at both sites is attributed to releases from gasoline and waste underground storage tanks (UST). Site Investigations (SI) and Supplemental Site Investigations (SSI) were performed between 1992 and 1994 at both sites. A RI/FS that evaluated potential remedial alternatives was completed in June 1996.

A ROD was then signed in October 1996 documenting intrinsic remediation as the final selected cleanup remedy at both AOCs 43G and 43J. Specific components of the selected remedy for both AOCs included: intrinsic bioremediation assessment, data collection and groundwater modeling, installation of additional monitoring wells, long term monitoring, and annual data reports. Contaminants of concern defined by the ROD included: iron, manganese, nickel, and BTEX. The focus of the remediation was organic compounds (BTEX) associated with petroleum release within the source area. Concentrations of BTEX within the source areas continue to decline and sentry wells meet the cleanup goals for BTEX.

The remedy at AOC 43G and 43J is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

Former Elementary School (AOC 69W): AOC 69W is located at the northeast corner of the intersection of Jackson Road and Antietam Street on the northern portion of what was formerly the Main Post at Fort Devens. AOC 69W is composed of the former Devens Elementary School (Building 215) and its associated parking lot and adjacent lawn extending approximately 300 ft northwest to Willow Brook. Contamination at AOC 69W is attributed to two separate releases of No. 2 heating oil in 1972 and 1978. It is estimated that 7,000 to 8,000 gallons of No. 2 heating oil were released into soil from each release.

In 1999, a Limited Action ROD was signed. The Limited Action consisted of long-term groundwater monitoring and ICs to limit potential exposure to contaminated soils and groundwater under both existing and future site conditions. The COCs were identified as VPH, EPH, arsenic and manganese. Annual LTM groundwater samples are collected. Groundwater concentrations for VPH and EPH are stable or decreasing over time and sentry wells indicate no off site migration.

The remedy in place at AOC 69W is protective of human health and the environment and exposure

pathways that could result in unacceptable risk are being controlled.

Former Moore Army Airfield (AOC 50): AOC 50 is located on the northeastern boundary of the former Moore Army Airfield (MAAF), within the former Fort Devens North Post in Ayer, Massachusetts. AOC 50 is currently defined by three distinct areas: the Source Area (Area 1), Southwest Plume and North Plume. Sources of groundwater contamination within AOC 50 include two World War II fueling systems, a drywell, and the former Drum Storage Area. These sources are collectively referred to as the Source Area. Although these sources have been removed or decommissioned, groundwater underlying AOC 50 contains elevated concentrations of chlorinated volatile organic compounds (CVOC); most notably tetrachloroethene (PCE). The primary area of groundwater contamination at AOC50 is referred to as the Southwest Plume. The Southwest Plume extends from the Source Area approximately 3,000-ft downgradient to the Nashua River and is divided into 5 areas (Area 1 (source area) and Areas 2 through 5) extending south/southwest to the Nashua River.

In March 2004, a ROD was signed to select a remedy with the following components: an enhanced reductive dechlorination (ERD) program, in-well stripping (IWS) system, soil vapor extraction (SVE), long-term groundwater monitoring, ICs, a contingency plan, and five- year reviews. The remedy was implemented in 2004. COCs identified in the 2004 ROD included VOCs, dissolved gases and metals.

The ERD treatment was amended in 2008 to maintain remedy effectiveness and reduce the CVOC concentrations throughout the plume, As reported in the 2014 O&MM Report, the remedy in place at AOC 50 is operating as designed and in accordance with the 23 year timeframe estimated during the remedial design, with the possible exception of the AOC 50 Source Area. A focused source area investigation in 2014 identified deeper impacts in the source area that appear to be untreated by the current remedial alternative. Annual ERD optimization will continue and the injection strategy modified as necessary to achieve the remedial goals within the estimated 10 to 15 year ROD timeframe.

The remedy at AOC 50 currently protects human health and the environment. Exposure pathways that could lead to unacceptable risk are being controlled. Human health is currently not at risk because groundwater at the site is not a potable water source nor is it planned to be used as a potable water source. However, the remedial actions at AOC50 are expected to allow unlimited use and unrestricted exposure following attainment of groundwater remediation goals.

Former Building 3713 Fuel Oil Spill Site (AOC 57): AOC 57 is located between Barnum Road and Cold Spring Brook on the northeast side of what was formerly the Main Post of Fort Devens in the town of Harvard, Massachusetts. AOC 57 is located to the south of a Zone II aquifer protection area and portions of AOC 57 are located within a Non-Potential Drinking Water Source Area and a medium-yield aquifer. The portion of the former Devens site that includes AOC 57 was used primarily as a storage and maintenance area for military vehicles. AOC 57 consists of three sub-areas (Area 1, Area 2, and Area 3) that are located south to southeast of Building 3713 and former Buildings 3756, 3757, and 3758. The sub-areas received storm water runoff and waste from vehicle maintenance at former vehicle storage yards related to Building 3713 and former Buildings 3757 and 3758.

Data obtained and observations made at Area 2 between 2002 and 2003, during the soil excavation activities and subsequent investigations prompted the submittal of an ESD in March 2004. The ESD expanded ROD mandated long-term monitoring (LTM) activities to include extractable petroleum hydrocarbons (EPH) C_{11}- C_{22} aromatics and polychlorinated biphenyls (PCBs) as contaminants of concern (COC) for Area 2 groundwater, include EPH as a COC for Area 2 soil, monitor for the presence of petroleum waste at Area 2, and increase the soil volume and associated cost for Area 2 soil removal

activities.

The 2001 ROD determined that Area 1 required No Further Action (NFA) and selected remedies for Areas 2 and 3 to protect human health and the environment under current and future land use scenarios. Selected remedy components included: soil excavation and treatment, wetland protection and groundwater and surface water long term monitoring. Soil excavation and treatment was completed in 2002-2003. Wetland protection and annual LTM sampling continues. Contaminants of concern included: PCBs, EPH (C11-C22 aromatics), PCE and TCE and arsenic. PBCs are no longer considered COCs as contaminated soil was removed.

The remedies in place at AOC 57 are protective of human health and the environment and exposure pathways that could lead to unacceptable risk are being controlled. .

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Former Fort Devens Army Installation		
EPA ID: MA7210025154		
Region: 1	**State:** MA	**City/County: Devens/Middlesex & Worcester**

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** U.S. Army Base Realignment and Closure (BRAC) Environmental Office, Devens, MAU.S.
Author name (Federal or State Project Manager): Not Applicable
Author affiliation: Not applicable
Review period: - January 2015 – June 2015
Date of site inspection: May 31, 2015
Type of review: Statutory
Review number: 4
Triggering action date (Installation and AEC to confirm DoD's approval date): September 26, 2010
Due date *(five years after triggering action date)*: (Installation and AEC to determine DoD's preferred date) September 26, 2015

Protectiveness Statement(s)		
Shepley's Hill Landfill AOC 4,5, and 18	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*

Protectiveness Statement:

The remedy is considered to be protective of human health and the environment in the short-term. Short-term protectiveness is achieved because:

- There is no current exposure of Site related waste to humans or the environment at levels that would represent a health concern.
- The landfill cover system prevents exposure to the waste material and contaminants within the landfill.
- The public water line has eliminated ground water use within the area impacted by the landfill.
- The remedy protects potential residential receptors from exposure to contaminated groundwater migrating from the landfill through land use controls that prohibit access to groundwater.

Long term protectiveness will be accomplished through continued performance of operation, maintenance and monitoring activities and the eventual restoration of the groundwater. A reduction in the cleanup level for arsenic will be necessary prior to the certification that long-term protectiveness has been achieved.

Devens Consolidated Landfill AOC 9, 40 and SA13	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*

Protectiveness Statements:

The remedy at the Devens Consolidation Landfill (DCL) and its contributor sites AOC 9, 40 and SA13 are protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled. Long-term protectiveness of the remedial action will be verified by groundwater monitoring at the DCL. Current monitoring data indicate that the remedy is functioning as required.

South Post Impact Area AOC 25, 26, 27 and 41	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*

Protectiveness Statements:

The No Action remedy at *AOCs 25, 26, 27, and 41*is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. The Army continues to complete LTM at this active range.

Protectiveness Statement(s)		
Barnum Road Maintenance Yards AOC 44 and 52	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*
Protectiveness Statements: The remedy at Area 44 and 52 is protective of human health and the environment because institutional controls are enforced, and no exposures are currently occurring or imminent.		

DRMO Yards AOC 32 and 43A	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*
Protectiveness Statements: The remedy at AOCs 32 and AOC 43A is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Post construction groundwater flow patterns have been defined and no new potential receptors have been identified. ICs that prohibit access to the site's groundwater for residential or commercial use are in place.		
Former Gas Station AOC 43G and 43J	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*
Protectiveness Statements: The remedy at Area 44 and 52 is protective of human health and the environment because institutional controls are enforced, groundwater is not used as a drinking water source and no exposures are currently occurring or imminent.		
Former Elementary School AOC 69W	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*
Protectiveness Statements: The remedy at AOC 69W is protective of human health and the environment and exposure pathways that could result in unacceptable risk are being controlled. All soil and groundwater contamination remains within the confines of this AOC and ICs are in place that limits exposure to the soil and groundwater at the site.		

Former Moore Army Airfield AOC 50	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*

Protectiveness Statements:
The remedy at AOC 50 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. The remedial actions at AOC 50 are expected to allow unrestricted use and unlimited exposure following achievement of groundwater remedial goals.

Former Building 3713 Fuel Spill AOC 57	*Protectiveness Determination: Protective*	*Addendum Due Date (if applicable):*

Protectiveness Statements:
The remedy at Area 57 is protective of human health and the environment because institutional controls are enforced, and no exposures are currently occurring or imminent.

1 INTRODUCTION

H&S Environmental, Inc. (H&S) has prepared this comprehensive Five-Year Review of the remedial actions for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites at the former Fort Devens Army Installation (Devens). The report has been prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 121 the National Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) § 300.430(f)(4)(ii) and USEPA guidance (USEPA 2001).

Section 121(c) of CERCLA, as amended, and Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require that periodic (at least once every five years) reviews be conducted for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use or unrestricted (UU/UE) exposure following the completion of all remedial actions for the site. As stated in the NCP, statutory five-year reviews are required no less than every five years after the initiation of the remedial action.

1.1 Purpose of the Review

This report documents the methods, findings, and conclusions of the CERCLA five-year review conducted by the U.S. Army Corps of Engineers (USACE)–New England District (NAE), at Fort Devens, Devens, Massachusetts. As stated in the Executive Summary, the purpose of the five-year review is to evaluate the implementation and performance of a remedy to determine if the remedy continues to, or will meet, the remedial action objectives specified in the ROD and is, or will be, protective of human health and the environment. In addition, five-year review reports identify deficiencies, if any, found during the review, and identify recommendations to address them.

The Review sites addressed under this five-year review include:

- Shepley's Hill Landfill (SHL) (AOCs 4, 5, and 18);
- Devens Consolidation Landfill (DCL) (AOCs 9, 40, and SA 13);
- South Post Impact Area (SPIA), (AOCs 25, 26, 27, and 41 – groundwater);
- Barnum Road Maintenance Yards (Area of Contamination [AOC] 44 and 52);
- Former DRMO Yards (AOC 32 and 43A)
- Historic Gas Stations (AOC 43G and 43J);
- AOC 69W;
- Moore Army Airfield (AOC50) and,
- Former Building 3717 Fuel Oil Spill (AOC 57);

1.2 Background

Devens is located approximately 35 miles west of Boston, Massachusetts. Devens consists of approximately 9,280 acres divided into North, Main and South Posts. The South Post is approximately 4,800 acres, and the North and Main Post make up the remaining 4,480 acres. The facility is located in the towns of Devens, Ayer, Shirley, Lancaster and Harvard. Massachusetts. Highway 2 divides the South

Post from the Main Post. The Nashua River trends through the North, Main and South Posts. The area surrounding Devens is largely rural residential property.

In 1991, the U.S. Army (Army) and the USEPA signed a Federal Facility Agreement (FFA) under Section 120 of CERCLA for environmental investigations and remedial actions at Devens. The agreement required that Site Investigations (SI) be undertaken at each Study Area (SA) to verify whether a release or potential release of contaminants existed and to determine whether further investigations or response actions would be required.

In 1981, Devens applied for a Resource Conservation and Recovery Act (RCRA) Part B Permit for its hazardous waste storage facility. The submission included a list of Solid Waste Management Units that showed potential for the release of hazardous substances to the environment. Under the FFA between the Army and the USEPA, these potential areas of contamination are referred to as SAs. A SA includes field activities with site characterization. These may include physical and chemical monitoring; however, an AOC is defined as an area where releases of hazardous substances may have occurred or a location where there has been a release or threat of release of a hazardous substance, pollutant, or contaminant.

Argonne National Laboratory's Environmental Assessment and Information Sciences Division completed an environmental assessment in November 1988, as part of the environmental restoration of Devens. The objective of the assessment was to characterize on-site contamination and provide recommendations for potential response actions.

In December 1989 Devens was placed on the NPL.

The results of this assessment are reported in the Master Environmental Plan for Fort Devens, Massachusetts (Biang et al., 1992). This plan summarizes preliminary assessment activities and provides a historical summary of the installation, discusses the geologic and hydrologic setting, discusses the nature and extent of contamination, and proposes response actions.

In 1991, Devens was identified for closure by July 1997 under Public Law 101-510, the Defense Base Realignment and Closure (BRAC) Act of 1990. This resulted in accelerated schedules for the environmental investigations at Devens. Since 1991, the U.S. Army Environmental Center (USAEC) and the USACE have tasked Army contractors to perform SIs, Remedial Investigations (RI), Feasibility Studies (FS) and other CERCLA related activities for the sites addressed in this report. To a significant extent, this Five-Year Review draws on information collected during the previous activities performed by Army contractors. Previous reports were used during the preparation of this Five- Year Review, and are referenced in **Appendix A**.

1.3 Community Participation

In February 1992, the Army released a Community Relations Plan that outlined a program to address community concerns and keep citizens informed about, and involved in, remedial activities at Devens. As part of this plan, the Army established a Technical Review Committee (TRC) in early 1992. The TRC, as required by SARA Section 211 and Army Regulation 200-1, included representatives from USEPA, USAEC, Fort Devens, Massachusetts Department of Environmental Protection (MassDEP), local officials, and the community. Until January 1994, when it was replaced by the Restoration Advisory Board (RAB), the TRC generally met quarterly to review and provide technical comments on schedules, work plans, work products, and proposed activities for the SAs and AOCs at Devens. The RI, FS, Explanation of Significant Differences (ESD) and Proposed Plan (PP)

reports, and other related support documents have been submitted to the RAB for their review and comment.

The Army, as part of its commitment to involve the affected communities, forms a RAB when an installation closure involves transfer of property to community. The Devens RAB was formed in February 1994 to add members of the Citizen's Advisory Committee (CAC) to the TRC. The CAC had been established previously to address Massachusetts Environmental Policy Act/Environmental Assessment issues concerning the reuse of property at Devens. The RAB consists of representatives from the Army, USEPA Region I, MassDEP, local governments and citizens of local communities.

The Army has held regular and frequent informal meetings, performed presentations, issued fact sheets and press releases, and held public meetings to keep the community and other interested parties informed of activities at Devens. Currently, the RAB meets quarterly, or more if needed. The RAB members provide advice to the installation and regulatory agency on Devens cleanup programs. Specific responsibilities include:

- Addressing cleanup issues such as land use and cleanup goals;
- Reviewing plans and documents;
- Identifying proposed requirements and priorities; and
- Conducting regular meetings that are open to the public.

At the January 15, 2015, RAB meeting, the USACE announced the commencement of this Five-Year Review.

A newspaper display advertisement announcing that USACE was conducting the Five-Year Review and welcoming public participation was published in two local newspapers and one regional paper in March 2015. Another advertisement will announce the availability of the final report and where to obtain the report, including its placement at the local information repository, Ayer Public Library.

Copies of the applicable community participation information are included in **Appendix B** of this Five-Year Review Report.

1.4 Next Review

This is the fourth comprehensive Five-Year Review that has been performed for AOCs at the Former Fort Devens; however, this is the third Five-Year Review for AOC 50 and AOC 57, and the fifth Five-Year Review for SHL. The next review will be performed within five years of the completion of this Five-Year Review Report.

2 SHEPLEY'S HILL LANDFILL (AOCs 4, 5, and 18)

2.1 Introduction

This is the fifth five-year review for Shepley's Hill Landfill (SHL) the last being completed in 2010. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. Shepley's Hill Landfill consists of four areas of contamination (AOCs 4, 5 and 18); all of which are addressed in this five-year review. The Army will continue, as recommended in the 2010 Five-Year Review, to evaluate the potential for off-site migration, impact to sensitive receptors, trend analysis, and remedial duration as part of the 2014 LTMMP for SHL.

2.2 Site Chronology

Table 2.1
Chronology of Events, Shepley's Hill Landfill

Event	Date
The Army initiates the Fort Devens Sanitary Landfill Closure Plan	1984
Fort Devens placed on NPL	December 1989
Waste disposal at Shepley's Hill Landfill (SHL) ends	July 1992
Landfill (LF) capping complete	May 1993
Remedial Investigation (RI) and Supplemental RI complete	December 1993
Feasibility Study (FS) complete	February 1995
Record of Decision (ROD) complete	September 1995
Long-Term Monitoring and Maintenance (LTMM) Plan complete	May 1996
Long-Term Monitoring begins	November 1996
Final SHL Capping Closure Report	March 1996
ROD Contingency Remedy 60% extraction design complete	November 1997
First SHL Five-Year Review (FYR) Report	August 1998
Second Five-Year Statutory Review Report	September 2000*
Supplemental Groundwater (GW) Investigations complete	May 2003
Draft Explanation of Significant Differences (ESD)	February 2004
Draft Final 60% and Draft 100% Extraction Design complete	September 2004
Performance Work Statement for Comprehensive Site Assessment (CSA) and Corrective Action Alternatives Analysis (CAAA)	March 2005
Contingency Remedy – Remedial Design/Remedial Action Work Plan 100% submittal for SHL GW Extraction, Treatment, and Discharge	May 2005
Final ESD for implementation of the Contingency Remedy	June 2005
SHL Contingency Remedy construction complete and start-up and testing of GW Extraction, Treatment, and Discharge System	August 2005
Third FYR Report	September 2005
SHL Contingency Remedy Long-Term Operations, Maintenance, and Monitoring commences	March 2006

Event	Date
Final Scope of Work for SHL Supplemental GW & LF Cap Assessment for LTMM (formerly CSA) to address Third FYR findings	May 2007
SHL Contingency Remedy – GW extraction pumping rate increased from 25 gallons per minute (gpm) to 45-50 gpm	June 2007
Draft Final SHL Supplemental GW & LF Cap Assessment for LTMM Report (SAR) completed	June 2009
SAR Addendum follow up Report	August 2010
Fourth FYR for SHL	September 2010
Complete construction for SHL barrier wall	September 2012
Final Removal Action Completion Report for SHL barrier wall	July 2013
Final ESD – Land Use Controls to restrict groundwater use in NIA	December 2013
Final Land Use Control Implementation Plan (LUCIP) for implementing Land Use Controls in NIA	August 2014
LUCIP-directed Door-to-door Survey of residences in NIA	November 2014
Draft Final LTMMP Update	April 2015

* In 2000, FYRs were required for all sites on Devens with remedial decisions regardless of the time since the previous FYR to consolidate all future reviews into the same year.

2.3 Background

Shepley's Hill Landfill (SHL) comprises three AOCs of the more than 70 study areas and AOCs that have been identified at the former Fort Devens Military Reservation since the mid-1990s. The 1995 Record of Decision (ROD) for SHL addresses three AOCs: AOC 4, the former sanitary landfill incinerator; AOC 5 – sanitary landfill No. 1; and AOC 18 – the asbestos cell. AOCs 5 and 18 are located within the capped area of SHL and all three AOCs are collectively referred to as SHL.

Landfill operations at Shepley's Hill began at least as early as 1917 and ceased as of July 1, 1992. Evidence from test pits within the landfill suggests earlier usage, possibly as early as the mid-nineteenth century. The principal waste types in SHL include incinerator ash, household refuse, glass, construction debris, asbestos-containing materials, and spent shell casings. Army documentation indicates that no hazardous wastes were disposed of in SHL after November 19, 1980. Assuming an average waste thickness of 10 feet and a maximum waste depth of 30 feet, the volume of waste in the SHL is estimated to be approximately 1,300,000 cubic yards (*USEPA, 1995*). More recent reports suggest that more than 1,500,000 cubic yards of waste are present at SHL with about 11%, or 160,000 cubic yards situated below the water table *(Sovereign, 2011).*

2.3.1 Physical Characteristics

SHL encompasses approximately 84 acres of the 9,600-acre Fort Devens Military Reservation and is situated in the northeast corner of the Main Post, **Appendix C Figure 2.1**. As shown on the Ayer Quadrangle surficial geology map from the early 1940s, the SHL area was elongated in a north-south orientation along a pre-existing small valley containing at least two mapped swampy areas lying between

the bedrock outcrop of Shepley's Hill to the west and a kame terrace (i.e. flat-topped glaciofluvial deposit) with an elevation of approximately 250 feet above sea level (a.s.l.) to the east, next to Plow Shop Pond (*HLA, 2000*). During landfilling activities, the valley was filled in and much of the kame terrace may have been used as cover material (*HLA, 2000*).

According to the Final Soil Arsenic Background Study at Former Fort Devens – Devens, Massachusetts (*US Army, 2005*), the geologic setting of the Devens area include Paleozoic metasedimentary, metavolcanic, and granitic intrusive rocks that are believed to contain sulfidic minerals of manganese, nickel, and arsenic. In the vicinity of the Devens site, coarse glacial sediments that have experienced little reworking are expected to contain background arsenic concentrations of approximately 17.5 mg/kg (*US Army, 2005*).

2.3.2 Land and Resource Use

SHL is situated between the bedrock outcropping of Shepley's Hill to the west and Plow Shop Pond to the east. To the north of SHL are a low-lying wooded wetlands and the Devens Reservation boundary. Nonacoicus Brook, which drains Plow Shop Pond, also flows through this wooded wetland area and represents an important site feature. The southern portion of SHL borders the Defense Reutilization and Marketing Office (DRMO) yard, motor repair shops, and a warehouse.

Contaminant History Landfill operations at SHL began as early as 1917 although field evidence suggests that glass shards obtained from trenches in the northwest portion of the landfill may have dated back to the mid-1800s (*ABB-ES, 1995*). The principal waste streams included incinerator ash, household garbage, glass, construction debris, asbestos-containing wastes, and spent shell casings. During the last few years of operation, approximately 6,500 tons per year of household refuse and garbage were disposed of in SHL.

2.3.3 History of Contamination

Following the BRAC-related closure of Fort Devens in 1990, the Army began investigations at SHL to determine the nature and extent of contamination in impacted environmental media. Three AOCs were identified including AOC4 – the sanitary refuse incinerator, AOC5 – sanitary landfill No. 1, and AOC18 – the asbestos cell. All three AOCs are collectively referred to as SHL. A brief description of the salient contents and key timeframes associated with these AOCs is summarized as follows (*ABB-ES, 1995*):

- AOC4: the former sanitary refuse incinerator was located in former Building 38 near the end of Cook Street and within the 50-acre is closed in Phase I of the landfill capping sequence. The former incinerator was constructed in 1941, burned household refuse, and reportedly operated until the late 1940s. Incinerator ash was disposed of in the landfill and, in September 1967, the incinerator itself was demolished and buried in the landfill. The foundation for the former incinerator building was demolished and disposed of in the landfill in 1976.
- AOC 5, typically referred to as "Sanitary Landfill No. 1" was closed in five phases between 1987 and 1992-93 in accordance with Massachusetts Regulations 310 CMR 19.000. The MassDEP approved the closure plan in 1985. Details regarding landfill closure and related requirements are provided in Section 2.3.4..
- AOC18: refers to the asbestos cell and is situated in the section of SHL closed during Phase IV of the landfill capping sequence. Between March 1982 and November 1985, an estimated 6.6 tons of asbestos-containing construction debris was disposed of in the area of SHL closed during

Phase IV-A. Between 1990 and July 1992, a second asbestos waste cell was operated in the section of SHL closed during Phase IV-B.

2.3.4 Initial Response

To mitigate the potential for off-site impacts attributable to SHL, the Army initiated the Fort Devens Sanitary Landfill Closure Plan in 1984 in accordance with Massachusetts regulations entitled "The Disposal of Solids Wastes by Sanitary Landfill" (310 CMR 19.00; April 21, 1971). The Massachusetts Department of Environmental Protection (MassDEP) approved the closure plan in 1985 which contained the following requirements:

- Grading the landfill surface to a minimum 2 percent slope in non-operational areas of the landfill and 3 percent in operational areas;
- Removing waste from selected areas within 100 feet of the 100-year floodplain;
- Installing a gas venting system;
- Installing a low permeability cap and covering the cap with sand, gravel, loam, and seeding to provide cover vegetation and prevent erosion; and
- Implementing a groundwater monitoring program based on sampling five existing monitoring wells every four months.

Capping activities were completed in phases over the timeframe of 1986 to 1993 as shown in Figure 2.2, Appendix C of the revised Shepley's Hill Landfill Supplemental Groundwater Investigation Report (*Harding ESE, 2003*) and as Figure 1-2 in the 2005 FYR, and summarized as follows (*ABB-ES, 1995*):

- Phase I: October 1986 – 50 acres;
- Phase II: November 1987 – 15 acres;
- Phase III: March 1989 – 9.2 acres; and
- Phase IV: 10 acres closed in two stages, IV-A in 1991 and IV-B in July 1992 although the geomembrane cap was not completed over stage IV-B until May 1993.

On July 21, 1995, the Army submitted a draft closure plan to MADEP pursuant to 310 CMR 19.000 to document that SHL was closed in accordance with plans and applicable regulatory requirements. Following a review by MADEP and implementation of specific recommendations regarding issues of concern, the Army submitted the final closure report for SHL pursuant to 310 CMR 19.000 in March 1996 and the Long Term Monitoring and Maintenance Plan in May 1996. Key elements of the implemented closure and associated infrastructure included the following (*ABB-ES, 1995*):

- Phases I through III of the closure were completed with 2-3 percent grades, because of the large area and shallow surface slopes of the existing landfill, but the slope was increased to 5 percent in the Phase IV-B closure;
- The capping system for Phases I through IV-A included a 30-mil polyvinyl chloride (PVC) geomembrane liner overlain by a 12-inch drainage layer and a 6-inch topsoil layer;
- The capping system for Phase IV-B, at the request of MassDEP, featured a thicker 40-mil PVC geomembrane liner overlain by a 6-inch drainage layer and a 12-inch topsoil layer;

- The landfill gas (LFG) collection system utilized for all closure Phases included 3-inch diameter gas collection pipes bedded in a minimum 6-inch thick venting layer installed beneath the PVC geomembrane;
- Gas vents were installed through the PVC geomembrane and were located at 400 foot centers; and
- By 1986, groundwater monitoring infrastructure at SHL included a total of nine wells, including five wells requested by USEPA and MassDEP to supplement the original four.

Following listing on the NPL and cessation of landfilling activities, the Army conducted a Remedial Investigation (RI) at SHL (*E&E, 1993*) and a then Supplemental RI (*ABB-ES, 1993*). These investigations determined that the primary environmental risk at SHL included human exposure to arsenic-containing groundwater and potential ecological risks to aquatic and semi-aquatic receptors exposed to surface water and sediments from Plow Shop Pond. A Feasibility Study (FS) was conducted in 1995 to evaluate potential remedies to reduce potential human exposure risks to arsenic-containing groundwater at SHL. In September 1995, the ROD for SHL operable unit was finalized by the Army, USEPA, and MassDEP. Also in 1995, the Plow Shop Pond operable unit, designated as AOC-72 by the Army, was established to manage risks associated with exposure to arsenic-impacted sediments and surface waters at Plow Shop Pond.

Based on types of contaminants, environmental media of concern, and potential exposure pathways, the following RAOs were documented in the ROD to mitigate existing and future potential threats to public health and the environment:

- Protect potential residential receptors from exposure to contaminated groundwater migrating from the landfill having chemicals in excess of MCLs; and
- Prevent contaminated groundwater from contributing to the contamination of Plow Shop Pond sediments in excess of human-health and ecological risk-based concentrations.

The ROD did not identify remedial objectives for surface soil, landfill gas, or leachate because the risk assessments did not identify potential risks from exposure to surface soil and ambient air. Landfill leachate was not identified during the RI or supplemental RI activities.

The Plow Shop Pond OU was established to evaluate additional actions that may be necessary to manage potential risks from exposure to Plow Shop Pond surface water and sediment. The Army performed surface water and sediment characterization as well as sediment toxicity characterization in Plow Shop Pond and Grove Pond from 1992-95. Results of these studies were reported in Appendix J of Final Remedial Investigation Addendum Report (*ABB-ES, 1993*) and in the Draft Plow Shop Pond and Grove Pond Sediment Evaluation (*ABB-ES, 1995c*).

To address groundwater contamination at SHL, Alternative SHL-2 (Limited Action) was selected, as the preferred alternative as part of the ROD, with Alternative SHL-9 (Groundwater Extraction and Discharge to the Ayer POTW) as the contingency remedy if Alternative SHL-2 proved not to be protective. Each component contained provisions for the containment of landfill waste and management of contaminant migration. Groundwater cleanup levels were developed using appropriate USEPA guidance at the time the ROD was signed and are listed in Table 2.2.

The ROD indicated that the residual human health risk from residential exposure for groundwater, after attainment of cleanup levels with an arsenic cleanup goal of 50 µg/L, is estimated to be approximately 1E-03, or, if modified to account for the uncertainty associated with exposure to arsenic, 1E-04. This uncertainty relates to toxicological data that suggest the dose response curve for skin cancer may be sub-linear and, consequently, the CSF used to generate risk estimates may be overestimated.

Table 2.2
Contaminants of Concern Cleanup Levels, Shepley's Hill Landfill

Chemical of Concern1	Cleanup Level (µg/L)	Selection Basis
Arsenic2	50	MCL
Chromium	100	MCL
1,2-Dichlorobenzene	600	MCL
1,4-Dichlorobenzene	5	MassDEP MCL
1,2-Dichloroethane	5	MCL
Lead	15	Action Level
Manganese	1,715	Background
Nickel	100	MCL
Sodium	20,000	Health Advisory
Aluminum3	6,870	Background
Iron3	9,100	Background

Notes:
1. The LTM Program (Stone and Webster Technology and Services, 1996) established arsenic, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and 1,2-dichloroethane as trigger chemicals because of the carcinogenic risk associated with each of these compounds.
2. Based on the MCL at the time of the ROD. EPA lowered the MCL to 10 mg/L in 2006.

3. The background concentrations for aluminum and iron were based on the 68th percentile of upper-bound limits calculated for Ft. Devens (ABB-ES, 1993).

2.3.5 Basis for Taking Action

Between 1991 and 1993, the Army performed a RI and supplemental RI at SHL. The RI and RI Addendum reports identified potential human exposure to arsenic in groundwater as the primary risk at SHL. The RI Addendum Report also identified potential ecological risks to aquatic and semi- quatic receptors from exposure to Plow Shop Pond surface water and sediments.

2.4 Remedial Actions

2.4.1 Selected Remedy

Alternative SHL-2 contained components to maintain and potentially improve the effectiveness of the existing landfill cover system and to satisfy the Landfill Post-Closure Requirements of 310 CMR 19.142, and to reduce potential future exposure to contaminated groundwater. Key components of this alternative included:

- Landfill closure in accordance with applicable requirements of 310 CMR 19.000;
- Survey of SHL;
- Evaluation/improvement of storm water diversion and drainage;
- Landfill cover maintenance;
- Landfill gas collection system maintenance;
- Groundwater LTM;
- Landfill gas LTM;
- ICs;
- Educational programs;
- 60% design of an ATP;
- Annual reporting to MassDEP and USEPA; and
- Five-Year Site Reviews.

2.4.2 Remedy Implementation

This section outlines key remedy components designed and implemented at SHL, with the focus on design, remedial actions, sampling, and institutional controls implemented since 2010.

2.4.2.1 Design and Remedial Actions

The status of the key components of alternative remedy SHL-2 is addressed in this sub-section as follows:

2.4.2.2 Landfill Closure in Accordance with Applicable Requirements of 310 CMR 19.000

Status: The Army submitted a draft closure report for SHL to MassDEP in July 1995, and the MassDEP issued a Landfill Capping Compliance Letter approving the closure as of February 8, 1996 with review comments and specific recommendations to address issues of concern.

Following review of the MassDEP comments, the Army submitted the final closure report in March 1996 pursuant to 310 CMR 19.000 (*SWET, 1996b*) and the LTM and Maintenance Plan in May 1996 (*SWET, 1996c*).

SHL was closed in five phases between 1987 and 1993 in accordance with MassDEP regulations 310 CMR 19.000. Closure components included a 30-mil and 40-mil polyvinyl chloride (PVC) geosynthetic membrane cap covered with and vegetation and an integrated landfill gas venting system. Ancillary

closure-related components included a series of monitoring wells and drainage swales to control surface water run-off.

2.4.2.3 Survey of SHL

Status: The landfill surface was surveyed as part of post-closure activities (*SWET, 1996a*) and was resurveyed in 2002 to monitor subsidence.

Between June 17, 2013 and June 21, 2013, a land survey of the area was completed by a certified land surveyor. The survey included horizontal and vertical coordinates for the ground, rim, and casing of all monitoring wells, stream gauges, and piezometers at SHL and in the NIA to address vertical discrepancies noted from previous uncertified survey data. In addition, the horizontal and vertical coordinates were surveyed for the ground surface at the location of the soil borings which were performed in spring 2013. During surveying, all coordinates were cross-checked with existing survey data to ensure accuracy. The survey was conducted on the Massachusetts State Plane Coordinate System and vertically on North American Vertical Datum (NAVD) 1988 datum. The results of the survey are documented in the Shepley's Hill Landfill 2013 Annual Report (*Sovereign, June 2014).*

A supplemental survey was conducted in early 2014 to capture monitoring wells installed since the previous certified survey, to fill in identified data gaps, and to integrate the EPA piezometers into the same datum for comparison of hydraulic data. Although this data was used to construct Figures 5-3 and 5-4 and Table 5-4 in the Shepley's Hill Landfill 2013 Annual Report (*Sovereign, June 2014*), results of the survey event in early 2014 is presented in the 2014 Annual Report (*Sovereign, 2015*).

2.4.2.4 Evaluation/Improvement of Stormwater Diversion and Drainage

Status: As part of LTM activities, the Army has performed routine maintenance on stormwater ditches at the landfill. Significant portions of drainage ditch have been re-graded and seeded or lined with rip-rap stone to reduce erosion. Periodic maintenance of the drainage swales have been performed as part of cap maintenance activities.

Yearly inspections of the drainage swales are typically performed during mowing activities and have resulted in the removal of large vegetative growth. Small vegetation and wetland plants are not disturbed as they have been found to mitigate erosion in the swales.

2.4.3 System Operations/Operation and Maintenance (O&M)

2.4.3.1 Landfill Cover Maintenance

Status: There has been no evidence of poor conditions affecting the cover surface. No new depressions have been observed and vegetative growth has been monitored and removed when necessary to preserve the cover system.

During barrier wall construction activities a portion of the eastern edge of the landfill was disturbed. After barrier wall construction activities concluded, the disturbed eastern portions of the landfill were re-graded and seeded to prevent erosion on the eastern slope.

2.4.3.2 Landfill Gas Collection System Maintenance

Status: The above ground portion of the landfill-gas collection system is inspected annually as part of landfill monitoring activities. The landfill gas vents have been observed to be in good condition. All

pipes are functioning and screens are present on vents to prevent any wildlife or debris from entering the vents. Additionally, all landfill gas points have been observed to be in good condition.

2.4.3.3 Long-Term Landfill Gas Monitoring

Status: Quarterly gas sampling was conducted through the first two quarters of 2010 with annual sampling commencing in October of that year. The Draft 2014 Annual Report (Sovereign, 2015), includes 18 passive gas vents and 25 perimeter soil gas probes in these annual sampling events.

In general, gas vents in the northern section of the landfill did not exhibit elevated levels for any of the parameters measured, but gas vents in the southern section of the landfill exhibited relatively high levels methane, CO2, and LEL associated with low barometric pressure. These transient events persist only as long as the low atmospheric pressure conditions and return to low/ND levels when atmospheric pressure is normal (>29.86 inches Hg). Landfill gas vent results were consistent with or lower than historical levels in all areas of the landfill.

Landfill perimeter monitoring results show similar trends, with elevated levels of methane/LEL observed in the southern end of the landfill during periods of low barometric pressure with no elevated levels during periods of normal barometric pressure. Elevated levels were not observed at the LGPs in the northern portion of the landfill.

2.4.3.4 Long-Term Groundwater Monitoring

Status The ROD required development of a long-term groundwater monitoring plan at SHL to evaluate remedy performance and assess future environmental effects. The revised LTMMP (Sovereign, 2015), includes evaluations of remedy performance. The ROD called for semiannual groundwater monitoring for a minimum of 30 years.

The groundwater monitoring program includes a total of 46 monitoring wells. Hydraulic monitoring is conducted at all 46 monitoring wells. Water quality sampling (including analysis for arsenic) is conducted at 46 monitoring wells in the fall (October) and 9 of those 46 wells are sampled in the spring (April), and every five years 7 additional wells are included in the sampling program. The analytical parameters are appropriately limited to field parameters, selected inorganic parameters, and seven metals (including arsenic, iron, and manganese).

2.4.3.5 Institutional Controls

The ROD required implementation of ICs in the form of zoning and deed restrictions for any property released by the Army at SHL during Fort Devens base closure activities. The Fort Devens Reuse Plan specifies that Army land bordering Plow Shop Pond is zoned for open space and rail-related uses. By pre-empting residential use, these controls helped limit human exposure. In addition, in 1996 the Army placed lease and deed restrictions on surrounding landfill area property to the south and east (parcels A.1SHL, A.1, A.1b, A.1c, A.3, A.3a and A.24) to prohibit installation of drinking water wells. This, in combination with landfill capping and long term groundwater monitoring, protects potential human receptors from risks resulting from exposure to contaminated groundwater. The ROD indicated that there were no current human receptors for groundwater exposure and that ICs would be drafted, implemented, and enforced in cooperation with state and local governments as necessary.

Additionally, the second ESD for SHL (*Explanation of Significant Differences, Shepley's Hill Landfill Superfund Site, Former Devens Army Installation, Land Use Controls to Restrict Groundwater Use;*

Sovereign, December 2013) documents a modification to the ROD that incorporates additional land use control (LUC) language as an enforceable component of the ROD that will further protect potential receptors in the area located north of the landfill (i.e., the groundwater impacted off-site that includes properties in Ayer along West Main Street, north of the landfill, or the "north impacted area" or NIA).

LUCs for the NIA were not incorporated in the ROD because the extent of the impact was not defined at the time. Post-ROD investigations have established that the SHL has impacted groundwater within the NIA as documented in the Supplemental Groundwater Investigation Report *(Harding ESE, 2003*); the Supplemental Groundwater & Landfill Cap Assessment for Long-Term Monitoring & Maintenance (*AMEC, 2009*); and the Supplemental Groundwater & Landfill Cap Assessment for Long-Term Monitoring & Maintenance Addendum Report (*Sovereign, 2011*).

The LUCs implemented pursuant to this ESD address the RAO to protect potential residential receptors from exposure to contaminated groundwater migrating from the landfill in excess of MCLs, until remedial goals have been met, as stipulated in the ROD. In addition, the LUCs will also protect any commercial receptors from exposure to contaminated groundwater.

The performance objectives of the LUCs shall be to:

- Restrict access to groundwater so the potential exposure pathway to the contaminants would remain incomplete.
- Prohibit the withdrawal and/or future use of water from the aquifer within the identified groundwater LUC boundary (except for monitoring).
- Maintain the integrity of any current or future monitoring system.

To meet these objectives, the Army has established the Area of Land Use Controls where the use of groundwater will be restricted. This area is based on the defined limits of groundwater contamination as documented by the site investigations referenced above. The LUC boundary limits were then set approximately 400 feet from the horizontal limits of groundwater contamination in order to conservatively establish the restricted area.

Status: ROD ICs are in place and functioning properly. As documented in the Shepley's Hill Landfill 2014 Annual Report, on 2 December 2014, Sovereign conducted a door-to-door survey in the NIA to ensure that residents were informed about the restrictions on groundwater use north of SHL, all properties were connected to municipal water, and there were no undocumented private/irrigation wells were present (*M2S JV, 2015*). No private/irrigation wells were identified in the survey which will be repeated every five years or sooner, if required by changes to the LUCIP.

2.4.3.6 Educational Programs

Status: Numerous public meetings and presentations were held during the reporting period (2010-2014) for this FYR to enhance public knowledge and awareness. The Devens Restoration Advisory Board meetings, which are held on a quarterly basis, have served as the primary educational outreach forum for information regarding SHL, arsenic-impacted groundwater, and the remedies to be exchanged.

2.4.3.7 60 Percent Design of a Groundwater Extraction System

Status: The 60% complete engineering design was completed in November1997. Post-ROD groundwater monitoring results indicated that the selected remedy, Alternative SHL-2, would not meet risk-based

arsenic performance standards. Therefore, the Army issued an ESD, Groundwater Extraction, Treatment, and Discharge Contingency Remedy for SHL (*CH2MHill, 2005*), and implemented the contingency remedy, Alternative SHL-9. The ATP was designed to extract groundwater and provide pretreatment of inorganics, primarily arsenic, prior to discharge to the POTW. In August 2005, the construction, start-up, and testing for the SHL contingency remedy including the groundwater extraction, treatment, and discharge system was completed.

To address elevated contaminant concentrations in SHL groundwater, the Army installed a groundwater treatment and extraction system in 2006. This contingency remedy was focused on treating arsenic-impacted groundwater emanating from the northern portion of SHL. By the completion of the Third Five-Year Review for SHL (*HGL, September 2010*), the arsenic treatment plant (ATP) was operating at 49 gpm which was equivalent to full design capacity. Principal ATP operational systems include:

- Extraction system – two extraction wells;
- Chlorine dioxide (ClO2) generation and addition;
- Coagulation system via a contact tank with direct-drive batch mixer;
- Microfiltration system;
- Solids removal via inclined plate clarifier (IPC);
- Bag filtration and discharge of IPC decant water;
- Polymer-aided flocculation of sludge using a filter bed roll-off (FBRO); and
- Discharge to Devens publically-owned treatment works (POTW).

A non-time-critical removal action involving the installation of a vertical hydraulic barrier wall along the eastern portion of SHL was conducted in 2012. Principal project goals were to:

- Mitigate the arsenic-in-groundwater flux from SHL to Red Cove/Plow Shop Pond to reduce potential risk to environmental receptors consistent with local conditions in Plow Shop Pond; and
- Comply with applicable ARARs as applicable to Red Cove as summarized in Appendix A of the RAWP (*Sovereign, 2012a*).

As detailed in Removal Action Completion Report – Shepley's Hill Landfill Barrier Wall (*Sovereign, 2013*), the vertical barrier wall was designed to intercept and divert groundwater flowing in overburden soils away from Red Cove. Groundwater modeling was conducted to aid in the design and determination of the key barrier characteristics (e.g. location, length, and depth). As designed, the barrier wall was 850-feet long extending through overburden soils to the top of bedrock with an effective hydraulic conductivity of 1E-07 cm/sec. The soil-bentonite slurry wall was constructed using a slurry trench method between 15 August and 13 September 2012 (*Sovereign, 2013*). The low permeability backfill consisted of excavated overburden soils supplemented with approximately 50% imported plastic silt/clay fines and about 1.5% bentonite (*Sovereign, 2013*). Barrier wall capping was accomplished from 20 September through 26 September 2012 and consisted of 2 feet of low permeability backfill set on top of a secured geotextile membrane situated on top of the soil-bentonite wall (*Sovereign, 2013*). Because barrier wall installation disrupted a portion of the landfill liner system, a geomembrane patch was installed atop the soil-bentonite wall in October 2012 (*Sovereign, 2013*). Finally, ten overburden piezometers were installed along the barrier wall in October 2012 to facilitate hydraulic performance

assessment (*Sovereign, 2012*).

2.4.4 Annual Reporting to MassDEP and USEPA

Status: Annual Reports have been submitted to MassDEP and USEPA each year of this five-year review period (i.e., 2011 through 2014).

2.5 Five-Year Reviews

The ROD requires the Army to perform five-year reviews to assess whether the implemented remedy is protective of human health and the environment and whether the implementation of additional remedial action is appropriate. This is the fifth review to be completed and will be issued in September 2015.

Status: Five-Year Review Reports were submitted in 1998, 2000, 2005 and 2010. This report is the Five-Year Review Report for 2015.

2.5.1 Groundwater Sampling

Groundwater monitoring at SHL was conducted in accordance with the Revised LTMMP (*CH2M Hill, 2007*) and amended in December 2009 (*ECC, 2009*) over the timeframe from 2010-2013. An update to the LTMMP was submitted as the Draft Final Long Term Monitoring and Maintenance Plan Update (*Sovereign, 2015*). While the Army will continue to work with EPA to resolve any remaining issues related to the draft final LTMMP (*Sovereign, 2015*); the plan as it relates to groundwater monitoring wells, sampling frequency and analysis is currently being implemented.

Major changes and/or highlights associated with groundwater sampling at SHL are provided as follows:

2010

- Discontinuation of quarterly snapshots of field parameters;
- Field parameters continue to be collected during annual and semi-annual events;
- SHL-21, SHL-23, SHL-10, and SHM-93-10C were sampled biennially; and
- A reduction in sampling frequency to biennially was proposed for eight wells (i.e. N5-P1, N5-P2, SHP-99-29X, SHL-13, SHL-15, SHP-01-36X, and SHP-01-37X) based on meeting three criteria: (1) not located downgradient of SHL, (2) exhibit a comparatively stable arsenic concentration history (+/- 50 µg/L for four years or more of monitoring results), and (3) are providing little value insofar as delimiting the As-impacted area (*ECC, 2011*).

2011

- A reduction in sampling frequency to biennially was proposed for two wells (i.e. SHL-13 and SHL-15) based on meeting three criteria: (1) not located downgradient of SHL, (2) exhibit a comparatively stable arsenic concentration history (+/- 50 µg/L for four years or more of monitoring results), and (3) are providing little value insofar as delimiting the As-impacted area (ECC, 2012).

2012

- In additional to the semi-annual LTMMP event, an additional groundwater sampling event was conducted in October 2012 to further delineate arsenic and other metal impacts within the NIA.

2013

- In additional to the semi-annual LTMMP event, an additional groundwater sampling event was conducted in November 2013 at the request of the Army to further delineate arsenic and other metal impacts within the NIA.
- An update to the LTM network was proposed in the draft Long Term Monitoring and Maintenance Plan Update (Sovereign, 2013) in October 2013. This would entail LTM semi-annually at 12 wells, annually at 38 wells, and every 5 years at 11 wells; and

  A supplemental groundwater investigation was conducted in the spring of 2013 at the request of USEPA and MassDEP to refine the understanding of the extent of both dissolved arsenic and chemically-reduced conditions (i.e. prevalence and extent of negative ORP values) in the NIA. A total of 13 boring/profiling locations (e.g. SHM-13-01 through SHM-13-13) were completed in the vicinity of West Main Street and Nonacoicus Brook to delineate impacted groundwater. SHM-13-04 was situated within the core of the arsenic-impacted groundwater in the NIA at a location intermediate between existing wells on Scully Road and West Main Street.

2014

- In 2014, the spring and fall monitoring events were conducted in accordance with the LTMMP submitted in 2007 and as amended in 2009; however, both events incorporated additional monitoring locations. In April 2014, 23 monitoring wells were sampled and in October 2014, 61 monitoring wells were sampled. The 2014 sampling program incorporated the wells included in the draft Final LTMMP (*Sovereign, 2015*)The Army will continue to work with EPA to resolve any remaining issues related to the draft final LTMMP; however, the plan as it relates to groundwater monitoring wells, sampling frequency and analysis is currently being implemented.
- The draft proposed LTMMP stipulated groundwater sampling semi-annually at 9 wells, annually at 46 wells, and every 5 years at 7 wells; and
- At the request of USEPA and MassDEP, a supplemental investigation was conducted in January and February 2014 to ascertain the extent of dissolved arsenic and reducing ORP conditions in the northern wetland area of the NIA.

2.5.2 Institutional Controls

Significant events and developments pertaining to institutional controls (IC) during the 2010-2014 timeframe are briefly summarized below:

- A draft Explanation of Significant Differences (ESD) was submitted to BCT for review and comment in October 2012. The purpose of this ESD is to outline the LUC needed to address the RAO to protect residential receptors from exposure to contaminated groundwater migrating from the landfill having constituents of concern at concentrations exceeding MCLs, as stipulated in the ROD.
- LUCs were established in the NIA in 2013 and were documented in the December 2013 Explanation of Significant Differences (ESD) for Land Use Controls to Restrict Groundwater Use (Sovereign, 2013).
- A Land Use Control Implementation Plan (LUCIP) was submitted in August 2014 describing the

procedures for implementing LUCs in the NIA (Sovereign, 2014).

- As part of the LUCIP, in November 2014, educational pamphlets were mailed to owners and residents within the NIA to inform them about the restriction to use groundwater north of SHL in the Town of Ayer. A subsequent door-to-door survey was conducted in December 2014 to confirm that all properties were connected to municipal water supplies and to ensure that no undocumented private/irrigation wells were present. During the door-to-door canvassing, no private/irrigation wells were identified.

System Operations/Operation and Maintenance (O&M) Major highlights regarding system operation and maintenance over the 2010-2014 timeframe are as follows:

2010

- The landfill cap was mowed to an average height of 6 inches in the fall and trees were removed within the drainage swales and near monitoring well SHL-4.
- The landfill cover system, drainage system, gas vent system, access road, monitoring wells, and piezometers all appeared to be in good working order during the annual inspection.
- Three landfill gas (LFG) monitoring events were conducted in 2010 and elevated levels of methane and lower explosive limit (LEL) were observed in 11 LGPs situated on the southern end of the landfill during low barometric pressure conditions as has been observed in previous years.
- LFG vent results were consistent with historical trends indicating proper venting operations.
- The ATP was on-line approximately 85% of the time in 2010. A significant portion of the downtime was attributable to unscheduled system maintenance and upgrades including: air compressor, chlorine dioxide generator, microfilter, and extraction well rehabilitation. During routine operations, the single largest contributor to downtime was the frequent need for FBRO pump-outs and clean-in-place maintenance for the microfiltration system.
- With the exception of reduced extraction well yield between August-September, the on-line extraction rate was consistently 49 gpm.
- The ATP remains effective at treating arsenic in extracted groundwater to concentrations below the Special Condition permit limit of 75 µg/L. The average influent concentration was 3,150 µg/L and the average effluent value was 19.17 µg/L. Through 31 December 2010, the ATP had removed approximately 2,139 lbs of arsenic from the treated groundwater.
- In general, arsenic concentrations in LTMMP wells remained relatively stable or decreasing, relative to historic levels.

2011

- The landfill cap was not mowed in 2011 due to wet conditions persisting through the fall. Several small trees were removed within the drainage swales and near monitoring well SHL-4.
- The landfill cover system, drainage system, gas vent system, access road, monitoring wells, and piezometers all appeared to be in good working order during the annual inspection.
- Three landfill gas (LFG) monitoring events were conducted in 2011 and elevated levels of methane and lower explosive limit (LEL) were observed in 8 LGPs situated on the southern end

of the landfill during low barometric pressure conditions as has been observed in previous years.

- LFG vent results were consistent with historical trends indicating proper venting operations.
- The ATP was on-line approximately 84% of the time in 2011. A significant portion of the downtime was attributable to unscheduled system maintenance and upgrades including: air compressor, T-1 tank replacement, and FRBO roll-off repairs. During routine operations, the single largest contributor to downtime was the frequent need for FBRO pump-outs and clean-in-place maintenance for the microfiltration system.
- With the exception of reduced extraction well yield between August-September, the on-line extraction rate was consistently 49 gpm.
- The ATP remains effective at treating arsenic in extracted groundwater to concentrations below the Special Condition permit limit of 75 µg/L. The average influent concentration was 3,110 µg/L and the average effluent value was 16.9 µg/L. Through 31 December 2011, the ATP had removed approximately 2,696 lbs of arsenic from the treated groundwater.
- In general, arsenic concentrations in LTMMP wells remained relatively stable or decreasing, relative to historic levels.

2012

- The landfill cap was mowed in 2012. Shrubs and small trees were removed within the drainage swale north of the landfill near the ATP building and from the southern drainage swale. The eastern drainage swale was disturbed during the construction of the barrier wall and needed repairs were effectuated.
- The landfill cover system, drainage system, gas vent system, access road, monitoring wells, and piezometers all appeared to be in good working order during the annual inspection. Liner repairs and other repairs were implemented in October 2012 over a 2.2 acre section of the landfill resulting from disturbances associated with the barrier wall construction.
- Annual landfill gas (LFG) monitoring was conducted in October 2012 and elevated levels of methane and lower explosive limit (LEL) were observed in 2 LGPs situated on the southern end of the landfill during low barometric pressure conditions as has been observed in previous years.
- LFG vent results were consistent with historical trends indicating proper venting operations.
- The ATP was on-line approximately 83% of the time in 2012. A significant portion of the downtime was attributable to unscheduled system maintenance and upgrades including: chlorine dioxide generator repairs, IPC repairs, bag filter addition, rotameter replacement, extraction well redevelopment, and microfiltration system tank replacement. During routine operations, the single largest contributor to downtime was the frequent need for FBRO pump-outs and clean-in-place maintenance for the microfiltration system.
- The ATP remains effective at treating arsenic in extracted groundwater to concentrations below the Special Condition permit limit of 75 µg/L. Influent concentrations ranged from 2,640 to 2,970 µg/L. With the exception of two sampling events on 13 April 2012 and 14 May 2012 with reported concentrations of 269.3 and 90.5 µg/L, respectively, effluent arsenic concentrations ranged from 8.7 to 32.9 µg/L. Results of subsequent re-sampling in April and May indicated

arsenic concentrations were below the special condition limitation and consistent with historic results. Between 1 January and 31 December 2012, the ATP treated and discharged approximately 20.4 million gallons of arsenic-contaminated groundwater.

- In general, arsenic concentrations in LTMMP wells remained relatively stable or decreasing, relative to historic levels.

2013

- The landfill cap was mowed in 2013. Shrubs and small trees were removed from the landfill margins, within the drainage swale north of the landfill near the ATP building and from the southern drainage swale.
- The landfill cover system, drainage system, gas vent system, access road, monitoring wells, and piezometers all appeared to be in good working order during the annual inspection.
- Annual landfill gas (LFG) monitoring was conducted in October 2013 and elevated levels of methane and lower explosive limit (LEL) were observed in 3 LGPs situated on the southern end of the landfill during low barometric pressure conditions as has been observed in previous years.
- LFG vent results were consistent with historical trends indicating proper venting operations.
- The ATP was on-line approximately 85% of the time in 2013. A significant portion of the downtime was attributable to unscheduled system maintenance and upgrades including: chlorine dioxide system solenoid valve replacement, effluent pump motor starter and overload replacement, microfiltration air header replacement, chlorine gas regulator replacement, level transducer controller re-set, air compressor repairs, influent line cleaning and re-piping, and microfiltration V-3 actuator replacement. During routine operations, the single largest contributor to downtime was the frequent need for FBRO pump-outs and clean-in-place maintenance for the microfiltration system.
- The ATP remains effective at treating arsenic in extracted groundwater to concentrations below the Special Condition permit limit of 75 µg/L. Influent concentrations ranged from 2,680 to 3,070 µg/L while effluent values ranged from 13.9 to 20.7 µg/L. Between 01 January and 31 December 2013, the ATP treated and discharged approximately 22.1 million gallons of arsenic-contaminated groundwater.
- In general, arsenic concentrations in LTMMP wells remained relatively stable or decreasing, relative to historic levels.

2014

- The landfill cap was mowed in 2014. Shrubs and small trees were removed from the landfill margins, within the drainage swale north of the landfill near the ATP building and from the southern drainage swale. Vegetation was also removed from the vicinity of the barrier wall installation.

- The landfill cover system, drainage system, gas vent system, access road, monitoring wells (with the exception of SHP-99-34A), and piezometers all appeared to be in good working order during the annual inspection. Well SHP-99-34A was removed from the LTMMP and a recommendation to properly abandon the well was made upon finalization of the updated LTMMP (*Sovereign, 2015*).
- Annual landfill gas (LFG) monitoring was conducted in October 2014 and elevated levels of methane and lower explosive limit (LEL) were observed in 10 LGPs situated on the southern end of the landfill during low barometric pressure conditions as has been observed in previous years.
- LFG vent results were consistent with historical trends indicating proper venting operations.
- The ATP was on-line approximately 88% of the time in 2014. A significant portion of the downtime was attributable to unscheduled system maintenance and upgrades including: microfiltration solenoid valve I/O card replacement, sodium chlorite rotameter repair, sludge transfer valve replacement, chlorine gas cylinder manifold upgrade, air compressor replacement, fire sprinkler re-pipe, influent line cleaning, flow controller installation, pressure transducer installation, and microfilter module upgrades. During routine operations, the single largest contributor to downtime was the frequent need for FBRO pump-outs and clean-in-place maintenance for the microfiltration system.
- The ATP remains effective at treating arsenic in extracted groundwater to concentrations below the Special Condition permit limit of 75 µg/L for each monthly sampling event. Influent concentrations ranged from 2,520-2,630 µg/L With the exception of one sampling event on 06 November 2014 with a reported concentration of 742 µg/L, effluent arsenic concentrations ranged from 5.2 to 68.0 µg/L. Results of subsequent re-sampling indicated arsenic concentrations were below the special condition limitation and consistent with historic results. Between 1 January and 31 December 2014, the ATP treated and discharged approximately 23.2 million gallons of arsenic-contaminated groundwater. In general, arsenic concentrations in LTMMP wells remained relatively stable or decreasing, relative to historic levels.

- With respect to the hydraulic capture zone analysis, the lines of evidence evaluated as per *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems* (USEPA, 2008) indicate the ATP effectively controls the migration of impacted groundwater at the north end of SHL. Despite apparent minor seasonal fluctuations and brief system operational shutdowns, the extraction wells are effective in maintaining a capture zone across the toe of the landfill as designed. However, due to site conditions specified in the CSM, the current SHL remedy (i.e., extraction and treatment of arsenic contaminated groundwater) is unlikely to achieve the groundwater cleanup levels within a reasonable timeframe as set forth in the 1995 SHL ROD.

2.6 Progress since Last Five Year Review

This section of the 2015 FYR for SHL contains sub-sections focusing on:

- The Protectiveness Statement, Recommendations, and Actions from the 2010 FYR and opportunities for remedy optimization since the 2010 FYR;
- Status of the Recommendations from the 2010 FYR; and
- A description of the effectiveness of the implemented remedial measures.

2.6.1 Protectiveness Statement, Recommendations, and Actions from 2010 Five Year Review

The protectiveness statement in the fourth FYR (*HGL, 2010*):

Table 2.3

Protectiveness Determinations Statement from the 2010 FYR

SHL	Protectiveness Determination	Protectiveness Statement
Site wide	Protective	"*The SHL remedy is considered protective in the short-term, because there is no evidence of current exposure. However, in order for the remedy to remain protective in the long-term, an updated SHL remedy must incorporate ICs that restrict the installation of private drinking water wells throughout the "Impacted Area" and effectively meet RAOs developed under the SHL FFS to address both groundwater restoration within the "Impacted Area" and groundwater discharging to Plow Shop Pond.*"

Table 2.4

Actions Taken Since the Last Five-Year Review

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Arsenic-impacted groundwater in the NIA poses an unacceptable human health risk if used for potable purposes, and potentially represents an unacceptable risk if used for irrigation purposes.	Through a ROD ESD or amendment, ICs prohibiting groundwater use in the NIA should be implemented.	Army	4/30/11	ESD to establish Land Use Controls that specified both ICs and affirmative measures that were subsequently implemented.	December 2013 ESD

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The remedy may not achieve cleanup goals for the arsenic-impacted groundwater in the NIA.	Develop a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that specifically addresses current site conditions	Army	1/31/11	The Supplemental Groundwater and Landfill Cap Assessment –Addendum Report *(Sovereign, 2011*) evaluated hydrogeologic conditions and fate and transport of As from anthropogenic and naturally-occurring sources. The Report concluded that the dominant SHL Groundwater Conceptual Site Model was reductive dissolution of naturally occurring Arsenic and that the restoration potential to achieve groundwater MCLs was LOW. A draft final Focused Feasibility Study was completed in 2011*(Sovereign, 2011*) to evaluate other remedial alternatives. The *Focused Feasibility Study (Sovereign, September 2011)* was submitted and recommended installation of a slurry containment between SHL and Red Cover in Plow Shop Pond, shutting down the Arsenic Treatment Plant (ATP) in favor of long term monitoring, and use of a Technical Impracticability (TI) waiver on achieving Maximum Contaminant Levels (MCLs) at SHL as well as restoration of beneficial use in the NIA. The FFS was subsequently withdrawn as the recommendations were disputed by EPA (*November 2011, Informal Dispute Resolution letter, EPA*), (*Army FFS Withdrawal letter, November 2011*). The EPA disputed the FFS conclusions that a Technical Impracticability (TI) waiver may be appropriate under the existing site conditions and the FFS demonstrated remedial	2010 through 2011

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
				alternative may not satisfy CERCLA, NCP and EPA guidance. EPA also disputed the conclusions that "the primary source of arsenic in groundwater is naturally occurring solid phase *arsenic in the aquifer sand that is mobilized by groundwater under reducing conditions….created by both landfill waste and peat.* Instead, EPA's conceptual model for the site points to arsenic from incinerator ash that was disposed of in the landfill as the source of the highest levels of arsenic. Finally, EPA disputed the conclusions that the ATP was operating as designed and was capturing the majority of the arsenic plume. EPA commented that additional groundwater monitoring and ATP operation at design capacity be conducted before the Army makes any conclusions on remedy effectiveness. EPA noted that the ATP "has reduced the magnitude and extent of the arsenic in the NIA" (*Informal Dispute Resolution letter, EPA, pg. 12).*	

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Contaminated groundwater is discharging into the Red Cove area of Plow Shop Pond.	Develop a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that addresses the groundwater discharge to Plow Shop Pond.	Army	1/31/11	Slurry containment wall keyed into bedrock to divert groundwater flow northward and limit discharge to Red Cove in Plow Shop Pond.	August/ September 2012

2.6.2 Status of and Effectiveness of Measures

The 2013 ESD ICs and affirmative measures are in place and will prevent the use of and exposure to Arsenic contaminated groundwater in the NIA. The Army has established the Area of Land Use Controls where the use of groundwater is restricted. This area is based on the defined limits of groundwater contamination; the LUC boundary limits were then set approximately 400 feet from the horizontal limits of groundwater contamination in order to conservatively establish the restricted area.

The NIA area continues to demonstrate elevated concentrations of arsenic in groundwater downgradient of the ATP extraction wells. Supplemental NIA investigations completed in the spring of 2013 refined the understanding of arsenic extent and chemically-reducing conditions in the NIA. Additional investigation conducted in the NIA in late 2013 and early 2014 assessed the potential for localized discharge of dissolved arsenic to Nonacoicus Brook. The results of the investigation indicated decreasing arsenic concentrations in groundwater profile and monitoring wells approaching the Nonacoicus Brook. Along with the existing data, the findings indicate the presence of a zone of arsenic attenuation adjacent to the brook that limits discharge of appreciable concentrations from discharging to the Brook. The Army is continuing efforts to revise the hydrogeologic groundwater flow model for SHL and to further evaluate site data to determine the impact of naturally-occurring arsenic on observed arsenic concentrations in groundwater underlying the NIA.

Since installation of the Barrier Wall adjacent to Red Cove, data indicates the wall is operating as designed. This is based on piezometer gauging data demonstrating a lower groundwater elevation east of the wall, monitoring well groundwater elevations showing groundwater flow is being diverted to the north, and increasing arsenic concentrations in well SHL-20 west of the barrier.

Overall, the SHL Remedy with the recently installed barrier wall when coupled with the landfill cap and recently instituted ICs as described in the December 2013 ESD achieves the RAOs of the ROD.

2.7 Five Year Review Process

2.7.1 Administrative Components of the Five-Year Review Process

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led by Carol Keating of the U.S. EPA, Remedial Project Manager for the Site and Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

2.7.2 Community Notification and Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479

2.7.3 Document Review

This five-year review for SHL consisted of a review of relevant documents including previous Five-year reviews, LTM plans, RI reports, FS reports, ESDs, annual reports and monitoring data.

2.7.4 Data Review

Data reviewed for this FYR included data presented in the 2010 through 2014 Annual Reports, which are listed in **Appendix A**.

The following data summaries are provided in **Appendix C**:

- A summary of groundwater quality results from 2010 through 2014;
- Arsenic concentration trend plots for selected monitoring wells; and
- Landfill gas monitoring data and site inspection documentation.

Highlights and major trends associated with groundwater data at SHL over the reporting period (e.g. 2010-2014) is as follows:

2010

- Arsenic was detected above 10 µg/L in 26 of 37 monitoring wells and in general, arsenic concentrations were relatively stable compared to historic levels;
- Three monitoring wells contained arsenic at concentrations higher than their historic maximum detections: SHM-05-41A at 66.7 µg/L, SHM-05-41C at 896 µg/L, and SHP-99-29X at 3,156 µg/L;
- The majority of samples with arsenic above 10 µg /L also had negative ORP values. Elevated iron concentrations tended to correlate with the samples containing high arsenic and negative ORP values; and

2011

- As was the case in 2010, arsenic was detected above 10 µg /L in 26 of 37 monitoring wells but in general, arsenic concentrations were relatively stable compared to historic levels;
- Two monitoring wells contained arsenic at concentrations higher than their historic maximum detections: SHM-05-41C at 917 µg /L, an increase over the previous historic high in 2010 and SHL-19 at 62.9 µg /L. The arsenic concentration in well SHP-99-29X was a historic low of 1,457 µg /L;
- The majority of samples with arsenic above 10 µg /L also had negative ORP values and elevated iron concentrations;

2012

- As was the case in 2010 and 2011, arsenic was detected above 10 µg /L in 26 of 37 monitoring wells but in general, arsenic concentrations were relatively stable compared to historic levels;
- The majority of samples with arsenic above 10 µg /L also had negative ORP values and elevated iron concentrations;

2013

- Results from the May 2013 sampling event showed that arsenic was detected above 10 µg/L in 34 of 55 monitoring wells and piezometers which included both LTMMP and additional wells with the maximum concentration, 5,540 µg/L detected in SHM-10-14. In general, arsenic concentrations were relatively stable compared to historic levels;
- Results from the October 2013 sampling event showed that arsenic was detected above 10 µg/L in 25 of 29 monitoring wells and piezometers with the maximum concentration, 5,740 µg/L detected in SHM-10-15. In general, arsenic concentrations were relatively stable compared to historic levels;
- The majority of samples with arsenic above 10 µg/L also had negative ORP values and elevated iron concentrations; and
- Maximum dissolved arsenic concentrations ranged from ND to 3,510 µg/L, in SHM-13-04, as noted in the 2013 Annual Report (Sovereign, 2014). SHM-13-04 was situated within the core of the arsenic-impacted groundwater in the NIA at a location intermediate between existing wells on Scully Road and West Main Street. However, very importantly, dissolved arsenic drops from 3,510 µg/L at SHM-13-04 to 357 µg/L at SHM-13-03 as it approaches Nonacoicus Brook, suggesting that arsenic is not discharging into the brook.

2014

- Results from the April 2014 sampling event showed that arsenic was detected above 10 µg/L in 16 of 23 monitoring wells and piezometers which included both LTMMP and additional wells with the maximum concentration, 2,850 µg/L detected in SHM-13-06. In general, arsenic concentrations were relatively stable compared to historic levels;
- Results from the October 2014 sampling event showed that arsenic was detected above 10 µg/L in 41 of 61 monitoring wells and piezometers with the maximum concentration, 5,870 µg/L detected in SHM-10-15.
- The majority of samples with arsenic above 10 µg/L also had negative ORP values and elevated iron concentrations; and
- At the request of USEPA and MassDEP, a supplemental investigation was conducted in January and February 2014 to ascertain the extent of dissolved arsenic and reducing ORP conditions in the northern wetland area of the NIA. Two borings were installed (SHM-13-14S/D and SHM-13-15) with minimum and maximum concentrations observed of ND and 48.9 µg/L, respectively at SHM-13-14S/D (Sovereign, 2015).

2.7.4.1 ATP Effluent

Based on review of the 2010 through 2014 monthly, quarterly, and annual effluent monitoring data, sampled parameters have been observed at concentrations below respective discharge limits except for arsenic in April 2012 and November 2014. As described in Section 3.4, follow up sampling in the same months indicated concentrations were below the special condition limit of 75 µg/L and consistent with

historical results. Arsenic effluent concentrations fluctuate around 20 µg/L from 2010 to 2014 except for the three samples with higher arsenic concentrations in April and May, 2012 and November 2014. Other parameters have remained consistently low or non-detect, consistent with historical results.

2.7.4.2 ATP Operation

The ATP system operated approximately 85% of available hours during the reporting period with downtime related primarily to routine maintenance. The 2010 through 2014 Annual Reports document the non-routine shutdown periods during this time. The average online flow rate for the system during this period was approximately 48.5 gpm. Several upgrades to the ATP were implemented in in 2014. These upgrades were primarily related to increasing the average effective flow rate of the system. Upgrades and changes included two additional modules to the skid (filtration from 8 to 10 units) and upsized the effluent pump, storage tanks and other related components to increase maximum flow rate. ATP operation in conjunction with ICs and LUCs are designed to protect potential downgradient receptors from ingesting contaminated groundwater by mitigating downgradient migration of contaminants emanating from the landfill (ATP) and by prohibiting use of groundwater within the identified impacted area.

2.7.4.3 Groundwater Monitoring

Arsenic Concentration Results

A review of groundwater sampling results during the period from 2010 through 2014 indicated the following: Arsenic was detected above its cleanup level of 10 µg/L in 26 of 37 monitoring wells sampled at the site during 2010; in 26 of 37 monitoring wells sampled at the site during 2011; in 9 of the 14 monitoring wells/piezometers sampled in April 2012 and 26 of the 37 monitoring wells/piezometers sampled in October 2012; in 34 of the 55 monitoring wells/piezometers sampled in May 2013, in 25 of the 29 monitoring wells/piezometers sampled in October 2013 and 11 of the 19 monitoring wells/piezometers sampled in November 2013; in 16 of the 23 monitoring well/piezometers sampled in April 2014 and 41 of the 61 monitoring wells/piezometers sampled in October 2014. Review of temporal arsenic concentrations in monitoring wells indicate decreasing concentrations in somewells and relatively stable concentrations in others. Long-term groundwater monitoring data from wells located within the landfill foot print and adjacent to the bedrock slope (SHM-10-12, SHM-10-14, SHM-10-15), and likely recharge area of Shepley's Hill, indicate that arsenic concentrations remain elevated, in the range of 3 to 6 mg/L. Monitoring wells in the NIA located along the slope of Shepley's Hill also exhibit high arsenic concentrations (greater than 1 mg/L) suggesting that groundwater originating from Shepley's Hill may be a significant source of arsenic within the footprint of the landfill as well as downgradient from the landfill in the vicinity of SHM-05-41C and SHM-10-16. Another area of significant arsenic impact to groundwater is observed in the vicinity of SHM-05-40X and SHM- 13-06. These wells monitor an area of the overburden that is located downgradient from the north toe of Shepley's Hill bedrock and is shallower than, and west of, the deeper plume migrating from the landfill within the bedrock valley (see Figure 2). In 2001, arsenic at similar concentrations was observed in this area in profile wells SHX-01-10X and SHX-01-09X, suggesting that a separate arsenic source that is unrelated to the deep plume migrating from the landfill may be present within the NIA.

Groundwater arsenic concentrations comprise one line of evidence when evaluating the performance of the ATP and its contribution to restore the aquifer downgradiant of the landfill to drinking water standards. As noted above, a majority of arsenic monitoring wells exhibit decreasing or stable

concentrations which may suggests that the ATP is contributing to mitigation of dissolved arsenic transport from the landfill. However, the arsenic concentration levels above the cleanup level in many monitoring wells are indicative of complex interplay between the geochemical and hydrogeological processes that are controlling the concentrations of dissolved arsenic downgradient of the landfill. These arsenic data indicate that a significant decrease in dissolved arsenic concentrations off-site and in the NIA may not be achievable through continued operation of the ATP.

2.7.4.4 Barrier Wall Performance Monitoring

Groundwater level data and arsenic analytical data were collected from monitoring wells and/or piezometers on the western and eastern side of the barrier wall after its completion in September 2012.

Water level gauging in five piezometer pairs (PZ-12-01 through PZ-12-10) was completed weekly or monthly for six months after wall installation and concurrent with LTMMP monitoring. Even numbered piezometers are located on the western edge of the wall and odd numbered piezometers on the eastern edge of the wall. Water level gauging data consistently show higher water level elevations in piezometers located west of the barrier with the difference in water level elevations ranging from 0.27 (PZ-12-02 to PZ-12-01) to 1.83 feet (PZ-12-10 to PZ-12-09).

In addition, groundwater samples were collected for dissolved arsenic analysis from several wells located on both sides of the barrier. Notably, the dissolved arsenic concentrations in well SHL-20 have shown an increase since the barrier was installed. Data including the change in water levels across the barrier wall in the PZ-12 series and the increasing trend in dissolved arsenic concentrations in monitoring well SHL-20 suggest that the barrier wall is mitigating the arsenic flux to Red Cove. As future data continues to demonstrate mitigation of arsenic discharges to Red Cove, the barrier wall will be assisting in achieving the RAO regarding protection of Plow Shop Pond from impacted groundwater discharge emanating from the landfill.

Additional groundwater quality data per the LTMMP will be utilized to further assess the effect of the barrier on dissolved arsenic flux to Red Cove. Future evaluation should focus on the change in vertical gradient between bedrock and overburden across the barrier and monitoring of dissolved arsenic concentrations in wells SHM -11-02, SHL-04, SHL-11, SHL-19, and SHL-20.

2.7.4.5 Landfill Gas Monitoring Data

Annual landfill gas monitoring was performed in October or November from 2010 through 2014. Typically the gas vents in the southern section of the landfill exhibited the highest levels of methane, carbon dioxide and LEL, with the exception of the 2014 event when gas vents in the center of the landfill exhibited the highest levels of methane/LEL and carbon dioxide. Post-purge levels of VOCs ranged from below instrument detection limits in the majority of the gas vents to a high of 1.2 ppm in 2012. Post-purge carbon monoxide levels ranged from below instrument detection limits in the majority of the gas vents to a high of 6.0 ppm in 2014. Post-purge levels of oxygen ranged from 0.5 to 21.8%. All of the landfill gas vents exhibited levels of hydrogen sulfide below instrument detection limits. For all events from 2010 through 2014 the gas monitoring results were consistent with historical results throughout the landfill, indicating proper gas venting. Although these results are not directly related to RAOs for Shepley's Hill Landfill, they are indicative of the continued absence of landfill gas migration away from the landfill and therefore continue to support the protectiveness of the remedy with regards to nearby buildings and the potential for landfill gas migration to these buildings.

2.7.4.6 North Impact Area Investigation

The results of the 2013 supplemental investigation in the NIA indicated arsenic concentrations and distribution consistent with historical data including the 2001 vertical profiling investigation. Detected dissolved arsenic concentrations in the vertical profiling investigation ranged from 0.55 to 3,510 µg/L. The supplemental NIA investigation confirmed the eastern, western, and downgradient (north-northwestern) extent of dissolved arsenic where arsenic has not migrated at elevated concentrations beyond Nonacoicus Brook. Further, the consistency of arsenic concentrations in 2001 and 2013 (after seven years of ATP operation) indicate that the operation of the ATP has not substantially changed downgradient dissolved arsenic concentrations in groundwater.

As described above, additional investigations were conducted in late 2013 and early 2014 to further assess discharge to Nonacoicus Brook. Vertical profiling and groundwater monitoring indicate arsenic precipitation prior to discharge to the brook. Further, the CSM for the site indicates that the northern extent of dissolved arsenic at the brook is due to precipitation/attenuation of arsenic as groundwater discharges to the oxygenated zone of the brook and associated wetlands.

2.7.5 Site Inspection

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. Features of the landfill that were inspected included the cover system, drainage system, gas vent system, access road, monitoring wells and piezometers. Observations were made regarding the vegetative cover, vegetative types, erosion, settlement and general conditions. The overall condition of the landfill was satisfactory.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix C** along with supporting photographs.

2.7.6 Interviews

As part of the FYR review process, interviews were conducted in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in **Appendix B**. Those interviewed included the following:

- Dan Groher, USACE
- Bob Simeone, USACE
- Pam Papineau, Ayer Board of Health (BOH)
- Ron Ostrowski, Mass Development
- Deputy Fire Chief Adams, Devens Fire Department
- Ayer Police Chief Murray, Ayer Police Department
- Jason Overgaard, Sovereign Consulting (ATP Operator)
- Richard Doherty, People of Ayer Concerned about the Environment (PACE)

In general, comments related to the site were positive and supportive. The Devens Deputy Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be

improved. Mr. Doherty of PACE indicated a fundamental disagreement regarding the Army's assertion the primary source of arsenic at SHL is naturally-occurring. He also indicated that the community appreciated receiving draft reports for review prior to final submittal.

The Army and BOH indicated that the LUCs and ICs were in place and working as planned to prohibit use of groundwater wells in the NIA. They also indicated that information had been presented to the community through the RAB meetings and door-to-door surveys. The Army also indicated that there are ongoing requirements and reporting related to the ICs including observing new construction in the area and that this is going well. No reports of planned new construction or development on the Site or in the NIA were indicated by the interviewees.

Mr. Overgaard indicated that the ATP system was operating well and had recently completed several upgrades. These upgrades were primarily related to increasing the average effective flow rate of the system. Upgrades and changes included two additional modules to the skid (filtration from 8 to 10 units) and upsized the effluent pump, storage tanks and other related components to increase maximum flow rate.

2.8 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

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

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes The contingency groundwater extraction remedy, landfill cap, and supplemental barrier wall when considered in the context of the ICs that prohibit use of groundwater as drinking water in the NIA, generally achieves the RAOs stated in the ROD. However, due to site conditions specified in the CSM, the ATP while operating as designed and intended, is unlikely to achieve cleanup levels within a reasonable timeframe as specified in the ROD.

2.8.1 Remedial Action Performance and Monitoring

The remedial actions are functioning as intended and response actions are operating as designed including the following:

- The landfill cap system continues to prohibit contact with site contaminants,
- The cap appears to be functioning as designed and limiting direct recharge through the landfill materials to the underlying aquifer,
- The ATP system is controlling the migration of arsenic impacted groundwater northward, and
- Preliminary data indicates the barrier wall limits groundwater flow and likely arsenic flux to Plow Shop Pond.

Although the remedy is operating as intended, dissolved arsenic concentrations downgradient of the ATP extraction wells remain elevated and stable in many locations. Review of historical and recently collected

data continues to indicate that the site conditions specified by the CSM are contributing to the downgradient concentrations. The data indicates that ATP operation appears to have less influence on concentrations downgradient of the extraction wells even though available data support hydraulic capture of the arsenic impacted groundwater emanating from the landfill.

Further analysis is being conducted using groundwater flow models and site data analysis to refine ATP influence on the downgradient dissolved arsenic concentrations and the geochemical conditions of the aquifer and site.

2.8.2 System Operations/ Operation and Maintenance

O&M for the ATP is being performed in accordance with the 2015 Draft Final LTMMP (*Sovereign, 2015*) and the O&M Manual for the ATP.

2.8.3 Opportunities for Optimization

As described previously, several enhancements to the ATP were completed during this reporting period. In addition, ATP performance and LTM results are evaluated annually to determine if any optimization opportunities exist.

2.8.4 Early Indications of Potential Remedy Failure

No indications of remedy failure have been observed to date. As described above, the remedy is generally functioning as intended. Effectiveness is evaluated regularly as part of system O&M and the LTMMP.

2.8.5 Implementation of Institutional Controls and Other Measures

ROD ICs are in place and functioning properly. The second ESD for SHL, Explanation of Significant Differences, Shepley's Hill Landfill Superfund Site, Former Devens Army Installation, Land Use Controls to Restrict Groundwater Use (Sovereign, 2013), documented additional LUC language as an enforceable component of the ROD that will further protect potential receptors from exposure to arsenic-impacted groundwater flowing from SHL. As documented in the *Draft Shepley's Hill Landfill 2014 Annual Report*, on 2 December 2014, Sovereign conducted a door-to-door survey in the NIA to ensure that residents were informed about the restrictions on groundwater use north of SHL, all properties were connected to municipal water, and there were no undocumented private/irrigation wells were present (M2S JV, 2015). No private/irrigation wells were identified in the survey which will be repeated every five years or sooner, if required by changes to the LUCIP.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid. This includes review of Applicable or Relevant and Appropriate Requirements (ARARs) including several modifications since the 2010 FYR, none of which affect the protectiveness of the implemented remedy. A summary of the ARAR review is provided in **Appendix C**.

As noted in the 2010 FYR, the MCL for arsenic decreased from 50 µg/L to 10 µg/L in 2006 whereas the remedy assumptions stated in the 1995 ROD included the 50 µg/L MCL. However, since ICs and LUCs are in place to prohibit use of groundwater in areas overlying concentrations above the ROD cleanup level of 50 µg/L, the remedy is still protective, meets RAOs, and the assumptions are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. At this time, the Army is not aware of additional information that would question the protectiveness of the remedy.

2.8.6 Summary of Technical Assessment

Based on the data reviewed, the response actions related to the Shepley's Hill Landfill are generally performing as designed and meeting the remedial action objectives.

The ATP and LTMMP are evaluated annually and the data is used to adjust operation, maintenance and monitoring activities accordingly. In general arsenic concentrations in LTMMP wells remain relatively stable compared over time.

The MCL for arsenic in effect at the time of the ROD (50 µg/L) was selected as a groundwater cleanup goal. Arsenic was present onsite at concentrations greater than its MCL during the RI and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 1995 ROD. Changes to the MCL for arsenic, in association with changes of the USEPA National Primary Drinking Water Regulations for arsenic as implemented on January 23, 2006, effectively reduce the clean-up level for arsenic from 50 µg/L to 10 µg/L.

Monitoring wells upgradient and cross-gradient from the landfill, and wells outside the influence of the ATP, exhibit arsenic concentrations in excess of the MCL. This suggests that the expectation that the Contingency Remedy can achieve the ROD objectives is potentially unrealistic due to elevated local background arsenic concentrations and the source strength of reducing conditions within the landfill and throughout the impacted area.

Additional items of concern were noted during the technical review of SHL. These issues do not affect the protectiveness of the remedy but have recommendations for additional consideration at the site. These include:

- The remedy ROD and by extension the RD/RA Work Plan do not define containment or the target capture zone. The presence of ICs and LUCs prohibit the use of groundwater as drinking water such that uncertainty in the capture zone does not affect protectiveness.
- Additional site characterization and CSM refinements continue to indicate the existing remedy is unlikely to achieve groundwater cleanup goals per the ROD (i.e., the restoration potential is low due to very complex site conditions causing a high level of remediation difficulty.). Since ICs and LUCs are in place in the NIA, there is not a concern for potential exposure and therefore this does not affect protectiveness of the remedy.
- The current ROD clean up goal to meet MCLs downgradient of the SHL is unlikely to be achieved within a realistic timeframe, given the complexity of the site conditions (i.e., naturally occurring arsenic concentrations in aquifer sands, till and bedrock).

The following are recommendations to the technical concerns noted above.

- Development of site-specific groundwater arsenic background concentration range
- CSM refinements with focus on sources of naturally occurring arsenic (bedrock) and natural attenuation processes that exits near the brook in the NIA.
- Define the target capture zone limits

2.9 Issues

During completion of this five year review, no concerns or areas needing additional information were identified.

Unresolved Concerns Raised by Stakeholders

At this time, there are not any significant unresolved concerns or items from the community, support agencies, or other stakeholders. As noted previously, improved communication with members of the community has been identified as important. The Army and its contractors will discuss potential approaches to enhance community communication and involvement where appropriate.

2.10 Recommendations and Follow up Actions

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

2.11 Protectiveness Statement

The remedy at SHL is considered to be protective of human health and the environment in the short-term. Short-term protectiveness is achieved because:

- There is no current health concerns due to exposure of Site-related waste to humans or the environment
- The landfill cover system prevents exposure to the landfill waste material and contaminants
- The remedy protects potential residential receptors from exposure to contaminated groundwater migrating from the landfill through land use controls that prohibit access to groundwater.

Long-term protectiveness will be accomplished through continued performance of operation, maintenance, and monitoring activities and the eventual restoration of the groundwater to cleanup goals or background conditions.

2.12 Next Review

See Section 1.4 for further details.

2.13 References

All references are contained in **Appendix A**.

3 DEVENS CONSOLIDATION LANDFILL (AOCs 9, 40, and SA 13) (SOLID WASTE) STATUTORY FIVE-YEAR REVIEW

3.1 Introduction

This is the fourth five-year review for the Devens Consolidation Landfill (DCL), the last being completed in 2010. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. DCL includes three areas of contamination (AOC9, AOC 40 and SA13), all of which are addressed in this five-year review. The 2010 five-year review stated that no "recommendations and follow up actions" are needed at the DCL or any of its contributor sites subject to five-year reviews (*HGL, 2010*).

3.2 Site Chronology

The site chronology presented in Table 3.1 includes the dates of major events, such as the final National Priorities List (NPL) listing, decision and enforcement documents, start and completion of remedial and removal actions, construction completion, and prior five-year reviews.

Table 3.1
Chronology of Events Devens Consolidation Landfill

Event	Date
Fort Devens Final NPL listing	November 1989
Fort Devens/EPA signed a Federal Facilities Agreement (FFA) establishing a timetable for implementing clean-up activities	November 1991
Enhanced Preliminary Assessment	1992
Landfill Consolidation FS Report	September 1995
Contributor Sites (SA 6, SA 12, SA 13, AOC 9, AOC 11, AOC 40, and AOC 41) Site Inspections/Remedial Investigations	1994-1996
Landfill Remediation FS Report	January 1997
PP issued describing the Army's preferred remedy	December 1997
Off-site disposal evaluated	Spring/Summer 1998
Expanded on-site landfill site search	Spring/Summer 1998
Landfill Remediation FS Addendum Report	November 1998
Second PP issued describing the Army's Alternative 4C as the preferred option	December 1998
ROD signed	July 1999
First Five-Year Statutory Review	September 2000
Commenced Landfill Construction	September 25, 2000
Mobilized at AOCs 11 and 40, and SAs 12 and 13	October 2000
Mobilized at AOC 9	January 2001
Easement Agreement Tract No. 400E (DCL)(between MassDevelopment & Army)	June 2001
Work completed at AOCs 11 and SA 13	May 2002
Mobilized at AOC 41	July 2002
Work completed at AOC 41	September 2002
Landfill cap construction completed; work completed at AOC 40	November 2002

Event	Date
Work completed at AOC 9	December 2002
Work completed at SA 12	January 2003
Landfill site restoration	Spring 2003
O&M activities at landfill and remedial sites begins	July/August 2003
Remedial action complete.Closure Report	October 2003
Second Five-Year Statutory Review	September 2005
AOC 9, AOC 40, and SA 13 transferred to MassDevelopment via Quitclaim Deed	March 2006
DCL Incorporated into revised Devens LTMP	November 2008
Annual LTM	2005-2009
Third Five-Year Review	September 2010
Annual LTM	2010 - 2014

3.3 Background

3.3.1 Physical Characteristics

The Devens Consolidation Landfill (DCL) (**Appendix D Figure 3.1**) was constructed on the former Fort Devens golf course driving range in order to accommodate excavated material from seven remedial areas consisting of two Study Areas (SAs), four Areas of Contamination (AOCs), and one pesticide removal project at three Fort Devens housing areas. The approved landfill easement occupies 16.88 acres with approximately 8 acres utilized for debris disposal. A current site map for the DCL is presented as **Figure 3.2, Appendix D**.

Descriptions of the seven contributor sites are as listed below:

- SA 12: A half-acre location where construction debris and yard waste were deposited (approximately 8,700 cy);
- SA 13: A one-acre area used from 1965 to the mid-1990s for yard-waste (approximately 10,000 cy);
- AOC 9: An area used for storing wood, concrete, asphalt, metal, brick, glass, and tree stumps (approximately 121,000 cy);
- AOC 11: A former landfill used from 1975 to 1980 for disposal of wood-frame hospital demolition debris (approximately 35,000 cy);
- AOC 40: Four acres used for construction debris, ash, stumps, and logs (approximately 125,400 cy);
- AOC 41: A one quarter-acre landfill in the SPIA that was used up to the 1950s for disposal of non-explosive material and household debris (approximately 1,500 cy); and
- Housing areas Grant, Locust, and Cavite: Soils and walling materials contaminated with VOCs or pesticides (approximately 2,290 tons of soil and 1,240 tons of concrete).

The USEPA approved the ROD for landfill remediation of the first six areas in July 1999. It included provisions for either on-site or off-site disposal options. The on-site landfill construction alternative was selected as the best option. Construction of the DCL commenced in September 2000 and was completed

in November 2002. The Remedial Action Closure Report prepared by Shaw Environmental (formerly Stone & Webster, Inc.) in September 2003 was accepted, certifying that the DCL was constructed and capped in accordance with the ROD, and met the performance standards and/or response objectives in the ROD. LTM activities have been performed since the completion of the landfill construction.

MassDevelopment maintains ownership of the DCL property and agreed to grant the Army a permanent easement to build and operate the landfill (Easement Agreement Track No. 400E, June 2001). The easement additionally details the Land Use Controls (LUC) between the Army and MassDevelopment for the DCL. The 1999 ROD had indicated Institutional Controls (ICs) "were planned for the proposed Consolidation Landfill." DCL LUCs have been evaluated through annual IC inspections, which are conducted per the "IC Monitoring Plan" included in the LTMP (HGL, 2008).

3.3.1.1 Hydrology

Groundwater flow patterns at the DCL show a northeasterly flow pattern. Groundwater elevations collected during LTM events remain consistent from year to year. Groundwater flow patterns beneath the landfill also remain consistent from year to year. Groundwater flow lines indicate the groundwater level continues to be lower than the landfill liner.

3.3.2 Land and Resource Use

The landfill was constructed at the former golf course driving range at the intersection of Patton Road and Queenstown Street. The approved landfill easement occupies 16.88 acres with approximately 8.0 acres used for debris disposal. Restrictions are in place to prevent access and groundwater use.

3.3.3 History of Contamination

The following sections provide a summary of the primary DCL contributor sites that were transferred from Army control to the MassDevelopment for redevelopment and retain deed-recorded restrictions not allowing the property to be used for residential purposes. These sites include AOC 9, 40, and SA 13. AOC 41 is inclusive of the SPIA site and is discussed in the SPIA portion of the five-year review. As per the ROD, the remediation of contributor sites AOC 41 and SA 12 were considered non-CERCLA actions and are not subject to five-year site review requirements. In 2005, the Army provided clarification to the EPA indicating that AOC 11 was remediated to allow for unrestricted use. Based on the clarifications to the EPA, ICs and five-year site reviews were no longer needed for AOC 11.

3.3.3.1 AOC 9

AOC 9 was located on the former North Post, north of Walker Road and west of the wastewater treatment plant. The landfill was operated from the late 1950s until 1978 and was used by the Army, National Guard, site contractors, and off-post personnel. Landfill materials at AOC 9 were generally demolition debris, including wood, concrete, asphalt, metal, brick, glass, and tree stumps. Debris volume was estimated to be 112,000 cy.

A geophysical survey was performed during the 1996 SI to supplement information derived from evaluation of aerial photographs and to delineate the actual limits of the landfill. The results of the survey assisted in the placement of test pits and groundwater monitoring wells, and provided insight into the distribution of landfill debris. Results of the geophysical survey indicated that the landfill encompassed 5 acres with a larger northern pod containing the majority of landfill material and four smaller southern pods adjacent to the wetlands containing mostly near-surface debris.

Surface water and sediment samples were collected from the Nashua River and the swampy area south of the debris landfill during the 1996 SI. The SI report concluded that the results of the surface water and sediment samples were generally representative of Nashua River water quality in the area. Soil and groundwater samples were also collected. The results of the soil and groundwater samples were evaluated in the SI report and were used to help delineate the extent of the landfill.

3.3.3.2 AOC 40

AOC 40 is located along the edge of Patton Road, in the southeastern portion of the Main Post. This area was used for the disposal of construction debris (masonry, asphalt, wire and metal), ash, stumps, and logs.

AOC 40 covers approximately 4 acres and was estimated to contain 110,000 cy of debris. Portions of the landfill area were situated in a wetland, and were subsequently submerged under Cold Spring Brook Pond. The area was densely populated with trees and other vegetative cover. The northern edge of the landfill area dropped off abruptly to the wetland or to the pond with a difference in elevation ranging between 10 and 20 ft. The area is also within a recharge zone for the Patton water supply well.

Surface water and sediment samples were collected from Cold Spring Brook and soil samples were collected from the landfill soil cover. Groundwater samples were also collected as part of the RI and supplemental RI in 1992. The supplemental RI concluded that AOC 40 was not the source of contamination.

3.3.3.3 Area 13

SA 13 was used between 1965 and 1990 for disposal of construction debris, stumps, and brush. Debris volume was estimated to be approximately 10,000 cy. The landfill was less than one acre in size and is located on the west side of Lake George Street near Hattonsville Road on the former Main Post. SA 13 is surrounded by large trees, but no trees were growing on the landfill itself. Tree stumps, limbs, and trunks were deposited on the surface of the landfill and down the steep lower slope. A wetland was located at the base of this slope.

Surface water and sediment samples were collected from the wet area at the toe of the debris area. Soil samples were collected from stained areas directly over the debris area. Groundwater samples were also collected. Results of the surface water and sediment samples presented potential risks to sensitive aquatic ecological receptors. Results of the soil samples directly over the debris area contained PAHs, TPH, pesticides and inorganics. Groundwater results were below applicable standards.

3.3.4 Initial Response

A history of post-site investigation activities related to Devens landfill remediation is presented in this subsection.

The Landfill Consolidation Feasibility Study (FS) Report (*ABB-ES, 1995a*) contains an evaluation of options to consolidate debris from other landfills into a single waste disposal site. After reviewing the FS Report, the United States Army Forces Command (FORSCOM) requested evaluation of non-consolidation, containment options such as capping landfills in-place. In response to FORSCOM comments, the Debris Disposal Area Technical Memorandum (*ABB-ES, 1996b*), was issued in February 1996. The memorandum evaluated a cap-in-place and a consolidation option for each of the seven landfills.

To respond further to the FORSCOM comments, the Landfill Remediation FS Report was prepared

(*ABB-ES, 1997*). This FS report evaluated nine debris management alternatives, including various combinations of No Further Action (NFA), capping in place, and debris removal and consolidation.

In the December 1997 Proposed Plan (PP), the Army proposed an alternative that consisted of debris removal at three of the debris disposal areas (AOCs 9 and 40, and SA 13), with consolidation at a new landfill to be constructed near the Shepley's Hill Landfill. Public comment on the Plan indicated a community preference for debris disposal either in an off-site landfill, or in a new on-site landfill. Also, because of AOC11's proximity to the Nashua River floodplain, the community indicated a preference that this AOC be fully excavated and the debris consolidated at the new landfill.

In response to public comment, the Army issued a second PP in November 1998. The proposed alternative included full debris removal at AOCs 9, 11, and 40, and SA 13, with disposal at either an off-site landfill, or at a new on-site landfill to be constructed at the former golf course driving range. The proposed alternative was evaluated in detail in the Landfill Remediation FS Addendum Report (*HLA, 1998*).

A ROD was issued in July 1999 (*HLA, 1999*). The ROD presented the selected remedial actions for seven debris disposal areas. In accordance with the ROD, the option of either onsite consolidation or off-site disposal of the debris would be based on a "best value" evaluation of proposal to be solicited upon completion of the design for both options. Methods and practices for construction and operations and closure of the DCL were documented in the Final Design Technical Specifications and Drawings for Consolidation Landfill (*USACE, 1999*). An evaluation of the on-site versus off-site disposal option was conducted and the findings were presented in the Remedy Selection Report (*S&W, 2000*). The remedy selection process indicated that disposal of the remedial debris in an on-site landfill to be built at the former golf course driving range on Patton Road was the "best value" alternative. The approved remedial alternative (Alternative 4c) documented in the ROD called for NFA at SA 6, limited removal at SA 12, and AOC 41, and full excavation of AOCs 9, 11, and 40, and SA 13, with on-site consolidation or off-site disposal.

3.3.5 Basis for Taking Action

Contaminants of concern included low levels of inorganic analytes in surface water and groundwater, PAH, TPH and inorganic analytes were detected in sediment samples from wet areas around AOCs 9, 40 and SA 13. PAH, TPH, pesticides and inorganic analytes were also detected in soil samples collected from above the debris areas at AOCs 9, 40 and SA 13.

The remedy component for AOC 9 was selected to assist the civilian redevelopment effort at Devens and remove the potential, future threat of contaminant release to area groundwater. Removal of landfill debris allowed for unimpeded expansion of the nearby wastewater treatment facility and eliminated the potential release of contaminants to groundwater.

The remedy component for AOC 40 eliminated the threat of potential, future risk to a nearby public groundwater supply well. Removal of landfill debris at AOC 40 allowed for unimpeded, expanded use of the water supply well and allowed for planned realignment of Patton Road.

The remedy component at SA 13 eliminated the threat of potential risk within an area of possible redevelopment. Removal of debris and wet area soil, followed by site restoration, addressed the potential ecological risks to sensitive aquatic receptors.

3.4 Remedial Actions

The landfill Remedial Action Objectives (RAOs) as defined by the ROD were:

- Prevent human exposure to groundwater contaminants released from Devens landfills that exceed acceptable risk thresholds;
- Protect human and ecological receptors from exposure to landfill soils having concentrations of contaminants exceeding acceptable risk thresholds;
- Prevent landfill contaminant releases to surface water that result in exceedance of AWQC or acceptable ecological risk-based thresholds;
- Reduce adverse effect from contaminated landfill media to the environment that would reduce the amount of land area available for natural resource use;
- Prevent exposure by ecological receptors to landfill-contaminated sediments exceeding acceptable risk-based thresholds and
- Support the civilian redevelopment effort at Devens.

3.4.1 Selected Remedy

Key components of the selected remedy for the sites where consolidation of landfill debris was recommended are described below.

AOCs 9, 11, and 40 and SA 13

- Mobilization/demobilization;
- Site preparation;
- AOC 40 sediment removal with disposal either in the DCL or in an off-site landfill;
- AOC 40 drum removal with disposal either in the DCL or in an off-site landfill (It should be noted that this remedy was included in the ROD, but no drums were encountered during removal and consolidation construction operations.);
- Debris excavation, backfill, and re-grading;
- Wetland restoration at AOC 9, 11, and 40;
- Consolidation of excavated debris at the DCL, or transport to an off-site landfill;
- If required, cover system monitoring and maintenance at the DCL; and
- ICs and Five-Year Site Reviews at those sites where unrestricted future use is not achievable or economical.

3.4.2 Remedy Implementation

The decision to proceed with on-site consolidation was issued June 30, 2000, and a temporary (120 day) access agreement to begin construction was signed on September 15, 2000. The DCL was constructed at the former golf course driving range at the intersection of Patton Road and Queenstown Street. Debris from six landfill areas and former housing areas was excavated, characterized, transported and disposed at either the new on-site landfill or an off-site licensed TSDF/Recycling facility if characterization results exceeded on-site disposal requirements. Materials disposed off-site included wood, scrap metal, tires and

creosote wood, for a total waste volume of 12,270 cubic yards (cy). Soils disposed at the DCL included those contaminated with petroleum, pesticides, PCBs, PAHs, and asbestos, for a total waste volume of 365,000 cy. Excavations were then backfilled and/or re-graded to restore the sites to pre-construction conditions. After completing the removal actions, the DCL was graded and permanently capped. A current site map of the DCL is included as **Figure 3.2**. The major components of the remedial actions at each of the sites are presented in the following sections.

3.4.2.1 Remedial Action AOC 9

Debris was excavated from the 8.9-acre disposal area and transported to staging areas, which were used for material holding during sampling and waste characterization activities. Excavation activities at AOC 9 began in January 2001 and were completed in June 2002. Excavated debris was analyzed for waste disposal characteristics designated in the Sampling and Analysis Plan (SAP) (*S&W, 2000*). Characterized debris material was transported to the DCL for disposal. A total of 161,477 tons of debris materials from AOC 9 were disposed in the DCL. Debris materials primarily consisted of concrete, scrap steel, tires, soil, and miscellaneous demolition debris.

During the excavation process, larger debris (i.e., wood, scrap steel, concrete debris and tires) was segregated from the stockpiled material and stored separately in an effort to recycle and reduce the volume of material to be disposed in the landfill. Segregated material was disposed of off-site at a licensed facility. Concrete debris was processed through a crushing plant for possible reuse as backfill in other areas, if analytical results indicated the material met the PRGs.

A total of 156,000 cy of debris was removed from AOC 9; this was 44,000 cy more than the original estimated volume of 112,000 cy. The 44,000 cy of additional debris was attributed to greater excavation depths due to extended debris limits beyond those originally estimated..

Following verification that confirmatory sampling results met the PRGs and the excavation limits had been reached, restoration activities commenced. Restoration activities were completed in accordance with the Habitat Restoration Work Plan (*S&W, 2002*). The majority of the site was restored as upland areas. Upland areas were seeded with a restoration seed mixture that contained native grasses. The wetland area was restored by backfilling with clean fill and manufactured wetland soil. The restored wetland was stabilized with a custom wetland seed mix.

The property was transferred from Army ownership to MassDevelopment for redevelopment purposes in 2006. LUCs were recorded in the March 2006 deed to prevent residential development of the property.

3.4.2.2 Remedial Action AOC 40

Debris was excavated from the 3.9-acre disposal area and transported to the staging areas, which were used for material holding during sampling and waste characterization activities. Excavation activities at AOC 40 began in November 2000 and were completed in September 2002. Excavated debris was analyzed for waste disposal characteristics. Characterized debris material was transported to the DCL for disposal. A total of 166,799 tons of debris materials from AOC 40 were disposed in the DCL. Debris materials primarily consisted of concrete, scrap steel, stumps, soil and miscellaneous demolition debris.

A total of 148,450 cy of debris was removed from AOC 40; this was 38,450 cy more than the original estimated volume of 110,000 cy. The 38,450 cy of additional debris was attributed to greater excavation depths than originally anticipated. It should be noted that although drum removal was included in the selected remedy, no drums were encountered during these remedial actions. Excavation limits to remediate the extent of debris encroached onto the existing roadway (Patton Road) adjacent to the

disposal site. Road realignment was designed and constructed so that traffic would be detoured during the remedial activities.

Following verification that confirmatory results met the PRGs and the excavation limits had been reached, restoration activities began in September 2002 and were completed in October 2002. Due to the steep gradient, the side slopes adjacent to Patton Road were stabilized and protected by rip rap. Rip rap was placed from the base of the slope to approximately 10-foot above the waterline. Remainder of the slope was stabilized with six inches of loam and seeded with a native grass seed mixture. The restoration activities were completed in accordance with the Habitat Restoration Work Plan (*S&W, 2002*).

The property was transferred from Army ownership to MassDevelopment for redevelopment purposes in 2006. LUCs were recorded in the March 2006 deed to prevent residential development of the property.

3.4.2.3 Remedial Action SA 13

Debris was excavated from the 0.8-acre disposal area and transported to the staging area, which was used for material holding during sampling and waste characterization activities. Characterized debris material was transported to the DCL for disposal. A total of 13,715 tons of debris materials from SA 13 were disposed in the DCL.

During the excavation process, larger debris (i.e., wood, scrap steel, concrete debris and tires) was segregated from the stockpiled material and stored separately in an effort to recycle and reduce the volume of material to be disposed in the landfill. Material that resulted from these efforts was disposed of off-site at a licensed facility. Although the concrete was segregated and processed, the end product did not meet the requirements for reuse as backfill or road base material. Processed concrete was mixed with the debris stockpile and was disposed at the DCL. Debris materials primarily consisted of concrete, scrap steel, soil and miscellaneous demolition debris (i.e., glass and wood) along with some stumps and brush.

A total of 13,900 cy of debris was removed from SA 13, 3,900 cy more than the original estimated volume of 10,000 cy. The 3,900 cy of excess debris was attributed to deeper excavation over extended debris limit than originally anticipated. The actual excavation depths ranged from 4 ft to 8 ft deeper than proposed excavation grades throughout the center of the excavation area.

Following verification that confirmatory results met PRGs and the excavation limits had been reached, restoration activities commenced in October 2001. Minimal restoration operations took place at SA 13. Slopes were graded as necessary to provide a safe area and to promote drainage to feed the small wetland area to the south. Topsoil was placed over disturbed areas that were then seeded to stabilize and reestablish vegetation of the wetland and upland areas. Restoration activities were completed in accordance with the Habitat Restoration Work Plan (*S&W, 2002*).

The property was transferred from Army ownership to MassDevelopment for redevelopment purposes in 2006. LUCs were recorded in the March 2006 deed to prevent residential development of the property.

Confirmation soil samples were collected from all AOCs after excavation and debris removal and submitted for the following analyses: VOC, SVOC, pesticides/PCBs, total metals, and VPH and EPH analyses. Results were compared to USEPA Region 9 PRGs for residential soils. MassDEP S-1 Soil standards were used if PRGs were not available for any analyte. All confirmation soil sample results were below applicable standards as reported in the Remedial Action Closure Report (*Shaw 2003*).

3.4.2.4 Construction of the Consolidated Landfill

Construction of the DCL was performed between September 2000 and November 2002. The landfill was

constructed in accordance with MassDEP Landfill Technical Guidance Manual (May 1997) and the Final Design Technical Specifications (*EA, October 1999*). The Remedial Action Closure Report (*Shaw 2003*) presents the details of the Devens Consolidation Landfill construction activities.

Over the course of construction, approximately 591,804 tons of materials were placed at the landfill. Materials disposed of at the landfill included the debris excavated from the contributor AOCs. The approved landfill easement occupies 16.88 acres with approximately 8.0 acres used for debris disposal. The landfill construction consisted of several components, performed in three phases. The first phase involved construction of the landfill liner system, leachate collection system, and sedimentation pond. The second phase primarily consisted of transportation and disposal of excavated debris, debris placement, and compaction and grading. The final phase involved capping of the landfill which included installation of gas vents and a gas venting layer, a dual composite and 40-mil flexible polyethylene (VFPE) liner, a sand drainage layer, and vegetation support layers.

3.4.3 System Operation/Operations and Maintenance

O&M since 2010 has been performed in accordance with the approved Long Term Monitoring Plan (LTMP) (*HGL, 2008*), which specifies the DCL O&M activities. LTM and landfill O&M activities from 2010 through 2014 included semi-annual landfill gas vent monitoring, semi-annual groundwater sampling, monthly O&M of the leachate pump station, and semi-annual well gauging and landfill cap inspections. Eleven landfill gas vents are monitored semi-annually, four groundwater monitoring wells are sampled annually, seven monitoring wells are gauged semi-annually, and leachate discharge is sampled annually as part of the current LTM program for the DCL.

The LTMP also included annual IC inspections and interviews. Existing land use and site conditions were assessed during these interviews to ensure that IC requirements are met.

In addition, settlement and cover system monitoring is conducted on a visual basis during the scheduled annual inspections. The landfill is mowed on an annual basis, typically in the fall months. Order of magnitude costs for yearly O&M are $75,000.

3.5 Progress since Last Five-Year Review

Overall progress towards achievement of the RAOs and protection of human health and the environment at OU#2 is assessed annually and reported in Annual O&M and Monitoring Reports.

Table 3.2
Protectiveness Determinations Statement from the 2010 FYR

DCL	Protectiveness Determination	Protectiveness Statement
Site wide	Protective	*The remedy at the DCL and the DCL contribution sites AOCs 9, 40, and SA 13 are protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled. Long-term protectiveness of the remedial action will be verified by groundwater monitoring at the DCL to assess potential leachate migration. Current monitoring data indicate that the remedy is functioning as required And will be verified by groundwater monitoring at the DCL to assess potential leachate migration. Current monitoring data indicate that the*

		remedy is functioning as required And will be verified by groundwater monitoring at the DCL to assess potential leachate migration.

Table 3.3
Status of Recommendations from the 2010 FYR

AOC	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
DCL	None	No "recommendations and follow up actions" were made in the 2010 FYR	Federal Facility	EPA/State	NA	Ongoing	

3.5.1 Remedy Implementation Activities

The findings of annual inspections at DCL contributor sites revealed no abnormalities or changes in land-use at the individual contributor sites and there was no evidence of residential development or changes in site use that would lead to increased exposure potential.

3.5.2 System O&M Activities

Current LTM and landfill O&M activities at DCL include annual landfill gas vent monitoring, semi-annual groundwater sampling, monthly O&M of the leachate pump station, semi-annual well gauging, and annual landfill cap inspections. Eleven landfill gas vents are monitored annually, four groundwater monitoring wells are sampled semi-annually, seven monitoring wells are gauged semi-annually, and leachate discharge is sampled annually, as part of the current LTM program for the DCL.

Existing land use and site conditions are assessed remotely during annual LUCs interviews with site representatives and on site during LTM events to ensure that the LUC requirements are being met.

3.6 Five-Year Review Process

As documented in the following subsections, the FYR process for DCL included a document review, a data review, a site inspection, interviews, and an assessment of community participation.

3.6.1 Administrative Components of the Five-Year Review Process

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led by Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

3.6.2 Community Notification and Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479

3.6.3 Document Review

This five-year review consisted of a review of relevant documents including previous Five-year reviews, LTMP and O&M plans, remedial action reports, Annual reports and monitoring data.

3.6.4 Data Review

Sampling is not conducted at any of the individual contributor sites to the DCL as all of these sites are closed and no sampling is required. Groundwater monitoring wells LFM-99-02B, LFM-99-05A, LFM-99-06A, and LFM-03-07 are included in the current LTM sampling program for the DCL and have been sampled semi-annually over the past five years. In addition, monitoring wells LFM-99- 01B, LFM-99-03B, and LFM-99-05B are gauged for the depth to water. Groundwater at DCL is sampled as part of the spring and fall LTM events and submitted for the following analyses: VPH, EPH (including target PAHs), pesticides, total metals, and wet chemistry parameters: total dissolved solids [TDS], chloride, sulfate, nitrate/nitrite, total alkalinity, total cyanide, and chemical oxygen demand [COD]. Samples are collected and submitted for PCB analysis every five years.

Historical analytical results for the DCL are summarized in tables, see **Appendix D**. Groundwater from all four monitoring wells contained VPH, EPH, and pesticide concentrations below the respective GW-1 standards in groundwater data from 2010 through 2014. Metals have been consistently below respective GW-1 standard in groundwater at all four DCL monitoring wells since the November 2003 sampling event, and the 2010 through 2014 results were in agreement with the historical data. The wet chemistry parameters from 2010 through 2014 also remained generally consistent with past data.

The annual fall DCL leachate sampling events consist of a single landfill effluent leachate sample collected to fulfill the requirements of MassDevelopment Industrial Wastewater Discharge Permit No. 017. The DCL leachate pumping station effluent sample results were within the discharge permit limits for all parameters from 2010 through 2014.

3.6.5 Site Inspection

Detailed landfill inspections are performed annually by the Army as part of the LTM and maintenance activities. Inspection results and recommendations for follow-up actions are included in annual reports that are submitted to USEPA and MassDEP.

The LUC inspections of the DCL contributor sites (AOCs 9 and 40, and SA 13) were performed annually from 2010 through 2014 and revealed no changes in land-use at the individual contributor sites. Per the requirements of the 2006 transfer deed, these contributor sites are not being used, or under development, for residential purposes.

The leachate pumping system was operational during the site inspections. Operating logs indicate that the

volume of leachate emitted from the landfill each year has decreased since start-up in 2002 and has remained generally consistent over the past five years. The landfill is in good condition with no apparent signs of disturbance to the grass-covered landfill cap.

The DCL contributor sites with ICs include AOC 9, 40, and SA 13. The three contributor site properties were transferred from the Army to MassDevelopment in March 2006. ICs were incorporated into the deed to prevent residential development of the properties. In addition, the DCL has IC inspection requirements. IC inspections were performed annually over the five-year period to identify the following:

- Any signs of increased exposure potential to the public from soil and/or surface water contaminants;
- Any evidence that groundwater extraction wells had been installed at the site;
- Any evidence of site use changes; and
- Any evidence of residential use (DCL contributor sites only).

The site inspection findings over the five-year period covered by this review revealed no abnormalities or changes in land use at the DCL and its three contributor sites with retained ICs.

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. Features of the landfill that were inspected included the cover system, drainage system, gas vent system, access road, monitoring wells and piezometers. Observations were made regarding the vegetative cover, vegetative types, erosion, settlement and general conditions. The overall condition of the landfill was satisfactory.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix D** along with supporting photographs.

3.6.6 Interviews

As part of the FYR review process, interviews were conducted in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in **Appendix B**. In general, comments related to the site were positive and supportive. The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved.

- Dan Groher, USACE
- Bob Simeone, USACE
- Pam Papineau, Ayer Board of Health (BOH)
- Ron Ostrowski, Mass Development
- Deputy Fire Chief Adams, Devens Fire Department
- Ayer Police Chief Murray, Ayer Police Department
- Jason Overgaard, Sovereign Consulting (ATP Operator)

- Richard Doherty, People of Ayer Concerned about the Environment (PACE)

In general, comments related to the site were positive and supportive. The Devens Deputy Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved. Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

3.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

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

Under the CERCLA Five Year guidance, the DCL contributor sites (AOC 9, AOC 40 and SA13) meet the ROD remediation goals for unrestricted use/unrestricted exposure (UU/UE). It is recommended that the DCL contributor sites be removed from the CERCLA five year review process.

The human health and ecological risk discussed in the ROD have been eliminated from the contributor sites by the excavations and removal of the soils to prevent exposure. The details of the remediation and landfill construction have been presented in the approved Remedial Action Closure Report (Shaw, 2003). While LTM and leachate monitoring results have consistently been below applicable standards, LTM and leachate monitoring of the DCL will continue to assess the effectiveness of the source containment remedy.

A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation, is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2015*). This report presents the results of an optimization evaluation of the long-term monitoring (LTM) program at Fort Devens, including the DCL.

A performance-based evaluation of post-closure care at the DCL was performed in 2014 to determine the appropriate level of optimization. The evaluation incorporated both the USACE and EPA long-term monitoring evaluation program (*USEPA and USACE, 2005*) as well as the module-based approach described in Evaluating, Optimizing or Ending Post-Closure Care at Municipal Solid Waste Landfills Based on Site-Specific Data Evaluations (*Interstate Technology & Regulatory Council [ITRC], Alternative Landfill Technologies Team, 2006*). A separate module was evaluated for each of four post-closure care components that apply to the DCL: leachate management, landfill gas management, groundwater monitoring, and cap monitoring and maintenance. The evaluation of each module included five steps: satisfy prerequisites, evaluate change, implement change, monitor change and module completed.

The performance-based evaluation resulted in the following recommended changes to the DCL LTM

program:

- Evaluate the feasibility of modifying the leachate collection and recovery system (LCRS) to allow discharge on-site to groundwater instead of to the MassDevelopment sewer system via a technical memo. If deemed feasible, obtain regulatory approval for the modification per the appropriate state regulatory procedures (310 CMR 19.000 and 314 CMR 5.000). Discharge of leachate to groundwater on site would, per 40 CFR 261.4 (b) 15) (iv), be subject to federal regulation under sections 307 (b) or 402 of the Clean Water Act. Once approved, perform an engineering redesign of the LCRS to allow for on-site discharge.
- Revise the LTM frequency from semi-annual (fall event) after demonstrating that discharge of leachate to ground surface is not impacting groundwater.

Landfill gas was evaluated based on information included in the 2004 to 2014 Annual Reports. Gas vents located along the highest point on the top crest of the landfill generally had methane levels higher than other areas of the landfill. Although there were high low explosive limit (LEL) readings for some of the higher elevation vents, the Army believed this is not a concern for the following reasons, the landfill is fully encapsulated, methane production results from the natural degradation of the organics n the soils and the majority of methane appears to be confined within respective vents of the passive gas collection system. Based on these observations, no change to the landfill gas monitoring frequency was recommended.

Cap monitoring and maintenance has been ongoing since the completion of the DCL, and has consisted of documenting the cap condition via field notes and photographic record. Maintenance has consisted primarily of mowing and herbicide treatments. Based on the annual need to control and maintain vegetation on the DCL cap, no changes are recommended at this time.

It is recommended the DCL associated contributor sites be removed from the five year review requirement under CERCLA, as the site has met the ROD objectives of unlimited use/unrestricted exposure

3.8 Issues

This five year review indicates that no issues are present at the DCL or any of its contributor sites (AOCs 9, 40 and SA13) subject to five-year reviews.

3.9 Recommendations

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

3.10 Protectiveness Statement

Under the CERCLA Five Year guidance, the DCL contributor sites (AOC 9, AOC 40 and SA13) meet the ROD remediation goals for unrestricted use/unrestricted exposure (UU/UE). It is recommended that the DCL contributor sites be removed from the CERCLA five year review process.

The remedy at DCL is protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled.

Long-term protectiveness of the remedial action is verified by groundwater and leachate effluent monitoring at the DCL. Current monitoring data indicate that the remedy is functioning as required.

3.11 Next Review

It is recommended the DCL associated contributor sites be removed from the five year review process. Under the CERCLA Five Year guidance, the DCL contributor sites meet the ROD remediation goals for unlimited use/unrestricted exposure (UU/UE). The next five year review for the DCL only will be conducted five years from the completion of this review.

3.12 References

References are included in **Appendix A**.

4 SOUTH POST IMPACT AREA (AOCS 25, 26, 27, AND 41)

4.1 Introduction

This is the fourth five-year review for South Post Impact Area (SPIA) the last being completed in 2010. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. OU#3 consists of four areas of contamination (AOCs 25, 26, 27 and 41); all of which are addressed in this five-year review. The Army will continue, as recommended in the 2010 Five-Year Review, to evaluate the potential for off-site migration, impact to sensitive receptors, trend analysis, and remedial duration as part of the 2013 LTMMP for SPIA.

4.2 Site Chronology

Table 4.1
Chronology of Events South Post Impact Area 25

Event	Date
1,200 pounds per year (lbs/yr) disposal of explosives and ammunition by open burn or open detonation	From 1979 to 1992
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-2004
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Annual LTM sampling discontinued at AOC 25	2005
Revised LTMP	October 2008
Annual LTM & Maintenance	2005-2009
Third Five-Year Review	October 2010

Note: Annual LTM& Maintenance activities include annual inspection of monitoring wells and every 5 years water levels are collected

Table 4.2
Chronology of Events South Post Impact Area 26

Event	Date
Open burn and open detonation of waste explosives	Prior to 1979
Demolition training	Ongoing
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-Present
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Annual LTM & Maintenance	2005-2009
Revised LTMP	October 2008
Perchlorate Source Investigation	November 2009

AOC 26 Perchlorate Injection Letter Report	February 2010
Third Five-Year Review	October 2010
Annual LTM & Maintenance	2010 - 2014
Perchlorate and Explosives Explosive Investigation	February and October 2014
Fourth Five-Year Review	2015

Table 4.3
Chronology of Events South Post Impact Area 27

Event	Date
Open burn and open detonation of grenades and pyrotechnics	Prior to 1979
Firing of small-caliber automatic weapons	Ongoing
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-Present
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Revised LTMP	October 2008
Annual LTM & Maintenance	2005-2009
Third Five-Year Review	October 2010
Annual LTM & Maintenance	2010 - 2014
Fourth Five-Year Review	2015

Table 4.4
Chronology of Events South Post Impact Area 41

Event	Date
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-Present
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Waste debris removed to DCL	2002
Second Five-Year Review	September 2005
Annual LTM & Maintenance	2005-2006
LTM discontinued	April 2007

4.3 Background

The SPIA is located within the 4,800-acre area known as the South Post of former Fort Devens. The SPIA is a 964-acre area that includes four AOCs to be addressed in this Five- Year Review: AOC 25, AOC 26, AOC 27, and AOC 41. For AOC 41, the provisions of the July 1996 ROD only apply to AOC 41 groundwater. AOC 25 is known as the former explosives ordnance discharge (EOD) Range and was closed in 1996. It is used for emergency explosive ordnance disposal (EOD) and unexploded ordnance

(UXO) detonation. AOC 26 is known as the Zulu Range and includes the Zulu 1, which is used for EOD training, and Zulu 2, which is used for grenade training. AOC 27 is known as the Hotel Range and is used for small arms training. AOC 41 was used as a landfill consisting of non-explosive military and household debris. A SPIA site location map showing the locations of AOCs 25, 26, 27 and 41 is provided as **Appendix E Figure 4.1**. Close-up views of AOCs 26, 27 and 41 are depicted on **Appendix E Figures 4.2** through 4**.4**, respectively. The SPIA is currently an active weapons and ordnance discharge area that is used by the Army, the Massachusetts National Guard and local law enforcement agencies.

Early investigations performed at the SPIA have detected the presence of explosives, metals and VOCs in soil and groundwater at AOCs 26 and 27. The investigations also determined that groundwater discharges to surface water before leaving the South Post and therefore site contaminants are not a threat to off-site wells. A ROD was issued in July 1996 for the SPIA sites that selected "No Action" as the remedy for groundwater. Cleanup goals and ARARs were not specified in the "No Action" ROD but MCP GW-1 and GW-3 groundwater standards, or background, if no MCP standard is available, have been adopted as a point of comparison for the required LTM groundwater monitoring. The remedy did not include any formal remedial action, but did include LTM activities and an Integrated Natural Resources Management Plan (INRMP). The INRMP was written to monitor impacts of the current land use to ecosystems within the SPIA monitoring area.

4.3.1 Physical Characteristics

The SPIA RI indicated that two distinct watersheds are present and are separated by a bedrock ridge, which acts as a groundwater divide in the northern SPIA area (Horne, 1996). One of the watersheds has a groundwater flow regime to the north into Slate Rock Brook and Slate Rock Pond. Areas having this flow regime include Zulu (AOC 26) and Hotel (AOC 27) ranges and Cranberry Pond in the northeast corner of the SPIA. The second watershed has a southeast and east flow regime towards an unnamed brook and New Cranberry Pond. This watershed also has a flow regime directly to the Nashua River encompassing the area directly north of the New Cranberry Pond. AOC 41 wells are located within the second watershed with groundwater flow towards New Cranberry Pond. The water level of New Cranberry Pond is significant in defining the direction of the groundwater flow in the lower sand. The water level in the pond has been controlled by a culvert located on the eastern shore, impeding flow and maintaining a high water level. The pond recharges the aquifer and helps direct the local groundwater flow toward the north and east.

4.3.1.1 AOC 25 (EOD Range) Background

The EOD Range is located east of Firebreak Road, approximately 2 miles south of the main entrance to the South Post. The site is rectangular and measures approximately 600 ft by 1,500 ft.

From 1979 to 1992, approximately 1,200 pounds per year of explosives and munitions were disposed of at the disposal area at the east end of the range by either open burning or open detonation. The 1994 RI indicated that the EOD Range currently operates with RCRA emergency permit status on a case-by-case basis. Open burning involved the placement of ordnance (small arms ammunition, smoke grenades, cartridge activated devices, and pyrotechnics) in a pit or a trench within the designated 2-acre area. The items were completely covered with packing material, wooden crates, or cardboard; soaked with diesel fuel, oil, and non-serviceable waste flammables; and ignited with smokeless powder charges. The pit was allowed to burn out and to cool for 24-hours before the items were inspected for completeness of burn. Typically, if the pit was to be reused, the items were excavated and buried nearby. If the pit was not to be reused, the pit was generally backfilled (E&E, 1994).

Open detonation was used on munitions and ordnance that contain explosive fillers. They were detonated with an explosive counter charge, such as Composition C-4 (Harrisite) or trinitrotoluene (TNT), in open pits or on a flat surface.

Possible metals contaminants, per the 2004 SPIA Annual Report, within AOC 25 include: copper and zinc from brass shell casings at disposal areas; lead from bullets in the impact areas; and iron, aluminum and possibly other metals (barium and cobalt) from pyrotechnics at impact or training areas. Manganese, chromium and nickel could also come from armored target vehicles, but these metals are in metallic form, which are relatively insoluble. The use of pyrotechnics could leave a more varied residue of several heavy metals (USACE, 2005).

The range was closed as part of the 1996 ROD (**Figure 4.1**).

4.3.2 History of Contamination

Groundwater and soil samples were collected from the EOD Range during the 1994 RI and submitted for explosives, metals and TPH analyses. Soils at the EOD Range ordnance detonation area contained compounds that exceeded the 1994 RI background concentrations in beryllium, cobalt, copper, iron, manganese, mercury, nickel, selenium, and zinc in one or more samples. Nitroglycerine, and TPH compounds were also found in surface soils. TPHC and a trace of PCE were noted in subsurface soils. Metals in filtered groundwater samples showed increased concentrations and increased frequency of detection in downgradient wells when compared to an upgradient background well, but only manganese exceeded its site health-based screening value as presented in the ROD. Several explosives were noted in groundwater within in the AOC, but only RDX exceeded its screening value.

The completed ecological risk assessment concluded that there were potential risks to small mammals and to plants in the ordnance detonation area, under reasonable maximum exposures, but not under average exposures. Based on the marginal exceedances of toxicity reference values, the potential for adverse ecological toxicological effects were determined to be minimal. The EOD range had not adversely affected the ecosystems in the general vicinity of the site, and the analytes detected were not ecologically significant. The ecological risk assessment concluded that no action was necessary at the EOD range to further investigate or mitigate ecological risks from soil or other media.

The RI concluded that no further investigation or remediation was warranted at AOC 25, due to the continued use of this land by the military.

4.3.2.1 AOC 26 (Zulu Ranges)

AOC 26 (Zulu Ranges 1 and 2) is located 2,000 ft north of the EOD Range, approximately 1.6 miles southwest of the main entrance to the South Post (**Figure 4.2**). The Zulu Ranges cover approximately 16 acres and consist of two adjacent land tracts, Zulu 1 and Zulu 2. Prior to 1979, the range was used for Open Burn/Open Detonation (OB/OD) of waste explosives and associated waste items. From 1979 to the present (2015), Zulu 1 has been primarily used for demolition training. The demolition training area is located in the center of Zulu 1. Zulu 2 has been historically used as a practice range for hand grenade training. The grenade training area is located on the eastern end of Zulu 2 and consists of two concrete bunkers, which are used for cover and protections, and two sand pits that are used for receiving grenades.

Possible metals contaminants within AOC 26 include: copper and zinc from brass shell casings at disposal areas; lead from bullets in the impact areas; and iron, aluminum and possibly other metals (barium and cobalt) from pyrotechnics at impact or training areas. Manganese, chromium and nickel could also come from armored target vehicles, but these metals are in metallic form, which are relatively

insoluble. The use of pyrotechnics could leave a more varied residue of several heavy metals (USACE, 2005).

Groundwater, surface water, sediment and soil samples were collected during the 1996 RI at AOC 26. Samples were submitted for TCL organics, explosives, metals and TPH analyses. Results of the RI indicated soils at AOC 26 were contaminated with several chemicals, including explosives, primarily RDX; pesticides, 2,2bis (para-chlorophenyl)-1, 1-1 trichloroethane (DDT); some PAHs; and traces of PCBs and volatiles. Lead, zinc antimony, arsenic, beryllium, and cadmium exceeded background, but only lead and zinc could be related to possible site activities. Groundwater was contaminated with explosives, primarily RDX (exceeding a Drinking Water Health Advisory level used as a screening value) and HMX, and bis(2-ethylhexyl) phthalate, also at concentrations exceeding a screening value. Groundwater was identified as discharging to surface water and sediment in the wetland north of the ranges. Unfiltered groundwater showed several elevated metals, but filtered groundwater only showed exceedances of health-based screening values for manganese. Surface water showed explosives, primarily RDX, and methylphenol and traces of VOCs. Sediments in the wetlands showed explosives, mainly RDX, and methylphenol and traces of VOCs. Many metals exceeded background. Because the ranges will remain active as a training facility and under DoD jurisdiction for the foreseeable future, risk from groundwater consumption was not assessed although there is a drinking water well, D-1, in the SPIA.

The ecological risk assessment found that some soils data exceeded reference values for plants, small mammals, and songbirds, but those exceedances were of such limited extent and the habitat is so disturbed at those locations from ongoing military training activities as to be ecologically insignificant. Concentrations of lead in surface water exceeded water quality criteria, but site specific toxicity testing indicated no toxicity attributed to lead for aquatic receptors. The ecosystems at AOC 26 did not appear to be adversely affected, as indicated by the thriving communities of benthic invertebrates and wildlife observed during the field surveys.

4.3.2.2 AOC 27 (Hotel Range) Background

Hotel Range is located adjacent to Cranberry Pond and is located approximately 1 mile south of the main entrance to the South Post (**Figure 4.3**). The Hotel Range covers approximately 23 acres and is currently used exclusively for firing small caliber weapons. The AOC is presently located entirely south of Old Turnpike Road; however, prior to 1979, the Hotel Range extended to the north side of the Old Turnpike Road and was used for M16s and small caliber weapons firing. The range has also been used as an M-70 range and after 1989 the range was modified for use as an M60-SAW range.

Possible metals contaminants within AOC 27 include: copper and zinc from brass shell casings at firing areas; lead from bullets in the impact areas; and iron, aluminum and possibly other metals (barium and cobalt) from pyrotechnics at impact or training areas. Manganese, chromium and nickel could also come from armored target vehicles, but these metals are in metallic form, which are relatively insoluble. The use of pyrotechnics could leave a more varied residue of several heavy metals (USACE, 2005).

Groundwater, surface water, sediment and soil samples were collected during the 1996 RI at AOC 27. Samples were submitted for TCL organics, explosives, metals and TPH analyses. Soil and groundwater at AOC 27 are affected by military training activities, shown primarily by the presence of explosives, pesticide, and TPHC in soil, groundwater, surface water, and sediment. Previous investigation results had indicated that lead concentrations were elevated in subsurface soil and in surface water. The pesticides, mostly DDT and its derivatives DDD and dichloro-diphenyl-dichloroethylene (DDE) were below background in soils and were not present in groundwater, which only showed low concentrations of

delta-BHC (0.045ug/L in the one confirmed result). Pesticide residues are likely to be a result of pest control rather than training activities at the site. Explosives in the groundwater are by far the most conclusive evidences of effects from site operations. During the RI investigation, groundwater from all wells showed at least some concentrations of explosives related compounds, with RDX, HMX, and 1,3-dinitrobenzene the most frequently observed compounds. The groundwater affected by the site flows north across Old Turnpike Road to a wetland within the northern part of Hotel Range, or possibly continuing towards Slate Rock Pond.

No evidence of site related chemical stress to plants or wildlife was observed during the field surveys. The toxicity testing done at Zulu Ranges (AOC 26) implied that the level of lead in Cranberry Pond water does not pose a hazard to aquatic biota. The mean concentrations of COPC were unlikely to pose a risk to the selected receptors, mallards, and raccoons, with the possible exception of the effect of copper on mallards. Potential risks to benthic invertebrates from several metals in sediments (antimony, copper, lead, mercury, and nickel), and also from 4-amino-2,6-dinitrotoluene, were noted.

Based on the results of the environmental investigations and the human health and ecological risk assessments, no contamination is present at concentrations that pose unacceptable risks to human health or the environment. AOC 27 will continue to be used as a firing range by the Army, and no further investigation or remedial action is recommended at the Hotel Range.

4.3.2.3 AOC 41 (Unauthorized Dumping Site) Background

AOC 41 is located immediately north of New Cranberry Pond (separate from Cranberry Pond), east of Delta Range, and west of Harvard Road, approximately 2 miles southeast of the main entrance to South Post. AOC 41 is approximately 6 acres in size. The dumping site occupies an area approximately 75 square ft in the central portion of the site. It appears to have been associated with a historic brick making kiln that was operated in this area in the 1800s. The AOC is overgrown with trees and swampy vegetation and no records are available detailing when the site was used or what type of material was disposed of in this area. It is believed that this AOC was used until the 1950s for disposal of non-explosive military and household debris. Miscellaneous debris was scattered over a small hill located approximately 75 ft north of New Cranberry Pond (**Figure 4.4**).

Groundwater and soil samples were collected during the 1996 RI at AOC41. Results of RI groundwater sampling and field analysis completed during the RI, indicated that the existing groundwater contaminant plume appears to be confined to the upper portion of the aquifer and it is oriented in a northeast-southwest direction. Based on the chemical properties of the contaminants, the slow rate of groundwater flow in the clayey silt, and the existing downgradient groundwater results, it appears that the distribution of the groundwater contamination has been determined, and that the likelihood of contaminant migrations to any exposure point (i.e., well D-1) is minimal.

4.4 Remedial Action

A ROD for the SPIA sites was signed in July 1996 documenting “No Action” as the final selected remedy for the SPIA monitored-area groundwater, surface water, soil, and sediment, and AOC 41 groundwater. Because “No Action” was selected and approved as the remedy, a FS was not performed and RAOs were not developed.

4.4.1 Selected Remedy

The selected remedy, as defined by the 1996 ROD, is summarized below.

- Groundwater monitoring; 1) monitoring wells will be used to monitor the groundwater from the

EOD Range, Zulu Ranges, Hotel Range, and AOC 41; 2) Monitoring wells will be used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area.

- Monitoring wells will be sampled for explosives, TCL organics, and TAL metals.
- Well D-1 will be sampled and samples will be analyzed for explosives and Massachusetts and federal drinking water requirements (MMCLs/MCLs).
- The Army will not develop new drinking water sources within the SPIA monitored area.
- An INRMP will be developed and implemented to monitor adverse effects on the ecosystem in the SPIA monitored area.
- Monitoring reports will include a description of site activities and a summary of analytical results. The Army will submit these reports annually.
- As required by CERCLA, because contaminants remain at the site at levels that are not appropriate for unrestricted land use and unlimited exposure, five-year reviews will be conducted to confirm the No Action remedy remains protective of human health and the environment.
- Should the Army close, transfer or change the use of this property, an EBS will be performed, and the "no action" decision of this ROD will be reexamined in light of the changed use following transfer or closure.

4.4.2 Remedy Implementation

Implementation of the remedy is described below.

The initial Long Term Groundwater Monitoring Plan (LTMMP) for the SPIA was issued in May 1997. The plan detailed the individual wells to be sampled on an annual basis. Perchlorate was added as a contaminant of concern for AOC 26 in 2006. Additional monitoring wells were installed at AOC 26 and within SPIA to act as sentinel wells.

The LTMMP was revised and reissued in October 2008 and in 2013 (*Sovereign/HGL, 2013*). The LTMMP incorporated changes to the SPIA monitoring program and included the following:

- Four monitoring wells and two well points sampled annually at AOC26. All wells sampled for explosives and TAL total metals. One monitoring well and both well points additionally sampled for perchlorate.
- Four monitoring wells sampled for TAL total metals and explosives biennially at AOC27.
- Eight SPM wells sampled for TAL metals and explosives annually. One SPM monitoring well, formerly part of AOC41, additionally sampled for VOCs.
- One drinking water well sampled annually for explosives.
- Gauge water levels at all monitoring wells at AOCs 25 and 41 every 5 years. Discontinuation of groundwater sampling at AOC 41 was approved after the 2006 LTM event with one well re-designated/retained as a SPM well. Discontinuation of groundwater sampling at AOC25 was approved based on recommendations in the 2004 LTM Report (*USACE-NAE, 2005*).

The SPM wells are used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area. One AOC 41 well was retained as an SPM well based on a detected VOCs constituent. Monitoring

wells at AOC 26 and 27 are sampled based on historic use of the sites for firearms and grenade training, as well as burning/open detonation of explosives. Three additional well points, not detailed in the 2008 LTMP, were installed in November 2009 at AOC 26 to delineate groundwater per an AOC 26 Perchlorate Work Plan (HGL, 2009).

A focused investigation was conducted in 2014 (*Sovereign/HGL, 2015*) to better define the explosives and perchlorate plumes known to be present at AOC 26. The LTMMP was updated in 2015 and included revisions to the AOC LTM as well as optimization recommendations.

4.4.3 System Operations/Operation and Maintenance (O&M)

4.4.3.1 Integrated Natural Resources Management Plan

An Ecological Sampling Work Plan was developed and implemented in 1998 to characterize surface water and sediment quality within the SPIA. Since 1998, the Army has completed various assessments including sensitive area characterizations, review of wetland complexes, benthic and mollusk studies, and review of impacted species. These studies have been submitted to the appropriate Fish and Wildlife Agencies.

The ROD issued for AOCs 25, 26, and AOC 27 in July 1996 selected "No Action" as the remedy for groundwater. The remedy did not include any formal remedial action but did include LTM activities and an INRMP. The ROD required INRMP was developed to assess if there were threats posed from SPIA ongoing or residual activities. The INRMP guided implementation of the natural resources program at Fort Devens, Massachusetts. The program provides conservation of Devens land and natural resources and helps ensure compliance with environmental laws and regulations. The INRMP helps ensure the maintenance of quality training lands to accomplish Devens critical military mission on a sustained basis and to ensure that natural resources conservation measures and U.S. Army Reserve military mission activities are integrated and consistent with federal stewardship requirements. The 2005 through 2009 INRMP accomplished the following:

The keystone for this five-year period was an interagency agreement between Devens and the national refuge system of the U.S. Fish and Wildlife Services (USFWS), Region 5. The agreement authorized the two agencies to cooperate on natural resource management action that are mutually beneficial to wildlife species, the two agencies, and the public. This achievement aided in the following:

1) The Army contributed to the cost of radio telemetry units and other supply items in support of the Service's efforts to help populate threatened species in the Oxbow National Wildlife Refuge (NWR) area to the Assabett NWR. The radios allowed biologists to monitor movements and survival, specifically, of the Blanding's turtle population. The goal has been to repopulate historical habitats with this species.
2) A second example of cooperative action involved habitat restoration on both sides of the Nashua River. The Army provided funds and contract specifications through the contracting office of the Service for the habitat. The result was additional bare ground for nesting turtles on the Oxbow NWR and a 3-acre clear-cut to regenerate a stand of aspen and maple on Army land. That stand will provide early succession forest habitat for species such as American woodcock and Woodland Jumping mouse.

- Continuation of surveying breeding bird populations on the South Post with emphasis on grassland birds on the Turner Drop Zone.
- Continuation of work with Mass Wildlife by hosting "Becoming an Outdoors Woman"

program events, and supporting the state's annual deer season for mobility impaired hunters.

4.4.3.2 Groundwater Sampling

Annual groundwater monitoring has been performed since 1997. The most recent LTM sampling event occurred in November 2014 and January 2015 (supplemental sampling). Annual reports have been provided for the 2010 through 2014 sampling events. The Hydrant/drinking water well, Well D-1, was sampled during each sampling event.

4.4.3.3 Other Control Measures

The Army will not develop new drinking water sources within the SPIA-monitored area. Should the Army close, transfer, or change the use of this property, an EBS will be performed, and the "No Action" decision of this ROD will be re-examined in light of the changed use and risk factors resulting from this closure/transfer.

4.5 Progress Since last Five Year Review

Overall progress towards achievement of the RAOs and protection of human health and the environment at OU#3 is assessed annually and reported in Annual Monitoring Reports.

Table 4.5
Protectiveness Determinations Statement from the 2010 FYR

SPIA	Protectiveness Determination	Protectiveness Statement
Site wide	Protective	*The No action remedy at AOCs 25, 26, 27, and 41 is protective of human health and the environment and exposure pathways that could results in unacceptable risks are being controlled*

Table 4.6
Status of Recommendations from the 2010 FYR

AOC	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
SPIA	None	*"The current remedy is effective at meeting the site's remedial objectives. Therefore, it is recommended that the current monitoring actions implemented at SPIA be continued."*	Federal Facility	EPA/State	NA	Ongoing	NA

The 2010 FYR also included the following recommendation: *"An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's LTM monitoring program is that the*

Army should install a new permanent monitoring well near downgradient well point 26WP-09-02. The permanent well will replace the well point as a sentry well for perchlorate monitoring." A monitoring well, 26M-10-09X was installed in 2010 near the well point 26WP-09-02 and has been added to the LTM program since 2010.

4.5.1 Long Term Monitoring Activities

An investigation was conducted in 2014 to better define the explosives and perchlorate plumes known to be present at AOC 26. This investigation included vertical groundwater profile sampling at eight locations, installation of monitoring locations (two monitoring wells, one well point, and two surface water level staff gauges); additional sampling (low-flow groundwater sampling, sediment sampling and surface water sampling); and one round of synoptic water level gauging across the SPIA facility. The results of this investigation are summarized in sections below and are presented in detail in the AOC 26 Investigation Report (Sovereign/HGL; 2015).

4.5.2 System Operation Activities

LTM activities at SPIA since 2010 have included annual and biennial groundwater sampling, annual well gauging and well gauging every five years.

4.6 Five Year Review Process

4.6.1 Administrative Components of the Five-Year Review Process

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led by Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

4.6.2 Community Notification and Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479.

4.6.3 Document Review

This five-year review for SPIA consisted of a review of relevant documents including previous Five-year reviews, LTM plans, RI reports, Investigation reports, annual reports and monitoring data.

4.6.4 Data Review

Groundwater at SPIA is sampled annually in the fall except for AOC 27 with is sampled biennially. Samples are submitted for explosives and dissolved metals analyses, samples collected from AOC26 are also submitted for perchlorate analyses. For this fourth five-year review, an increase in perchlorate at AOC 26 was noted in the fall of 2011 and an increase in RDX was reported in 2013. A focused investigation was conducted in 2014 to better define the perchlorate and explosives plumes in AOC 26.

4.6.4.1 AOC 25 Groundwater

Groundwater sampling at AOC 25 (a total of two wells) was discontinued after the 2004 annual event based on recommendations in the 2004 Annual Report.

4.6.4.2 AOC 26 Groundwater

Total metals detections at the AOC 26 wells have been below the respective monitoring requirements since 2003 and below the background levels since 2006. Since metals monitoring started at downgradient locations 26WP-06-01 in 2007 and at 26WP-08-02 in 2008, both well points have yielded groundwater exhibiting detections above the iron and the zinc background levels.

The elevated concentrations of iron and zinc in well point samples are likely the result of the iron/steel construction of the well points. It should also be noted that the well points were installed for the purpose of monitoring explosives and perchlorate and are not optimal for total metals.

Explosives have not been detected at well 26M-92-02X or 26WP-08-02. At the other AOC 26 wells, explosive compounds have been detected. In general, RDX concentrations in wells 26M-92-03X, 26M-92-04X, and 26M-97-08X are generally consistent with historical results and indicate a mixed but generally downward trend since the 2004 sampling event. However, a recent high of 1,010 ug/L was reported for 26M-92-04X in 2013;RDX was reported at 318 ug/L in the most recent sample collected in January 2015.

Perchlorate was permanently added to the AOC 26 contaminants list in 2006. The 2008 LTMP (*HGL 2008*) incorporated perchlorate as a sampling requirement for AOC 26 per agreement reached between the Army and regulatory agency. Recent monitoring as part of this 5-year review, suggest stable to decreasing concentrations, with a high of 332 ug/L detected in 26M-92-04X in 2011. Perchlorate was reported at 34.6 µg/L from the November 2014 sampling event.

The Army performed a perchlorate investigation at AOC 26 and determined that there is no indication that perchlorate is migrating off SPIA. Groundwater flow direction at AOC 26 would direct contaminants, if present, in the direction of AOC 27 towards Slate Rock Brook and not towards the western SPM boundary. The Army's findings, presented in a January 2010 letter report, indicate that perchlorate is decreasing and there is no significant perchlorate source present at the site.

Additional investigative actions were conducted from May to October 2014 at AOC 26 These results are presented in the Perchlorate and Explosives Investigation Report AOC 26 (*HGL/Sovereign, 2015*). This investigation work was conducted at the request of regulators to confirm the nature and extent of perchlorate and RDX contamination, to evaluate if there were potential impacts to an adjacent kettle pond and Slate Rock Brook and to confirm groundwater flow and potential for off-site migration.

This investigation included vertical groundwater profile sampling at eight locations, installation of monitoring locations (two monitoring wells, one well point, and two surface water level staff gauges); additional sampling (low-flow groundwater sampling, sediment sampling and surface water sampling);

and one round of synoptic water level gauging across the SPIA facility.

A total of eight direct push locations were advanced in May 2014 to better define the vertical and lateral extent of the perchlorate and explosives impacted groundwater plume. Four locations were advanced to profile the plume downgradient and sidegradient of 26M-92-04X (26GP-14-05, 26GP-14-06, 26GP-14-07 and 26GP-14-08). One profiling location, 26GP-14-04, was advanced to evaluate groundwater conditions between existing monitoring wells 26M-92-07X and 26M-92-06X. Profiling locations 26GP-14-01, 26GP-14-02 and 26GP-14-03 were advanced near existing monitoring locations, 26M-10-09X, 26WP-06-01, and 26M-92-04X, respectively, to provide characterization outside the associated well screen intervals. Following an evaluation of the analytical data obtained from direct push profile sampling, monitoring wells 26M-14-10X and 26M-14-11X were installed at groundwater profile points 26GP-14-08 and 26GP-14-07.

A sampling event was conducted in October 2014. Four groundwater wells (the two new wells and two existing wells (SPM-93-03X and SPM-93-06X), one sediment (26SD-41-01) and four surface water samples (26SW-14-01, 02, 03 and 04) were collected and submitted for explosives and perchlorate analyses. The sediment sample and three surface water samples were collected on the perimeter of the Kettle Pond to evaluate any potential interactions with the groundwater plume and surface water. The fourth surface water sample was collected from the Slate Rock Brook, west of Firebreak Road.

Well point 26WP-14-01 was installed near existing well point 26WP-06-01 to form a couplet to determine vertical hydraulic groundwater gradient near the kettle pond. Water level staff gauges were installed in the Kettle Pond near former SWEL18 (new location 26M-14-SWEL1) and 26WP-06-01 (new location 26M-14-SWEL2) to aid in the hydrogeologic evaluation of the site.

Perchlorate (0.15 J µg/L) and RDX (0.11 J µg/L) were detected in the groundwater sample collected from new monitoring well 26M-14-11X (screened 35 to 45 ft bgs). The sample collected from new monitoring well 26M-14-10X was non-detect for explosives and perchlorate. Groundwater samples collected from existing monitoring wells SPM-93-03X (screened 30 to 40 ft top of casing [TOC]) and SPM-93-06X (screened 39.5 to 49.5 ft TOC) were non-detect for perchlorate, but a detection of the explosives constituent 2,4-Dinitrotoluene (8.2 µg/L) was present in the groundwater sample from SPM-93-06X. All groundwater analytical results from the four monitoring wells sampled were below monitoring requirements for explosives and perchlorate.

The groundwater analytical results from the newly installed monitoring wells indicate that they will be useful sentry locations to monitor any future expansion of the contaminant plume downgradient and/or sidegradient of its present location. Groundwater analytical results from the existing SPM wells to the north/northeast indicate that the AOC 26 perchlorate and explosives plumes had not migrated into those areas.

The analytical result for the sediment sample collected at the Kettle Pond, 26SD-14-01, was non-detect for perchlorate; however, 2-nitrotoluene was reported at an estimated concentration of 20 milligrams per kilogram (mg/Kg). Analytical results from surface water sample 26SW-14-01, collected near the sediment sample location, indicated elevated concentrations of perchlorate (3.40 µg/L), RDX (33 µg/L), and HMX (6.6 µg/L). Surface water sample 26SW-14-02, collected directly to the north of 26WP-06-01 and on the other side of the Kettle Pond, was non-detect for explosives and perchlorate. Surface water sample 26SW-14-03, collected near new surface water level gauge 26M-14-SWEL1, was non-detect for perchlorate but had low level concentrations of RDX (0.25 J µg/L) and HMX (0.14 J µg/L). Surface water sample 26SW-14-04, collected from Slate Rock Brook west of Firebreak Road, was non-detect for explosives and perchlorate.

Based on results of the surface water sample 26SW-14-01, collected near 26WP-06-01/26M-14-SWEL2, elevated levels of perchlorate and explosives contamination appears to be discharging to the Kettle Pond in the general vicinity of 26M-14-SWEL2. The low detections of RDX and HMX in the surface water sample (26SW-14-03) collected near 26M-14-SWEL1 suggests that water discharging from the Kettle Pond to the west beyond Firebreak Road may be impacted. No contamination was detected in the surface water sample collected at Slate Rock Brook. Based on recommendations in the Perchlorate and Explosives Investigation Report (March 2015), surface water samples will be monitored seasonally over the course of one year to in order to evaluate impacts.

This investigation verified the lateral and vertical extent of explosives and perchlorate in groundwater to the east and south of the kettle pond at AOC 26. The investigation also confirmed the direction of groundwater flow, whether the kettle pond is a receptor and other potential contaminant migration routes.

Based on analytical results from 2010 through 2014, arsenic, iron and zinc exceedances above the respective groundwater standard or background level are confined to AOC 26. The groundwater flow direction is to the northeast based on the 2014 groundwater elevation data and any potential migration would be confined within the SPM boundary. A high of 68 ug/l arsenic and 9,790 ug/L zinc were reported for groundwater from well point 26WP-08-02 in 2012. In general, the recent results have been stable and consistent during this five year period. The total metals exceedances, even without turbidity issues, are not unanticipated because the well points were installed for perchlorate and explosives monitoring and are not optimal for metals analyses. The well points contain galvanized metals which is a potential contributor of iron and zinc. Total metals exceedances of background concentrations at permanent wells were also observed but did not show an increasing trend. Based on this information a potential for total metals migration does not exist.

4.6.4.3 AOC 27 Groundwater

In general, all metals detections in groundwater for the AOC 27 wells have remained below the respective monitoring requirements since 1997. Arsenic was detected in 2012 at 27M-93-06X at a concentration of 15 ug/L, which exceeds the GW-1 standard of 10 µg/L. Arsenic was non-detect in 2014.

At AOC 27, previously the only well with consistent detections for RDX X in groundwater was 27M-93-06X. The most recent detection of RDX in this well was 2.1 µg/L in October 2010; RDX was non-detect in 2012 and most recently in January 2015. Wells 27M-92-01X, 27M-93-05X, and 27M-93-08X had followed a general downward trend to non-detection.

4.6.4.4 AOC 41 Groundwater

Groundwater LTM was discontinued at AOC 41 following the 2006 LTM event.

Due to a minor exceedance of TCE in October 2006, annual sampling at well 41M-93-04X, groundwater sampling at this well was continued as part of the SPM well network. Although the 2006 TCE detection was above the historic results for well 41M-93-04X, TCE has not been detected (or was below monitoring requirements) since 2006.

4.6.5 South Post Monitoring Well Network

Explosives analytical results in groundwater at the SPM wells had been largely been non-detections since monitoring began in 1993, with the exception of two HMX and three RDX detections. All HMX detections were singular instances below 1 µg/L. RDX was detected in 2012 in SPM-93-06X at a concentration of 1.23 ug/L, exceeding the monitoring requirements of 1 ug/L. RDX was non-detect in

subsequent sampling events in 2013 and 2015.

Arsenic concentrations at SPM wells from 2010 through 2014 have exhibited a relative downward trend. This trend has continued through the 2014 sampling event with one exception of a detection of 15 µg/L in well SPM-93-06X in 2012; the results were non-detect in the most recent sample collected in 2014.

Historical data for well SPM-93-06X indicates periodic exceedance of arsenic. The 2014 total arsenic concentration reported for groundwater from this well was 12.5 µg/L. Low levels of arsenic above the 10 µg/L standard have been detected since 1993 but typically remain within a narrow detection range with no indication of an increasing concentration trend. Based on the well located centrally at SPIA, instead of at the perimeter, no potential for off-site migration exists.

4.6.6 Site Inspection

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. Features that were inspected included the access road, monitoring wells and piezometers. Observations were made regarding general conditions. The overall condition of the area was satisfactory. It should be noted Zulu and EOD Ranges could not be accessed due to military drills.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix E** along with supporting photographs.

4.6.7 Interviews

The following individuals were interviewed as part of the Five-Year Review:

- Mr. Daniel Groher, USACE, New England District;
- Fire Chief Joe LeBlanc, Devens Fire Department;
- Ms. Pamela Papineau, Ayer Board of Health
- Mr. Richard Doherty, PACE
- Mr. Ron Ostrowski, MassDevelopment; and,
- Mr. Neil Angus, MassDevelopment

As part of the FYR review process, interviews were conducted in March and April 2015 in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in **Appendix B**. In general, comments related to the site were positive and supportive. The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved.

Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

4.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

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

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning as intended by the decision documents as detailed below.

4.7.1 Remedial Action Performance

Long-term groundwater monitoring is performed on an annual basis to determine if contaminants are migrating off the SPIA-monitored area and to ensure that the no-action alternative remains protective of human health and the environment. The groundwater monitoring results reviewed for this fourth Five-Year Review indicates that contaminant migration beyond the monitored SPIA area has not occurred.

4.7.2 System Operations/Operation and Maintenance (Long-Term Groundwater Monitoring)

Groundwater monitoring is performed in accordance with the approved LTMP (HGL, 2008b) for SPIA. A focused investigation was conducted in 2014 to better define the explosives and perchlorate plumes at AOC 26.

4.7.3 Opportunities for Optimization

A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation *(Sovereign, 2014),* is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2014*). This report presents the results of an optimization evaluation of the long-term monitoring (LTM) program at Fort Devens, including the SPIA sites, AOC 26, AOC 27 and SPM.

Although contamination at these sites does not pose an unacceptable risk, continued monitoring is recommended due to the potential for additional releases at the active ranges (Zulu and Hotel Ranges). However, there are opportunities to optimize the monitoring program in terms of sampling frequency, sampling locations, and the analyte list. This evaluation is discussed in detail in Appendix A of the revised LTMMP (*Sovereign/HGL, 2014*).

4.7.4 Early Indicators of Potential Remedy Failure

No early indicators of potential remedy failure were noted during the review. Surface water samples collected during the 2014 AOC 26 investigation (*Sovereign/HGL, 2015*) appeared to indicate perchlorate and explosives impacts in groundwater and surface water due to surface water runoff discharges. A surface water sample collected from the northwest portion of Kettle Pond detected low levels of explosives which indicated that contamination may be discharging out of the pond to the northwest. Additional sampling has been recommended to confirm these results.

4.7.5 Implementation of Institutional Controls and Other Measures

There are no current or future plans for installation of potable water wells within the SPIA. The Army will maintain possession of the SPIA for the foreseeable future.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, and cleanup levels established in the 1996 ROD are still valid. However, updated groundwater standards for explosives and perchlorate have prompted additional investigations at AOC 26 to evaluate the extent of contamination.

4.7.6 Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance for the site were reviewed, as well as a review of current ARARs. The SPIA is a "No Action" site with no established RAOs but the reviews are performed to evaluate current site conditions with established or revised standards as discussed below.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD was 50 µg/L. Arsenic was present on site at concentrations greater than its MCL during the remedial investigation. The MCL for arsenic has been updated since the 1996 ROD and has been revised to 10 µg/L in 2006.

4.7.7 Changes in Exposure Pathways

The ROD did not identify any unacceptable risks from exposure to site contaminants in groundwater (i.e., limited to 2 weeks during a year) or soils under current use conditions. Because the remedy includes limiting the use of groundwater as drinking water (specifically the transient, non-community supply well, D-1), no excessive or unacceptable risks currently exist at the site.

Surface water samples collected during the 2014 AOC 26 investigation (Sovereign/HGL, 2015) appeared to indicate contamination from the perchlorate and explosives groundwater plumes via groundwater discharge. Further investigations have been proposed. Land use has not changed since the original BLRA and future use is expected to remain unchanged.

4.7.8 Changes in Toxicology and Other Contaminant Characteristics

The original HHRA identified no health threats to current receptors. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the ROD are still valid.

4.7.9 Changes in Risk Assessment Methodology

While numerous methodologies have changed since the original risk assessment was prepared, there are no risk assessment methodology changes that affect the protectiveness of the remedy since it was not risk-based. The LTM monitoring requirement remains valid for the purposes of confirming that migration and changes in land use have not occurred.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy as defined by the 1996 "No Action" ROD. Additional surface water and groundwater sampling has been recommended to confirm the results of the 2014 perchlorate and explosives investigation and evaluate the extent of contamination.

4.7.10 Summary of Technical Assessment

While several risk assessment methodologies have changed since the original risk assessments were prepared, the Army maintains ownership of the SPIA and controls are in place to limit groundwater use as drinking water source. Although impacts at these sites do not pose an unacceptable risk, continued monitoring is recommended due to the potential for additional releases at the active ranges (Zulu and Hotel Ranges). The LTMMP was revised in 2014 to update the LTM program at AOCs 26, AOCs 27 and

the SPM; These updates and optimization recommendations are presented in the 2015 Final LTMMP (Sovereign/HGL, 2015).

4.8 Issues

This Five-Year Review for SPIA sites AOC 25, AOC 26, AOC 27, and AOC 41 indicates that no issues are present that currently prevent the "no action remedy" from being protective now or in the future.

4.9 Recommendations and Follow Up Actions

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

4.10 Protectiveness Statement

The "No Action" remedy at AOCs 25, 26, 27, and 41 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

4.11 Next Review

The next five year review for SPIA is required five years from the completion of this review.

4.12 References

References are included in **Appendix A**.

5 BARNUM ROAD MAINTENANCE YARDS (AOCS 44 AND 52)

5.1 Introduction

This is the fourth five-year review for Barnum Road Maintenance Yards, consisting of AOC 44s and 52.

5.2 Site Chronology

Table 5.1

Chronology of Events, Barnum Road Maintenance Yards (AOCs 44 and 52)

Event	Date
Motor vehicle gasoline (MOGAS)(20 gallons) released at Cannibalization Yard	April 1985
Exploratory test pits for spill containment basin in the Table of Distribution and Allowances (TDA) Maintenance Yards; petroleum contaminated soil detected (0-12 inches depth)	July 1991
Contaminated soil removed from TDA Maintenance Yard during spill containment basin construction	December 1991
Waste oil underground storage tank (UST) removed at Cannibalization Yard (120 cy of contaminated soil removed)	May 1992 July 1992
SI completed	April 1993
SSI completed, SAs designated as AOCs	June 1993
FS issued	January 1994
ROD signature and Remedial Design issued	March 1995
Remedial actions	August 1995 – April 1996
Groundwater Monitoring Plan issued	April 1998
Round 1 Annual Groundwater Sampling Report issued	October 1998
Round 2 Annual Groundwater Sampling Report issued with recommendations to discontinue groundwater sampling	October 1999
First Five-Year Review	September 2000
Round 3 Groundwater Sampling Report	April 2004
Draft Remedial Action Report issued	May 2004
Second Five-Year Review	September 2005
Final Remedial Action Report	September 2005
Real Property Master Plan Long Range Component - Addendum	September 2007
Devens RFTA MMRP Site Inspection	May 2008
Environmental Protection Plan AFRC Fort Devens	April 2009
AFRC construction activities begin	April 2009
Third Five Year Review	September 2010

5.3 Background

The Barnum Road Maintenance Yards (AOCs 44 and 52) are former Army vehicle storage and maintenance yards located within the former Fort Devens. These sites were combined administratively under one ROD because of their proximity and similar petroleum releases. The sites are situated in the northeast corner of the former Main Post on Barnum Road, approximately ½ mile southwest of the former Barnum Road Gate. The total area of the Barnum Road Maintenance Yards is approximately 8.8 acres (**Appendix F, Figure 5.1**). The Maintenance Yards are bordered to the north by Massachusetts

Army National Guard (MANG) property, which is used for similar vehicle storage activities as the Barnum Road Maintenance Yards. Boston and Maine Railroad property and Barnum Road border the site to the west and east, respectively. Building 3713 (now demolished), was part of the maintenance yards infrastructure and was located adjacent to the south end of the yards. Through early 2009, the Maintenance Yards were fenced, paved, and were used for military vehicle parking. The site has undergone reconstruction and is used as an Armed Forces Reserve Center (AFRC). The former maintenance yards were removed during reconstruction activities. Construction activities included building demolition and construction of an AFRC building, maintenance shops, a multi-purpose classroom building, and a new parking area. Site reconstruction was initiated in March 2009 and completed in 2011.

Prior to base closure, AOC 44 was known as the Cannibalization Yard. It was an area where vehicles were stored before being dismantled for usable parts. AOC 52 was a maintenance yard where vehicles were stored awaiting repairs. AOC 52 was historically known as the TDA Maintenance Yard. Northwest of the Cannibalization Yard was a separately fenced vehicle storage yard known as the Regional Training Site Yard. An area that was fenced off southeast of the main portion of the TDA Maintenance Yard was known as K-Yard. All four of these yards had a long and continuing history of vehicle storage; hence at the direction of the Army, they were all included as AOCs 44 and 52 and combined as one operable unit. They are referred to collectively in the ROD and this Five-Year Review as the Maintenance Yards.

The groundwater in the aquifer underlying the Maintenance Yards has been assigned to Class 1 under Commonwealth of Massachusetts regulations. Class 1 consists of groundwater that is designated as a source of potable water supply. Based on a 1992 SI water level survey, inferred groundwater flow from the Maintenance Yards is northeast toward Grove Pond. The town of Ayer currently owns and maintains two water supply wells within 150 feet (ft) of the south side of Grove Pond and approximately ½ mile from the yards. There is no evidence that contamination found in the Maintenance Yards has or is affecting groundwater quality.

The soils of the site have been exposed to possible vehicle crankcase releases over a long duration. Gasoline, motor oil, and other automotive fluids have also likely been released during vehicle dismantling operations in the Cannibalization Yard. Individual releases were not likely to have been of significant volume, but numerous releases during the period in which the yard was used account for the soil contamination problem. The only recorded significant vehicle release was an estimated 20 gallons of MOGAS and hydraulic fluid released near the center of the Cannibalization Yard in 1985 during the cannibalization process. Approximately 4 cy of visibly contaminated soils were excavated immediately and containerized by Army personnel.

In July 1991, exploratory test pits were excavated for construction of a concrete spill- containment basin in the southeast corner of the TDA Maintenance Yard. The test pits revealed zones of petroleum-contaminated soil below the surface. In November and December 1991, the 100 by 160-foot proposed spill-containment basin area was excavated to begin construction. Excavation continued until field screening and visual observation indicated that contaminated soils had been removed. The contaminated layer was present from the ground surface to 12 inches below ground surface (bgs). The contaminated soil was believed to be asphalt treated, gravel road base. Field screening of soil samples collected from the proposed basin's subgrade at the bottom of the excavation indicated total petroleum hydrocarbon (TPH) compounds concentrations ranging from non-detect to 7 parts per million (ppm).

A 1,000-gallon UST formerly used to store waste oil was removed from the Cannibalization Yard in May 1992. Laboratory analysis of soil samples detected TPH compound concentrations of 17,600 ppm and

9,780 ppm. After over-excavation of the tank site in July 1992, residual soil TPH compound concentrations ranged up to 2,740 ppm at the limits of the excavation. In total, an estimated 120 cy of contaminated soil was removed from the waste oil storage tank area and shipped to an off-site facility.

5.4 Remedial Actions

The following is a summary of the remedial action selected for the AOCs 44 and 52 sites:

A ROD was signed in March 1995 documenting asphalt batching as the final selected remedy for cleanup of contaminated surface soils and soils associated with two known releases at AOCs 44 and 52 (*USAEC, 1995*). Remedial Action Objectives (RAO) for the selected cleanup remedy at AOCs 44 and 52 include:

- Minimize direct contact/ingestion and inhalation with Maintenance Yards surface soils, which are estimated to contain contaminants exceeding the USEPA Superfund target range of one in 1.0 x 10-4 to one in 1.0 x 10-6 (excess cancer risks for carcinogens).
- Reduce off site run off of contaminants that may result in concentrations in excess of Ambient Surface Water Quality standards and background concentrations in sediments.
- Reduce or contain the source of contamination to minimize potential migration of contaminants of concern (COC), which may result in groundwater concentrations in excess of the federal drinking water maximum contaminant levels (MCL).

5.4.1 Remedy Selection

Per the 1995 ROD, the selected remedy at AOCs 44 and 52 addressed long-term worker exposure to contaminated surface soil, the principal known threat at the Maintenance Yards, and two known release areas (a reported release of MOGAS and leakage from a former waste oil UST, herein referred to as the hot spot areas). The selected remedial alternative relied on cold mix asphalt batching soils to control site risks. The following were the major components of the remedy.

- Excavate surface soil (top 2 ft across the site);
- Excavate the two hot spot areas;
- Stockpile soils for sampling and analysis;
- Cold mix asphalt batch soils exceeding site cleanup levels of 7 ppm (average) total carcinogenic polynuclear aromatic hydrocarbons (PAH) and 500 ppm TPH compounds;
- Backfill excavations with uncontaminated stockpiled soil and then place the asphalt batched material;
- Apply a pavement-wearing course for vehicle-parking surface;
- Expand the existing stormwater collection system;
- Perform groundwater monitoring; and
- As a precautionary measure, institute the following institutional controls (IC) deed restrictions:
    1) Prohibit residential development/use of the Maintenance Yards;
    2) Minimize the possibility of long-term (working lifetime) exposure to subsurface soils; and
    3) Require management of soils resulting from construction related activities.

5.4.2 Remedy Implementation

Remedy implementation consisted of completion of a remedial design and the remedial action, performing groundwater monitoring, and enforcing ICs. Remedial construction was completed by April 1996. The Remedial Action Completion Report was issued on June 1996 (Weston, 1996). Implementation of the remedy is described below.

The design was performed by ABB Environmental Services, Inc. (ABB-ES) and MACTEC Engineering and Consulting. Pre-design field activities commenced July 1994 in anticipation that the ROD would be signed prior to completion of the remedial design. Pre-design field activities consisted of excavating test pits, evaluating the existing storm water system and performing a site topographic survey.

5.4.2.1 Remedial Actions

Construction commenced in August 1995 and entailed excavation and sampling of over 30,000 cy of soils. The top two ft of soils exceeding the cleanup level of 7 ppm for PAH and 500 ppm for TPH were excavated. During the excavation, a total of three hot spots were excavated below the 2 ft surface soil depth. These areas included the suspected batch contaminated sub-base soil at the UST over-excavated area and the MOGAS spill area. Sampling of soils from in situ and stockpiles from these areas revealed that TPH concentrations were below the site cleanup level of 500 ppm.

Treatment was performed by cold mix asphalt batching 11,800 cy of contaminated soils and then backfilling/compacting both the uncontaminated excavated soils and the asphalt batched material as a sub-base material in the excavation. The top 9 inches of backfilled material consisted of batched material and the bottom 15 inches consisted of uncontaminated backfill soil. Four inches of bituminous pavement was placed over this sub-base material to complete a pavement wearing course for Army vehicle parking.

In addition to the excavation, a drainage system was installed throughout the Maintenance Yards to collect stormwater from the new paved surface. A detention pond was constructed to store accumulated rainfall and minimize flow at the outfall at Cold Spring Brook during heavy storm events. In addition, an oil/water separator was installed as part of the storm drain system. The detention pond was constructed in the area of a suspected acid leaching pit associated with the TDA Building, SA 38D. The leaching pit was not located during construction activities. Remedial construction was completed by April 1996.

The 2009 construction activities removed the pavement and the oil water separator. The drainage system was modified to be compatible with the new site lay out.

Figure 5.2 shows the new site lay-out relative to the previous Maintenance Yards configuration. The detention pond located southeast of Barnum Road was not modified. The construction activities were performed in accordance with an Environment Protection Plan (EPP) for the AFRC reconstruction to meet the requirements of the ROD for remedy protectiveness during construction and to and ensure the remedy maintained its intended protectiveness after construction activities were complete (GeoInsight, Inc., 2009).

5.4.2.2 Groundwater Sampling

The objective of the groundwater monitoring required by the ROD was to provide assurance to the public and regulatory agencies that the groundwater in the aquifer underlying the facility remains unaffected by past Maintenance Yard activities and that it has not been adversely affected by remedial activities.

The need to investigate groundwater directly downgradient of the former waste oil tank and MOGAS spill was discussed during a draft FS review meeting held at Devens on May 5, 1993 (ROD, Barnum

Road Maintenance Yards, ABB-ES, 1995a). In response to comments, the Army installed two monitoring wells positioned to readily detect the full impact of the tank and spill contamination sources on the groundwater. The two monitoring wells, G3M-93-10X and G3M-93-11X, were installed at the edge of the Cannibalization Yard. G3M-93-10X was located approximately 50 ft downgradient of the former tank area and G3M-93-11X was located approximately 50 ft downgradient of the MOGAS spill area.

Two rounds of samples were collected from wells G3M-93-10X and G3M-93-11X and analyzed for volatile organic compounds (VOC), semi-volatile organic compound (SVOC), TPH, and inorganics. Results from Round 1 (June 1991) showed no detections of TPH or VOCs.

In Round 2 (September 1993), trace concentrations of toluene (2.6 µg/L and 1.25 µg/L in G3M-93-10X and -11X, respectively) and tetrachloroethene (PCE) (2.6 µg/L G3M-93-10X) were detected in the groundwater. Concentrations for these analytes were below state and federal drinking water MCLs and below MCP GW-1 standards. The only detected SVOC was bis (2-ethylhexyl) phthalate, a suspected laboratory contaminant, at 22 µg/L in the Round 1 sample from G3M-93-10X. No significant contamination was detected supporting the conclusion that surface soil contaminants at the Cannibalization Yard had not affected the aquifer and indicated that the waste oil UST and the MOGAS spill were not significant contributors to groundwater contamination. Based on these results, the ROD did not require installation of additional monitoring wells.

The SAP for groundwater LTM required by the ROD was issued in April 1998 (Weston, 1998a). This plan specified that annual sampling would be performed at three existing monitoring wells G3M-92-04X, G3M-92-05X, and MNG-1, for two years. These wells were located within the maintenance yard fence at the downgradient edge of the maintenance yards (G3M-92-04X), downgradient and outside the maintenance yard fence (MNG-1), and cross- gradient of the maintenance yards (G3M-92-05X). Monitoring well MHG-1, located on MANG property north of the Maintenance Yards, could not be located during sampling rounds and was likely destroyed during previous construction activities.

The first annual round of samples was collected at monitoring wells G3M-92-04X and G3M 92-05X in May 1998, and no concentrations of extractable petroleum hydrocarbons (EPH), volatile petroleum hydrocarbons (VPH) or lead were detected above MCP Method 1 GW-1 Standards. The analytical results were presented in the 1998 Annual Groundwater Sampling Report along with recommendation to discontinue monitoring if the 1999 sampling showed similar results (Weston, 1998b). The second annual round of sampling was completed in June 1999 with no reported exceedances of MCP GW-1 standards. Because 2 years of monitoring had been completed as planned and there were no exceedances of the standards, the 1999 Annual Groundwater Sampling Report recommended that groundwater monitoring be discontinued (Weston, 1999).

In response to the recommendations of the sampling reports, USEPA provided a letter of concurrence to the Army agreeing that groundwater monitoring was no longer needed at the site. USEPA stated that one more round of sampling would satisfy the ROD requirement that sampling be performed "…for a period of five years upon commencement of remedial activities" (USEPA, 1999). MassDEP questioned the recommendation to discontinue sampling and the matter was discussed at a BRAC Cleanup Team (BCT) meeting in April 2000. Meeting minutes indicate brief discussion with the outcome that the need for additional sampling was left to the discretion of the Army. The decision to terminate sampling was documented in the First Five-Year Review (HLA, 2000).

Subsequently, a third round of groundwater monitoring was performed in December 2003 to verify that the aquifer remained unaffected. Some PAHs were detected in the groundwater samples but all reported

detections were below MCP GW-1 standards. This final round was completed more than five years after issuance of the Groundwater SAP and more than eight years after commencement of remedial activities. The requirements of both the SAP and ROD for the duration of groundwater monitoring were thereby satisfied. No additional groundwater sampling has been performed after the December 2003 event.

Analytical summary tables are provided in **Appendix F**.

5.4.2.3 Institutional Controls

The ROD required implementation of ICs as a precautionary measure to prevent exposure to subsurface soils and possible long-term exposure to site workers. The ICs are described in Section 2.3.2 of this report.

There are no current or future plans for transfer of property from Army ownership at this time. The Real Property Master Plan (RPMP), Long Term Component, currently defines the ICs. If property transfer occurs in the future, ICs, if still required, will be incorporated into the Finding of Suitability to Transfer (FOST) and property transfer deed.

5.4.3 System Operation/Operations and Maintenance

At this time, other than standard maintenance requirements of the surface water drainage system and ensuring the subsurface soil remains capped by a 2-foot layer of clean soil or pavement, there are no long-term operations and maintenance (O&M) needs to maintain the integrity of the remedial action.

5.5 Progress Since last Five-Year Review

The following is the protectiveness statement from the 2010 Five-Year Review:

Table 5.2
Protectiveness Determinations Statement from the 2010 FYR

AOC 44/52	Protectiveness Determination	Protectiveness Statement
Site wide	Protective	*"The remedy at AOCs 32 and AOC 43A is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Post construction groundwater flow patterns have been defined and no new potential receptors have been identified. ICs that prohibit access to the site's groundwater for residential or commercial use are in place. Current remedial action activity consists of implementing the remaining components specified in the ROD: the long-term groundwater monitoring program, utilizing ICs, annual reporting, evaluation of the monitored natural attenuation performance, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress."*

The following recommendations were made:

Table 5.3
Status of Recommendations from the 2010 FYR

AOC	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
44/52	None	*Perform post-construction inspection and review of as-built construction plans to ensure ROD provisions for maintaining a 2-foot surface cover over subsurface soil are maintained and stormwater drainage system is adequate and discharges to retention basin.*	Federal Facility	EPA/State	NA	Ongoing /completed	NA

In the last five years, these recommendations were addressed as follows:

The LUCs that are applicable for AOCs 44 and 52 were included in the September 2007 Real Property Master Plan Long Range Component Addendum and were identified as Area F (3700 Area–Barnum Road Maintenance Yards). O&M of the AOC 44 and 52 drainage system was performed per the Storm Water Management Plan on a semi-annual basis or following storm events up until the time of the AFRC construction in April 2009. The selected remedy is complete and no additional site activities concerning remedy implementation are required. An AFRC building located over a portion of the former AOC 44 and 52 areas incorporated a vapor barrier beneath the building slab to alleviate any concerns with potential vapor intrusion from any potentially impacted subsurface soils. No impacted soils were noted in this area during construction. All site constructions activities followed provisions of the 2009 EPP. A Soils Management Plan, which detailed the ROD requirements during construction, was included as Appendix O of the EPP.

Based on the noted conditions and finding of third five year review, the Army updated the Storm Water Management Plan and the IMP describing the O&M of the drainage system.

5.6 Five-Year Review Process

5.6.1 Administrative Components of the Five-Year Review Process

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led by Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

5.6.2 Community Notification and Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479

5.6.3 Document Review

This five-year review for AOC 44 and 52 consisted of a review of relevant documents including previous Five-year reviews and SI and RI reports.

5.6.4 Data Review

No new soil or groundwater data was available for review during this Five-Year review. The latest groundwater data from the site was obtained during 2003 and evaluated during the previous Five-Year review. Comparison of the previous (2003) data to current standards revealed no COC exceedance.

According to the 2005 Final Remedial Action Report (Mactec, 2005), the remedial action at AOCs 44 and 52 is considered complete and no additional sampling activities are required.

5.6.5 Site Inspection

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. Site features that were inspected included the asphalt pavement, access road, monitoring wells and piezometers. Observations were made regarding the general conditions. The overall condition of the site was satisfactory.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix F** along with supporting photographs.

5.6.6 Interviews

The following individuals were interviewed in May 2015 as part of the five-year review:

- Mr. Daniel Groher, USACE, New England District;
- Fire Chief Joe LeBlanc, Devens Fire Department;
- Ms. Pamela Papineau, Ayer Board of Health

- Mr. Richard Doherty, PACE
- Mr. Ron Ostrowski, MassDevelopment; and,
- Mr. Neil Angus, MassDevelopment

As part of the FYR review process, interviews were conducted in March and April 2015 in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in **Appendix B**. In general, comments related to the site were positive and supportive. The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved.

Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

5.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

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

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the ROD.

5.7.1 Remedial Action Performance

Remedial action and groundwater monitoring at AOCs 44 and 52 are complete. The asphalt batching of contaminated soils remains effective at immobilizing the petroleum related contaminants and has met the objectives of the remedial action. The cover over the untreated subsurface soils remains in place and recent on-site construction activities have complied with the provisions of the ROD concerning construction activity soil management practices. Previous groundwater monitoring has confirmed that migration of surface soil contaminants to the aquifer following the historic releases at the site, or because of remedial activities, has not occurred.

5.7.2 System Operations/Operation and Maintenance

Other basic maintenance of the stormwater system, there is no system O&M requirement.

5.7.3 Opportunities for Optimization

Remedial action activities have been completed at this site. Therefore, there are no proposed opportunities for optimization.

5.7.4 Early Indicators of Potential Remedy Failure

No early indicators of potential remedy failure were noted during the review. No infractions of the IC requirements were noted during the site inspection; however, a post-construction site inspection is recommended to ensure provisions specified in the ICs are maintained.

5.7.5 Implementation of Institutional Controls and Other Measures

The property that consisted of the former Maintenance Yards remains under Army ownership. ICs remain in place per the RPMP Long Range Component, September 2007 Addendum.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes. The remedy is complete and there were no changes that could affect the protectiveness of the remedy.

Remedial excavation activities and asphalt batching of contaminated soils at AOC 44 and 52 were completed in April 1996. The RAOs for soil specified in the ROD have been permanently achieved. Because the remedy minimizes the exposure pathway, changes in exposure assumptions, toxicological values, or other aspects of the risk assessment process do not affect the remedy protectiveness. Construction activities were performed in accordance with ROD requirements. The physical condition remains consistent with ROD requirements thus remedy protectiveness is not affected.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. No information that would call into question the protectiveness of the remedy was noted. The AFRC construction is compliant with the requirements of the ROD and there is no change or impact to the protectiveness of the remedy.

5.7.6 Summary of Technical Assessment

Excavation activities and asphalt batching of contaminated soils at AOCs 44 and 52 were completed in April 1996. The RAOs for soil specified in the ROD have been permanently achieved.

Annual groundwater monitoring has been completed, and a supplemental sampling round performed in December 2003 revealed no data exceeded the groundwater MCLs or MCP Method 1 GW-1 standards. The site reconstruction activities have not affected the protectiveness of the remedy and the remedy is functioning as intended by the 1995 ROD. There is no other information that calls into question the protectiveness of the remedy. The remedial action is complete and annual groundwater monitoring has been completed as of the Final Remedial Action Report, September 2005

5.8 Issues

This five year review indicates that no issues are present at the AOC 44 and 52.

5.9 Recommendation and Follow up Actions

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

5.10 Protectiveness Statement

The remedy at AOCs 44 and 52 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

5.11 Next Review

The next five year review for AOCs 44 and 52 is required five years from the completion of this review.

5.12 References

References are included in **Appendix A**.

6 DEFENSE REUTILIZATION AND MARKETING OFFICE AREA OF CONTAMINATION 32 AND 43A

6.1 Introduction

This is the fourth five-year review for Defense Reutilization and Marketing Office (DRMO) AOCs 32 and 43A the last being completed in 2010. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The DRMO consists of two areas of contamination (AOCs 32 and 43A); all of which are addressed in this five-year review.

6.2 Site Chronology

Table 6.1
Chronology of Events for AOC 32

Event	Date
Final NPL Listing	November 1989
SI initiated	1991
RI completed	1994
FS completed	1997
ROD signature	1998
First Five-Year Statutory Review	September 2000
MNA Assessment	2000
Replacement monitoring well and piezometer installation	2001
Groundwater LTM	2002 to present
Second Five-Year Review	2005
Draft Technical Memorandum: Analysis of Bedrock Structure, Implications to LTM	May 2006
LTMP	November 2008
Persulfate Injection Work Plan	January 2009
Persulfate Injection	February 2009
Persulfate Injection Evaluation Report	June 2009
Draft Final Technical Memorandum, Sampling and Evaluation of Vapor Intrusion	August 2009
Annual LTM	2005-2009
Third Five-Year Review	September 2010
Annual LTM	2010-2015

Table 6.2
Chronology of Events for AOC 43A

Event	Date
Final NPL Listing	November 1989
SI initiated	1991
RI completed	1994
FS completed	1997
ROD signature	1998
First Five-Year Statutory Review	September 2000
MNA Assessment	2000
Replacement monitoring well and piezometer installation	2001
Groundwater LTM	2002 to 2005
Second Five-Year Review	September 2005
Groundwater Monitoring Discontinued	October 2005
Semiannual water level gauging	2005-2009
Third Five-Year Review	September 2010

6.3 Background

AOCs 32 and 43A are historically contaminated locations within the former Fort Devens property. AOC 32, the Defense Reutilization and Marketing Office Yard (DRMO) was located on the west side of Cook Street (West Yard) in the northeast portion of the former Main Post. AOC 43A was located to the south of AOC 32, across from the former Market Street. Market Street was removed during construction of a distribution warehouse. The warehouse is currently vacant. It was sold in 2014 and is currently owned by Ozark Automotive Distributers, Inc. LUCs were established to limit the potential exposure to the contaminated soil and groundwater under both the existing and future site conditions, per the ROD signed in February 1998, and were incorporated into the deed upon transfer to MassDevelopment, then to Calare Properties, Inc, and now to Ozark Automotive Distributers, Inc. **Figure 6.1** in **Appendix G** shows current conditions with a new buildings and roads.

The two sites were combined administratively under one ROD, but are described separately in the following subsection for clarity.

AOC 32 was known as the Defense Reutilization and Marketing Office (DRMO) Yard and consisted of three fenced areas. The West Yard, located on the west side of Cook Street, was a paved area used for the storage of used equipment with lead-acid batteries, and telecommunications and administrative equipment. The East Yard, located on the east side of Cook Street, was a paved area used for disassembling vehicles for reusable parts. This yard previously contained scrap metal, tires, stored items for sale, and used photographic solutions. The third fenced area was an unpaved area located just north of the East Yard. It was used for the storage and recycling of tires. AOC 32 also contains a former UST site (UST #13) located just northeast of Building T-204 (DRMO Office) that was incorporated into AOC 32. The UST was used to store waste oil. Operational records indicated that the facility was active from at least 1964 to 1995.

In 1991, the Army performed a SI at AOC 32 and reported contamination exceeding screening concentrations for soil and groundwater. A RI was initiated to determine the nature and distribution of contamination at AOC 32, assess the risk to human health, and provide a basis for performing a FS. The final RI report, issued in 1994, concluded that soil contamination and groundwater contamination required a remedial action evaluation.

A FS designed to develop and analyze potential remedial alternatives for cleanup at AOC 32 was issued in January 1997. After submission of the Army's PP and receipt of public comments on the preferred remedial alternatives, the Army issued a ROD, documenting the final choice of remedy for cleanup of soils by excavation with off-site disposal and cleanup of groundwater by monitored natural attenuation. The ROD was signed in February 1998.

An evaluation of monitored natural attenuation as was performed for AOC 32. The Monitored Natural Attenuation Assessment (MNAA) Report (SWETS, 2000b) summarized the data collected from MNA field activities that began in January 1999, and presented the final assessment and recommendations concerning natural attenuation effectiveness based on ROD criteria. The report concluded that natural attenuation, supplemented with long-term groundwater monitoring and establishment of ICs, would be an effective remedial action at AOC 32.

AOC 43A, known as the POL (petroleum, oils and lubricants) Storage Area at the time of base closure in 1996, was located across Market Street from AOC 32. AOC 43A consisted of a fenced lot located within an industrial area and served as the distribution point for all gasoline and other fuels at Devens during the 1940s and 1950s.

The former distribution facility consisted of a main gasoline station building (T250), a pump house, four 12,000-gallon USTs, one 10,000-gallon UST, two 12,000-gallon above ground storage tanks (ASTs), and two 8,000-gallon ASTs. Gasoline was delivered to the facility via railroad and was transferred to the storage tanks. The railroad tracks formerly used to transport fuels to the site, formed the site's northern boundary. An asphalt driveway led into the POL storage area from Antietam Street. The driveway was bermed to contain potential spills. A pump station was located in the center of the fenced area and the USTs were located on the eastern side of the site.

During the 1992 SI of the POL storage area, field screening and confirmation sampling indicated that a low level of xylene and an elevated level of petroleum hydrocarbons existed within the subsurface soils. An RI was performed and the final report concluded that groundwater contamination required a remedial action evaluation.

A FS, performed to develop and assess potential remedial alternatives for cleanup at AOC 43A, was issued in January 1997. Following submission of the Army's PP and receipt of public comments on the preferred remedial alternatives, the Army issued a ROD to document the final choice of a remedy for cleanup of groundwater by MNA. The ROD was signed in February 1998.

A separate (from AOC 32) MNA evaluation was performed for AOC 43A. The MNAA Report (SWETS, 2000c) summarized the data collected from MNAA field activities that began in January 1999 and presented the final assessment and recommendations concerning natural attenuation effectiveness based on ROD criteria. The report concluded that natural attenuation, supplemented with long-term monitoring and establishment of institutional controls, would be an effective remedial action at AOC 43A.

6.3.1 Physical Characteristics

Interpretive water table elevation maps prepared for AOCs 32 and 43A show the presence of a groundwater divide that dissects the sites. Groundwater on one side of the divide flows to the east and groundwater on the other side of the divide flows to the south. The groundwater gradient east of the divide was 0.004 ft/ft in the bedrock wells during the spring 2014 monitoring event and 0.008 ft/ft in overburden wells during the same period. The groundwater gradient west of the divide was 0.017 ft/ft in the bedrock wells during the spring 2014 monitoring event and 0.01 ft/ft in the overburden wells during

the same period. The selected flow direction and subsequent gradient calculations were based on areas perceived to represent typical gradients based on the observed equipotential contours.

6.3.2 Land and Resource Use

In 2000, AOCs 32 and 43A underwent significant redevelopment. The two AOCs, now lot 10, were modified by the construction of a large warehouse that was completed in 2001. Bedrock outcrops east of the DRMO East Yard and east of the POL Storage Area were removed to accommodate the construction of the distribution warehouse. The warehouse and pavement cover major portions of both AOCs, thereby altering local recharge patterns to overburden and bedrock which potentially altered the site hydrology. The ROD included LUCs to limit exposure to contaminated groundwater under current and future site use.

6.4 Remedial Actions

The RAOs for AOCs 32 and 43A as defined by the ROD are discussed in the following subsections.

Surface and Subsurface Soil Remedial Objectives

The RAOs for surface and subsurface soils were:

- Prevent direct and indirect contact, ingestion, and inhalation of the soil contaminated with COCs at levels that could pose risks to human and ecological receptors.
- Prevent erosion and migration of soil contaminated with COCs to storm sewers and surface water bodies.
- Prevent COC migration to the groundwater at levels that could adversely affect human health and the environment.

6.4.1.1 Groundwater Remedial Objectives

The RAOs for groundwater included the following:

- Prevent off-site migration of COCs at levels that could adversely affect flora and fauna.
- Prevent lateral and vertical migration of COCs at levels that could adversely affect potential and existing drinking water supply aquifers.
- Prevent seepage of groundwater from AOC 32 and 43A that could result in surface water concentrations in excess of ambient water quality standards.

The Main Post groundwater cleanup goals were developed from numerous sources and were presented in the ROD. These cleanup goals were used to screen groundwater data from both AOC 32 (UST #13) and AOCs 32 and 43A (DRMO/POL). When available, the most stringent of the ARARs was selected as a potential candidate cleanup goal. If no risk values were established, then the most stringent of the USEPA Office of Drinking Water Health Advisories, USEPA Region III tap water criteria, or the MassDEP Office of Research and Standards Guidance Levels, for chemicals for which MMCLs have not been promulgated, was selected. If measurable concentrations were below background values, the background concentrations were established as the goal. Because cleanup goals were not established in the ROD for EPH/VPH, the MCP GW-1 standard was used as the effective cleanup goal. Site- specific cleanup goals were developed for cis-1,2-dichloroethene (*cis*-1,2-DCE), 1,1,1 trichloroethene, and C19-C36aliphatics. Current groundwater cleanup goals for COCs are shown in the following Table.

Table 6.3
Contaminants of Concern Cleanup Goals in Groundwater AOCs 32 and 43A

Contaminant of Concern	Cleanup Goals [1,4](µg/L)
VOCs	
Vinyl Chloride	2
trans-1,2-dichloroethene(trans-1,2-DCE)	100
cis-1,2-dichloroethene(*cis*-1,2-DCE)	55[3]
1,1,1-trichloroethane	5[3]
Trichloroethene (TCE)	5
Benzene	5
Chlorobenzene	100
Ethylbenzene	700
Toluene	1,000
1,1,2-trichloroethane	5
1,2-dichlorobenzene (1,2-DCB)	600
1,3-dichlorobenzene (1,3-DCB)	40[2]
1,4-dichlorobenzene (1,4-DCB)	5[2]
VPH	
Benzene	5
Ethylbenzene	700
Tuolene	1,000
C_5-C_8Aliphatics (adjusted)	300
C_9-C_{12}Aliphatics (adjusted)	700[2]
C_9-C_{10} Aromatics	200
Total Xylenes	10,000
EPH	
C_9-C_{18}Aliphatics	700[2]
C19-C36 Aliphatics	5,000[3]
C11-C22 Aromatics	200
INORGANICS	
Arsenic – total	10
Manganese - total	3,500

[1] *Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 standard (310 CMR 40 Subpart P).*
[2] *The groundwater standard is lower than the site-specific cleanup goal.*
[3] *The site-specific cleanup goal is lower than the groundwater standard.*
[4] *GW-1 standard effective June 26, 2009.*

6.4.2 Remedy Selection

The selected remedy to address surface soil contamination at AOC 32 is Alternative A6. The selected remedies to address groundwater contamination at AOC 32 (UST#13) and AOCs 32 and 43A (POL/DRMO) are Alternatives B3 and C3, respectively. Each of these alternatives included components for monitoring contaminant degradation and migration.

6.4.2.1 Area 32 (UST#13) Selected Soil Remedial Components (Alternative A6)

Alternative A6 did not treat or destroy soil contamination, but completely removed it from the site by placing it in an off-site, non-hazardous landfill. A description of key components of Alternative A6 is presented in Section 10.C.1 of the ROD and summarized below.

- Excavate contaminated soil and collect confirmation samples prior to backfilling;
- Transport soils to an off-site, non-hazardous landfill for disposal;
- Backfill the excavated area with clean material, and re-vegetate the area; and
- Monitor groundwater on an annual basis and review the site at five-year intervals for 30 years or until contamination is reduced to remedial goals.

6.4.2.2 Areas 32 and 43A Areas Selected Groundwater Remedial Components (Alternatives B3 and C3)

Alternatives B3 and C3 are equivalent and were combined for discussion. This alternative relies on natural attenuation to remediate groundwater contaminants in the subsurface. The Army would follow the *Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater* (USEPA/AFCEE, 1995). A description of key components of Alternative B3 and C3, as presented in Sections 10.C.2 and 10.C.3 of the ROD, respectively, is summarized below.

- Establish ICs;
- Install additional groundwater monitoring wells;
- Collect data on MNA, assess the data, and performing groundwater modeling;
- Perform groundwater LTM on a semiannual basis;
- Review the site at five-year intervals for 30 years or until contamination is reduced to remedial goals;
- Provide annual data reports to USEPA and MassDEP; and
- Incorporate data into groundwater flow and transport models. Field data and model predictions were to be reviewed as part of the Five-Year Review.

6.4.3 Remedy Implementation

6.4.3.1 Soil Remedial Action

Excavation and disposal activities were completed between October 1998 and December 1998, as summarized within the USACE *Final Soils Remedial Action Operable Unit Completion Report: Soil, Asphalt, and Debris Removal* (Weston, 2000) and outlined below:

- Removal and disposal of approximately 50 cy of metal debris;
- Removal and disposal of approximately 1,200 cy of petroleum-contaminated soil;
- Removal and disposal of approximately 800 cy of non-hazardous soil with shredded tire scrap;
- Removal and disposal of approximately 400 cy of soil contaminated with lead and containing

shredded tire scrap; and

- Removal and disposal of approximately 600 cy of soil and asphalt contaminated with low levels of PCBs and pesticides.

The Removal Action for AOC 32, performed by the Army in October and November 1998, appeared to have permanently achieved the RAOs specified in the ROD as discussed in the *Operating Properly and Successfully (OPS) Report* (SWETS, 2000a). The final confirmation data indicated that not only were cleanup levels met, sample concentrations were actually lower than the more conservative MCP S-1 criteria.

An evaluation of the remedial actions was performed. The OPS Report (SWETS, 2000a) demonstrated that the selected remedial actions for AOC 43A were operating properly and successfully in accordance with applicable USEPA guidance.

6.4.3.2 Monitored Natural Attenuation Assessment

The original MNAA was performed separately for each AOC. The MNAA Report (SWETS, 2000b and 2000c) summarized the data collected from MNAA field activities that began in January 1999, and presented the final assessment and recommendations concerning natural attenuation effectiveness based on ROD criteria. The report concluded that natural attenuation, supplemented with groundwater LTM and establishment of ICs, would be an effective remedial action at AOCs 32 and 43A.

6.4.3.3 Long-Term Monitoring

Semiannual long-term groundwater sampling was initiated in the spring of 2002. Groundwater samples were collected once in the spring (April/May) and once in the fall (October/November). The purpose of the LTM program is to monitor the potential for off-site migration of contaminants and to verify that concentrations of contaminants are decreasing over time.

As part of the LTM program, through the 2007 events, groundwater from eight monitoring wells (three source wells and five down-gradient/sentry wells) was sampled for EPH, VPH, and metals (total) on a semiannual basis (spring/fall). Beginning in 2008, the fall event was changed to a performance monitoring event. Per the 2008 LTMMP (HGL, 2008) recommendations, annual sampling commenced in 2010. Source wells include: 32M-01-13XBR, 32M-01-15XBR, and 32M-01-18XBR. Down-gradient/sentry wells include: 32Z-99-02X,32M-01-14XOB, 32M-01-14XBR, 32M-01-16XBR and 32M-01-17XBR. No AOC 43A wells are sampled due to an absence of contaminant exceedances in the 43M series wells since 2002. The six AOC 43A wells are gauged during the LTM sampling as are an additional 12 AOC 32 wells to determine groundwater flow patterns across the site.

6.4.3.4 Institutional Controls

The ROD stipulated that ICs should be imposed on the properties to limit potential exposure to groundwater under both existing and future site conditions. ICs would ensure that exposure to and extraction of groundwater from the site for industrial and/or potable water supply would not be permitted. The ICs for AOCs 32 and 43A were specified in the Findings of Suitable Transfer (FOST), dated May 2000, and were incorporated into the deed prior to property transfer. The deed restriction on parcel A-3 (the subject site), preventing groundwater extraction, was recorded in June 2000. Based on information collected during this review, the IC is effective in limiting

potential exposure to groundwater.

6.4.3.5 In Situ Chemical Oxidation (ISCO) Remedial Action

Based on LTM analytical data a residual hydrocarbon "hot spot" remained within groundwater in a source area well near the former UST #13) An ISCO injection was proposed and accepted and a total of 1,800-gallons of water/sodium persulfate solution was injected into four injection wells in February 2009. Sodium hydroxide was used as the catalyst with the sodium persulfate to form sulfate radicals. Three of the injection wells were located near the former waste oil UST grave source area well 32M-01-18XBR (one to the east, one to the north and one to the south) and extended into bedrock. The fourth injection well was located further north of the 32M-01-18XBR within the former UST pit grave and straddled bedrock and overburden.

Groundwater sampling results at source area well 32M-01-18XBR following the injection remedial action indicated a drop in COCs concentrations one month after injection (March 2009), a rebound in COC concentrations three months after injection (May 2009), a decrease in concentrations 9 months after injection (November 2009). The current groundwater analytical data from 2014 for well 32M-01-18XBR indicates significantly diminished COC concentrations as a result of the February 2009 persulfate injection event. While a slight rebound was observed in 32M-01-18XBR during the 2014 LTM event, the current groundwater analytical data for well 32M-01-18XBR indicates significantly diminished COC concentrations as a result of the February 2009 persulfate injection event. LTM and performance monitoring samples will continue to be collected during spring and fall sampling events.

6.4.4 System Operation/Operations and Maintenance

Groundwater monitoring from 2010 through 2014 have been performed in accordance with the LTMMP (HGL, 2008) for AOCs 32 and 43A. Recommendations have been proposed in the revised 2014 LTMMP (*Sovereign/HGL, 2014*) to include updates to the LTM program.

6.5 Progress since Last Five-Year Review

Overall progress towards achievement of the RAOs and protection of human health and the environment at AOC 32 and 43A is assessed annually and reported in Annual Reports.

Table 6.4
Protectiveness Statement from the 2010 FYR

AOC	Protectiveness Determination	Protectiveness Statement
32 and 43A	Protective	*"The remedy at AOCs 32 and AOC 43A is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Post construction groundwater flow patterns have been defined and no new potential receptors have been identified. ICs that prohibit access to the site's groundwater for residential or commercial use are in place. Current remedial action activity consists of implementing the remaining components specified in the ROD: the long-term groundwater monitoring program, utilizing ICs, annual reporting, evaluation of the monitored natural*

AOC	Protectiveness Determination	Protectiveness Statement
		attenuation performance, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress."

The following recommendations/follow up actions was presented in the 2010 Five-Year Review.

Table 6.2: Status of Recommendations from the 2010 FYR

AOC	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
32/43A	None	*In accordance with the revised LTMMP (HGL, 2008), the Army transitioned to annual LTM sampling events beginning with the spring 2009 LTM event. Data from each spring LTM event will be used to evaluate whether fall performance monitoring should continue for another year or could be terminated. The Army should use spring 2010 LTM event data and an evaluation of long-term trends (i.e., the continuance of existing trends or the emergence of new trends) to evaluate the need for a fall 2010 performance monitoring event*	Federal Facility	EPA/State	NA	Ongoing Completed	NA

In the last five years, these recommendations/follow-up actions were addressed as follows:

LTM and performance monitoring events will continue as defined by the 2008 LTMMP (HGL, 2008). Groundwater monitoring wells 32M-01-14XOB, 32M-01-14XBR, 32M-01-13XBR, 32M-01- 15XBR, 32M-01-16XBR, 32M-01-17XBR, 32M-01-18XBR, and 32Z-99-02X are included in the current annual LTM sample program for AOCs 32 and 43A (April/May). Site reviews will be conducted every 5 years to ensure that the remedy continues to provide adequate protection of human health and the environment.

6.5.1 Remedy Implementation Activities

The excavation and off-site disposal of contaminated soils have been effective at removing any contaminant source soils and has met the objectives of the remedial actions.

Analysis of groundwater data from 2010 through 2014 has indicated that off-site migration is not occurring. The current groundwater analytical data for well 32M-01-18XBR indicates significantly diminished COC concentrations as a result of the February 2009 persulfate injection event. Although the COC concentrations have fluctuated since the 2009 persulfate injection, the COC concentrations through 2013 have been far below the historical seasonal fluctuations and reveal concentrations either below detection limits or below respective cleanup goals. A mild concentration rebound was observed in October 2014.

6.5.2 System Monitoring Activities

LTM activities from 2010 through 2014 at OU#5 have been performed in accordance with the LTMMP (HGL, 2008) for AOCs 32 and 43A. Groundwater sampling was discontinued at AOC 43A in 2004. Groundwater gauging is performed at AOC 43A on an annual basis. Beginning in 2010, a total of eight LTM monitoring wells at AOC 32 have been be sampled annually during the spring event and four wells have been sampled during the fall performance monitoring event. Samples are collected and submitted for VOCs, VPH, EPH, metals and alkalinity analyses.

6.6 Five-Year Review Process

6.6.1 Administrative Components

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led by Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

6.6.2 Community Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479

6.6.3 Document Review

This five-year review for OU#5 consisted of a review of relevant documents including previous Five-year reviews, LTM plans, RI reports, Investigation reports, annual reports and monitoring data.

6.6.4 Data Review

Annual Reports present groundwater sampling data; the LTM and performance monitoring data for AOC 32 were reviewed for this Five Year Report and are discussed below. Analytical results are tabulated in **Appendix G** and summarize AOC 32 COCs that have exceeded the monitoring criteria from the 2010 though 2014 sampling events at well 32M-01-18XBR. Groundwater sampling was discontinued at AOC 43A in 2004.

The concentration of TCE in well 32M-01-18XBR has decreased since the April 2002 sampling event and has remained below the 5 µg/L cleanup goal since October 2004. All other AOC 32 wells have exhibited target VOC concentrations in groundwater below the respective cleanup goal since April 2002, with the exception of the chlorinated benzenes. Statistical analysis conducted on well 32M-01-18XBR indicates a decreasing trend. Trend analysis charts are included in **Appendix G**.

Target analytes 1,2-dichlorobenzene (1,2-DCB), 1,3-dichlorobenzene (1,3-DCB), and 1,4-DCB have generally been detected above the associated cleanup goals in groundwater at well 32M-01-18XBR since monitoring began in spring 2002. However, due to the February 2009 sodium persulfate injection, all three isomers have exhibited definitive concentration declines. Furthermore, the three isomers continue to depict inter-related trends that fluctuate together from event to event and are likely the result of sequential microbial dechlorination and degradation reactions.

Chlorobenzene in groundwater from well 32M-01-18XBR has portrayed a variable concentration trend since December 2003, mirroring the fluctuating trends noted for the dichlorobenzene (DCB) isomers. However, just as for the DCB isomers, due to the February 2009 injection, chlorobenzene has exhibited a definitive concentration decline.

The VPH and EPH carbon fractions have only been detected above the cleanup goals in groundwater from well 32M-01-18XBR. The VPH C_9-C_{10} aromatics concentrations have consistently fluctuated above the 200 µg/L cleanup goal since monitoring began in spring 2002, and on addition of the 2010 through 2013 data, the concentrations depict a distinct and sustained downward trend, with a slight increase in 2014 relative to the 2010 through 2013 data. However, the overall decreasing trend indicates that no new C_9-C_{10} aromatic depositions have occurred since the peak concentration in May 2004, and that the microbial community has degraded all of the formerly available fraction. By comparison, the C_9-C_{12} and C_9-C_{18} aliphatic concentrations declined to a point of non-detection or low-level detection by 2010 and 2011.

Arsenic has been detected, either consistently or sporadically, above the 10 µg/L cleanup goal in groundwater at all AOC 32 wells since the spring 2002 sampling event. Well 32M-01-14XOB is the only remaining point yielding an elevated arsenic concentration to date. In addition, arsenic at well 32M-01-18XBR has remained below the cleanup goal since the October 2010 event. By comparison, well 32M-01-14XOB portrays a consistent concentration trend, with arsenic values oscillating above and below an average of 56 µg/L. This consistency likely stems from the well-established reducing environment under this well compared to that of the other AOC 32 wells. As discussed for other AOCs, such a reducing environment, combined with a low DO concentration, promotes a more soluble, non-sequestered arsenic molecule and, therefore, a higher groundwater concentration.

Manganese concentrations have remained below the 3,500 µg/L goal since December 2003, with the exception of infrequent concentration spikes in well 32M-01-14XOB. However, just as for arsenic, recent data from October 2009 through October 2014 indicate that the groundwater under well 32M-01-18XBR has reverted to an oxidized environment. Combined with increasing DO, the result is sequestration of the arsenic and manganese species back into the aquifer soils and lower concentrations in the groundwater sample.

Transitory 1,4-DCB exceedances have been observed in groundwater at sentry well 32M- 01-17XBR, and arsenic exceedances continue to be observed at sentry well 32M-01-14XOB, located adjacent to Shepley's Hill Landfill; however, the ROD point of compliance is the Zone II boundary located approximately 2,000 feet to the east of AOC 32. Monitoring beyond perimeter well 32M-01-14XOB is not practical as this would place any downgradient well within the Shepley's Hill Landfill. Data obtained from such a well would provide data reflective of landfill conditions and not groundwater conditions generated from the area of AOCs 32 and 43A. The migration of arsenic or 1,4-DCB to the Zone II boundary at concentrations exceeding cleanup goals is not likely due to the low level of the observed exceedances and the overall decrease in source area contaminant concentrations following the 2009 persulfate injection. The Army expects inorganic contaminants, including arsenic and manganese, to return to naturally occurring background levels as the anthropogenic carbon is further reduced from the persulfate treatment and natural degradation.

Natural attenuation parameters DO and ORP are only useful from bedrock source area well 32M-01-18XBR, as it is the only well with groundwater that continues to show exceedances of organic parameters. Prior to the ISCO remedial injection event in 2009, low values of DO and ORP were well into the ranges indicating anaerobic conditions. Both had decreased markedly since 2002 and remain low. This well is located beneath pavement adjacent to the warehouse and the lack of groundwater recharge was reflected in the DO values and slow rate of contaminant attenuation.

6.6.5 Site Inspection

Existing land-use is evaluated as part of the Five-Year Review process to ensure control requirements are being met. A site-specific annual Land Use Control (LUC) checklist, including physical on-site inspection and interview components, was developed in 2007 for use during LUC verification activities.

LUC inspections are performed during sampling events to identify the following:

- Any signs of increased exposure potential to the public from soil and/or surface water contaminants;
- Any evidence that groundwater extraction wells had been installed at the site; and
- Any evidence of site use changes.

Annual site inspections have indicated that: MassDevelopment supplies potable water to the large warehouse that currently occupies the property. No evidence of increased exposure potential was observed during sampling events over the past five years.

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. Features that were inspected included the asphalt areas, access road, monitoring wells and piezometers. The overall condition of the site was satisfactory.
A summary of findings and observations are presented below and within the landfill inspection checklist

included in **Appendix G** along with supporting photographs.

6.6.6 Interviews

The following individuals were interviewed as part of the five-year review:

- Mr. Daniel Groher, USACE, New England District;
- Fire Chief Joe LeBlanc, Devens Fire Department;
- Ms. Pamela Papineau, Ayer Board of Health
- Mr. Richard Doherty, PACE
- Mr. Ron Ostrowski, MassDevelopment; and,
- Mr. Neil Angus, MassDevelopment

As part of the FYR review process, interviews were conducted in March and April 2015 in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in **Appendix A**. In general, comments related to the site were positive and supportive. The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved.

Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

6.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

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

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning based on the long-term monitoring results and ICs implemented with no early indicators of remedy failure. Information to support this statement provided below.

6.7.1 Remedial Action Performance and Monitoring Results

The excavation and off-site disposal of contaminated soils have been effective at removing any contaminant source soils and has met the objectives of the remedial actions.

Analysis of groundwater data has indicated that off-site migration is not occurring. While a slight rebound was observed in 32M-01-18XBR during the 2014 LTM event, the current groundwater

analytical data for well 32M-01-18XBR indicates significantly diminished COC concentrations as a result of the February 2009 persulfate injection event. The time frame estimated to achieve the remedial

goals outlined in the ROD is still estimated to be in compliance with the 2026 goal.

6.7.2 Systems Operations/Operation and Maintenance (Long-Term Groundwater Monitoring)

Groundwater monitoring is performed in accordance with the LTMMP (HGL, 2008) for AOCs 32 and 43A. Groundwater sampling was discontinued at AOC 43A in 2004 due to two consecutive years of contaminant non-detections within groundwater wells at this AOC. Groundwater gauging is performed at AOC 43A on an annual basis. Beginning in 2010, four LTM monitoring wells at AOC 32 have been sampled annually during the spring monitoring event.

6.7.3 Opportunities for Optimization

As noted above, annual LTM and performance monitoring events continued through 2014. A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation, is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2015*). This report presents the results of an optimization evaluation of the monitoring program at Fort Devens, including AOCs 32 and 43A.

6.7.4 Early Indicators of Potential Remedy Failure

As discussed previously, because natural attenuation was not effectively remediating contamination in a localized area, as defined by 32M-01-18XBR, near AOC 32 former waste oil UST grave (source area) ISCO injections were performed. The performance monitoring data since 2009 indicates that the persulfate injection was effective in reducing the COCs.

6.7.5 Implementation of Institutional Controls and other Measures

There are no current or future plans for additional development or installation of potable drinking water wells at AOCs 32 and 43A. Based on information collected during this review, this IC is effective in ensuring the remedy's protectiveness because exposures to contaminants are not allowed to occur. The warehouse was recently bought by Ozark Automotive Distributers, Inc. in November 2013.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection are still valid based on supporting information provided below, with the exception of the MCL for arsenic and 1,3-DCB. The arsenic MCL was previously 50 µg/l and changed to 10 µg/l in January 2006. The GW-1 standards in the MCP were revised and the GW-1 standard for 1,3-DCB was lowered from 600 µg/L to 40 µg/L.

As part of this five-year review, ARARs and TBC guidance presented in the ROD and current ARARs were reviewed. Excavation activities at AOC 32 were completed in 1998. The RAOs for soil specified in the ROD have been permanently achieved. There are no current ARARs that apply to soil contaminants at the site. Because the cleanup goals for soil at AOC 32 were based on HHRA levels determined specifically for the site and the contaminated soils were removed, changes to soil TBCs do not affect the protectiveness of the implemented remedy.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 µg/L) was selected as a groundwater cleanup goal. Arsenic was present on site at concentrations greater than its MCL during the remedial investigation and was a primary risk driver for the ingestion of groundwater exposure pathway at AOC 32. The MCL for arsenic has been updated since the 1996 ROD and has been revised to 10 µg/L in 2006. There have been no changes to the COC MCLs since the previous five-year review.

The GW-1 standards in the MCP were revised in 2006 and the GW-1 standard for 1,3-DCB was lowered from 600 µg/L to 40 µg/L. This change in standard does not affect the remedy.

6.7.6 Changes in Exposure Pathways

The ROD identified unacceptable risks from the following exposure pathways: ingestion of groundwater as the primary drinking water source at both AOCs 32 and 43A; direct contact with, and ingestion of, contaminated soils by current and future site workers and future construction workers at AOC 32. Based on analytical results of confirmatory soil samples collected from excavated areas, the excavation and removal of contaminated soil from AOC 32 have eliminated the direct contact exposure pathway to contaminated soils.

ICs prohibiting the use of site groundwater as drinking water at both AOCs 32 and 43A have effectively eliminated exposure via ingestion of groundwater. The construction of a large warehouse was completed in 2001. The warehouse and associated pavements now cover much of both AOCs 32 and 43A. Land use at the site has not changed from the presumed future industrial use evaluated prior to the ROD and is not expected to change. Current use is in compliance with deed restrictions on groundwater extraction recorded in November 1997 for parcel A-3, which includes AOCs 32 and 43A.

6.7.7 Changes in Toxicology and Other Contaminant Characteristics

Because the groundwater cleanup goals presented in the ROD are not risk-based calculated values, changes in toxicity values do not impact cleanup goals. Also, the remedy includes the prohibition of groundwater use as drinking water so any changes in toxicity of the COCs do not affect the protectiveness of the remedy. Because the soil cleanup goals at AOCs 32 and 43A were based on site-specific HHRA, changes in toxicity values for soil contaminants could have affected the soil cleanup goals. However, because the contaminated soil has already been removed, changes to soil contaminant toxicity do not affect the implemented remedy.

6.7.8 Changes in Risk Assessment Methodology

While numerous methodologies have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. No other information has come to light that would call into question the protectiveness of the remedy. No natural disaster impacts occurred at AOCs 32 or 43A during this review period.

6.7.9 Technical Assessment Summary

Groundwater data indicates that contaminant concentrations are declining and that off-site migration is not occurring. While several risk assessment methodologies have changed since the original risk assessments were prepared, ICs are in place to limit the groundwater use as drinking water, thus maintaining the protectiveness of the current remedy.

Although the COC concentrations have fluctuated somewhat since the 2009 persulfate injection, the current COC concentrations are far below the historical seasonal fluctuations. All three dichlorobenzene

isomers have exhibited definitive concentration declines and continue to depict inter-related trends that fluctuate together from event to event. These trends are likely the result of sequential microbial dechlorination and degradation reactions. It is expected that inorganic contaminants, including arsenic and manganese, will return to naturally occurring background levels as the anthropogenic carbon is further reduced from the persulfate treatment and natural degradation. The LTMMP has been revised in 2015 (*LTMMP, Sovereign/HGL, 2015*) to include updates to the LTM program.

A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation, is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2015*). This report presents the results of an optimization evaluation of the long-term monitoring (LTM) program at Devens, including AOCs 432 and 43A. Based on the site conditions and established COC trends, the following optimization steps were recommended to the LTM program at AOCs 32 and 43A:

- Discontinue the fall performance monitoring event;
- Reduce the number of monitoring wells sampled during the primary spring event to the four wells sampled for performance monitoring, with the exception of substituting 32M- 01-14XOB in place of 32M-01-15XBR. The other three sampled wells are 32M-01-13XBR, 32M-01-17XBR, and 32M-01-18XBR;
- Reduce site-wide groundwater gauging from annually to every 5 years prior to five-year reviews;
- Discontinue non-LTM program monitoring well gauging after the 2015 five year review and decommission all non-LTM program wells west of the groundwater divide;
- Remove EPH carbon ranges COC list;
- Use HydraSleeve™ technology to collect groundwater samples; and
- Prepare technical memorandum for AOCs 32 and 43A presenting site specific information for reclassification of groundwater from GW-1 to GW-3, justification for site closure and path forward.

6.8 Issues

There are no issues with respect to protectiveness of the remedy at AOC 32 and 43A as specified by the 1998 ROD.

6.9 Recommendations and Follow-up Actions

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

6.10 Protectiveness Statement

The remedy at AOC 32 and 43A is considered protective because there is no evidence of current exposure and exposure pathways that could result in unacceptable risks are being controlled.

6.11 Next Review

The next five year review for AOC 32 and 43A is required five years from the completion of this review.

6.12 References

References are included in **Appendix A**.

7 HISTORIC GAS STATION AREAS OF CONTAMINATION 43G AND 43J

7.1 Introduction

This is the fourth five-year review conducted for AOCs 43G and 43J. The five year review is required due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited used and unrestricted exposure. Progress since the 2010 five-year review is detailed below for both AOCs and includes the 2010 five-year review protectiveness statements.

7.2 Site Chronology

Table 7.1
Chronology of Events for AOC 43G

Event	Date
Final NPL Listing	November 1989
Five gasoline USTs removed at Area 2	October 1990
One waste oil UST removed at Area 3	May 1992
SI Report issued	August 1992
SSI completed – NFA for Area 1, SA 43G designated as an AOC	January 1994
RI/FS completed for Areas 2 and 3	June 1996
Three replacement USTs (Area 2) and a sand and gas trap (Area 3) removed	August 1996
ROD signature	October 1996
Devens Public Water Supply Zone II and III were finalized	September 1997
Intrinsic Remedial Assessment completed	November 1999
Groundwater LTM initiated	December 1999
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Revised LTMMP	November 2008
Third Five-Year Review	September 2010
Annual LTM	2005-2009
Annual LTM	2010-2014

Table 7.2
Chronology of Events for AOC 43J

Event	Date
Final NPL Listing	November 1989
Abandoned gasoline UST discovered	May 1992
Waste oil UST removed	May 1992
Gasoline UST removed	August 1992
SI Report complete	May 1993
Supplemental SI (SSI) completed – SA 43J designated as an AOC	January 1994
RI/FS completed	June 1996
Three replacement USTs (Area 2) and a sand and gas trap (Area 3)	August 1996
ROD signature	October 1996
Devens Public Water Supply Zone II and III were finalized	September 1997
Intrinsic Remedial Assessment completed	November 1999
Groundwater LTM Initiated	December 1999
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Environmental Baseline Survey	May 2006
Grant of Environmental Restriction and Easement (GERE)	June 2006
Approval of Covenant Deferral Request (USEPA)	June 2006

Event	Date
Approval of Nomination of AOC 43J, AREE 61AF, AREE 61J and AREE 63BB for Addition to Schedule I (MassDEP)	June 2006
Technical Update to the 1996 Risk Characterization Parcel C – AOC 43J	June 2006
Environmental Assessment for the Commercial Redevelopment of Parcel	June 2006
Explanation of Significant Differences for ROD AOC 43J	June 2006
Finding of Suitability for Early Transfer (FOSET) Parcel C	June 2006
Site transferred to MassDevelopment	June 2006
AOC 43J ESD prepared by Army BRAC incorporating ICs in deed	June 2006
Test Pit Investigation	July 2006
Monitoring Well Installation (four well pairs)	2006-2007
Quarterly Groundwater Monitoring	2007
Annual LTM	2005-2009
Sulfate Injection Pilot Test/Well Installation (two injection wells, 2 monitoring wells)	December 2009
Monthly Pilot Study Performance Monitoring	January 2010
Follow up sulfate injection	Fall 2010
Third Five-Year Review	September 2010
Annual LTM	2010-2014
OBC™ injection	May 2012
Monitoring rounds	April, November, December 2014
2014 Devens Annual Report and Remedial Strategy Evaluation	April 2015

7.3 Background

Both AOCs 43G and 43J are historic gas stations located within the former Fort Devens in the Town of Harvard, Massachusetts. AOC 43G is located on Queenstown Road in the central portion of the former Main Post (**Figure 7.1, Appendix H**) AOC 43J is located on Patton Road in the southern portion of the former Main Post (**Figure 7.2, Appendix H**).

7.3.1 AOC 43G Background

AOC 43G consist of a decommissioned Army Air Force Exchange Service (AAFES) gas station and historic gas station G. For purpose of field investigations, AOC 43G was divided into three areas. Area 1 is the former location of historic gas station G. Areas 2 and 3 are associated with the AAFES gas station and represent the locations of former gasoline USTs and the former waste oil UST/sand and gas trap, respectively.

The original study area (SA 43G [Area 1]) was the historic gas station, which was used as a motor vehicle pool to support military operations during World War II. Operations concerning the motor pool were halted during the late 1940s or early 1950s. The reported location of the historic gas station was to the southwest of the AAFES gasoline station (Building 2008) and to the southwest of Building 2009. Based on the results of the 1992 SI and 1993 SSI, NFA was recommended for Area 1. Therefore, all further discussions in this Five-Year Review pertain only to Areas 2 and 3.

The location of the former AAFES gasoline station is approximately 120 ft northeast of the site of historic gas station G. At the time of the 1992 SI and 1993 SSI, it consisted of a service station (Building

2008), which housed three vehicle service bays and the AAFES store. It also included three 10,000-gallon USTs, associated pump islands, and a sand and gas trap (Area 3).

SA 43G was expanded to include the former AAFES gas station (Areas 2 and 3) as part of the 1993 SSI. The AAFES gas station was added to investigate the distribution of contamination observed during the removal of three former 9,000-gallon (removed in 1990) and two former 10,000-gallon gasoline USTs (removed in 1996). Although soil samples were collected from the walls of the excavation, no samples were collected from the base of the excavation. Contamination was also identified during the removal of a 500-gallon waste oil UST (completed in 1992). Impacted soils were not removed due to the close proximity of Building 2008.

The 1993 SSI identified fuel related compounds, principally benzene, toluene, ethylbenzene, and xylenes (BTEX), in site soil and groundwater within Area 2 and 3. Due to the presence of soil and groundwater impacts, a RI and subsequent FS were recommended for Areas 2 and 3.

The HHRA completed for the RI identified no unacceptable threats to human health from exposure to contaminated soil, but did find potential threats to human health from future exposure to groundwater. In 1996, the Army completed a FS to analyze potential remedial alternatives for the groundwater contamination at AOC 43G.

7.3.2 AOC 43J Background

At the time of base closure in 1996, the area around AOC 43J was used as a vehicle storage yard and maintenance facility (former Buildings T-2446 and T-2479) for a Special Forces Unit of the Army. The former maintenance facility used a 1,000-gallon UST for storage of maintenance wastes. This UST was located just south of former Building T-2446. The yard and maintenance facility are paved with asphalt and surrounded by a chain-link fence with a locked gate located at the northern side of the yard. AOC 43J is within the Shebokin Supply Well Zone III.

Prior to construction of the vehicle maintenance facility, this area was used as a gas station/motor pool (historic gas station J) during the 1940s and 1950s. The structures of this historic gas station consisted of a pump island and a small gasoline pump house. This gas station was reported to be a Type A station, with one 5,000-gallon UST located between the gasoline pump house and pump island. The station was used during World War II as a vehicle motor pool to support military operations. The motor pool operations were discontinued during the late 1940s or early 1950s. No records were available on the decommissioning of this motor pool or the removal of the associated UST.

During the 1992 SI, an abandoned 5,000-gallon UST was found at historic gas station J. This UST was added to the Devens UST removal program and removed in 1992. The former waste oil UST was also removed during the same year. During both UST removals, contaminated impacted soil was removed and disposed of by the Army. Based on the data and the findings of the 1992 SI, additional investigation was recommended.

In 1993, a SSI was performed to investigate the soil impacts observed during the SI and to install groundwater monitoring wells. The 1993 SSI investigations detected fuel related compounds, principally BTEX, in site soil and groundwater. Because of the presence of soil and groundwater contamination, a RI and subsequent FS were recommended. The site designation for SA 43J was administratively changed to AOC 43J at that time. The HHRA completed for the RI identified no unacceptable threats to human health from exposure to contaminated soil, but did find potential threats to human health from future exposure to groundwater. In 1996, the Army completed a FS to analyze potential remedial alternatives that addressed the groundwater contamination at AOC 43J. In October1996, the ROD was signed.

Another site, AREE 61 AF, also known as the 10th Special Forces Headquarters Motor Pool Buildings is located directly adjacent to AOC 43J. Various studies and removal actions have been previously performed at the site. The monitoring wells included in the AOC 43J LTMP are distributed across a major portion of AREE 61 AF. An NFA designation was approved by the USEPA in late 2003.

AOC 43J property was transferred from the Army to MassDevelopment in June 2006. The ICs wee detailed in a June 2006 Grant of Environmental Restriction and Easement (GERE) issued by MassDEP. Mass Development was directed by MassDEP to record the GERE with the appropriate Registry of Deeds

7.4 Remedial Action

A ROD was signed in October 1996 documenting intrinsic remediation as the final selected cleanup remedy at both AOCs 43G and 43J (*USAEC, 1996*). RAOs for AOCs 43G and 43J are identified below.

7.4.1.1 Remedial Action Objectives at AOC 43G

The RAOs at AOC 43G are to:

- Protect potential commercial/industrial receptors located on Devens property from exposure to groundwater having chemicals in excess of the following remedial goals (RG): iron (9,100 µg/L), manganese (291 µg/L), nickel (100 µg/L), benzene (5 µg/L), ethylbenzene (700 µg/L), and xylenes (10,000 µg/L). (note: the goal for manganese was changed to 375 µg/L in 2008).
- Protect potential commercial/industrial receptors located off Devens property from exposure to groundwater having chemicals in excess of the above RGs.

The RGs for benzene, ethylbenzene, xylenes, and nickel are the MCLs and MMCLs in effect at the time. The RGs for iron and manganese are Devens background concentrations, because background concentrations exceeded the risk-based concentrations derived from available RfD values at the time of the RI/FS.

7.4.1.2 Remedial Action Objectives at AOC 43J

The RAOs at AOC 43J are to:

- Protect potential commercial/industrial receptors located on the Devens property from exposure to groundwater having chemicals in excess of the following RGs; arsenic (50 µg/L), iron (9,100 µg/L), manganese (291 µg/L), benzene (5 µg/L), ethylbenzene (700 µg/L), toluene (1,000 µg/L), and carbon tetrachloride (5 µg/L).
- Protect potential commercial/industrial receptors located off the Devens property from exposure to groundwater having chemical in excess of the above RGs.

The RGs for benzene, carbon tetrachloride, ethylbenzene, toluene, and arsenic are the MCLs and MMCLs in effect at the time. Current values are used for evaluation of clean-up levels. The RGs for iron and manganese are Devens background concentrations because background concentrations exceeded the risk-based concentrations derived from available RfD values.

7.4.2 Remedy Selection

The selected remedy at each site addresses long-term commercial/industrial exposure to impacted groundwater, the principal known threat at both AOC 43G and 43J. Both of these sites are upgradient or within Zone IIIs that directly connect to Zone IIs of public water supplies. AOC 43J is situated within the Shebokin Supply Well Zone III. The selected remedial alternative for both AOC 43G and 43J relies on intrinsic remediation, groundwater and contaminant modeling, and groundwater LTM to evaluate the effectiveness of the alternative at controlling groundwater contamination and site risk. The remedy will mitigate existing groundwater contamination through natural attenuation and reduce the potential risk of future commercial/industrial exposure to contaminated groundwater. The major components of the selected remedy for both AOC 43G and 43J include:

1. Intrinsic bioremediation;
2. Intrinsic bioremediation assessment data collection and groundwater modeling;
3. Installation of additional groundwater monitoring wells;
4. Groundwater LTM;
5. Annual data reports to USEPA and MassDEP; and
6. Five-year reviews.

The 1996 ROD states that if the intrinsic bioremediation assessment results at AOC 43G and 43J indicate that: 1) the groundwater contaminant plume increases in size on Army property and/or, 2) the groundwater contaminant plume remains the same size, but cannot be remediated within 30 years, then a soil vapor extraction (SVE) system will be installed at the AOC 43G source area and an additional cleanup action (not defined in the ROD) will be implemented at AOC 43J. Furthermore, if at any time during this remedy there is an indication that contaminants are migrating off Army property at either AOC above drinking water standards (MCLs/MMCL or risk-based concentration [i.e., groundwater cleanup levels]) and/or if the Five-Year Review indicates that the intrinsic remediation alternative is not protective of human health, the Army will implement an additional cleanup action to protect human health and the environment as required under CERCLA.

Should the Army change the use of either AOC, additional assessment and/or possible remedial action may be needed. In addition, if the Army transfers either AOC by lease or deed, an Environmental Baseline Survey (EBS) will be performed, and a determination will be made by the Army and USEPA whether the remedy remain protective of human health and the environment

7.4.3 Remedy Implementation

Remedial Component 2 (IRA and groundwater modeling) and Component 3 (installation of additional groundwater monitoring wells) were completed by SWETS and HLA between 1998 and 1999. The results of the IRA and associated field efforts are detailed in a Final IRA Report for each site (SWETS, 1999a, 1999b).

The IRA performed at both sites demonstrated that intrinsic remediation was working and the Army did not need to conduct additional cleanup actions. The model predicted that COCs would be less than the groundwater cleanup levels within 30 years and COCs would not migrate off the Army property. Uncertainties identified for the model included the degradation rates of the heavier hydrocarbon fractions and the timeframe for the evolution of redox conditions (and consequently, inorganic concentrations). The predictions presented in the IRA have subsequently been evaluated using trend analyses taken from

LTM data collected since the IRA was performed and additional model evaluations were performed during the 2008 LTMMP revision. The 1999 IRA methodology and results are summarized below.

7.4.4 IRA Lines of Evidence

The IRA considered the following lines of evidence:

- Statistically significant historical trends in contaminant concentrations to show that a reduction in the total mass of concentrations was occurring at the site;
- Chemical analytical data in mass balance concentrations to show that electron acceptor concentrations in groundwater (oxygen, nitrate, sulfate, or iron) were sufficient to facilitate degradation of dissolved contaminants; and
- A solute fate and transport model to predict future migration of contaminants and estimate concentrations at potential receptor locations.

7.4.5 IRA Field Activities

7.4.5.1 AOC 43G

Field work commenced in March 1997, and entailed soil sampling and assessment of free product on the groundwater below the former USTs that were removed in 1990. Field activities included advancement of three soil borings and sampling of soil and sampling for groundwater from one groundwater monitoring well.

Sampling results from the March 1997 field work identified several contaminants exceeding MCP Method S-3/GW-1 standards. However, statistical and modeling assessments performed as part of the intrinsic remediation assessment suggested that source groundwater contamination had been substantially reduced by UST and soil removal in this area.

Eight rounds of groundwater sampling were conducted quarterly during 1997 and 1998 for the months of March, June, September, and December. Results of the eight rounds of groundwater sampling indicated a decrease in BTEX concentrations over time since the early SI/RI rounds.

7.4.5.2 AOC 43J

Field work commenced in March 1997, and entailed installation of one bedrock monitoring well at the source area and two bedrock monitoring wells at downgradient locations. The objective was to measure the hydraulic gradient between the overburden and bedrock aquifer to determine whether a vertical gradient exists. Additionally, the data would provide information on whether VOCs and chlorinated solvents were present in bedrock groundwater at these three locations. Results of the vertical gradient monitoring suggested that seasonal downward/upward gradients may occur.

Eight rounds of groundwater sampling were conducted quarterly during 1997 and 1998 for the months of March, June, September, and December. Results of the eight rounds of groundwater sampling indicated a decrease in BTEX concentrations over time since the early SI/RI rounds.

7.4.6 Statistical Analysis

The Mann-Kendall test for trends was used as the first line of evidence to assess, at 95% confidence level, whether contaminant concentrations at AOC 43G and AOC 43J have been decreasing throughout the Groundwater Sampling Program. Data used in the statistical analyses were collected from eight quarterly IRA groundwater sampling rounds (March 1997 through December 1998) and from up to four

rounds of historical data (SSI/RI September 1993, January 1994, December 1994, and March 1995 rounds).

Input parameters, variables, and the statistical approach considered during the Mann-Kendall test are included in the Final IRA Report (SWETS, 1999a, 1999b).

7.4.6.1 AOC 43G

The statistical results for BTEX showed that all but four well/parameter pairs evaluated (or 28 of 32 combinations) exhibited a statistically significant downward trend at the 95% confidence level. The four well/parameter pairs that did not meet this confidence level exhibited a decreasing trend in concentration, but at the 80 to 90% confidence level. Only two of these four pairs had MCL exceedances in 1997 through 1998 (AAFES-6/benzene and XGM-97 12X/benzene). Using the most conservative data set, the regression models predicted that benzene concentrations in all selected wells would be at or below the MCL by October 2011, which followed the signing of the ROD by only 15 years. This duration was within the 30 year remedial duration (year 2026) specified by the ROD. It was noted that uncertainties involved in predicting the course of contaminant reduction existed and the estimates were dependent upon the assumption that concentrations would continue to decline at rates consistent with the historical data. As a result, LTM was proposed to evaluate the predicted decline in contaminant concentrations.

7.4.6.2 AOC 43J

The Mann-Kendall test results for BTEX trends revealed that the source area overburden groundwater from monitoring wells at AOC 43J exhibited a statistically downward trend at the 95% confidence level for almost all the well/contaminant pairs that historically had exceeded MCLs. The only exception in the source area occurred in XJM-97-05X for ethylbenzene and toluene. A downward trend was distinguishable at a slightly lower (92 to 94%) confidence level for ethylbenzene and toluene. However, consideration of seasonal effects (i.e., changes in groundwater elevation) resulted in the finding that the ethylbenzene concentrations in XJM 94-05X had significantly decreased since 1994, a result not identified in the less powerful, non-parametric Mann-Kendall trend analysis.

With the exception of monitoring well 2446-02, the regression model predicted that compliance with the MCLs would be achieved by the end of 2004. This was only 8 years following signature of the ROD and within the 30-year monitoring period defined by the ROD. The regression analysis for well 2446-02 predicted that all MCLs would be achieved by the year 2001. However, because of the relatively weak correlation coefficients for the three regression models for well 2446-02, no meaningful conservative upper bound estimate of cleanup duration for well 2446-02 could be derived at the time of the IRA. The COC concentrations detected in well 2446-02 during the December 1998 sampling event deviated greatly from the generally decreasing trend observed during the previous six years, contributing to the weak correlation in the regression analysis. It was premature to calculate that downward trends at this well would continue. Additional sampling of this well was required as part of the LTM program to refine estimates of cleanup duration and to enable continued assessment and reporting of the remedial process.

Groundwater from the bedrock well XJM-97-12X, within the source area, did not show a decreasing statistical trend for benzene and ethylbenzene using the Mann-Kendall test, primarily because of elevated concentrations detected in the previous three groundwater sampling rounds (performed in 1998). These concentrations were expected to decrease with degradation of the overburden contamination. Further sampling was expected to improve statistical analysis of variability in vertical gradients and flow direction. Consideration of seasonal effects resulted in the finding that ethylbenzene concentrations in

XJM-97-12X had decreased significantly since 1997, a result not identified in the less powerful non-parametric Mann-Kendall trend analysis.

Overall, the trend and regression analysis for BTEX in groundwater wells from the source area, at the time of the statistical analysis in 1999, strongly supported the finding that degradation was occurring, and that the concentrations above groundwater cleanup levels, MCLs, or MMCLs were not likely to expand or migrate to established compliance points. Furthermore, subject to refinement of the cleanup period for well 2446-02, MCLs were believed to be achievable with the 30-year period specified by the ROD. It should be noted, however, that these predictions were dependent upon the assumption that concentrations would continue to decline at historical rates. Long-term groundwater monitoring would be performed to verify these statistical predictions.

7.4.7 Assimilative Capacity Calculations

Analytical field data were evaluated to assess whether sufficient electron acceptors were present to support degradation of the contaminants. The calculations verified that electron acceptor concentrations in groundwater (i.e., primarily sulfate, manganese, iron and oxygen at AOC 43G and sulfate and oxygen at AOC 43J) were sufficient to facilitate degradation of dissolved contaminants.

7.4.8 Fate and Transport Modeling

Solute fate and transport modeling was used in conjunction with assimilative capacity calculations, to support the viability of intrinsic remediation as an acceptable remedial alternative. BIOSCREEN modeling suggested that even with continuing residual sources (both sites have undergone substantial removal actions) the extent of the contamination as defined by the remedial goals would be limited to about 25 ft from one of the source area wells at AOC 43G and to about 90 ft from the assumed center of the source area at AOC 43J. These distances put the furthest predicted extent of the groundwater contamination (above RGs) within the existing Fort Devens site boundary.

Results from the BIOPLUME II modeling were used to estimate remedial duration and contamination migration potential. Modeling demonstrated an unlikely potential for benzene contamination migration off Army property and general agreement with regression analysis results. The modeling also considered added demands from other competitors (non-BTEX petroleum hydrocarbons). It revealed that this additional demand added only about 2 years to the time to reach remedial goals at each site. The benzene criterion at AOC 43G was estimated to be achieved approximately in the years 2007 to 2009, or between 11 to 13 years total following signing of the ROD, which is compliant with the 30-year criterions in the ROD. Benzene criterion at AOC 43J is predicted to be achieved between 7 to 9 years total (from the baseline event in 1997), or about in the years 2004 to 2006, which is compliant with the 30-year criterion in the ROD. The BIOPLUME II modeling determined that aerobic degradation was the overriding process at these sites.

7.4.9 Long-Term Monitoring

Remedial action implementation at both AOCs consisted of continued LTM and data reporting. The first long-term groundwater monitoring round was performed in December 1999. LTM has been performed annually since 1999. The resulting LTM data was evaluated against the groundwater performance and VPH boundary standards as detailed below.

7.4.10 Groundwater Performance Standards

Groundwater performance standards are used to ensure that the effectiveness criteria set forth in the ROD and presented in the LTMP continue to be met and remedial objectives are ultimately achieved. Two sets

of performance standards were developed, one to address contaminant migration and the other to address remedial duration. These standards are described below.

7.4.11 Contaminant Migration Assessment

Intrinsic remediation at AOCs 43G and 43J would continue to be considered effective if the extent of groundwater contamination with concentrations exceeding the clean-up goals does not increase in size and migrate off Army property. Recommendations for additional field actions would be made with revisions to the LTMP if monitoring data indicate the potential for off-site migration of site COCs.

7.4.12 Remedial Duration Assessment

Intrinsic remediation at AOCs 43G and 43J would continue to be considered effective if COC concentrations will be reduced to cleanup levels within the expected duration criteria specified in the ROD. The need for additional assessment/remedial action would be evaluated if source area well data indicate that COC concentrations will not achieve remedial goals within 30 years of ROD signature.

Data evaluation would be performed on a continual basis after receipt of annual LTM data and the data evaluation would be presented in the annual LTM report

7.4.13 VPH Boundary Standard

Remedial action implementation at both AOCs consisted of continued LTM and data reporting. The first long-term groundwater monitoring round was performed in December 1999. LTM has been performed annually since 1999. The resulting LTM data was evaluated against the groundwater cleanup goals per the ROD.

The Army uses the MCP Method 1 GW-1 concentrations for VPH/EPH to evaluate remedy performance. Remediation goals within the plume are not established for VPH. However, if Method 1 GW-1 concentrations are exceeded at the boundary or compliance point, the Army will develop risk-based VPH concentrations. As concluded in the IRA, migration of VPH concentrations in exceedance of GW-1 standards is not probable and no risk-based concentrations or "VPH boundary standards" are required at this time.

7.4.14 Additional AOC 43J Investigations Post-2010 Five-Year Review

7.4.14.1 Sulfate Injection Pilot Study

As part of the 2010 five-year review process, EPA, MassDEP, and community groups expressed concerned that MNA at AOC 43J would likely not achieve site cleanup goals by 2026. To address these concerns, MassDevelopment, after taking over responsibility from the Army for cleanup of AOC 43J, undertook an independent analysis of MNA at the Site. The site was monitored over four quarters in 2007, the data analyzed, and a 2008 Report concluded that MNA without augmentation was unlikely to be successful in attaining remediation goals by 2026.

A sulfate injection pilot study was conducted in December 2009 to address the concerns of the intrinsic remediation remedy likely not meeting the remedial duration timeline in the ROD. The target area for the pilot study was determined based on monitoring data from quarterly sampling in 2007 and one sample event in 2008. Samples were collected prior to and following the 2009 sulfate injection. The effects of the initial injection test were unclear, so an additional sulfate injection was performed in 2010 followed by the annual groundwater monitoring event.

It was concluded after evaluation of the 2009 and 2010 results, that enhanced anaerobic degradation by sulfate was a slow process that showed minimal effects on residual concentrations of volatile petroleum hydrocarbons (VPH). An alternate amendment was proposed and OBC™, a proprietary sodium persulfate/calcium peroxide product manufactured by Redox Tech, LLC, was injected into the source area in May 2012. The details of this remedial strategy are presented in the 2014 Devens Annual Report and Remedial Strategy Evaluation – AOC43J (*Haley and Aldrich, Inc, April 2015*). Annual LTM sampling events will continue to evaluate the effects of the OBC™ treatment.

7.4.15 System Operations/Operations and Maintenance

Groundwater monitoring is performed in accordance with the LTMMP (*HGL, 2008b*) for AOC 43G. AOC 43J is currently being monitored by MassDevelopment.

7.5 Progress since the Last Five Year Review

Protectiveness statements for AOCs 43G and43J were combined together during previous five-year reviews due to both sites being addressed under the same 1996 ROD and both AOCs were under Army ownership. Separate protectiveness statements are provided below due to transference of AOC 43J from the Army to MassDevelopment for commercial redevelopment and development of an ESD for AOC 43J in 2006.

Table 7.3
Protectiveness Statements from the 2010 FYR

AOC	Protectiveness Determination	Protectiveness Statement
43G	Protective	The remedy at AOC 43G is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. Human health is not currently at risk at 43G because groundwater is not used as a drinking water source. AOC 43G remains under Army ownership and is within the confines of the Army Garrison at Fort Devens and access to the site is restricted. ICs are in place that prevent exposure to contaminated soil and groundwater at the site. HASP and IDW handling procedures are in place and are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling. Human health is currently not at risk at AOC 43G because groundwater at the AOC is not being used for potable use, and organic and inorganic COCs exceeding cleanup goals are not migrating off Army property. Current remedial action activity consists of intrinsic bioremediation, intrinsic bioremediation assessment data collection and groundwater modeling, annual long-term groundwater monitoring, annual reporting, ICs, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress. Source. AOC 43G remains under Army ownership and is within the confines of the Army Garrison at Fort Devens and access to the site is restricted. ICs are in place that prevents exposure to contaminated soil and groundwater at the site. HASP and IDW handling procedures are in place and are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling. Human health is currently not at risk at AOC 43G because groundwater at the

AOC	Protectiveness Determination	Protectiveness Statement
		AOC is not being used for potable use, and organic and inorganic COCs exceeding cleanup goals are not migrating off Army property. Current remedial action activity consists of intrinsic bioremediation, intrinsic bioremediation assessment data collection and groundwater modeling, annual long-term groundwater monitoring, annual reporting, ICs, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress

AOC	Protectiveness Determination	Protectiveness Statement
43J	Protective	The remedy at AOC 43J is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. In 2006, AOC 43J was joined with other adjacent properties and transferred from Army ownership to MassDevelopment to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. When the property transfer occurred, the existing ICs were incorporated into the property deed. As part of the property transfer process a technical update of the risk assessment was prepared for the 1996 ROD and recommended RAO that consisted of the addition of LUCs to prohibit residential site development and access to the site's groundwater. The technical update also required that a vapor intrusion evaluation would be required prior to any commercial or industrial development to ensure appropriate safeguards are in place relative to building design to minimize vapor intrusion concerns. The site is currently vacant and remains undeveloped. Current remedial action activity consists of intrinsic bioremediation, intrinsic bioremediation assessment data collection and groundwater modeling, a long-term groundwater monitoring program, annual reporting, and five-year site reviews. A sulfate injection pilot study is currently ongoing to determine if enhanced intrinsic remediation will address the increasing organic concentrations in source area groundwater at AOC 43J and ensure long term protectiveness. An ESD will be submitted for the ROD to implement a full scale sulfate injection if the pilot study is proved to be effective and can meet the remedial duration requirement of the ROD. These components enable continued assessment for compliance with performance standards and reporting of remedy progress. ship to MassDevelopment to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. When the property transfer occurred, the existing ICs were incorporated into the property deed. As part of the property transfer process a technical update of the risk assessment was prepared for the 1996 ROD and recommended RAO that consisted of the addition of LUCs to prohibit residential site development and access to the site's groundwater. The technical update also required that a vapor intrusion evaluation would be required prior to any commercial or industrial development to ensure appropriate safeguards are in place

AOC	Protectiveness Determination	Protectiveness Statement
		relative to building design to minimize vapor intrusion concerns. The site is currently vacant and remains undeveloped. Current remedial action activity consists of intrinsic bioremediation, intrinsic bioremediation assessment data collection and groundwater modeling, a long-term groundwater monitoring program, annual reporting, and five-year site reviews. A sulfate injection pilot study is currently ongoing to determine if enhanced intrinsic remediation will address the increasing organic concentrations in source area groundwater at AOC 43J and ensure long term protectiveness. An ESD will be submitted for the ROD to implement a full scale sulfate injection if the pilot study is proved to be effective and can meet the remedial duration requirement of the ROD. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

There were no recommendations for AOC 43G in the 2010 five year review.

Table 7.4
Status of Recommendations from the 2010 FYR

AOC	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
43J	None	*If the pilot study evaluation currently in progress at AOC 43J indicates that sulfate addition is an effective and feasible augmentation to the intrinsic remediation remedy, the remediation timeframe should be reevaluated to determine if COCs will reach the ROD-projected clean up goal of complete remediation of the site by 2026. If the pilot study meets both these requirements a full scale injection will be implemented following the approval of an ESD for the ROD. MassDevelopment*	Federal Facility	EPA/State	NA	Ongoing	NA

		currently plans to issue a comprehensive report on the pilot study in 2011."					

In the last five years, the recommendations for AOC 43J were addressed as follows:

A sulfate injection pilot study was conducted in December 2009 and 2010 to address the concerns that the intrinsic remediation remedy for AOC 43J was not likely meeting the remedial duration timeline in the ROD. The sulfate tests were followed by an injection of OBC™ in May 2012. The 2014 Annual Report (*H&A, 2015*) evaluated six post-2012 groundwater monitoring rounds and concluded that, "the injection programs were effective at reducing volatile organic compounds (VOCs) to below ROD cleanup goals."

7.5.1 Details on the Transfer and Management of AOC 43J

Parcel C, which includes AOC 43J, was transferred from the Army to MassDevelopment in June 2006. A Covenant Deferral Request (CDR) per CERCLA Section 120(h)(3) was issued to and approved by the USEPA in June 2006.

Based on the FOSET and EBS, an ESD was prepared which was then approved by the USEPA. The ESD incorporates ICs into the AOC 43J ROD that provide for a residential and groundwater use restriction, a building project notification, and a condition that a proposed building construction project may require a subsurface vapor intrusion evaluation as part of the building design process. In addition, the deed for the property between the Army and MassDevelopment and the GERE between MassDevelopment and MassDEP includes these restrictions.

As part of the transfer of property between the Army and MassDevelopment, MassDevelopment made an agreement to assume the responsibilities for all remaining cleanup actions for AOC 43J. MassDevelopment would conduct the remaining response actions to comply with the terms of the ROD, ESD, five-year review and the ACO. MassDEP had assumed over-site responsibilities for the remedial actions conducted by MassDevelopment.

7.5.2 Remedy Implementation

Remedy implementation at AOC 43G continues with annual sampling. Samples are collected from eight existing monitoring wells (four source wells and four sentry wells) and submitted for BTEX, VPH, iron, and manganese. AOC 43J has been transferred to Mass Development and Mass Development is responsible for conducting response actins at ACO 43J to comply with the terms of the ROD.

7.5.3 System Operations /Operation and Maintenance

LTM activities at AOC 43G since 2010 have included annual groundwater sampling and evaluation and discussion of results in annual reports. MassDevelopment continues the remedial actions at AOC 43J.

7.6 Five Year Review Process

7.6.1 Administrative Components

The commencement of this five-year review was announced at the RAB meeting on1/15/2015. The Devens Superfund Site Five-Year Review was led Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the

representative for the support agency.

The review, which began on2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

7.6.2 Community Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479

7.6.3 Document Review

This five-year review for AOC 43g and 43J consisted of a review of relevant documents including previous Five-year reviews, LTM plans, RI reports, Investigation reports, annual reports and monitoring data.

7.6.4 Data Review

The COCs in groundwater at AOC 43G are BTEX, nickel, iron, and manganese. The cleanup goals for these COCs are the GW-1 standards as established by the MCP, with the exception of a site-specific cleanup goal of 375 µg/L for manganese (note: the goal for manganese was changed to 375 µg/L in 2008).

The benzene concentrations for wells AAFES-2, XGM-93-02X, and XGM-97-12X indicate a general downward trend, most notably since the November 2002 sampling event, and well XGM-93-02X has been non-detect for benzene since November 2009. Well AAFES-2 had maintained benzene detections below the 5 µg/L cleanup objective from October 2005 through October 2011 with the exception of detections (6.6 µg/L and 5.04 µg/L) just above the cleanup objective in samples collected from the 2012 and 2013rounds. Benzene was below the cleanup criteria in 2014 at 3.7 µg/L. Benzene detections in well XGM-97-12X remain above the remedial goal in 2011 (13.6 µg/L) after a non-detect in 2010 with results below the remedial goal in the last three rounds. All other AOC 43G wells have maintained benzene concentrations below the GW-1 standard.

Statistical analysis was performed on wells XGM-97-12X, AAFES-2 and XGM-93-02X using Mann-Kendall. The results indicate decreasing trends. Copies of the trend analysis charts are included in **Appendix H**.

The iron concentrations in groundwater at wells AAFES-2, XGM-93-02X, and XGM-97-12X have remained above the 9,100 µg/L cleanup goal since 1999. Abandoned well AAFES-6 and replacement

well AAFES-6R have remained below the cleanup goal through 2014, with the exception of a detection of 9,100 µg/L in 2013. The iron concentrations in sentry well XGM-94-07X was below the cleanup goal to 6,820 µg/L in 2014. All other AOC 43G wells have maintained iron concentrations below the cleanup standard since 2003.

The manganese concentration at source well XGM-97-12X indicates a general downward trend since sampling began in fall 1993. With the exception of well AAFES-5, all other wells at AOC 43G exhibit manganese concentrations above the 375 µg/L cleanup goal. It should be noted that EPA revised the cleanup goal for manganese in 2008 to 375 µg/L from 291 µg/L.

The increase in iron and manganese metals at AOC 43G is due to a reducing groundwater environment induced through biodegradation of the site's organic contaminants.

A 2008 Report evaluating four quarters of groundwater monitoring concluded that MNA at AOC 43J without augmentation was unlikely to be successful in attaining remediation goals by 2026. A sulfate injection pilot study was conducted in December 2009 and 2010 to address this concern. The sulfate tests were followed by an injection of OBC™ in May 2012. Six groundwater monitoring rounds have been completed since the May 2012 injection event. The results of this evaluation are reported in detail in the 2014 Annual Report (H&A, 2015) and are summarized below.

BTEX concentrations did not exceed ROD cleanup goals in any wells during the last (November/December 2014) monitoring event; however, benzene detection limits for a few samples were higher than the ROD clean up criteria due to sample dilution. As shown in the mosaic of plume limits over time provided in Appendix B of the Annual Report (H&A, 2015), considerable progress was made over the period of 2009 through 2013 (spanning the injection programs) in reducing the area of the plume which exceeded ROD cleanup goals for BTEX.

Since the OBC™ injection in May 2012, BTEX concentrations have decreased over time in most monitoring wells.

Twelve monitoring wells exceed ROD cleanup goals for one or more of the three COC metals, arsenic, iron, and manganese, with the highest concentrations typically found in wells in or near the source area (2446-02, 2446-03, 2446-04 and HA-5S). The transition from aerobic to reducing conditions near the source area is evident in the DO values, which are now generally below 1 mg/L and in many wells 0.1 mg/L or less. This has resulted in rebounding iron concentrations and relatively stable arsenic and manganese concentrations.

7.6.4.1 Remedial Duration Assessment

Site impacts have shown a steady decline from 1994 to 2014. These empirical results supported conclusions of the BIOSCREEN modeling conducted in 1999 to estimate remedial duration and plume migration potential (*SWETS and HLA, 1999*). The results of this model demonstrated the unlikelihood that impacts would migrate off Army property. Furthermore, the cleanup goal was estimated to be achieved approximately between 2007 and 2009, or between 11 and 13 years following remedy implementation, which is compliant with the 30-year criteria stated in the ROD. The BIOSCREEN modeling determined that aerobic degradation was the overriding process at these sites, although the relatively high hydraulic conductivity of these sediments suggests that dilution and plume movement could also account for the reduction observed.

The reliability of the BIOSCREEN modeling was re-evaluated during the completion of the 2008 LTMMP (*HGL, 2008*), and included an investigation of the model input parameters and a comparison of

the model predictions to the observed distributions. An evaluation of the input parameters indicated that the hydrogeologic input parameters are consistent with conditions currently observed at the site. A comparison of the modeling results observed during the Fall 2007 sampling event revealed they were consistent with the model predictions.

In general, COC concentrations have declined in wells in the source areas since the Army implemented monitoring in 1993. A sulfate injection pilot study was conducted in December 2009 and 2010 to evaluate its effectiveness to augment intrinsic remediation at AOC 43J. The sulfate tests were followed by an injection of OBC™ in May 2012. Six groundwater monitoring rounds have been completed since the May 2012 injection event. The results of this evaluation are reported in detail in the 2014 Annual Report (*H&A, 2015*).

7.6.4.2 Contaminant Migration Assessment

The analytical data from January 2005 through October 2014 were reviewed with respect to the Contaminant Migration Assessment Performance Standard described in the intrinsic remediation assessment. This standard states that additional field actions will be implemented if COC concentrations exceeding clean up goals are likely to migrate beyond the site boundary.

No detections above the cleanup goals for benzene and toluene have been reported for any of the AOC 43G sentry wells since monitoring began. Metals, primarily manganese, were detected within most source area wells and three sentry wells. Well AAFES-7, located at the downgradient perimeter of the AOC 43G area, was added to the LTM program in 2008 and was sampled for total and dissolved metals. Manganese concentrations at AAFES-7 increased from 2012 to 2013 and then decreased in 2014. These fluctuations are consistent with the site wide CSM for Devens reveals that metals dissolution and potential migration of dissolved metals within groundwater is an anticipated occurrence at hydrocarbon release sites. The production of reducing conditions that are conducive to metals dissolution is considered an anticipated byproduct and is self-limiting once the hydrocarbon release is mitigated. The dissolved metals will come out of solution when the aquifer reverts to an oxidizing state within the impacted area or when the plume front reaches and expands into an oxidizing environment.

The 2014 LTM event showed an overall decrease in concentrations. The groundwater velocity in this area is approximately 29 feet per year, which indicates that off-site migration will not occur. Annual LTM monitoring results will continue to evaluate contaminant migration.

The COC concentrations observed in AOC 43J source and sentry wells fluctuate between sampling events but recent sampling data indicate that organic contaminant concentrations that exceed the clean-up goal are generally increasing within the source area while only one sentry well shows an organic contamination exceedance; however this sentry well (2446-02) is located near the center of AOC 43J. Based on these observations, no potential for off-site migration of organics exists at AOC 43J but increasing concentrations in the source area have been the focus of a current ongoing sulfate injection pilot study.

All source wells and sentry well 2446-04 have routinely yielded arsenic, iron and manganese concentrations above the respective cleanup goal since 1999 and have remained unchanged through 2008, with no overall discernable increasing or decreasing trends. Moreover, sentry wells XJM-93-02X, XJM-94-08X, and XJM-94-03X have yielded manganese concentrations above the 291 µg/L cleanup goal since 1999. By comparison, arsenic at sentry well XJM-93-02X has remained below the cleanup goal since 2001, and sentry well XJM-97-10X has largely maintained manganese concentrations close to

or below the cleanup goal since 1999. However, migration is not occurring as indicated by nearby site sentry wells with manganese concentrations below the background concentration.

Overall, the analytical results indicate that intrinsic bioremediation may be occurring for benzene and toluene at AOC 43J; however, there is contrary evidence to support the same conclusion for the target metals. Based on the most recent analytical results, it appears that the COC exceedances and fluctuations are consistent with historic data and lack a definitive decreasing concentration trend.

7.6.5 Site Inspection

LUCs were verified during the annual sampling events in accordance with the September 2007 Addendum to the Real Property Master Plan. Annual LUC inspections were performed during sampling activities to identify the following:

- Any signs of increased exposure potential to the public from soil and/or surface water contaminants;
- Any evidence that groundwater extraction wells had been installed at the site; and
- Any evidence of site use changes.

No evidence of increased exposure potential was observed during the 2010 through 2014 sampling events.

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. AOC 43G consists of an inactive gas station and car wash, with paved and wooded areas. AOC 43J consists of a paved lot with perimeter landscaping and adjacent wooded areas. Features that were inspected included the asphalt areas, access road, monitoring wells and piezometers. The overall condition of the site was satisfactory.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix H** along with supporting photographs.

7.6.6 Interviews

The following individuals were interviewed in May 2015 as part of the five-year review:

- Mr. Daniel Groher, USACE, New England District;
- Fire Chief Joe LeBlanc, Devens Fire Department;
- Ms. Pamela Papineau, Ayer Board of Health
- Mr. Richard Doherty, PACE
- Mr. Ron Ostrowski, MassDevelopment; and,
- Mr. Neil Angus, MassDevelopment

As part of the FYR review process, interviews were conducted in March and April 2015 in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in Appendix A. In general, comments related to the site were positive and supportive. The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the

required emergency response condition. His general comment was that overall project communication could be improved. In general, comments related to the site were positive and supportive.

Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

7.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

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

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes. ROD COC levels in source area wells in AOC 43G continue to decline and are expected to meet cleanup goals. Sentry wells meet clean up goals for organic COCs. Long-term monitoring will continue to do determine statistically significant concentration trends and whether the remedy is functioning as intended.

Sulfate injections implemented at AOC 43J have been successful at reducing contaminant concentrations to below cleanup levels at AOC 43J. These injections were implemented following concerns expressed in the 2010 Five Year Review that intrinsic bioremediation would not achieve site cleanup goal by 2026..

7.7.1 Remedial Action Performance and Monitoring Results

7.7.1.1 AOC 43G

Long-term groundwater monitoring is performed on an annual basis to determine if contaminants are migrating off the site and to ensure that the intrinsic remediation remains protective of human health and the environment.

The manganese detections at the site were generally consistent with previous results with the exception of groundwater from wells XGM-94-04X and AAFES-7, with both showing increases since 2009 relative to previous results. To investigate the potential for off-site manganese migration, the farthest downgradient sentry well AAFES-7 was sampled. The 2012 through 2014 sampling events indicated total manganese concentrations above the cleanup goal of 375 µg/L. This increase is likely due to a well-established reducing groundwater environment that is low in DO and high in turbidity, generating a more soluble and mobile metal molecule.

Metals dissolution and limited migration is an expected byproduct of hydrocarbon degradation within this and similar petroleum release sites. The un-impacted downgradient (relative to the source area) conditions are oxidizing in nature; the dissolved metals are expected to come out of solution within the more oxidizing portions of the aquifer. The degradation by-products will attenuate over time as groundwater conditions change, and therefore off site migration is not an issue.

It should be noted that while manganese concentrations were above the cleanup goal during the 2014 LTM event, the 2014 manganese concentrations are less than those observed during the 2013 LTM event. The remedial goals are expected to be achieved within the ROD specified time frame.

7.7.1.2 AOC 43J

Long-term groundwater monitoring is performed on an annual basis to determine if contaminants are migrating off the site and to ensure that the intrinsic remediation remains protective of human health and the environment. Increasing organic contaminants were observed at some AOC 43J source wells. The increase in contaminant concentrations placed the remedy completion per the timeframe stipulated in the ROD in question.

A sulfate injection pilot study was conducted in December 2009 and 2010 to address the remedial action performance of AOC 43J. The sulfate tests were followed by an injection of OBC™ in May 2012. As reported in the 2014 Annual Report (*H&A, 2015*); after evaluation of the six groundwater monitoring rounds following the 2012 injection event, "the injection programs were effective at reducing volatile organic compounds (VOCs) to below ROD cleanup goals."

7.7.2 System Operations/Operation and Maintenance (Long-term Groundwater Monitoring)

Groundwater monitoring is performed in accordance with the approved LTMMP (*HGL, 2008b*) for AOCs 43G. Groundwater at AOC 43J is performed under MassDevelopment oversight.

7.7.3 Opportunities for Optimization

7.7.3.1 AOC 43G

A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation, is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2015*). This report presents the results of an optimization evaluation of the long-term monitoring (LTM) program at Devens, including AOC 43G. Until site closure is achieved, the following optimization steps have been recommended for the LTM program at AOC 43G:

- Based on results of the MAROs Mann-Kendall analyses of manganese trends discontinue sampling at monitoring wells AAFES-5 (only exceedance was in 1999), AAFES-6R (decreasing), XGM-94-07X (stable) and XGM-94-08X (decreasing).
- Use HydraSleeve™ technology to perform groundwater sampling at AOC 43G.
- Reduce TAL to report only manganese analyses for "alternate" year annual sampling events (CY2015, CY2017, etc.)
- Non-alternate year (CY2014, CY2016, etc.) annual sampling events will continue with current full TAL for metals.
- Prepare technical memorandum for AOC 43G presenting site specific information for reclassification of groundwater from GW-1 to GW-3, justification for site closure and path forward.

7.7.3.2 AOC 43J

Optimization of the AOC 43J monitoring program was proposed in the 2014 Annual Report (*H&A, 2015*). Based on groundwater monitoring data that dates back to the late 1990s, the 43J groundwater plume limits are well defined and trends continue to show that the plume is stagnant and therefore not

moving at a rate that poses a threat to the closest sensitive receptors – the Devens Patton and Sheboken municipal water-supply wells. The 2014 Annual Report (*H&A, 2015*) proposes to streamline the monitoring well network while maintaining a well network that continues to be protective, and that continues to provide sufficient data to monitor the effectiveness of the ROD remedy.

The report proposes to delete five overburden wells be deleted from the monitoring network. These wells include the following:

- HA-4S – Consistently below ROD cleanup goals; redundant to sentinel well XJM-93-03X;
- XJM-93-02X – Cross-gradient to plume; consistently below ROD goals;
- XJM-94-06X - Consistently below ROD cleanup goals; redundant to sentinel well XJM-93-03X;
- XJM-94-07X - Consistently below ROD cleanup goals; redundant to sentinel well HA-2S;
- XJM-94-09X - Cross-gradient to plume; all parameter below ROD goals.

No changes are proposed for the network of bedrock monitoring wells, as the distribution of upgradient wells, plume wells, and sentinel wells appears to be sufficient without redundant monitoring locations.

7.7.4 Early Indicators of Potential Remedy Problems

While metals as degradation byproducts remain above the established ROD cleanup goals, the focus of the remediation was on organic contamination. The sulfate tests at AOC 43J were followed by an injection of OBC™ in May 2012. As reported in the 2014 Annual Report (*H&A, 2015*); after evaluation of the six groundwater monitoring rounds following the 2012 injection event, "the injection programs were effective at reducing volatile organic compounds (VOCs) to below ROD cleanup goals." Annual LTM sampling will continue to evaluate the effectiveness of the treatment.

7.7.5 Implementation of Institutional Controls and Other Measures

There are no current or future plans for installation of potable water wells at AOC 43G or 43J. In 2006, AOC 43J was combined with other adjacent properties and transferred to MassDevelopment to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. When the property transfer occurred, the ICs were incorporated into the property deed. The deed can be located at the BRAC office library. AOC 43G was included in the "Real Property Master Plan Long Range Component for Devens Reserve Forces Training Area Addendum – September 2007". This document provided supplemental information on LUCs established under BRAC and CERCLA programs. IC inspections at AOC 43G are conducted annually as detailed in the 2008 LTMMP.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes, the assumptions remain valid however; there have been several changes in cleanup levels since the time of remedy selection. These changes are described below:

7.7.6 Changes in Exposure Pathways

The ROD identified unacceptable risk from the following exposure pathways: ingestion of groundwater The remedy includes prohibiting the use of groundwater as drinking as the primary drinking water source for commercial/industrial workers at both AOC 43G and AOC 43J. There are no current complete exposure pathways at the site. Land use at the site has not changed from the industrial use evaluated prior to the ROD and is not expected to change. No new contaminants, sources, or routes of exposure were

identified. There is no indication that hydrologic/hydrogeologic conditions are not adequately characterized.

7.7.7 Changes in Exposure Assumptions

The risk assessments supporting the RODs for AOCs 43G and 43J used exposure assumptions for the ingestion of groundwater pathway that are consistent with standard practice at the time.

Because the remedies include prohibiting the use of groundwater as drinking water, changes to the exposure parameters do not affect the protectiveness of the implemented remedy.

7.7.8 Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance presented in the ROD, and current ARARs were reviewed.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 µg/L) was selected as a groundwater cleanup goal. Arsenic was present on site at concentrations greater than its MCL during the remedial investigation and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 1996 ROD and has been revised to 10 µg/L in 2006. There have been no changes to the COC MCLs since the previous five-year review. Because the remedy includes restricting access to groundwater as drinking water, changes to groundwater standards do not affect the protectiveness of the implemented remedy.

Contaminant degradation at AOC 43J is occurring at a slower rate than anticipated and the remediation time frame is uncertain. The results of the pilot test seem promising in accelerating the degradation rate at AOC 43J. However, groundwater data from sentry wells at both AOCs support the position that the BTEX groundwater plume with concentrations exceeding MCLs is not expanding or migrating.

7.7.9 Changes in Toxicology and Other Contaminant Characteristics

Since the completion of the HHRA, the EPA has issued recent guidance recommending the use of additional sources of peer-reviewed toxicity values, as well as updated several toxicity values. Because the groundwater cleanup goals presented in the ROD are based on drinking water standards and not on risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals. Also, the remedies include the prohibition of groundwater use as drinking water any changes in toxicity of the COCs do not affect the protectiveness of the remedies.

As mentioned above, because the groundwater cleanup goals presented in the ROD are based on drinking water standards and not on risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals.

7.7.10 Changes in Risk Assessment Methodology

While numerous methodologies have changed since the original risk assessments were prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

AOC 43G

As noted in previous sections, there has been variations in manganese in AOC 43G wells XGM-94-04X and AAFES-7 since fall 2009 as a result of hydrocarbon degradation. These byproducts (dissolved metals) will attenuate over time as groundwater conditions approach clean-up goals. Continued LTM sampling is required to monitor decreasing petroleum compounds and confirm off site migration is not occurring.

AOC 43J

. Contaminant degradation at AOC 43J is occurring at a slower rate than anticipated and the remediation time frame is uncertain. The results of the pilot test seem promising in accelerating the degradation rate at AOC 43J. Groundwater data from sentry wells at both AOCs support the position that the BTEX groundwater plume with concentrations exceeding MCLs is not expanding or migrating.

7.7.11 Technical Assessment Summary

While several risk assessment methodologies have changed since the original risk assessment was prepared, ICs are in place to prohibit the groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. No new ARARS or modification to existing ARARs affects the protectiveness for the current remedy.

AOC 43G

There has been variations of manganese concentrations in AOC 43G wells XGM-94-04X and AAFES-7 since fall 2009. The 2014 results for manganese decreased in both wells but remained above the cleanup goal. Continued LTM sampling is required to establish whether a sustained increasing or decreasing trend is in place. Current remedial action activity consists of intrinsic bioremediation, intrinsic bioremediation assessment data collection and groundwater modeling, annual long-term groundwater monitoring, annual reporting, ICs, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

AOC 43J

A 2008 Report evaluating four quarters of groundwater monitoring concluded that MNA at AOC 43J without augmentation was unlikely to be successful in attaining remediation goals by 2026. A sulfate injection pilot study was conducted in December 2009 and 2010 to evaluate the effectiveness of augmenting the intrinsic remediation remedy to speed up the degradation process. The sulfate tests were followed by an injection of OBC™ in May 2012. Six groundwater monitoring rounds have been completed since the May 2012 injection event. After evaluation of these groundwater rounds, it was determined that: “the injection programs were effective at reducing volatile organic compounds (VOCs) to below ROD cleanup goals.” The results of this evaluation are reported in detail in the 2014 Annual Report (H&A, 2015). Groundwater contaminants, primarily manganese detected at AOC 43J sentry wells show a stable concentration trend and do not show evidence of migration.

In 2006, AOC 43J was bundled with other adjacent properties and transferred to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. Additional ICs were placed in the transfer deed to restrict residential development and provide for a vapor inhalation assessment if buildings are placed on the site.

A sulfate injection pilot study was conducted in 2009 and 2010 to address the concerns that the intrinsic remediation remedy was not likely meeting the remedial duration timeline in the ROD. A supplemental OBC™ pilot injection program was conducted in 2012. Six rounds of monitoring were conducted and indicate that contaminant concentrations were reduced to below cleanup level. The effectiveness of this treatment will be evaluated through continued annual monitoring. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

7.8 Issues

There are no issues with respect to protectiveness of the remedy at AOC 43G and AOC 43J as specified by the ROD.

7.9 Recommendations and Follow-up Actions

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

7.10 Protectiveness Statement

Separate protectiveness statements are provided for AOC 43G and AOC 43J below due to transference of AOC 43J from the Army to MassDevelopment for commercial redevelopment and development of an ESD for AOC 43J in 2006.

AOC 43G

The remedy at AOC 43G is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. Human health is not currently at risk at 43G because groundwater is not used as a drinking water source.

AOC 43J

The remedy at AOC 43J is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

7.11 Next Review

The next five year review for AOC 43G and 43J is required five years from the completion of this review.

7.12 References

References are included in **Appendix A**.

8 FORMER ELEMENTARY SCHOOL SPILL SITE AREA OF CONTAMINATION 69W

8.1 Introduction

This is the fourth five-year review for AOC 69W. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

8.2 Site Chronology

Table 8.1
Chronology of Events AOC 69W

Event	Date
Fuel line crimp during UST installation leaked approximately 8,000 gallons of No. 2 fuel oil released to the ground	1972
Oil recovery system was installed	1972-1973
Underground fuel line failed at a pipe joint and approximately 8,000 gallons of No. 2 fuel oil was released to the ground	1978
Fort Devens Final NPL Listing	November 1989
SI performed	1994
Removal action of contaminated soil from 1972 leak and oil recovery system	1997-1998
RI completed	1998
Limited Action ROD signed	1999
Final LTMP	March 2000
First Five-Year Review	September 2000
Final OPS Demonstration for AOC 69W	November 2005
Second Five-Year Review	September 2005
Finding of Suitability to Transfer (FOST)	November 2006
Property transferred from Army to MassDevelopment	August 2007
Final Indoor Air Soil Vapor Intrusion Study for Parker Charter School	February 2008
Revised LTMP	November 2008
Semiannual LTM	2000-2005
Annual LTM	2006-2009
Third Five Year Review	September 2010
Annual LTM	2010 - 2014

8.3 Background

AOC 69W is located at the northeast corner of the intersection of Jackson Road and Antietam Street on the northern portion of what was formerly the Main Post at Fort Devens. AOC 69W consists of the Former Fort Devens Elementary School (Building 215), the associated parking lot, and adjacent lawn extending approximately 300 ft northwest to Willow Brook. All contamination at AOC 69W is attributed to No. 2 heating oil, which leaked from underground piping in two separate incidents; in 1972 and in 1978. Approximately 7,000 to 8,000 gallons of fuel oil were released to soil from each release. A site map showing various features is included as **Figure 8.1**.

The following items summarize the history for AOC 69W.

- 1951. The Fort Devens Elementary School was built and consisted of the east/southeast half of the present school. The school was heated by an oil-fired boiler, and the heating oil was stored in a

10,000-gallon UST located in what is currently the school courtyard. The school was operated and maintained by the Ayer School Department.

- 1972. An addition to the school was built that formed the current school structure. Although a new boiler room was constructed, the old boiler room remained operational. The original 10,000-gallon UST was removed and a new 10,000-gallon UST was installed north of the school in the middle of the current parking lot. During the UST installation, the underground fuel line leading to the new boiler room was accidentally crimped, causing the pipe to split and leak approximately 7,000 to 8,000 gallons of No. 2 fuel oil to the ground.
- 1972-1973. As a result of the fuel release, an oil recovery system was installed in the vicinity of the 10,000-gallon UST. The system consisted of underground piping connected to a buried 250-gallon concrete vault that acted as an oil/water separator. The vault collected oily water and was pumped out approximately every 3 months.
- 1978. Underground fuel piping near the original boiler room failed at a pipe joint. Approximately 7,000 to 8,000 gallons of oil were released into the soil during the incident. Soil was excavated to locate the source of the release. The excavation remained open to collect the residual oil for 1 month before the damaged piping was found and replaced. A maximum of 2,600 gallons of residual oil was pumped from the oil recovery system.
- 1993. The Ayer School Department closed the school because the facility was excess to its needs. As part of the Base closure process, the Army performed a base wide evaluation of past spill sites and designated the elementary school spill site as Areas Requiring Environmental Evaluation (AREE). Based on document reviews and site visits, the evaluation concluded that residual fuel contamination might have been present in the soil and groundwater at the site.
- 1994. The Army performed a Site Investigation (SI), which revealed the presence of fuel-related contaminants in both soil and groundwater between the school and the existing UST, and in an area extending northwest from the existing fuel UST to near Willow Brook. The Army re-designated the site as AOC 69W and proposed a Remedial Investigation (RI) be performed.
- 1995-1998. An RI was performed to define the AREE SI, and to determine whether remediation was warranted. Investigation activities included an historical record search and personnel interviews, a geophysical survey and test pitting, sediment and toxicity sampling in Willow Brook, surface and subsurface soil sampling, groundwater monitoring well installation, groundwater sampling and groundwater level measurements, aquifer testing, ecological survey and wetland delineation, air quality sampling within the elementary school, and human health and ecological risk assessments. The RI data showed that fuel-related compounds, primarily TPHC and SVOCs were present in soils extending from the new (1972) boiler room to approximately 300 ft northwest. Fuel-related VOCs, SVOCs, TPHC, and inorganics comprised the observed groundwater contaminants. Soil and groundwater contamination appeared to be largely a result of the 1972 fuel oil release. The underground oil recovery system apparently acted as a conduit for contaminant migration in soil and groundwater. Observed contamination from the 1978 release did not appear to be migrating downgradient and further migration was considered unlikely considering the age of the release and the paved parking lot, which inhibited precipitation infiltration.
- 1996. Fort Devens officially closed. AOC 69W was slated for future transfer to the Massachusetts Government Land Bank (now MassDevelopment). The existing school building was expected to be re-opened.

- 1997-1998. The Army performed a removal action and excavated approximately 3,500 cy of petroleum-contaminated soil associated with the 1972 fuel oil leak. The 10,000 gallon fuel oil UST, oil recovery system's 250-gallon vault, and associated piping were also removed. The 10,000-gallon fuel oil UST was confirmed to be intact (i.e., no holes or leaks were observed). Confirmatory soil sampling in excavated areas indicated that EPH and VPH concentrations immediately adjacent to the school still exceeded MCP S-1/GW-1 soil standards after the removal action. Because of the proximity of the school, this soil could not be excavated without potential building structural damage.
- 1999. Limited Action ROD signed. The Limited Action consists of groundwater LTM and ICs to limit the potential exposure to contaminated soils and groundwater under both the existing and future site conditions. Because groundwater in this site's recharge area is not planned for as a drinking water source and because Devens has a municipal water supply, the Army's position has been that residual contamination of groundwater in this area does not pose an unacceptable risk. The Limited Action ROD has been in effect since 1999.
- 2000. The former Fort Devens Elementary School was reopened in September 2000 as the Parker Charter School and currently occupies the site.
- 2006-2007. The Army finalized the Findings of Suitable Transfer (FOST) for AOC 69W in November 2006 and the property was formally transferred from Army ownership to MassDevelopment in August 2007. The current property owner, Francis Charter School, is abiding by the ICs imposed on the property, and annual groundwater sampling continues as recommended in the current LTMP.

8.3.1 Physical Characteristics

The predominant soil type at AOC 69W consists of dark yellowish-brown fine to coarse sands, gravely sands, and silty sands. Explorations in the vicinity of Willow Brook and its associated wetlands revealed a 4- to 5-ft layer of dark grayish-brown, sandy silt overlying the sands. Organic material, believed to be from undisturbed native peat deposits, is located in the area north of the school at a maximum depth of 4 ft bgs. Near surface soils beneath the school and parking lot consist of reworked native soils. During the remedial investigation in 1998, bedrock was not encountered in any of the soil borings, which reached depths of up to 16 ft. The water table aquifer at AOC 69W occurs in the overburden at depths ranging from 4 ft to 6 ft bgs on the north side of the school building to approximately 1-ft bgs adjacent to Willow Brook. Groundwater flow direction is predominately from the south-southeast to north- northwest. Groundwater discharges to Willow Brook at times of high groundwater levels and is a losing stream during low groundwater conditions. Vertical gradients were not calculated as there are no deep overburden wells; however, the intermittent discharge to Willow Brook indicates locally upward gradients. Calculated groundwater flow velocities are consistent with the observed sandy soils with a maximum calculated flow velocity of 2 ft/day and a mean flow velocity of 0.7 ft/day. AOC 69W is located within the delineated Zone II for the MacPherson production well located approximately 3,000 ft to the north, and downgradient of AOC 69W (*USACE, 1998*).

8.3.2 History of Contamination (Soil)

A review of the field and analytical data from the 1995 and 1996 RIs (*HLA, 1998*) indicated that there were two areas of fuel-related soil contamination at AOC 69W. The larger area extended from the new boiler room to the oil recovery system 250-gallon concrete vault that acted as an oil water separator, in the wooded area approximately 300 ft northwest of the school. The contamination was attributed to the 1972 release of fuel oil from piping between the 10,000-gallon UST and the new boiler room. Analytical data and visual evidence suggested that the release may have been inside or near the new boiler room. Because of the release, an oil recovery system was installed in 1972 to remove oil from the source area and presumably from near surface soils in the grassy area north of the school. Contaminant distributions established by the RI indicated that the trench for the underground piping associated with this system may have acted as a conduit for contaminant migration. Detected contaminants were primarily TPHC, PAHs, and EPH/VPH at approximately 6 ft to 10 ft bgs adjacent to the school and 0 to 4 ft bgs downgradient in the grassy area and in the vicinity of the 250-gallon underground concrete vault. Subsurface contaminants were located primarily at or near the water table. Surficial contamination downgradient of the school (near Willow Brook) is attributed to sorption during times of high groundwater levels.

Based on the nature and distribution of contaminants, a Removal Action (Weston, 1998) was undertaken in the winter of 1997 and 1998 to remove contaminated soil associated with the 1972 release. Soil was excavated to a maximum depth of 13 ft bgs near the school, and 8 ft bgs near the 250-gallon underground concrete vault. Confirmatory subsurface soil sample results from the removal action showed that concentrations of fuel-related contaminants still exceeded MCP S-1/G-1 standards for EPH in subsurface soils immediately adjacent to the school building, but were generally low in downgradient areas (*Weston, 1998*).

The other identified area of soil contamination was located adjacent to the school building outside of the original boiler room. This contamination was attributed to the 1978 fuel oil release from ruptured piping. An excavation at the time of the release showed visible fuel oil contamination emanating from underneath the school. Analytical data indicated that the contaminants were primarily TPHC at depths of 4 ft to 7 ft bgs beneath the parking lot. Contaminants appeared to be localized to the area immediately adjacent to the school. Future leaching is not likely as the area is paved, thereby inhibiting leaching of soils via precipitation infiltration.

8.3.3 History of Contamination (Groundwater)

Fuel-related VOCs, SVOCs, TPHC, and inorganics comprise the observed groundwater contaminants at AOC 69W. Varying degrees of groundwater contamination, as identified by field and off-site analysis, were observed to extend from the new boiler room towards the 250 gallon underground concrete vault located approximately 300 ft to the northwest. The area of groundwater contamination was coincident with the underground piping associated with the oil recovery system installed in response to the 1972 fuel oil release. Contaminant concentrations were highest between the new boiler room and monitoring well 69W-94-13, which was also the area of highest observed soil contaminant concentrations. The soil around monitoring wells 69W-94-10 and 69W-94-13 exhibited the highest contaminant and inorganic concentrations. This soil was removed during the soil Removal Action (*Weston, 1998*).

Arsenic, calcium, iron, manganese, potassium, and sodium were detected in filtered groundwater samples at concentrations in excess of calculated Devens background concentrations and in some

cases in excess of cleanup values based on the MCP GW-1/GW-2 groundwater standards. Analytes that exceeded MCLs in these wells included arsenic, naphthalene, and the EPH and VPH aromatic fractions. Contaminated soils surrounding these wells were removed during the soil Removal Action (*Weston, 1998*).

The RI (*HLA, 1998*) did not reveal significant groundwater contamination associated with the 1978 fuel oil release in the vicinity of the old boiler room. Low concentrations of chlorinated VOCs were detected during the 1995 field analysis and the first round of groundwater sampling. No chlorinated VOCs were detected during the next three subsequent rounds of groundwater sampling efforts.

8.3.4 Basis for Taking Action

The RI report (*HLA, 1998*) completed a HHRA following a four-step process: (1) contaminant identification; (2) exposure assessment; (3) toxicity assessment; and (4) risk characterization. Detailed discussion of the HHRA approach and results is presented in the RI report.

As presented in the RI report (*HLA, 1998*), under the current land use conditions the estimated excess carcinogenic risks for exposure of a pupil, trespasser and site maintenance worker to soil, sediment, and groundwater were within the USEPA acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. Similarly, potential non-cancer risks did not exceed the USEPA HI threshold value of "1". Excess carcinogenic risks under future land use were estimated for a pupil (exposure to surface soil, sediment, groundwater, and indoor air) and utility worker (exposure to surface soil and subsurface soil). The excess carcinogenic risk for a pupil is within the USEPA acceptable risk range while the utility worker was below $1x10^{-6}$. Again, potential non-cancer risks did not exceed the USEPA upper threshold limit of HI = 1 (*HLA, 1998*).

At the time of the RI, there was no use of (or known exposure to) groundwater at AOC 69W; therefore, risk assessment evaluated the potential risks associated with hypothetical residential use of water. Estimated cancer and non-cancer risks associated with this hypothetical future exposure exceeded levels generally considered acceptable by the USEPA. These risks resulted primarily from the presence of arsenic in the groundwater.

Potential risks for ecological receptors were evaluated during the RI report for chemicals detected in surface soil, sediment, and groundwater at AOC 69W. The RI report concluded that contamination posed minimum threat to ecological receptors.

In June 1999, a Limited Action ROD was signed. The Limited Action consists of groundwater LTM and ICs to limit the potential exposure to any residual contaminated soils and groundwater under both existing and future site conditions.

8.4 Remedial Actions

The RAOs, as stipulated in the 1999 ROD included:

- Restore the aquifer to drinking water standards within a reasonable period;
- Monitor potential future migration of groundwater contamination;
- Eliminate risk from potential consumption of groundwater; and
- Reduce or eliminate the direct contact threat of contaminated soils.

The groundwater monitoring criteria for COCs are shown in **Table 8.2**

Table 8.2
Groundwater Contaminants of Concern Monitoring Criteria AOC 69W

Contaminant of Concern	Monitoring Criteria (µg/L)
VPH/EPH	
VPH C_9-C_{10} Aromatics	200
EPH C_{11}-C_{22} Aromatics	200
INORGANICS	
Arsenic, dissolved	50[2]
Manganese, dissolved	375

Notes:

[1] Monitoring Criteria is based upon the lower of the site-specific monitoring criteria or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] Based on MCL at time of ROD EPA lowered MCL to 10 µg/l in 2006.

The rationale for implementing the Limited Action alternative is two-fold:

1) The groundwater will not be used as a drinking water source. The town of Devens has a municipal water supply. Therefore, the groundwater poses no excessive risk to human health or the environment.

2) The Army will monitor arsenic, manganese, and EPH/VPH levels in groundwater and place ICs on the property to ensure protectiveness with regard to current and future land use.

For the purpose of assessing the VPH/EPH monitoring results there are no potential MCLs identified in the ROD, so the Army has elected to compare the results to the MCP standards for a GW-1/GW-2 aquifer. A GW-1 aquifer is defined as either a current or potential drinking water source area. A GW-2 aquifer is defined as any groundwater monitoring point that is located within 30 ft of an existing occupied structure and the average annual groundwater level is within 15 ft of the ground surface.

8.4.1 Remedy Selection

The ROD for AOC 69W, signed in June 1999, identified Limited Action as the selected remedy.

The Limited Action alternative for AOC 69W included the following key components:

- ICs, including deed and/or use restrictions, would be established and enforced to restrict or prevent potential human exposure to site soil and groundwater contaminants left in place.
- A LTMP would be developed to monitor for any potential off-site migration of contaminants and to verify that elevated concentrations decrease overtime. The LTMP details the installation of groundwater monitoring wells in the source area and downgradient sentry wells to monitor for off-site migration.
- Five-year reviews would be performed to review the data collected and assess the effectiveness of the remedy.

  The LTMP states that if there is an indication that contaminants are migrating downgradient from the former source area, the Army, in conjunction with MassDEP and USEPA representatives, will evaluate the need for additional action. Under the LTMP, downgradient migration is defined by the presence of a COC concentration in groundwater in any of the designated sentry wells (ZWM-95-

15X, ZWM-95-18X, ZWM-99-23X, and ZWM-99-24X) above its monitoring criteria.

8.4.2 Remedy Implementation

The final post-ROD LTMP for AOC 69W was issued in October 2000. The first round of groundwater LTM was performed in the spring of 2000 with semiannual sampling performed through 2005. Annual sampling was initiated in 2006 and a revised LTMP was prepared in 2008. MassDevelopment currently supplies potable water to the school. The Excavated Soil Management Area (ESMA) is monitored during sampling events for broken ground or excavations.

ICs are currently in place as administered by the ROD in June 1999, which were enforced in the transfer of the property from the Department of the Army to MassDevelopment in 2007 (Deed, 2007). Specifically, the ICs include: educational, institutional and open space use restriction, groundwater restriction, soil excavation restriction, modification or release of environmental protection provisions, and project notifications if any of the above restrictions are modified. The deed included a parcel boundary map that encompasses the restrictions.

8.4.3 System Operation/Operations and Maintenance

Groundwater monitoring at AOC 69W has been performed in accordance with the LTMP (Sovereign/HGL, 2008). Eight groundwater monitoring wells and one well point are sampled annually and submitted for EPH, and dissolved metals analyses.

8.5 Progress since Last Five-Year Review

The following is the protectiveness statement from the 2010 Five-Year Review Report:

Table 8.3
Protectiveness Determinations Statement from the 2010 FYR

AOC	Protectiveness Determination	Protectiveness Statement
Site wide	Protective	*"The remedy at AOC 69W is protective of human health and the environment and exposure pathways that could result in unacceptable risk are being controlled. All soil and groundwater contamination remains within the confines of this AOC and ICs are in place that limits exposure to the soil and groundwater at the site. The Army received certification from the USEPA in January 2006 on the Army's Operating Properly and Successfully demonstration document, which showed that the remedy is operating properly and successfully. that limits exposure to the soil and groundwater at the site. The Army received certification from the USEPA in January 2006 on the Army's Operating Properly and Successfully demonstration document, which showed that the remedy is operating properly and successfully, that limits exposure to the soil and groundwater at the site."*

Human health is currently not at risk at AOC 69W because groundwater at the AOC is not being used for potable use, nor proposed for potable use, and COCs exceeding monitoring goals are not migrating off-site. During transfer of the property in 2007 from Army ownership to MassDevelopment, deed covenants were included to prevent potable use of groundwater and unrestricted use of the property. Additionally, the Army has conducted sampling and modeling since the second five-year review to evaluate the potential for vapor intrusion. The results of the vapor intrusion evaluation concluded that there is no vapor intrusion pathway or risk attributable to a vapor intrusion pathway. HASP and IDW handling procedures are in place, are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling.

The continued LTM program remains implemented to track remnant organic and inorganic contaminant trends and to ensure that contaminants do not migrate off site. This strategy is also consistent with risk management decisions that attempt to balance the overall goals of protecting human health and the environment with practical realities involving the allocation of resources. Other remedial action activity consists of annual reporting, ICs, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress."

Table 8.4
Status of Recommendations from the 2010 FYR

AOC	Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
69W	None	There were no recommendations or follow-up actions suggested in the 2010 five-year review for AOC 69W.	Federal Facility	EPA/State	NA	Ongoing	NA

The Revised LTMMP, which was completed in October 2008, evaluated the sampling program for AOC 69W. It was concluded that until site closure is achieved, the Army recommends that monitoring at AOC 69W be continued on an annual basis with no changes. A well was installed in 2013 (69WP-13-01) downgradient of the existing well point 69WP-08-01 to characterize manganese concentrations in groundwater. This well was first sampled during the fall 2013 LTM event and has been added to future LTM sampling events.

8.5.1 Remedy Implementation Activities

The ROD remedy at AOC 69W includes LUCs to limit potential exposure to contaminated soil and groundwater under both existing and future site use. During annual sampling, observations were made to identify any signs of increased exposure potential. No evidence of increased exposure potential has been observed since the last five year review.

8.5.2 System O&M Activities

LTM activities from 2010 through 2014 at OU#8 included annual groundwater sampling and well

gauging. Eight groundwater monitoring wells and two well points are sampled annually for EPH and dissolved metals analyses.

8.6 Five-Year Review Process

8.6.1 Administrative Components

The commencement of this five-year review was announced at the RAB meeting on1/15/2015. The Devens Superfund Site Five-Year Review was led by Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency. EPA was not present at the meeting.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

8.6.2 Community Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479

8.6.3 Document Review

This five-year review for AOC 69W consisted of a review of relevant documents including previous Five-year reviews, LTM plans, annual reports and monitoring data.

8.6.4 Data Review

Annual Reports present LTM data, the LTM data for AOC 69W were reviewed for this Five Year Report and are discussed below. Tables in **Appendix I** summarizes the AOC 69W COCs that have exceeded the monitoring criteria from the 2010 though 2014 annual sampling events.

The groundwater COCs for AOC 69W are MassDEP VPH and EPH carbon fractions and arsenic, with the monitoring criteria based upon the lower of the site-specific monitoring criteria or the MCP GW-1 standard (310 CMR 40 Subpart P). Manganese is also tracked over the course of the LTM program as a byproduct of groundwater conditions created by the COC degradation, although it is not a COC.

The EPH concentrations, specifically the C11-C22 aromatic carbon fraction concentrations in wells 69W-94-13, ZWM-99-22X, ZWM-99-23X, and ZWM-95-15X have remained relatively constant since November 2002. Over time the EPH compounds may have sequestered within the soil organic matter, either as the original molecular structure or as the by-products of microbial utilization. Since the November 2002 event, wells ZWM-99-23X and ZWM-95-15X have maintained C11-C22 aromatic fraction concentrations of non-detect or below the 200 µg/L monitoring criterion, whereas well 69W-94-

13 has fluctuated slightly and has been above criterion since fall 2009. By comparison, well ZWM-99-22X has generally maintained a C11-C22 aromatic fraction concentration slightly above the monitoring criterion since fall 2008. All other sampled AOC 69W wells have yielded EPH carbon fraction results below the respective monitoring criterion since monitoring began.

The VPH concentrations, specifically the C9-C10 aromatic carbon fraction, have steadily decreased since the May 2003 sampling event, with well ZWM-99-22X exhibiting the most significant concentration decline. As noted for the EPH compounds, such a decline may result from microbial degradation and organic or mineral matter sequestration. The C9-C10 aromatic fraction concentration for well ZWM-99-23X has remained below the 200 µg/L monitoring criterion since May 2000 and has been non-detect since fall 2010. Well 69W-94-13 has remained below the monitoring criterion since the May 2005 event. As noted, well ZWM-99-22X has indicated a sharp decline in the C9-C10 aromatics concentration since May 2003 and has remained below the 200 µg/L criterion since fall 2009. All other sampled AOC 69W wells have yielded VPH carbon fraction results below the respective criterion since monitoring began.

All arsenic results have generally remained above the 10 µg/L monitoring criterion since May 2000 in wells 69W-94-13, ZWM-99-22X, and ZWM-99-23X. Well ZWM-99-22X continues to have the highest detections of arsenic, above the monitoring criteria, with a high of 408 µg/L in fall 2009 to 172 µg/L in fall 2014. Well ZWM-95-15X has experienced periodic arsenic detections above the criterion ranging from non-detect in fall 2009 to 30.2 µg/L in fall 2014. The arsenic concentrations in Well ZWM-99-25X have fluctuated with detections slightly above the monitoring criteria in both 2011 (13 µg/L) and 2012 (19 µg/L) to non-detect in 2014.

The manganese concentrations in source wells 69W-94-13 and ZWM-99-22X and sentry wells ZWM-95-15X, ZWM-99-23X and ZWM-01-25X have primarily remained above the monitoring criteria of 375 µg/L. In addition manganese was detected above the monitoring criteria at well point 69WP-08-01 for the first time in fall 2011 at 2,190 µg/L showed a significant decrease in fall 2012 and was below the criterion in 2013 (237 µg/L) in 2013. The newly installed well, 69WP-13-01, was below the criterion at 235 µg/L the first time it was sampled in the fall of 2013 followed by a decrease to 49.2 µg/L in 2014.

To determine the arsenic and manganese mobilization mechanism in the groundwater, ORP was evaluated against concentration. If fuel compound biodegradation was mobilizing natural arsenic and manganese, then consistently low ORP values would be expected with some correlation between fuel oils and metals concentrations downgradient from the historic fuel contamination. There does not seem to be a significant correlation between ORP and arsenic or manganese. There does, however, appear to be a correlation between elevated petroleum and manganese concentrations. AOC 69W exceedances from 2010 to 2014 are presented in **Table 8.5** below**.** As shown in the table, monitoring wells in which arsenic and manganese are regularly exceeded are the same wells where fuel hydrocarbons also exceed monitoring criteria. These observations suggest that metals mobility in groundwater is controlled by the geochemical changes caused by the biodegradation of the fuel hydrocarbons. This apparent inconsistency, in which high manganese concentrations are not correlated with low ORP values but are correlated with elevated petroleum concentrations, may be due to ORP readings and manganese concentrations being disproportionately affected by seasonal variations in geochemistry.

Table 8.5
Exceedances Over Time Area of Contamination 69W 2010 to 2014

Well Number	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014
C_{11}-C_{22} Aromatics - 200 µg/l Monitoring Criteria[1]					
69W-94-13	339	242	379	227	252
ZWM-95-15X	ND	ND	ND	ND	ND
ZWM-99-22X	209	327	308	286	332
ZWM-99-23X	ND	ND	ND	ND	ND
C_9-C_{10} Aromatics - 200 µg/l Monitoring Criteria[1]					
69W-94-13	(142)	(66.7)	(63 J)	(87.6)	NC
ZWM-99-22X	(76.4)	(114)	(55.5 J)	(119)	NC
ZWM-99-23X	ND	ND	ND	ND	NC
Arsenic, dissolved - 10 µg/l Monitoring Criteria[1]					
69W-94-13	127	120	115	73	101
ZWM-95-15X	13	41	23	17	30.2
ZWM-99-22X	343	367	299	233 J	172
ZWM-99-23X	15	60	29	27	19.5
ZWM-99-25X	ND	13	19	(5)	ND
Manganese, dissolved - 375 µg/l Monitoring Criteria[1]					
69WP-08-01	(78)	2,190	904	(237)	(64.5)
69W-94-13	1,360	1,840	1,400	1,730	1,940
ZWM-95-15X	1,120	1,010	1,580	1,280	900
ZWM-99-22X	1,750	2,160	1,120	998	1,280
ZWM-99-23X	523	1,720	500	556	533
ZWM-01-25X	1,490	2,820	2,540	1,570	435

Notes:
The number in parentheses denotes that the concentration is below the cleanup goal.
NC = not collected
ND = not detected
1 The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

8.6.5 Site Inspection

Existing land-use is evaluated as part of the Five-Year Review process to ensure control requirements are being met. A site-specific annual Land Use Control (LUC) checklist, including physical on-site inspection and interview components, was developed in 2007 for use during LUC verification activities.

LUC inspections are performed annually to identify the following:

- Any signs of increased exposure potential to the public from soil and/or surface water contaminants;
- Any evidence (repaved cut marks or penetrations in the pavement) within the ESMA that have not been otherwise identified and properly documented by the property owner;

- Any evidence that groundwater extraction wells had been installed at the site; and
- Any evidence of site use changes.

Annual site inspections have indicated that: No groundwater extraction wells have been installed on the site and no evidence of increased exposure potential was observed during the annual LTM sampling events. Annual Checklists and interviews are included in Annual Reports.

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. Features that were inspected included the asphalt areas, access road, monitoring wells and piezometers. The overall condition of the site was satisfactory.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix I** along with supporting photographs.

8.6.6 Interviews

Annual interviews with site personal have indicated that there has been no change in property in the past five years.

The following individuals were interviewed as part of the five-year review:

- Mr. Daniel Groher, USACE, New England District;
- Fire Chief Joe LeBlanc, Devens Fire Department;
- Ms. Pamela Papineau, Ayer Board of Health
- Mr. Richard Doherty, PACE
- Mr. Ron Ostrowski, MassDevelopment; and,
- Mr. Neil Angus, MassDevelopment

As part of the FYR review process, interviews were conducted in March and April 2015 in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in **Appendix A**. In general, comments related to the site were positive and supportive.

The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved. In general, comments related to the site were positive and supportive.

Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

8.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

- Question A: Is the remedy functioning as intended by the decision documents?
- Question B: Are exposure assumptions, toxicity data, cleanup levels, and remedial action objectives

used at the time of the remedy still valid?

- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning as intended by the decision documents as detailed below.

8.7.1 Remedial Action Performance and Monitoring Results

Fifteen years of groundwater monitoring have been performed following the LTMP (*HGL, 2000* and *2008*). The LTMP details the site monitoring that will be performed in order to meet the remedial goals for the site. These goals include: restoration of the aquifer to drinking water standards within a reasonable period, natural attenuation, monitoring of potential migration of groundwater contamination, elimination of risk from potential consumption of groundwater, and reduction or elimination of the direct contact threat of contaminated soils through implementation of ICs.

Based on the review of 2010 through 2014 data, groundwater concentrations for VPH and EPH are stable or decreasing over time and sentry wells indicate no off site migration. Sampling results at AOC 69W sentry wells indicate that EPH/VPH and arsenic are not migrating off site in groundwater. No evidence of increased exposure potential was observed during the 2010 through 2014 LTM events. The time frame estimated to achieve the remedial goals outlined in the ROD is still estimated to be in compliance with the 2029 goal. The remedy continues to be protective of human health and the environment.

8.7.2 System Operations/Operation and Maintenance

Groundwater monitoring from 2010 through 2014 has been performed in accordance with the approved LTMMP for AOC 69W (*Sovereign/HGL, 2008*). The purpose of the LTM program is to monitor the potential for off-site migration of contaminants and verify that elevated concentrations of contaminants are decreasing over time.

8.7.3 Opportunities for Optimization

A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation, is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2014*). This reports presents the results of an optimization evaluation of the long-term monitoring (LTM) program for AOC 69W.

8.7.4 Early Indicators of Potential Remedy Problems

Organic COC degradation is occurring; however, the increase in metals, primarily manganese should be monitored to ensure that off-site migration does not occur. Evaluation of the 2010through 2014 LTM data confirmed that the site currently does not pose a risk and is not expected to pose a risk in the future.

8.7.5 Implementation of Institutional Controls and Other Measures

The property was transferred in August 2007 from Army ownership to MassDevelopment, where deed covenants were included in the deed to prevent potable use of groundwater and prevent unrestricted use of the property. There are no current or future plans for installation of potable water wells at AOC 69W.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection and remedial activities are still valid.

8.7.6 Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance for the site presented in the ROD and current ARARs were reviewed. This review will be discussed further in Section 8.7.2.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 µg/L) was selected as a groundwater monitoring criteria. Arsenic was present on-site at concentrations greater than its MCL during the RI and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated in 2006 to 10 µg/L. The change to this standard does affect the effectiveness or duration of the remedy.

MassDEP MCP Method 1 standards are used as monitoring goals for petroleum hydrocarbon fractions because no EPA or state MCL is available and no cleanup goals were developed in the ROD. The lower of MassDEP GW-1 and GW-2 standards were used as monitoring criteria for petroleum hydrocarbon fractions. GW-1 standards are protective of groundwater used as drinking water. GW-2 standards are protective of groundwater with the potential to volatilize into indoor air spaces. Correction of the GW-1 standard for the VPH C9–C10 aromatic fraction in June 2003 resulted in a decrease from 1,000 µg/L to 200 µg/L.

Because the monitoring criteria are based on drinking water standards, changes to the MCLs and MassDEP GW-1 standards influence the monitoring goals. However, because the remedy includes prohibiting the use of groundwater as drinking water, changes to groundwater standards do not affect effectiveness of the remedy.

8.7.7 Changes in Exposure Pathways

There are no current complete exposure pathways at the site. There has been no change in exposure pathways since the original risk assessment was performed. The ROD identified potential risk from the following future exposure pathways: potential ingestion of groundwater as the primary drinking water source at AOC 69W. Exposure risks were also considered for indoor air and site worker exposure to soil but these risks were determined to be acceptable (no unacceptable risk).

The Francis W. Parker Charter Essential School currently occupies the property and MassDevelopment supplies potable water to the school. Significant construction has taken place since June 2006; however, no excavations or penetrations through pavement were observed within the ESMA. No groundwater extraction wells have been installed on the site. No evidence of increased exposure potential has been observed.

Groundwater at this site is not currently used as drinking water. The exposure to groundwater through drinking water and household use is of concern to future receptors on a hypothetical basis only. ICs prohibiting the use of site groundwater as drinking water at AOC 69W have eliminated this potential pathway. Land use at the site has not changed and is not expected to change, and current land use complies with the deed restrictions for AOC 69W. Hydrogeologic conditions have been adequately characterized and no new contaminants, sources, or routes of exposure have been identified.

8.7.8 Changes in Exposure Assumptions

The risk assessment supporting the ROD for AOC 69W used exposure assumptions for the ingestion of groundwater pathway that were consistent with standard practice at the time.

Because the remedy includes prohibiting the use of groundwater as drinking water, changes to the exposure parameters do not affect the protectiveness of the implemented remedy.

8.7.9 Changes in Toxicology and Other Contaminant Characteristics

Since the completion of the HHRA, the EPA has issued recent guidance recommending the use of additional sources of peer-reviewed toxicity values, as well as updated several toxicity values. While a few of the toxicity values have been revised since the HHRA was performed, these revisions would not result in the identification of additional COCs, nor would it change the overall conclusions of the risk assessment.

No groundwater cleanup goals are presented in the ROD, only a requirement to monitor the groundwater. The monitoring criteria are intended to track migration and trends of the groundwater. Also, the remedy includes the prohibition of groundwater use as drinking water, so any changes in toxicity of the COCs have no bearing on the remedy as implemented. Because the contaminated soil has already been removed, changes to soil contaminant toxicity do not affect the protectiveness of the implemented remedy.

8.7.10 Changes in Risk Assessment Methodology

While numerous methodologies have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water. In addition, ICs are in place to restrict excavation at the site and limit any exposure to potential residual soil contamination. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. No other information has come to light that would call into question the protectiveness of the remedy as noted. No natural disaster impacts occurred at AOC 69W during this review period.

8.7.11 Technical Assessment Summary

The site currently does not pose a risk and is not expected to pose a risk in the future. The removal actions performed by the Army mostly eliminated the petroleum-contaminated soils that would otherwise be continuing sources of contamination; however, a portion of the impacted soils were left in place due to their location under the existing school building. There are no known human or ecological risks associated with AOC 69W. Groundwater quality will continue to improve and site restrictions are in place to prohibit potable use of groundwater.

The AOC 69W remedy is functioning as intended by the decision documents. The LTMMP has been revised in 2015 (LTMMP, Sovereign/HGL, 2015) to include updates to the LTM program.

A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation, is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2015*). This reports presents the results of an optimization evaluation of the long-term monitoring (LTM) program at Fort Devens, including AOC 69W.

Revisions to the MCP, which became effective February 2008, allows the adoption of alternative exposure points and monitoring criteria for those sites that are contaminated with oils [i.e., CMR 40.0924(2) and CMR 40.0926(8)]. This revision is applicable to sites that are designated GW-1 solely on the basis of the being within a Zone II or an Aquifer Protection District that overlays or is contiguous with a Zone II. The MCP revision for petroleum release sites recognizes the established CSM for the fate and transport of hydrocarbon compounds in groundwater (i.e, that biodegradation and attenuation occur within a short distance of a release, such that the constituents do not generally migrate substantial distances in groundwater). AOC 69W has demonstrated these conditions and the "incomplete" source removal is not affecting or contributing to conditions such that any remnant source strength is causing conditions to persist or worsen. On the contrary, the source area well has steadily declined and is approaching the monitoring criteria and most site wells meet the monitoring criteria.

The following recommendations were presented for AOC 69W:

- Eliminate VPH carbon ranges and target analytes from the LTM program.
- Prepare technical memorandum for AOC 69W presenting site specific information that supports conditions defined within the MCP revision for petroleum release sites, justification for site closure and path forward.

8.8 Issues

There are no issues with respect to protectiveness of the remedy as specified by the 1999 ROD.

8.9 Recommendations

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

8.10 Protectiveness Statement

The remedy at AOC 69W is considered protective because there is no evidence of current exposure and exposure pathways that could result in unacceptable risks are being controlled.

8.11 Next Review

The next five year review report for AOC 69W is required five years from the completion of this review.

8.12 References

References are included in **Appendix A**.

9 FORMER MOORE ARMY AIRFIELD AOC 50

9.1 Introduction

This is the third five-year review for AOC 50, the last being completed in 2010. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

9.2 Site Chronology

Table 9.1
Chronology of Site Events

EVENT	DATE
NPL listing	December 1989
Remedial Actions (Pre-ROD)	SVE 1996 Pilot ERD 2001
RI initiated	1996
RI completed	January 2000
FS complete	December 2002
Proposed Plan	January 2003
ROD signed	March 2004
Final Remedial Action work Plan	June 2005
Five Year Review (All Fort Devens AOCs)	September 2005
Demonstration of Remedial Action Operating Properly and Successfully Report	March 2007
AOC 50 Interim Five Year Remedy Review	January 2008
Revised LTM Plan AOC 50	March 2008
ERD O&M Manual Addendum 1	March 2009
Five Year Review (All Fort Devens AOCs)	September 2010
Draft Final LTM Plan	March 2012
Performance Monitoring Work Plan AOC 50	September 2013
Annual O&M and Monitoring Reports	2010 - 2014
2014 Performance Monitoring Data Report	June 2014
AOC50 Source Area MiHPT Investigation Summary (Draft)	February 2015

9.3 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 Fort Devens, Ayer, Massachusetts (**Figure 9.1, Appendix J**). 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. AOC 50 is currently defined by three distinct areas; the Source Area (also referred to as Area 1), Southwest Plume, and North Plume (**Figure 9.2** and **9.3, Appendix J)**.

The AOC 50 Source Area comprises less than two acres and includes 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) the former drum storage area (FDSA) and the

former dry well area (FDW). The Army currently leases the areas designated as the Source Area to Massachusetts Development and Finance Agency (MassDevelopment). The Source Area buildings are included in the lease but are abandoned. The Army, MassDevelopment, and the U.S. Fish and Wildlife Service (USFWS) own portions of the area overlying the Southwest Plume, including the majority of the former airfield. The former airfield is closed to aircraft traffic and is currently leased by the Massachusetts State Police for training and vehicle storage.

The Merrimack Warehouse Realty Co., Inc. owns the area overlying the North Plume. The property is zoned commercial and is developed with a building used for the manufacture of windshield washer fluid and as a storage facility. A fire pond is located on the property and would be used for fire suppression source water in the event of a fire.

The Army retained approximately 14 acres of the former airfield for use by the Devens Reserve Forces Training Area (RFTA) for vehicle storage, maintenance, and office space. The 14 acre area includes the AOC 50 source area. The Army transferred the remaining 246 acres of the property to MassDevelopment in 1996 for reuse. Under the Devens Reuse Plan (November 14, 1994), the area is zoned for Special Use II and Innovation and Technology Business. Special Use II and Innovation and Technology Business zone may include a broad range of industrial, light industrial, office, and research and development uses. There are currently no other plans for development of the MAAF, although the area can be developed if interested parties are identified. The portion of the property managed by the USFWS is located adjacent to the Nashua River, within the floodplain, is generally forested and heavily vegetated with steep terrain and limited access. There are presently no plans to develop this area. Due to its designation as a wildlife refuge and location within the floodplain, future development is unlikely.

Sources of groundwater contamination within AOC 50 include two World War II fueling systems, a drywell formerly connected to the parachute stakeout tower, a PCE drum storage area and cesspool. These sources are collectively referred to as the AOC50 Source Area. Although these sources have been removed or taken out of commission, groundwater underlying AOC 50 contains elevated concentrations of volatile organic compounds (VOC) most notably tetrachloroethene (PCE). The primary area of groundwater contamination at AOC 50 is referred to as the Southwest Plume. In its pre-remediation extent, the plume extended from the Source Area approximately 3,000 feet (ft) downgradient to the Nashua River. The Southwest Plume is divided into five areas (Source Area/Area 1), Area 2 (located east southeast of building 3818), Area 3 (located south of building 3813), Area 4 (located within the runway) and Area 5 (located southwest of Area 4 and northeast of the Nashua River).

A single water table aquifer occurs within the overburden deposits below the former MAAF and AOC 50. Low permeability confining units were not encountered during the previous investigation programs and no confined aquifers have been identified. Restrictions to vertical groundwater flow, such as silty clay layers, are present, but not prevalent in boring logs within the kame deposit or along the Nashua River. Some silty clay layers were encountered within the aquifer in the AOC 50 Source Area. These thin, silty clay 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.

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 three ft below ground surface (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 for 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. Since remedial activities were implemented in 2004/2005, the plume has diminished in its extent and is no longer a continuous plume but is segmented into smaller sections.

Figures 9.4 and **9.5** present the most recent interpretive groundwater elevations.

9.3.1 Fueling Systems

During World War II, two fueling systems were used in the area subsequently designated as AOC 50; one system was used for fueling aircraft and trucks (System A), and the other for fueling trucks only (System B). These systems were not used for refueling operations after the late 1940s (Biang, et aI., 1992). The two separate fueling systems were filled by gasoline shipments on a Boston & Maine Railroad spur (which no longer exists) located adjacent to Fueling System B.

At the time of the initial SI in 1992 (ABB, 1993), several fueling system components were still visible in their original locations. Devens removed all of these components in 1992. In addition, approximately 450 tons of contaminated soil was removed from under the water separator, water control pits, and three 25,000-gallon USTs. The excavation extended to a depth of approximately 19 ft bgs. All excavations were backfilled to grade.

9.3.2 Dry Well

In 1969, Building 3840 was constructed and attached, via an enclosed walkway, to Building 3803. In addition, two large sinks, and a janitor's room were added to Building 3803. The design drawings for Building 3840 indicated that a floor drain was constructed in the center of the concrete floor. This floor drain, the additional sinks in Building 3803, and the roof drains for Building 3840 were piped to a drywell located approximately 20 ft northeast of Building 3840. The drywell and associated piping were removed between November and December 1996 (Weston, 1997). The resulting excavation was 9.5 ft deep and covered an area 21 ft by 30 ft, equating to 225 bank cy of soil.

In addition, a 750-gallon fuel UST associated with the Building 3840 heating system was removed. In conjunction with the tank removal, 787 gallons of oil, water, and residual sludge were recovered from the tank and approximately 25 cy of contaminated soil were excavated. Solid and liquid wastes generated during removal of the drywell and fuel USTs were taken off site for proper treatment and disposal. Details regarding the removal activities are documented in a Removal Action Report (Weston, 1997).

9.3.3 PCE Drum Storage Area

A PCE drum storage area, east of Building 3801, was identified during field investigation activities completed in 1992. Historical records and interviews with former Fort Devens personnel indicated that this area was used to store single drum quantities of PCE (HLA, 2000). The PCE was used by Army personnel in Buildings 3803 and 3840 for spot cleaning of parachutes. Parachute cleaning was performed only as needed to maintain the integrity of the parachute material. Unused PCE was either reused or may have been washed down into the drywell system associated with Buildings 3803 and 3840. This information was supported by a review of the historic hazardous waste manifest, which did not include the removal of waste chlorinated solvents from AOC 50 (Mott, 1997). The use of this area for drum

storage was discontinued in 1992. The length of time or total number of drums stored in this area of AOC 50 is unknown.

An in-situ SVE system was installed between December 1993 and January 1994 adjacent to the former drum storage area. Five soil vapor extraction wells (SVE-l through SVE-5) were installed, one in the center of the presumed PCE source and four on the periphery. The SVE system was shut down in 1996 due to poor PCE recovery but was operated again for a brief period in December 1998, May and June 1999, and October and November 1999, again experiencing poor PCE recovery. The SVE system was permanently shut down in September 2004 due to continued poor recovery of PCE. The system was decommissioned and disconnected from the recovery piping in November 2005. The treatment system building and SVE system components remain on site.

9.3.4 Cesspool

A cesspool associated with the bathroom in Building 3803 was identified on the site drawing as the only septic system structure for the building. The drywell and cesspool were investigated as potential contaminant sources for the various volatile contaminants, including PCE. The cesspool was removed concurrent with the drywell and UST removal actions described in previous sections. During the cesspool removal activities, a total of 25cy of soil, sludge, and concrete were excavated and taken off site for treatment and disposal (HLA 2000).

9.3.5 Basis for Taking Action

The baseline human health risk assessment revealed that workers and residents potentially exposed to COCs in groundwater via potable water ingestion and vapor inhalation may present unacceptable human health risks (i.e., cancer risks greater than 10^{-4} and non-cancer hazard indices greater than 1). In addition, the screening-level ecological risk assessment indicated significant but low ecological risks (hazard quotients for benthic organisms greater than 1 indicating low potential risk). Therefore, actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the ROD (2004), may present an imminent and substantial endangerment to public health, welfare, or the environment. Groundwater is the focus of remedial actions at AOC 50.

9.4 Remedial Actions

There are three main areas of contamination identified for AOC 50; the Source Area, the Southwest Plume and the North Plume. The Remedial Action Objectives (RAO), per the ROD, selected for each of these areas are as follows:

Source Area

- Protect potential residential and commercial/industrial receptors from ingesting contaminated groundwater.
- Protect commercial/industrial workers from inhaling vapors released from groundwater used as "open" process water.
- Prevent potential construction/occupation of residential dwellings and inhalation of vapors released from contaminated groundwater to indoor air.

Southwest Plume

- Protect potential residential and commercial/industrial receptors from ingesting contaminated groundwater.

- Prevent low to moderate potential ecological effects to benthic organisms.

North Plume

- Protect potential residential receptors from ingesting contaminated groundwater.

9.4.1 Remedy Selection

The selected remedial technologies for AOC 50, per the 2004 AOC 50 ROD, included Soil Vapor Extraction (SVE), Enhanced Reductive Dechlorination (ERD), in-well stripping (IWS)/aerobic bioremediation, long term monitoring (LTM), and Institutional Controls (IC). In addition, geochemical additives and In Situ Chemical Oxidation (ISCO) were included as contingencies to address inorganics and VOCs, respectively. This remedy is a comprehensive approach that addresses all current and potential risks caused by groundwater contamination and mitigates residual soil contamination in the Source Area.

The components of remedy selected for AOC 50 were chosen to reduce potential human health and ecological risks associated with contaminated groundwater under current and anticipated future land use scenarios. The remedial system for AOC 50 is also protective to the environment, attains ARAR and offers long-term and short-term effectiveness. The principal components of the remedial systems for AOC 50 consisted of the following:

- SVE in the Source Area;
- ERD throughout the site;
- IWS along the downgradient portion of the Southwest Plume;
- Contingency for chemical oxidation in the North Plume;
- Contingency for evaluation and manipulation of aquifer chemistry for re-precipitation of solubilized inorganics associated with the ERD process;
- Long Term Monitoring (LTM);
- Institutional Controls (IC); and
- Five-year site reviews.

In accordance with the ROD, the Remedial Design (RD) (ARCADIS, 2004b) included four active remedial elements:

- ERD;
- IWS;
- SVE; and
- Contingency remedies.

9.4.2 Remedy Implementation

Remedy implementation was initiated in May 2004 for ERD, IWS and SVE systems in accordance with the Remedial Design (ARCADIS, 2004) and the Final Remedial Action Work Plan (ARCADIS, 2005). ERD injections were performed monthly per an Operations and Maintenance Plan (ARCADIS, 2005) but transitioned to semi-annual beginning in Fall 2008 (HGL, 2009). The AOC 50 substrate also changed

from molasses to Anaerobic BioChem (ABC®) in Fall 2008. IWS operations continued until system shutdown in March 2013 with the infrastructure left fully intact onsite. SVE operations in Area 1 began in September 2004 and ended in November 2005 with subsequent decommissioning of the system. LTM and IC inspections have been conducted in accordance with the Long-Term Monitoring Plans (LTMPs) developed in 2008 (ARCADIS) and 2012 (HGL). Operation and maintenance and evaluation of the operating remedial systems continued throughout their operation and are discussed in annual OM&M reports.

9.4.2.1 SVE System Summary

SVE operations began in September 2004 and ended in November 2005. The data from 2005 showed a very low mass removal rate that indicated that the bulk of the recoverable CVOC mass had been removed from the vadose zone in the former drum storage area. As a result, the Army provided a recommendation to the USEPA and the MassDEP that the system be shut down due to the limited CVOC mass removal potential remaining in the soil.

The BRAC Cleanup Team (BCT) approved decommissioning of the SVE system in November 2005, and the system components and wells were decommissioned between December 2005 and June 2006. Additional details regarding the SVE decommissioning activities are documented in the November 2006 *O&M and Groundwater Monitoring Report* (ARCADIS G&M, 2006). The SVE treatment shed and most of the former SVE system remain on site.

9.4.2.2 Enhanced Reductive Dechlorination (ERD)

The objective of the ERD is to expedite the degradation of CVOCs in the groundwater by adding an electron donor to stimulate microbial activity. Sustained organic carbon concentrations are supplied during the ERD activities to serve as the electron donor supporting biological VOC degradation within the treatment area.

ERD injections began in September 2004 and were performed monthly through Fall 2008 when they were transitioned to a semi-annual injection schedule. At that time, the former molasses ERD substrate was replaced with Anaerobic BioChem'" (ABC®) which is a formulated timed-release compound that allows better control of the development of reducing conditions within the aquifer to create and maintain in-situ reactive zones (IRZ) and promote microbial activity to treat VOCs.

Semi-annual ERD injection events are conducted in the Spring/Summer and Fall/Winter. Injection activities are preceded by groundwater sampling events. The ERD injection events are presented in annual OM&M reports, which summarize each injection event, including injection volumes delivered, injection flow rates and each well and well head pressures. Groundwater data are evaluated annually to determine whether modifications are needed to the injection program.

9.4.2.3 In-Well Striping (IWS)

The mechanical and control components of the IWS system were constructed and activated in May 2004. IWS operations continued until system shutdown in March 2013. The IWS consisted of two recirculation wells (IWS-1 and IWS-2) that were positioned to intercept the zone of highest CVOC impact in groundwater and treat volatile compounds in situ. The IWS system also created aerobic conditions in the event that reducing conditions extended beyond the area of the ERD treatment. The IWS infrastructure remains fully intact onsite.

9.4.3 System Operation/Operation and Maintenance

The full-scale remedy of the ERD and IWS treatment systems was implemented in September 2004 and presently includes the active operation of the ERD injection system. ERD injections continue in a semi-annual basis (Spring and Fall events). Recommendations for modifications to the ERD injection program and/or the monitoring network are presented in Annual OM&M Reports.

9.4.3.1 ERD Operation and Maintenance

O&M activities for the ERD remedy include semiannual injection events in the Source Area and along the Southwest Plume. There are five ERD injection transects (Areas 1 through 5). Area 1 is located within the Source Area and Areas 2 through 5 are located in four transects along the Southwest plume (**Figure 9.2**). Semiannual sampling is conducted in accordance with the most recent LTMMP (*HGL, 2012*). Data collected from the semiannual sampling events are used to evaluate the effectiveness of the ERD remedy.

Since ERD operations began in 2004, the injection well network has been modified and expanded on several occasions to address the dissolved plume. These expansions have included the transition of former monitoring wells to injection wells, in addition to new well installation, if needed. Groundwater sampling events are conducted one month prior to injection activities. In general, groundwater from monitoring wells located upgradient of ERD transects will be sampled to measure COC levels coming into the treatment area, wells located downgradient of the ERD transects will be monitored for total organic carbon loading, system performance, and inorganics solubilization downgradient of the injection transects.

The monitoring wells associated with the ERD transects, serve two purposes: 1) to monitor the geochemical environment in and downgradient of the in situ reactive zones (IRZ) created at each injection area, and 2) to monitor trends in groundwater quality in and downgradient of the IRZs. The 2014 ERD monitoring well network consisted of 10 wells to be sampled semiannually, and 42 wells to be sampled annually (which includes the 10 semi-annual wells). In addition to the designated semi-annual and annual sampling, four wells are designated for biennial sampling and three wells for sampling every 3 years. Four Microwells® (installed in 2012) and one monitoring well, located South of Area 5, will be sampled annually for dissolved metals and monitored for geochemical parameters to augment the LTM program.

Twenty-nine (29) monitoring wells and two (2) injection wells were abandoned in Fall 2012. The monitoring wells selected for abandonment were no longer required for the LTM program and were located outside of the delineated VOC plume. In addition, the decommissioned wells were inappropriately screened for any potential future monitoring use. The two injection wells were abandoned based upon their location outside the area requiring ERD injections. Well abandonments were conducted by Geosearch following MassDEP protocols as detailed in Appendix F of the 2012 Annual OM&M Plan (Sovereign/HGL; 2013). **Figures 9.6** through **9.10** present the current groundwater concentrations for AOC 50 COCs, tetrachloroethene, trichloroethene, cis-1,2 dichloroethene, vinyl chloride and dissolved arsenic respectively.

9.4.3.2 IWS Operation and Maintenance

The IWS system is located on USFWS property at the most southwestern portion of the plume as shown in **Figure 9.2**. The IWS system consists of two recirculation wells (IWS-1 and IWS-2) located at the downgradient end of the site (upgradient of the Nashua River) that are positioned to intercept the zone of

highest VOC impact in groundwater and treat VOCs in situ.

An IWS evaluation was prepared and submitted to the BRAC Cleanup Team (BCT) in February 2013. Based on the recommendation provided in this evaluation, the IWS system was shut down. Concurrence was provided by both the USEPA and MassDEP prior to the shutdown, which occurred on March 29, 2013. Although the system was shut down, quarterly visits are conducted to maintain the system for potential future restart, if increasing concentrations of VOCs or dissolved metals are detected within the capture zone of the wells. Influent groundwater samples are collected during the quarterly visits.

9.5 Progress since Last Five-Year Review

Overall progress towards achievement of the RAOs and protection of human health and the environment is assessed annually and reported in Annual O&M and Monitoring Reports.

Table 9.2:
Protectiveness Determinations Statement from the 2010 FYR

AOC	Protectiveness Determination	Protectiveness Statement
Site wide	Protective	*The remedy at AOC 50 is protective of human health and environment. Exposure pathways that could result in unacceptable risks are being controlled. The remedial actions at AOC 50 are expected to allow unrestricted use and unlimited exposure following achievement of groundwater remediation goals.*

The following recommendations were made:

Table 9.3
Status of Recommendations from the 2010 FYR

OU	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
	None	*An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that the Army should revise the AOC 50 LTMP. The site conditions have changed since the remedy was implemented and the primary VOC contaminants have degraded significantly within many portions of the treatment area. The revised monitoring*	Federal Facility	EPA/State	NA	Ongoing	NA

OU	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
		network should place additional focus on areas where metals mobilization is well established and at areas where VOC degradation is lagging relative to the more degraded areas of the plume. The wells located on the western ends of Areas 2, 4, and 5 that reveal slowly degrading VOC concentrations may require additional monitoring to ensure the degradation continues and the location of area transect injection wells remain effective in providing optimal IRZs based on VOC concentrations. Solubilized metals, particularly arsenic and manganese, prevalent throughout the IRZs in all treatment areas may require more focused monitoring to confirm their attenuation within aerobic portions of the aquifer. Proposed revisions to the existing LTM monitoring program will be included in the LTMP revision.					

These recommendations were addressed as follows through remedy implementation activities from 2010 through 2014: The remedial actions as specified in the ROD were continued throughout the preceding five year review period (2010-2014). The IWS system was shut down in March 2013. ERD injections continued on a semi-annual basis and are routinely evaluated to address the dissolved plume. Four small diameter MicroWells® were installed in 2012 in a downgradient location relative to the AOC 50 source area and southwest of the Area 5 ERD treatment zone to evaluate the effectiveness of the Area 5 IRZ. The LTMP was revised in 2012 to include updates to the LTM program to account for changes in the site's geochemistry and contaminant distribution following the implementation of ERD. A focused investigation was performed in 2013 to identify and address the western portions of the groundwater plume where elevated concentrations may be bypassing injection areas or where portions of the plume are not being effectively treated by the existing ERD injection network. This investigation included

vertical groundwater profiling at 25 locations and the installation of six additional monitoring wells and one injection well. A Source Area MiHPT (i.e., Membrane Interface Probe plus hydraulic profiling) investigation was conducted in 2014 to further address the findings from the 2013 profiling event which identified zones where elevated [>1,000 micrograms per liter (µg/L)] concentrations of tetrachloroethene (PCE) remained in Area 1.

Overall, contaminant concentrations have been reduced significantly across AOC 50 since implementation of the ERD remedy in 2004 and degradation of primary CVOC contaminants is continuing.

9.5.1 System O&M Activities

LTM activities from 2010 through 2014 at AOC 50 have been performed in accordance with the approved LTMMPs. The LTMMP for AOC 50 was revised in 2012 to include updates to the LTM program to account for changes in the site's geochemistry and contaminant distribution following the implementation of ERD.

9.6 Five-Year Review Process

9.6.1 Administrative Components

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

9.6.2 Community Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100, Devens, MA 01434-4479

9.6.3 Document Review

This five-year review for OU#8 consisted of a review of relevant documents including previous Five-year reviews, LTM plans, RI reports, Investigation reports, annual reports and monitoring data.

9.6.4 Data Review

Analytical data collected during monitoring events performed between January 2010 and November

2014 were evaluated for this five-year review. Data pertaining to the ERD and IWS remedial components are summarized in the following sections.

9.6.4.1 ERD System Operation Data Review

The ERD system currently consists of 47 substrate injection wells located in the Source Area and in the Southwest Plume. There are 20 ERD injection wells located in the Source Area (Area 1) (IW-7 through IW-12, IW-13S through IW-19S, IW-13D through IW-19D, IW-38, and G6M-96-13B [recently converted from a groundwater monitoring well to a permanent injection well]; and 27 ERD injection wells located in four transects (Areas 2 through 5) along the Southwest Plume (IW-1 through IW-6, IW-20 through IW-23, IW-24 through IW-28, and IW-29 through IW-37. Wells G6M-02-05X, G6M-06-01X and G6M-07-01X were recently converted from groundwater monitoring wells to permanent injection wells.

The ERD system operation consists of performing semi-annual substrate (Anaerobic BioChem® [ABC®] and water solution) injections into the ERD injection wells located at AOC 50 to create and maintain in situ reactive zones (IRZ) and promote microbial activity to treat VOCs. The reports of these injection events, which include detailed information regarding the ABC® solution concentrations and the amount injected into each injection well, are reported in Annual O&MM Reports**.**

The ultimate objective of the designed ERD system at AOC 50 was to stimulate and support the complete biodegradation of PCE within the source areas and downgradient plume. Progress toward this objective was evaluated based on the January 2010 through November 2014 LTM data and adherence to the aquifer criteria established for maximum PCE degradation. The aquifer criteria includes: consistent and adequate TOC concentrations in monitoring wells throughout the treatment areas; proper pH levels (between 5 and 9) to sustain dehalogenating bacteria; reducing conditions established throughout the IRZ at a level that supports reductive dechlorination; a notable decline in parent species (PCE) concentrations and increased production of degradation or daughter products (TCE, *cis-l,2*-DCE, and VC) and a subsequent decrease in TCE, *cis-l,2*-DCE, and VC concentrations in fully developed IRZs.

Data trends are used to evaluate the overall success of the ERD system at AOC50. These trends indicate the extent of enhanced contaminant degradation and included the following observations:

- Degradation of PCE is evident throughout the ERD injection areas. In most cases, the degradation of PCE is followed by an increase in degradation byproducts including TCE, cis-1,2-DCE, and VC.
- Residual pockets of VOCs in groundwater are found along the western edge of transects 2, 4 and 5. The western edges of these transects have had a less developed reducing environment and subsequently show a slower dechlorination of the primary PCE contaminant. The latest data confirm that targeted application of ERD substrate within these transects is effective at stimulating reductive dechlorination at the western edge of the former PCE plume; however, it was determined that the ERD injection network needed to be expanded further to the west to provide a greater distribution of ERD substrate to more comprehensively address the VOCs in this portion of the plume.
- The results from the 2013 profiling event suggest that specific dense saturated low permeability zones may need additional or enhanced application/treatment under the current ERD injection program to remediate any remaining hot spots. The follow-on results of the MiHPT investigation in the Source Area indicate that preferential flow may be preventing delivery of substrate to areas/depths of higher residual concentrations. Injection optimization may address these areas.

A more detailed discussion of the ERD system adherence and progression by each IRZ area is presented in the following section. Subsequent to this discussion, current data (2010 through 2014) are compared to the initial groundwater dechlorination model developed in the Remedial Design (RD). The latest complete LTM analytical data set is available through 2014.

9.6.4.2 Bio-Stimulation and Development of Anaerobic Conditions

A successful ERD process is executed through the development of an anaerobic aquifer and in situ biostimulation of the native bacterial community. As compared to pre-ERD conditions, the change in redox conditions and PCE decrease in the monitoring wells with increases in daughter compounds indicate that biostimulation at AOC 50 is occurring in response to the remedy in place. Furthermore, increased degradation byproduct concentrations in the wells imply that the reducing conditions required for enhanced dechlorination of PCE and TCE are present and that the mechanism is progressing through to the generation of end products.

Analytical data collected for all associated monitoring wells since initialization of the ERD technology are presented in **Appendix J**. To demonstrate successful operation of the ERD remedy, trends for key parameters are presented for selected wells from each Area. The specific parameters in each figure include dissolved iron and arsenic, pH, TOC, methane, and chloroethenes (Figures are located in **Appendix J**). Statistical analysis was conducted on select wells and contained in **Appendix J** to support conclusions identified in the following sections. An abbreviated discussion of the individual criteria for optimum ERD progression is presented below.

9.6.4.3 TOC Distribution

Implementation of the ERD remedy through regular substrate injections has achieved successful distribution of TOC within the groundwater under all areas of concern: the former drywell and former drum storage areas, and Areas 2, 3, 4, and 5. The readily available organic carbon in the substrate has promoted microbial growth through stimulation of the native community and promoted a strong anaerobic environment within the aquifer.

9.6.4.4 Permanent Gases and Biostimulation

Methane concentrations have remained generally elevated over the course of the ERD treatment in each of the treatment zones. According to trend lines, the sustained evolution of high methane levels in each area along with a decline in dechlorination by-product concentrations indicate that the reducing conditions required for dechlorination are equally established within the IRZs.

9.6.4.5 Maintenance of Optimal pH Conditions

The pH levels within and up gradient of the established IRZ boundaries have remained generally consistent exhibiting a slightly acidic nature, fluctuating between 5 and 7 pH, since monitoring events began.

9.6.4.6 Transient Metals Solubilization

Metals solubilization, especially arsenic and manganese associated with the ERD process, is evident within the IRZs across AOC 50. The resulting extent of metals desorption is directly correlated with the geochemically reducing conditions within the IRZ for each injection area. Specifically, the more reductive the environment and, thus, conductive to chlorinated hydrocarbon degradation, the more likely metals dissolution will occur within a reducing zone. This relationship is observed throughout the AOC 50 treatment area and was an anticipated byproduct of the selected remedy.

Solubilization of naturally-occurring metals is isolated to the area constituting the IRZs due to the production of arsenite (III) versus arsenate (V). The highest dissolved metals concentrations, primarily arsenic and manganese are detected in groundwater from the following nine monitoring wells, which are located within an established IRZ. . The dissolved arsenic and manganese levels remained elevated from 2009 through 2014 with little fluctuation. The latest results for these wells are summarized per area below.

Area 1 Monitoring wells:

G6M-96-13B (arsenic 365 µg/L in October 2013, manganese 17,600 µg/L in October 2013),

G6M-04-09X (arsenic 600 µg/L in November 2014, manganese 16,500 µg/L in November 2014),

G6M-04-22X (arsenic 667 µg/L in November 2014, manganese 1,600 µg/L in November 2014),

Area 2 Monitoring Well:

G6M-02-01X (arsenic 384 µg/L in November 2014, manganese 1,820 µg/L in November 2014),

Area 3 Monitoring Wells:

G6M-03-07X (arsenic 355 µg/L in November 2014, manganese 1,400 µg/L in November 2014),

G6M-04-04X (arsenic 453 µg/L in November 2014, manganese 8,520 µg/L in November 2014),

Area 4 Monitoring Well:

G6M-02-13X (arsenic 128 µg/L in November 2014, manganese 7,920 µg/L in November 2014), and,

Area 5 Monitoring Wells:

G6M-02-12X (arsenic 760 µg/L in November 2014, manganese 4,870 µg/L in November 2014),

G6M-02-11X (arsenic 624 µg/L in November 2014, manganese 4,860 µg/L in November 2014

All nine monitoring wells discussed above are located within an established IRZ. The dissolved metals concentrations will likely continue to fluctuate within an IRZ and are not anticipated to significantly diminish until the IRZ reverts to an oxidizing state. By comparison, oxygenated environments with a positive ORP promote the oxygenation of arsenite to arsenate, which is readily and firmly bound within the surrounding mineral and natural organic matrices. The presence of dissolved iron within the aquifer further promotes rapid oxidation of the arsenite to arsenate once the groundwater reaches the oxidizing portions of the aquifer. Such phenomena are substantiated by the monitoring data in **Appendix J.**

As is evident from the monitoring data, dissolved arsenic concentrations are below the regulatory limit of 10 µg/L in wells downgradient of the defined Area 5 IRZ. The conditions within these wells are primarily oxidizing. The diminished VOC concentrations, reduction in ERD substrate loading, and natural groundwater flux and precipitation infiltration in this area will allow the aquifer to return to its natural, oxidizing state.

9.6.4.7 Enhanced Contamination Degradation

The primary objective of the ERD system is to stimulate and support the complete reduction of PCE within the source area and the downgradient plume. The following discussion presents current trends as related to the enhanced dechlorination activity occurring at each area.

North Plume Area Summary

No VOCs were documented above laboratory detection limits in groundwater from the North Plume Area monitoring wells (G6M-96-22A and G6M-96-22B) since the October 2009 sampling event. These results confirm that VOCs are not migrating into this area from the AOC 50 source area.

Former Drum Storage Area (FDSA)

As presented in **Appendix J** groundwater from monitoring wells in the FDSA generally exhibit a decline in PCE concentrations, specifically at monitoring wells G6M-04-09X (7,400 µg/L in September 2004 to 0.21 J µg/L in November 2014) and G6M-04-10A (6,100 µg/L in June 2006 to non-detect in November 2014). **Figure 9.17** presents the PCE decline for G6M-04-10A graphically. The highest CY 2014 PCE concentration (14,000 µg/L in November 2014) documented was in groundwater from monitoring well G6M-07-02X, which is located in the FDSA. The PCE concentrations at groundwater monitoring well G6M-07-02X have increased since 2009 but are expected to decline with continued ERD injections at nearby injection wells (IW-38).

Overall, PCE concentrations are greatly diminished within the FDSA and no PCE exceedances were documented along the northern perimeter of the AOC 50 site (2014 Annual OM&M Report).

Former Dry Well Area (FDW)

Groundwater from three monitoring wells consistently demonstrating the highest historic PCE concentrations, G6M-02-08X, G6M-03-02X and G6M-96-13B, are located downgradient of the FDW injection transect and all groundwater sampling results for these three monitoring wells are presented graphically in **Figures 9.18 and 9.19** in **Appendix J**. G6M-96-13B was converted to an injection well in December 2013 and replaced with G6M-13-06X which was installed in January 2014. Since 2003 and 2004, the groundwater analytical results from these three monitoring wells have exhibited reductions in PCE (4,500 µg/L in 2003/2004 to non-detect in 2014) and TCE (46 µg/L in 2003/2004 to non-detect in 2014) and VC (non-detect in 2003/2004 to 140 µg/L in 2014) with increases in methane concentrations (2.6 µg/L in 2003/2004 to 38,000 µg/L in 2014). This indicates that the ERD process is well established and proceeding through to completion, with one exception. The exception consists of the delayed response to the ERD remedy observed at a western edge monitoring well G6M-04-12X. In 2009, groundwater from this well, located to the west of the injection transect, began to show a decline in PCE content. To aid in addressing the concentration of PCE in this portion of Area 1, monitoring well G6M-04-12X was converted to an injection well during the July 2014 ERD injection event. Monitoring well G6M-13-05X was installed in January 2014 to replace G6M-04-12X. .

9.6.4.8 Area 1 2013 Groundwater Investigation

An additional groundwater investigation was conducted in 2013 identify and address the western portions of the groundwater plume (Areas 2, 3and 4) and to evaluate the current conditions in Areas 1 and 5. This investigation was conducted in accordance with the Final Performance Monitoring Work Plan (Sovereign/HGL, 2013) and included vertical groundwater profiling at a total of 25 locations and the installation of six additional monitoring wells and one injection well. The data, summarized below, are discussed in detail in the 2014 Performance Monitoring Data Report (Sovereign/HGL, 2014).

There were 15 borings (GP-13-02 to GP-13-09 and GP-13-16 to GP-13-23) advanced within Area 1 in September/October 2013 utilizing Direct Push Technology (DPT). Twelve of the borings (GP-13-03 to GP-13-09, GP-13-16 and GP-13-18 to GP- 13-21) were advanced to determine the current conditions in the source area and three borings (GP-13-17, GP-13-22 and GP-13-23) were advanced to locate two new

groundwater monitoring wells. Drill refusal ranged from approximately 43 ft bgs to 77 ft bgs. Groundwater samples were collected at 10 foot intervals starting at approximately 15 to 20 ft bgs to refusal depth.

The highest PCE concentrations (1,000 to 7,400 µg/L) in the groundwater profile samples were located at a depth of approximately 47 to 65 ft bgs. These concentrations are located south of the parachute shakeout tower and near the drywell formerly connected to the parachute shakeout tower generally document decreasing VOC concentrations away from the source area. Vertical groundwater profiling documented that 11 borings (GP-13-03, GP-13-06, GP-13-08, GP-13-09, GP-13-16, GP-13-17, GP-13-18, GP-13-19, GP-13-20, GP-13-21 and GP-13-22) at Area 1 had groundwater samples with PCE concentrations above the regulatory and compliance standard of 5 µg/L. Of these 11 borings, five (GP-13-17, GP-13-18, GP-13-19, GP-13-20 and GP-13-21) had PCE concentrations greater than 1,000 µg/L and were located around Building 3840 in the Source area.

Two new groundwater monitoring wells (G6M-13-05X and G6M-13-06X) were installed in Area 1. The first groundwater monitoring well (G6M-13-05X) was installed west of current groundwater monitoring well G6M-04-12X to provide monitoring data and facilitate optimization of the ERD injections. The second groundwater monitoring well (G6M-13-06X) installed is located southeast of the former parachute tower and southwest of current groundwater monitoring well G6M-96-13B to provide monitoring data and facilitate optimization of the ERD injections.

The concentration of PCE in groundwater sampled from new groundwater monitoring well G6M-13-05X showed increased levels from January 2014 (250 µg/L) to November 2014 (1,700 µg/L). The PCE degradation compound, cis-1,2-dichloroethene (cis-1,2-DCE), was also present ranging from 16 µg/L in January to 77 µg/L in November. PCE was below the regulatory compliance concentration at new monitoring well G6M-13-06X (3.9J µg/L) in January 2014 and was not detected in November 2014. These wells will be integrated into LTM program to aid in the effective optimization of the ERD injection program.

9.6.4.9 AOC 50 Source Area 2014 Membrane Interface Hydraulic Profiling Tool Investigation

A Membrane Interface Probe Hydraulic Profiling Tool (MiHPT) Investigation was conducted in the AOC50 Source Area in October 2014 in accordance with the 2014 Source Area Investigation Work Plan, AOC50 (Sovereign/HGL). The purpose of the MiHPT investigation was to improve the overall understanding of the location/source of residual VOC contamination both vertically and laterally in the source area, and use that information to ascertain required modifications of the existing remedy to more effectively treat the source area. This work was performed to further address the findings from the 2013 profiling event in the Source Area (Area 1) which identified zones where elevated [>1,000 µg/L] concentrations of PCE remained in Area 1. The results of this investigation are presented in detail in the Draft AOC50 Source Area MiHPT Investigation Summary (Sovereign, 2015).

The overall project goals were therefore to:

- Utilize MiHPT technology to investigate beneath Building 3840 (parachute tower) to determine if an additional residual source exists which might be contributing to the elevated PCE in groundwater observed during the 2013 vertical groundwater profiling event;
- Utilize MiHPT technology to further investigate the specific depths and geological setting for the impacts in groundwater in the vicinity of the former drywell and drum storage areas;
- Utilize MiHPT technology to investigate areas downgradient of both source areas and the three

pairs of ERD injection wells (IW17, IW18 and IW19) to further understand the behavior of impacts in relation to geological setting with distance from the source areas; and,

- Utilize the gathered information to evaluate the overall effectiveness of the existing ERD injection remedy in the source area in continuing to reduce source area impacts and the appropriateness of the existing monitoring well network for continued monitoring.

The higher than expected results from the 2013 profiling event suggested that the existing ERD injection network, located in close proximity of many of these elevated PCE locations might not be adequately treating the source area at depth. MiHPT technology was used to help identify locations and zones of PCE impact through simultaneous direct sensing of PCE concentrations through a Membrane Interface Probe (MIP) and high resolution measurement of relative permeability/geological setting of those zones through a Hydraulic Profiling Tool (HPT).

9.6.4.9.1 MiHPT Technology Overview

The MiHPT, a tool developed by Geoprobe®, combines the standard MIP with the HPT to log chemical and hydraulic data simultaneously in a single push. This tool set provides a high resolution semi-quantitative screening tool for subsurface total VOC concentrations and hydrogeologic conditions. A detailed discussion of the MiHPT Technology is presented in the MiHPT Investigation Summary report (Sovereign, 2015).

The MIP portion of the MIHPT probe provides semi-quantitative concentrations of VOCs in the subsurface. The MIP can be used in both saturated and unsaturated materials to detect VOCs in the gaseous, sorbed, dissolved or free phases. The membrane acts as an interface between the VOCs in the subsurface and gas phase detectors situated above ground. The membrane is semi-permeable and is comprised of a thin film polymer impregnated into a stainless-steel screen for support. It is 6.35 millimeters (mm) in diameter and is placed in a heated block attached to the probe. This block is heated to approximately 120 degrees Celsius. A constant gas flow of 35 to 45 milliliters per minute (mL/min) sweeps behind the membrane and carries the diffused VOCs up the trunkline to the gas phase detectors. Detectors are housed in a gas chromatograph (GC) and data is displayed on a laptop computer. A combination of three types of detectors: Photoionization Detector (PID), Flame Ionization Detector (FID), and halogen (chlorinated) specific detectors (XSD) may be used to detect VOCs. Detection limits for typical MIP configurations generally range between 1 parts per million (ppm) and 150 parts per billion (ppb) or less, depending upon contaminant concentrations and soil matrix. In addition to the ability to detect VOC contaminants, the MiHPT also provides relative permeability and lithologic information, by measuring injection pressure and flow using a downhole transducer and soil electrical conductivity (EC) using a dipole array.

9.6.4.9.2 MiHPT Field Investigation

A total of 17 MiHPT borings were advanced as part of this investigation. Five locations (1, 1a, 1b, 1c, 1d) were advanced under and around the Building 3840 Source Area, four locations (2, 2a, 2b, 2c) were advanced in and around the former drywell source area, three locations (3, 4, 5) were advanced to the south, southeast and southwest downgradient of former sources, and five locations (6, 7, 8, 9, 10) were advanced at the request of regulators downgradient in the southwest and west direction. Detailed discussion of the field investigation and results is presented in the Draft AOC 50 Source Area MiHPT Investigation Summary report (Sovereign, 2015).

Results of each MiHPT boring are presented in MiHPT vertical logs, with each log having seven graphs. The first and second graphs are EC overlaid with Estimated K [(EC in Siemens per meter (mS/m) and Estimated K in feet per day (ft/day)]. The third and fourth graphs are the HPT data (HPT pressure and hydrostatic pressure, both in psi) overlaid on one another. On the hydrostatic pressure graph, the first green diamond represents the approximate depth of the water table while the subsequent green triangles represent the depths at which dissipation tests were run. The final three graphs are the FID, PID and XSD responses in microvolts (uV).

XSD responses were highest in MiHPT borings MiHPT-09 (southeast of building 3840), MiHPT-03 (south of the building 3840), MiHPT-01b (east of building 3840), MiHPT-01c (southwest of building 3840), MiHPT-04 (southwest of building 3840), MiHPT-05 (west of building 3840), and MiHPT-01 (located within building 3840). In general, decreasing XSD responses were observed in the north northeast and west direction and increased XSD responses were generally observed to the southeast of building 3840.

XSD data, in particular, collected from the MiHPT-01 and MiHPT-02 series, and MiHPT borings MiHPT-03 and MiHPT-09 borings continue to support the former dry well as a primary former source. The former floor drain in the parachute tower (which connected to the former dry well) did not appear to be a secondary source (from suspected piping leakage at the floor drain location) based on the lack of shallow cVOC responses in the XSD instrumentation. In general, impacts appear to be restricted to deeper depths.

9.6.4.9.3 ERD Injection Well Effectiveness

One of the data quality objectives for select MiHPT borings was to evaluate the subsurface conditions in the vicinity of several of the presently used ERD injection wells near Building 3840 and the former dry well. MiHPT borings with increased XSD responses were correlated with nearby ERD injection wells; MiHPT-09 with IW-17S/D, MiHPT-03 with IW-18S/D and MiHPT-01c with IW19S/D. In summary, it is likely that the substrate being injected into the "D" wells is entering the formation at about 40-45 feet bgs, with little material coming in contact with the higher concentrations in the less permeable portion of the formation below.

9.6.4.10 Monitoring Well Network Evaluation

Based on increased XSD responses observed in borings located southwest of building 3840, the Army completed an evaluation of the existing monitoring well network to determine if the existing network is adequate to fully delineate the source area plume.

As part of the Fall 2014 LTM event, groundwater from monitoring wells G6M-13-06X (southeast), G6M-04-09X (southeast), and G6M-04-15X (southeast) were sampled and submitted for laboratory analysis of VOCs. All analytes for each well listed above were below cleanup standards with the exception of vinyl chloride (15 µg/L) in groundwater from monitoring well G6M-13-06X, which exceeds the cleanup standard of 2 µg/L. Therefore, at this time, the existing monitoring well network does not appear to need modification.

9.6.4.11 Effectiveness of Existing ABC ERD Injection

Based on the data collected to date, the current ERD injection process appears to have been successful in treating the majority of the more permeable portions of the AOC 50 plume, especially at shallower depths in the source area. There is a general reduction of cVOC in the source area and downgradient plume with no stalling of daughter products, indicating complete dehalogenation is occurring.

However, the MiHPT investigation identified dense low permeability zones that do not appear to be effectively treated by the current injection process, in large part because the long length of the deep injection well screens appear to allow the majority of the substrate to infiltrate the aquifer at the upper section of the screens, which is in less dense geological formations.

The MiHPT investigation results also suggest that some changes to the methods of ERD application may be necessary to better treat the cVOC mass in the source area, it is also appropriate to consider modification to the type of ERD material used in the remediation as different substrates have different optimal delivery methods. In particular, substrate longevity and ability to force substrate contact with the most impacted areas are primary factors in consideration.

9.6.4.11.1 Area 2 Summary

The analytical results from groundwater sampled from monitoring well G6M-02-01X, located approximately 60 ft downgradient of the Area 2 injection transect, are presented on **Figure 9.20** in **Appendix J**. Based on the 2009, 2010, and 2012 data, it appears that the PCE concentration in groundwater sampled from monitoring well G6M-02-01X exhibited declining increases relative to previous decreases (smaller rebounds in PCE from previous decreases over time), potentially due to a decline in the redox potential (ORP becoming more positive) of the surrounding groundwater and contaminant inputs from upgradient monitoring wells. Although these rebounds occurred, the recent data (2013 and 2014) indicates a definitive overall decreasing concentration trend for PCE confirmed by a decline in dechlorination by-product concentrations and the sustained evolution of high ethene and methane concentrations. It is noted that the variation in both the 2011 and 2013 data suggest that the rebound periods were short-lived and that the ERD process continues to work toward completion, as demonstrated by non-detections for PCE in 2011, 2013 and 2014 along with a decline in dechlorination by-product concentrations. Monitoring well G6M-07-01X, along the western edge of transect 2, was transferred to the ERD injection program in December 2013 to provide a greater distribution of ERD substrate to the VOCs in this portion of the plume.

By comparison, groundwater sampled from monitoring well G6M-04-03X, which is approximately 175 ft directly downgradient of the Area 2 injection transect, has exhibited an increased PCE degradation rate since 2007 with PCE rebounds observed in both 2010 and 2013 followed by a decline in 2014. Degradation by-products, especially VC, have been observed in groundwater from the Area 2 upgradient monitoring well G6M-04-01X since 2009, with a reduction of VC observed in 2013 and 2014. PCE was observed in 2013 below detection limits for the first time in groundwater from monitoring well G6M-04-01X.

Two borings (GP-13-01 and GP-13-24) were advanced within Area 2 in September/October 2013 utilizing DPT. Drill rig refusal ranged from approximately 111 ft bgs to approximately 119 ft bgs. Groundwater samples were collected at 10 foot intervals starting at approximately 64 to 65 ft bgs to refusal depth. Laboratory analytical results from groundwater profile samples documented no VOC concentrations greater than the laboratory detection limit. No additional groundwater monitoring or injection wells were required in Area 2.

9.6.4.11.2 Area 3 Summary

Results from groundwater sampled from monitoring well G6M-03-07X, located approximately 60 ft downgradient of the Area 3 ERD injection transect, are presented in **Figure 9.21** in **Appendix J**. All chlorinated volatile organic compounds (CVOC) in groundwater sampled from this monitoring well have

either been non-detect or low-level concentrations since the 2010 Spring LTM event. Groundwater sampled from monitoring well G6M-04-04X, located downgradient of monitoring well G6M-03-07X, showed complete degradation of PCE by 2009. The geochemical environment of groundwater at well G6M-04-04X remains reductive and the remnant VOCs are expected to fully degrade. A rebound in PCE concentration in groundwater sampled at upgradient monitoring well G6M-04-02X was noticed during the 2014 event after concentration declines for the 2012 and 2013 events.

Two borings (GP-13-14 and GP-13-15) were advanced within Area 3 in September/October 2013 utilizing DPT. Drill rig refusal ranged from approximately 112 ft bgs to approximately 122 ft bgs. Groundwater samples were collected at 10 foot intervals starting at approximately 60 to 70 ft bgs to refusal depth. Laboratory analytical results from groundwater sampled indicate no VOC concentrations greater than the regulatory compliance concentration;

New groundwater monitoring well G6M-13-03X was advanced in Area 3, west of Building 3813. This groundwater monitoring well will provide western perimeter monitoring of the VOC-impacted groundwater plume and is screened at the same depth interval as groundwater monitoring well G6M-04-02X, which is 80-90 ft bgs.

Analytical results for samples collected from new groundwater monitoring well G6M-13-03X in January and October 2014, were non-detect for PCE and associated degradation products. This well will be integrated into LTM program.

9.6.4.11.3 Area 4 Summary

Similar to trends observed in Area 3, the Area 4 results present a decline in PCE concentrations throughout Area 4. Groundwater monitoring well G6M-02-13X is the downgradient ERD monitoring well for the Area 4 transect and groundwater results over time for this well are presented in **Figure 9.22** in **Appendix J**. Since April 2010, the PCE concentration in groundwater sampled from monitoring well G6M-02-13X has either been non-detect or yielded a low-level concentration, and the corresponding dechlorination by-products have either been slightly above or below the respective laboratory reporting limit. Such a decline, coupled with the increased presence of methane, confirm that the ERD process is well established within and downgradient of this transect. Furthermore, groundwater from upgradient monitoring well G6M-02-04X has exhibited only non-detections for PCA and all degradation by-products since the October 2011 sampling event, indicating that no additional input or migration from Area 3 has occurred.

By comparison, groundwater sampled from cross-gradient monitoring well G6M-06-01X, located on the western edge of the transect, has continued to exhibit fluctuations in the associated PCE concentrations since 2009. Continued ERD substrate injection at the northwest end of the transect is projected to slowly drive the aquifer toward a more reduced state and allow for rapid degradation of the residual contamination. Monitoring well G6M-06-01X was converted to an injection well in July 2013 to extend the existing transect further to the northwest.

Three borings (GP-13-12, GP-13-13 and GP-13-25) were advanced within Area 4 in September/October 2013 utilizing DPT. Drill rig refusal ranged from approximately 144 ft bgs to approximately 164 ft bgs. Groundwater samples were collected at 10 foot intervals starting at approximately 64 to 70 ft bgs to refusal depth. GP-13-25, the western most point advanced in Area 4, did yield enough water for sample collection.

Laboratory analytical results from groundwater sampled from these borings indicate that residual VOC

COC concentrations, greater than the applicable regulatory compliance concentration for PCE (5 µg/L) and cis-1,2-DCE (70 µg/L), are located at approximately 120 and 130 ft bgs, respectively. The maximum PCE concentration (50 µg/L) was detected at a depth of 120ft bgs in groundwater sampled from groundwater profiling point GP-13-13, located downgradient of ERD injection transect on the western edge of the VOC impacted groundwater plume. Laboratory analytical data collected from groundwater profiling point GP-13-12, located west of GP-13-13, reported VOCs (methylene chloride), at a depth of 114 to 124 ft bgs, above laboratory detection limits but below the applicable compliance standard. Profiling point GP-13-12 established the western extent of the VOC impacted groundwater plume at Area 4.

Groundwater monitoring well G6M-13-02X was advanced in Area 4, southwest of the former groundwater monitoring well G6M-06-01X to provide monitoring data to allow for the evaluation of the effectiveness of the ERD injections downgradient of the Area 4 ERD Injection transect. Monitoring well G6M-13-02X replaces former monitoring well G6M-06-01X and monitors groundwater slightly west and downgradient of the former monitoring well location.

The concentration of PCE in groundwater sampled from new groundwater monitoring well G6M-13-02X showed increased levels from January 2014 (120 µg/L) to November 2014 (210 µg/L). The PCE degradation compounds, TCE (increased from 20 to 39 µg/L), cis-1,2-DCE (increased from 34 to 95 µg/L) and VC (decreased from 14 to 6.7 µg/L) were also present. This well will be integrated into LTM program.

9.6.4.11.4 Area 5 Summary

The Area 5 ERD transect has been operational since December 2001, with the initiation of the ERD pilot study. The geochemical data indicate a well-established reducing environment throughout the area. As a result, groundwater sampled from all monitoring wells in Area 5 show a decrease in PCE concentrations relative to pre-ERD injection levels and the majority of the wells are currently below the PCE clean-up goal. Monitoring well MW-7 specifically had historically the highest PCE concentration at Area 5 (5,900 µg/L in February 2002) and has been below the regulatory action level of 5 µg/L for four consecutive LTM sampling events since October 2011. As shown in **Figure 9.23** in **Appendix J**, a decline in the PCE content coupled with a consistently elevated methane concentration and frequent detections of dissolved ethene are noted for groundwater sampled from monitoring well MW-3, indicating that the ERD process is well established and progressing through to completion. Groundwater monitoring well MW-3 is the primary ERD monitoring well for the Area 5 transect and has shown decreases in the PCE and dechlorination by-product concentrations since the historical high concentrations observed in 2001/2002 (5,200 µg/L observed in March 2002), resulting in generalized non-detections since 2008.

Further downgradient of the Area 5 ERD transect, groundwater from monitoring wells G6M-02- 11X and G6M-02-12X, have also shown decreases in PCE and daughter product concentrations since 2010 with corresponding increases in methane (ranging from 460 µg/L in 2003 to 25,000 in 2014). In addition, groundwater sampled from monitoring wells G6M-03-08X, G6M-03-09X, and G6M-03-10X, located approximately half way between the Area 5 transect and the IWS system enclosure, and monitoring wells G6M-04-06X and G6M-04-07X, situated downgradient of the IWS system, have all exhibited a general downward trend in PCE and daughter product concentrations. The PCE concentrations at these five monitoring wells ranged from 1,100 µg/L in 2004 (G6M-04-07X) to non-detect in 2014 (G6M-03-09X and G6M-03-10X).

One exception to the Area 5 trend is the PCE concentration documented in groundwater sampled from

monitoring well G6M-02-05X, located on the western edge of the Area 5 transect. Groundwater from this well exhibited an increase in PCE concentration from 2002 through 2007, followed by an overall drop in PCE since 2008. Although, data from the spring and Fall 2011 LTM events indicated that a reducing zone was potentially becoming more established within the vicinity of this well, the October 2012 data suggested that the area was reverting to an oxygenated state. Monitoring well G6M-02-05X was converted to an injection well in July 2013 to address the residual PCE concentrations in groundwater. ERD injections will continue in the western portion of the Area 5 transect, which now includes G6M-02-05X and new injection well IW-39, until a reductive environment becomes firmly established and the VOC degradation rate increases.

PCE concentrations in groundwater showed decreases in 2013 relative to 2012 data at three downgradient MicroWells® (XSA-12-95X, XSA-12-96X, and XSA-12-98X). The PCE concentrations at MicroWell®s XSA-12-95X (110 µg/L) and XSA-12-96X (84 µg/L) were the highest levels observed at Area 5 in 2014 but are far below historical highs observed at other Area 5 monitoring locations. Injections at new upgradient injection well IW-39 (screened 125- 145 ft bgs) and recently converted well G6M-02-05X (converted in July 2013)(screened 120-135 ft bgs) are expected to target the groundwater plume screened by both XSA-12-95X (screened 120- 130 ft bgs) and XSA-12-96X (screened 120-130 ft bgs). All four of the MicroWells® indicate that reducing condition are established based on negative ORP and low DO levels. This indicates that either the ERD process has reached this area, as supported by a decline in DO, and ORP for the 2014 event; and/or VOC contamination from the upgradient Area 5/Area 4 treatment zone has migrated with groundwater into this area.

Three borings (GP-13-02, GP-13-10 and GP-13-11) were advanced within Area 5 in September/October 2013 utilizing DPT. Drill rig refusal ranged from approximately 146 ft bgs to approximately 160 ft bgs. Groundwater samples were collected at 10 foot intervals starting at approximately 70 to 74 ft bgs to refusal depth.

Laboratory analytical results from groundwater sampled indicated no VOC COC concentrations greater than the regulatory compliance concentration, with the exception of PCE detected at a concentration of 170 µg/L in groundwater sampled from groundwater profiling point GP-13-11 at 140 ft bgs. Degradation of PCE is apparent at 140 ft bgs, based on detectable concentration of cis-1,2-DCE (5.4 µg/L). Groundwater profiling point GP-13-11 was located west of the existing injection transect. Groundwater sampled from groundwater profiling points GP-13-02 and GP-13-10 indicate that VOC COCs are not migrating beyond the currently delineated western edge of the VOC-impacted groundwater plume above regulatory criteria. Detectable concentrations of PCE (3.7 µg/L) and cis-1,2-DCE (0.52 µg/L) were detected at 144 ft bgs at GP-13-02 supporting the location of the PCE plume edge.

ERD injection well IW-39 was installed in 2013 in the vicinity of groundwater profiling point GP-13-11 to target the VOC COCs detected during the groundwater profiling investigation. Groundwater monitoring wells G6M-13-01X and G6M-13-04X were installed at Area 5. Groundwater monitoring well G6M-13-01X was installed south and west of the ERD injection transect, in the vicinity of groundwater profiling point GP-13-10, to fill a monitoring data gap. Groundwater monitoring well G6M-13-04X was installed downgradient of the ERD injection transect to replace the former groundwater monitoring well G6M-02-05X, which was converted to an injection well in July 2013. Groundwater monitoring well G6M-13-04X was required to adequately monitor the effectiveness of the Area 5 ERD injections immediately downgradient of the ERD injection transect.

The concentration of PCE from groundwater sampled from new injection well IW-39 in January 2014 was 180 µg/L. PCE degradation compounds TCE (4.4 µg/L) and cis-1,2-DCE (15 µg/L) were also

present and a reducing environment was supported by low DO (0.91 mg/L) and moderately low ORP (44.9 mV).

The concentration of PCE from groundwater sampled from new groundwater monitoring well G6M-13-04X decreased from 41 µg/L in January 2014 to 1.7 µg/L in October 2014. PCE degradation compounds, TCE (51 µg/L to 17 µg/L) and VC (150 µg/L to 72 µg/L) were also present at decreasing levels. Cis-1,2-DCE was also detected at more constant levels (68 µg/L in January and 69 µg/L in October).

The concentration of PCE in groundwater sampled from new groundwater monitoring well G6M-13-01X showed increased levels from January 2014 (12 µg/L) to October 2014 (150 µg/L). The PCE degradation compounds also showed increasing values; TCE (0.42 µg/L to 2.8 µg/L) and cis-1,2-DCE (0.73 µg/L to 7.8 µg/L). TCE and cis-1,2-DCE results, although increasing, were both below regulatory compliance levels. This well will be integrated into LTM program.

9.6.5 Site Inspection

Land Use Controls (LUCs) were a key component of the 2004 Record of Decision (ROD) and 2005 Final Remedial Action Work Plan (ARCADIS, 2005) and were developed to restrict or prevent potential human exposure to groundwater contaminants of AOC 50 until the property can be used for unlimited exposure and unrestricted use. The September 2007 Addendum to the Real Property Master Plan includes supplemental information on LUCs established under BRAC and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) programs that are applicable to Area G (Regional Training Site [RTS] Maintenance), as well as, for three other deeded areas located at the DRFTA. The LUCs were designed to protect the integrity and effectiveness of the remedy. Any proposed actions that affect the AOC 50 property must consider following the ROD requirements, which include:

- Provide continued access to treatment transects and monitoring wells and access to install additional injection or monitoring wells, if necessary;
- Coordinate construction plans with the BCT to facilitate ongoing remediation and future access to plume areas;
- No groundwater extraction or injection for any purpose; and,
- Coordinate construction plans for modifications to storm water systems with the BCT.

Furthermore, the deed notices provided at the time of property transfer to USFWS, Henry Woodle of Groton Ayer Realty Trust, and Ron Ostrowski of MassDevelopment, instruct each owner of their property use restrictions. Use restrictions per land transfer, are reinforced in yearly LUC letters presented to owners by the Sovereign team, on behalf of USACE.

Annual monitoring activities include a review of the documentation and records, on-site inspections, the submittal of annual LUC reinforcement letters, and annual LUC interviews with AOC 50 property owners. LUC letters are discussed and included in Annual OM & M reports.

LUCs are verified during annual physical inspections of the site. The physical inspections include the following observations:

- Any signs of increased exposure potential to the public from groundwater contaminants;
- Any evidence that groundwater extraction wells had been installed at the site;
- Any evidence of site use changes; and,

- Any site access issues related to monitoring and remediation activities.

No evidence of increased exposure potential or the installation of groundwater extraction wells was observed. The only site usage change noted was the demobilization of the Army RTS Maintenance organization in CY2012 from the area surrounding and including the former aircraft hangars. The buildings (3820, 3822, and 3818) and maintenance yard were abandoned and demolished in 2012. There is no evidence of any new activity in the area. There were no issues encountered related to site access for monitoring and remediation activities during the October 2013 site inspection.

Results of the annual compliance monitoring indicate that no breaches to the LUCs were evident and corrective action(s) were not necessary. Access to all ERD injection wells and groundwater monitoring wells is unobstructed and all wells were in good repair. There was no evidence of other site disturbance that might potentially have an impact to the AOC 50 remedy or be in violation of the site LUCs.

A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. AOC 50 consists of an inactive airfield, unoccupied buildings, with paved and wooded areas.. Features that were inspected included the asphalt areas, access road, monitoring wells and piezometers. The overall condition of the site was satisfactory.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix J** along with supporting photographs.

9.6.6 Interviews

The following individuals were interviewed in May 2015 as part of the five-year review:

- Mr. Daniel Groher, USACE, New England District;
- Fire Chief Joe LeBlanc, Devens Fire Department;
- Ms. Pamela Papineau, Ayer Board of Health
- Mr. Richard Doherty, PACE
- Mr. Ron Ostrowski, MassDevelopment; and,
- Mr. Neil Angus, MassDevelopment

As part of the FYR review process, interviews were conducted in March and April 2015 in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in Appendix A. In general, comments related to the site were positive and supportive. The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved.

Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

9.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

- Question A: Is the remedy functioning as intended by the decision documents?

- Question B: Are exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning as intended by the 2004 ROD with annual evaluations and modifications.

9.7.1 Remedial Action Performance and Monitoring Results

As presented in the latest 2014 O&M and Monitoring Report (*Sovereign/HGL, 2015*), the current ERD injection treatment system appears to have been successful in treating the majority of the more permeable portions of the AOC 50 plume, especially at shallower depths in the source area. . A source area investigation was conducted in October 2014 to address the findings from the 2013 profiling event in the Source Area which identified zones where elevated (>1000 µg/L) concentrations of PCE remained. The ERD injection system will be evaluated annually and modification will be made to enhance the effectiveness of the ERD remedy. The IWS system was shutdown in March 2013.

Monitoring data confirm that destruction of site COCs is ongoing and that the remedy remains protective of human health and the environment. Dechlorination rates are consistent with those predicted in the ROD; therefore, the remedy in place should achieve cleanup objectives within the proposed 23 year timeframe.

9.7.2 System Operations/Operation and Maintenance (Long-Term Groundwater Monitoring)

Groundwater monitoring is being performed in conjunction with the remedial implementation of the ERD and IWS treatment systems. The primary CVOC contaminant (PCE) is being reduced throughout the ERD treatment areas, and increases in secondary contamination of inorganics through metals solubilization is confined to areas of reductive groundwater conditions. The IWS system was suspended in 2013 as IWS-1 was no longer receiving impacted groundwater from an upgradient source and IWS-2, on the fringe of the remnant PCE plume was not intercepting impacted groundwater. The LTM program, with annual modifications, is providing the needed data to evaluate remedy effectiveness and to monitor long-term groundwater trends.

9.7.3 Opportunities for Optimization

The Army has been proactive in optimizing the ERD remedy by continuing to evaluate and modify the injection locations and/or the injection substrate concentrations. Investigations were conducted in 2013 and 2014 to identify and address potential portions of the groundwater plume where elevated concentrations may be by-passing injection areas or where portions are not being effectively treated by the existing enhanced ERD injection network. An additional groundwater investigation was conducted in 2013-2014 to evaluate and make recommendations for optimization of remedial actions at AOC50. A focused MiHPT investigation at the Source Area was conducted in 2014 to improve the overall understanding of the location/source of residual VOC contamination both vertically and laterally in the source area.

9.7.4 Early Indicators of Potential Remedy Problems

As noted above, the ERD injection process has been successful in treating the majority of the more

permeable portions of the AOC 50 plume, especially at shallow depths in the source area. However, recent investigations were conducted to evaluate and recommend suggestions for improvement and optimization.

The 2013-2014 groundwater investigation confirmed the western extent of the VOC impacted groundwater plume for Areas 2, 3 and 4. The results of this investigation were used to update current VOC concentrations in Area 1 to aid in the optimization of the ERD injection program. The MiHPT investigation in the Source Area (explained in detail in previous sections) confirmed that the former dry well as a primary former source with impacts generally restricted to deeper depths.

Recommendations to the monitoring program and ERD injection method and substrate evaluation have been made to further VOC destruction to meet remedial goals.

9.7.5 Implementation of ICs and Other Measures

In accordance with the ROD, ICs that prohibit the use of groundwater as a potable source, restrict groundwater pumping and stormwater recharge, limit construction in specific areas, provide access to treatment systems and the monitoring network, protect workers from inhaling vapors from process water and restriction of residential/educational uses in the source area, are currently in effect at AOC 50. Legal agreements between the Army, MassDevelopment, and USFWS are in place to restrict activities that would interfere with the operation of the remedy, including:

- The construction of structures;
- Groundwater withdrawal for any purpose;
- Stormwater discharge/recharge; and
- Provide for Army access to the properties during the operation of the remedy to install and maintain monitoring wells and treatment systems.

On behalf of the Army, IC reinforcement letters are sent out annually to the property owners impacted by the LUCs at AOC 50 to reinforce the restrictions for the affected areas. Annual interviews and inspections of the site are made following issuance of the letter to confirm continued compliance with IC objectives. The annual LUC compliance monitoring included:

- Review of documentation and records;
- Physical on-site inspections; and
- Interviews with knowledgeable personnel.

The last IC inspection, held in 2014, is summarized in the 2014 Annual O&M and Monitoring Report (Sovereign/HGL, 2015

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection and remedial activities are still valid.

9.7.6 Changes in Standards and To Be Considered

As part of this five-year review, ARARs guidance for the site presented in the ROD was reviewed. The MCLs are health-based standards established by the USEPA. The majority of the groundwater cleanup

goals are based on these drinking water standards. Changes to the MCLs impact the protectiveness of these cleanup goals. There have been no changes to the MCLs since the previous five-year review.

9.7.7 Changes in Exposure Pathways

There are no current complete exposure pathways at the site. There has been no change in exposure pathways since the original risk assessment was performed. The exposure to groundwater through drinking water, industrial water use, and household water use is a concern for future receptors only. The ROD identified potential risk from the following future exposure pathways: potential use of groundwater as the primary drinking water source under residential and industrial land use; inhalation of VOCs migrating from groundwater to indoor air; and use of groundwater as process water by future commercial/industrial workers.

Unacceptable risk from vapor intrusion was identified for residential use in the Source Area only. To eliminate this exposure pathway, an IC was put in place to restrict new building construction and residential/educational uses. ICs are also in place to prohibit the use of site groundwater as drinking water to eliminate the potential exposure pathways. Current site use is in compliance with planned land use restrictions and existing zoning for AOC 50 that prohibits residential use.

AOC 50 hydrogeologic conditions have been adequately characterized and no new contaminants, sources, or routes of exposure have been identified.

9.7.8 Changes in Toxicology and Other Contaminant Characteristics

Since the completion of the HHRA, the USEPA has issued recent guidance recommending the use of additional sources of peer-reviewed toxicity values, as well as, updated several toxicity values. Overall, since the cleanup goals presented in the ROD are based on drinking water standards and not risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals.

9.7.9 Changes in Risk Assessment Methodology

While numerous methodologies have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

9.7.10 Expected Progress toward Meeting RAOs

As presented in the latest 2014 O&M and Monitoring report (Sovereign/HGL, 2015), the remedy in place at AOC 50 is operating properly and successfully. Continued operation and optimization of the remedial program will ensure that the remedial goals are achieved as designed and the remedy will be complete within the time period predicted in the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. No other information has been noted that would call into question the protectiveness of the remedy. As detailed by the USEPA, in response to the Final Demonstration of a Remedial Action Operating Properly and Successfully (ARCADIS, 2007), the AOC 50 remedy is in place and functioning in a manner that is expected to adequately protect human health and the environment when the remedial actions are completed. The generation of secondary contaminants through metals solubilization was anticipated as a result of the selected ERD remedy but the solubilized metals are confined within the

reductive treatment areas and are not expected to persist once they encounter the aerobic portions of the aquifer; thus, are not anticipated to create a threat to the protectiveness of the remedy.

As noted in previous sections, the ERD system is continually evaluated and optimized to maintain the effectiveness of the system.

9.7.11 Summary of Technical Assessment

The remedy at AOC 50 is functioning as intended and is expected to meet the projected period to remedy completion. The IWS system was shut down in March 2013. Optimization of the ERD remedy is on-going with annual evaluations of the LTM groundwater data and ERD injection transects in order to optimize the ERD System. The remedy continues to perform effectively at the stated goal of reducing the CVOC contamination at the site. Secondary contamination created by metals solubilization was anticipated as a byproduct of the ERD process but is generally confined to the established IRZs and has not been detected as migrating outside of IRZs. Focused investigations in 2013 at all areas (1 through 5) and 2014 at Area 1 source area (Parachute Tower) have been conducted to refine the areas/zones where PCE hot spots exist and optimize the ERD injection system. These investigations are discussed in previous sections and discussed in investigation and annual OM&M reports.

Modifications in injection strategy remain effective at remediating the VOC that remain and meeting the AOC50 remedial objectives. Therefore, it is recommended that the current remedial actions be continued.

Four MicroWells® were installed in 2012 in a downgradient location relative to the AOC 50 source area and southwest of the Area 5 ERD treatment zone. A groundwater investigation conducted in 2013/2014 identified and addressed portions of the AOC50 groundwater plume where elevated concentrations were bypassing injection areas or where portions of the plume were not being effectively treated by the existing ERD injection network. This investigation included vertical groundwater profiling at 25 locations and the installation of six additional groundwater monitoring wells and one injection well. These microwells and monitoring wells have been added to the LTM schedule.

A Source Area (Area 1) investigation was conducted in 2014 to address the elevated (> 1,000 µg/L) concentrations of PCE detected in Area 1 during the 2013 profiling event. Membrane Interface Probe with Hydraulic Profiling Tool (MiHPT) technology was used to investigate PCE hot spots in Area 1 and to determine if a residual source of PCE exists beneath Building 3840. The details of the Source Area Investigation are presented in the Draft AOC50 Source Area MiHPT Investigation Summary (*Sovereign, 2015*).

Modifications to the current 2015 ERD plan (*Draft Work Plan for Supplemental ERD Injection, H&S 2015*)include the use of ABC Ole' to optimize the remedy within Areas 1, 2 and 3. Injections of ABC® in locations 4, 5 and 6 will continue. Direct injections of ABC Ole'+ to Area 1 Parachute Tower are planned. The injections will address deeper impacts determined in the 2014 Sovereign investigation study.

9.8 Issues

There are no issues with respect to protectiveness of the remedy as specified by the ROD.

9.9 Recommendations and Follow-up Actions

An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that supplemental ERD Injections (with pre- and post-monitoring) will be performed in targeted areas with concentrations above remedial goals.

9.10 Protectiveness Statement

The remedy at AOC 50 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. The remedial actions at AOC 50 are expected to allow unrestricted use and unlimited exposure following achievement of groundwater remedial goals.

9.11 Next Review

The next five year review for AOC 50 is required five years from the completion of this review.

9.12 References

References are included in **Appendix A**.

10 BUILDING 3713 FUEL OIL SPILL SITE AREA OF CONTAMINATION 57

10.1 Introduction

This is the third five-year review for AOC 57, the last being completed in 2010. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. AOC 57 consists of one area which is included in this FYR. The previous five-year review in 2010 recommended continued remedial action activity, which consisted of a long-term groundwater monitoring program, surface water monitoring, wetlands protection, ICs, IC inspections, annual reporting, and five-year site reviews.

AOC 57 consists of three sub-areas: Area 1, Area 2 and Area3. These sub-areas received storm water runoff and wastes from vehicle maintenance activities conducted at nearby storage yards. Area 1 is not part of the LTM program for OU#9.

10.2 Site Chronology

The following tables outline the chronology of site events at Areas 1, 2, and 3 at AOC 57:

Table 10.1
Chronology of Events – AOC 57, Area 1

Event	Date
Initial discovery of problem and contamination	February 13, 1977
SI, Preliminary Risk Evaluation (PRE)	1992
Area Requiring Environmental Evaluation (AREE)	1994
Soil Removal Action	1997
RI completed	2000
ROD signed	September 28, 2001
No Further Action following removal of contaminated soil	2001
First Five-Year Review	September 2005
Second Five-Year Review	September 2010

Table 10.2
Chronology of Events – AOC 57, Area 2

Event	Date
Final NPL Listing	November 1989
Drainage ditch investigated as part of SI for Group 2 and 7 historic gas stations	1992
Soil removal action in response to new MCP standards	1994
Soil removal action discontinued due to contamination extending beyond original estimates (1,300 cy soil removed)	1994
RIs conducted, identified most significant soil contaminants to be PAHs, PCBs and lead	1995-1998
USACE conducted additional soil/groundwater investigations	2000
FS completed	2000
ROD signed for AOC Areas 1, 2, and 3	September 28, 2001
USACE completed additional soil removal actions	January-February 2003
Remedial Action Work Plan (RAWP) started	January-February 2003
Additional Remediation and Work Plan Amendment	2003
Site Restoration completed	October 2003
Transportation and Disposal/Stockpiles	December 2003

Event	Date
Remedial Action Report Completed	September 2004
ESD issued for additional soil removal volume and additional soil and groundwater COCs for Area 2	March 10, 2004
LTMP	2003/2004
First Five-Year Review	September 2005
Draft Operating Properly and Successfully Demonstration for Area of Contamination 57	December 2005
Revised LTMMP completed	November 2008
Final Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Plan, Area of Contamination 57 Areas 2 and 3	January 2007
2004 to 2006 Final Annual Reports, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, Area of Contamination 57 Areas 2 and 3	January 2007
2007 & 2008 Final Annual Reports, Operation & Maintenance Phase, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, DCL Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of	May 2008 & June 2009
Annual LTM	2005-2009
Final Operating Properly and Successfully Demonstration for Area of Contamination 57	February 2010
Second Five Year Review	September 2010
Annual LTM	2010-2014

Table 10.3

Chronology of Events – AOC 57, Area 3

Event	Date
Final NPL Listing	November 1989
Four test-pits excavated east of Area 2, results indicated PAH and chlorinated VOCs, area designated Area 3	1995
RIs conducted, identified most significant soil contaminants to be PAHs, PCBs, some SVOCs and arsenic, lower concentrations of VOCs	1996-1998
USACE conducted soil removal action 1,860 cy of TPH and PCB contaminated soil removed	1999
USACE performed additional soil sampling	2000
FS completed	2000
Groundwater monitoring points installed	2000
USEPA and MADEP collected groundwater samples	April 3, 2001
ROD signed	September 28, 2001
Soil Removal Action completed	2002
Remedial Action Report/remedial work completed	2002-2003
LTMP	2003/2004
First Five-Year Review	September 2005
Draft Operating Properly and Successfully Demonstration for Area of Contamination 57	December 2005
Revised LTMMP completed	November 2008
Final Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Plan, Area of Contamination 57 Areas 2 and 3	January 2007
2004 to 2006 Final Annual Reports, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, Area of Contamination 57 Areas 2 and 3	January 2007

Event	Date
2007 & 2008 Final Annual Report , Operation & Maintenance Phase, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, DCL Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3	May 2008 & June 2009
Final Operating Properly and Successfully Demonstration for Area of Contamination 57	February 2010
Annual LTM	2005-2009
Second Five Year Review	September 2010
Annual LTM	2010-2014

10.3 Background

AOC 57 is part of the Bowers-Nonacoicus Brook Sub-basin, Nashua River Watershed, located south of former Building 3713, between Barnum Road and Cold Spring Road on the northeastern side of the former Main Post of Fort Devens in the Town of Harvard, Massachusetts.

The portion of the former Devens site that includes AOC 57 was used primarily as a storage and maintenance area for military vehicles. AOC 57 consists of three sub-areas; Area 1, Area 2, and Area 3, located south and southeast of former building 3713 and former buildings 3756, 3757, and 3758. These sub-areas received stormwater runoff and wastes from vehicle maintenance activities conducted at the storage yards related to Building 3713 and former Buildings 3757 and 3758. These yards were eventually abandoned in 1998, and the pavement and fencing were improved. The former storage yards are now soil and grass-covered areas. Areas 2 and 3 are located within Lease Parcel A6. Area 1 is not part of the LTM program.

Areas 1, 2, and 3 include upland areas [elevations between 228-ft and 240-ft mean sea level (msl)] that slope downward to a delineated wetland (elevations lower than 228-ft msl), which is part of the wetland system and feeder stream known as Lower Cold Spring Brook The ROD identified the 228-foot elevation line as the border between the upland and the 100-year flood plain for Cold Spring Brook. The floodplain boundary is located approximately 260 feet from Cold Spring Brook in Area 2 and approximately 400 feet from Cold Spring Brook in Area 3. The upland area is forested with trees and scrub bush. The wetland area is densely vegetated with brush and contains small areas of standing water. A portion of Area 1 is located outside the lease parcel A6a and outside of the 100-year floodplain, (i.e., at an elevation $>$ 228-ft msl).

The AOC 57 ROD, dated September 2001, determined that Area 1 required No Further Action (NFA) and selected remedies for Areas 2 and 3 to protect human health and the environment under current and future land use scenarios. “Alternative II-3, Excavation (For Possible Future Use), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls” was the selected remedy for Area 2 and “Alternative III-2a, Excavation (To Accelerate Groundwater Cleanup), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls” was the selected remedy for Area 3. Public access to Area 2 and 3 is not restricted, but the presence of floodplains/wetlands and existing zoning currently prevents residential use/exposure.

Analysis of data obtained and observations made at Area 2 during the January 2002 soil removal work and subsequent investigations between 2002 and 2003 for petroleum waste recovery efforts, resulted in the determination that conditions at Area 2 were different from the presumed conditions upon which the September 2001 ROD had been based. An Explanation of Significant Differences (ESD)

dated March 2004 expanded the ROD recommendations to include EPH C11-C12 aromatics and PCBs as COCs for Area 2 groundwater, include EPH as a COC for Area 2 soil, monitor for the presence of petroleum waste at Area 2, and increase the soil volume and associated cost for Area 2 soil removal activities.

10.3.1 AOC 57 – Area 1 Background

Area 1 consists of a former stormwater outfall and drainage area for runoff from paved areas proximal to former Building 3713. Drainage from Area 1 meanders and eventually flows into Cold Spring Brook. An estimated 50- to 100-gallon spill of No. 4 fuel oil was discharged through the Area 1 outfall in 1977. Approximately 3,000 gallons of mixed oil and water were recovered through the use of contaminant dikes and absorbent booms in 1977, and approximately 25 cy of petroleum contaminated soil was removed in 1997.

Area 1 was recommended for No Further Action (NFA) following the removal of this contaminated soil. The approved 2001 AOC 57 ROD indicated that Area 1 was closed with NFA.

10.3.2 AOC 57 – Area 2 Background

Area 2 is located approximately 700 feet north of Area 1 and adjacent to a former vehicle storage yard associated with the motor repair shops located in former Buildings 3757 and 3758. Area 2 grades down towards the wetlands associated with Cold Spring Brook and formerly consisted of an eroded drainage ditch created by rainfall runoff from vehicle storage yard associated with former Buildings 3757 and 3758. Initially, it was believed that contamination in Area 2 was the result of a No. 4 fuel release in Area 1. Subsequent investigations concluded that Area 2 was separate from Area 1. Following a soil removal action in 1994, Area 2 was re-graded and a permanent drainage swale was installed. Runoff drains into the swale and discharges east into Cold Spring Brook (**Figure 10.1, Appendix K**). Subsequent activities included subsurface investigations with soil sampling and monitoring well installation, removal of contaminated soil, construction of an interceptor trench, and operation of a petroleum product recovery system.

In 1992, the drainage ditch located at Area 2 was investigated as part of the SI (ABB, 1995) for Groups 2 and 7 Historic Gas Stations. Naphthalene and TPH were detected in soil samples. Fingerprint analysis of soil samples collected from the drainage ditch area indicated soil contamination was most likely derived from lubricating oil or vehicle crankcase oil, and not the 1977 release of No. 4 fuel oil.

During 1994, the Army performed a soil removal action at Area 2 in response to newly promulgated MCP standards. The 1994 soil removal action was discontinued due to soil contamination that extended below the water table and well beyond the area limits originally estimated. A total of 1,300 cy of contaminated soil was removed. The site was transferred to the RI/FS process.

During 1995 through 1998, the Army conducted a RI at AOC 57 Areas 2 and 3. The most significant soil contaminants identified at Area 2 included PAHs, PCBs, and lead. The Army performed additional soil and groundwater investigations in 2000, and completed a FS for selection of final remedies at AOC 57 Areas 2 and 3. On September 28, 2001, a ROD was signed to select excavation and Institutional Controls (ICs) as the remedy for Area 2.

Soil excavation conducted (in Area 2) as a ROD remedy was initiated in January 2002 and was conducted in phases until February 2003, when excavation activities were discontinued due to contamination extending beyond the limits identified in the ROD. The Army conducted further

sampling to delineate the extent of contamination and completed site restoration in October 2003. An ESD dated March 2004 expanded the ROD COC to include LTM of EPH C11-C12 aromatics and PCBs for Area 2.

A solar panel manufacturing facility was constructed between Areas 2 and 3 of AOC 57 and Barnum Road between 2008 and 2009. The solar panel manufacturing facility has since been closed but has been taken over by another company, Saint Gobain, Crystals division. A company called Nypro has taken over the property in 2014. The same building footprint and infrastructure remain in place. Construction activities complicated site access but otherwise had minimal impact to AOC 57.

10.3.3 AOC 57 – Area 3 Background

During investigation activities completed in 1995, four test-pits were excavated east of Area 2 where historical photos indicated soil staining. Sample analysis showed the presence of PAHs and chlorinated VOCs. The area was designated AOC 57 Area 3. Area 3 is located approximately 600 feet to the northeast of Area 2, south of former vehicle maintenance motor pools (**Figure 10.2, Appendix K**).

During 1996 through 1998, RI field investigations were performed to assess the nature and extent of contamination at Area 3. The most significant soil contaminants identified at Area 3 included PAHs, PCBs, some SVOCs, and arsenic. Lower concentrations of VOCs were detected at some locations.

The Army conducted a soil removal action in 1999 that targeted soils with TPH and PCB concentrations exceeding soil standards published under the MCP. A total of 1,860 cy of materials was removed for off-site disposal.

During 2000, the Army performed additional soil and groundwater investigations, and completed a FS for selection of final remedy for Area 3. On September 28, 2001, a ROD was signed to select excavation and ICs as the remedy for Area 3.

Soil excavation was initiated in January 2002 and completed in February 2003. Area 3 was excavated to the target limits, and the planned volume of soil was removed within these limits to depths ranging between 2 and 4 feet. All confirmatory samples met the ROD cleanup criterion for EPH, and Area 3 was backfilled and the extent of removal was documented.

10.3.4 Basis for Taking Action

Based on the results of the RI, the primary site-related contaminants at AOC57 were solvent and fuel-related contaminants in soil and groundwater. The primary release mechanism at both areas was infiltration into groundwater from source area contaminants above the water table. The secondary release mechanism was the contaminated soil downgradient of the source areas.

10.4 Remedial Action

10.4.1 Remedy Selection

No further action was required for AOC 57 Area 1. The selected remedy for Area 2 is "Alternative II-3, Excavation (For Possible Future Use), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls." Alternative II-3 contains components to reduce potential human-health risks associated with contaminated soil and groundwater at the Area 2 flood plain. Key components of Alternative II-3 consisted of the following:

- Soil Excavation and treatment/disposal at an off-site treatment, storage, or disposal facility
- Wetlands Protection
- Institutional Controls
- Existing zoning that prohibits residential use of Area 2 property and proposed deed restrictions that prohibit potable use of Area 2 groundwater and residential use of flood plain property
- Environmental Monitoring
- Long-term groundwater monitoring
- Long-term surface water monitoring
- Institutional Control Inspections
- Five-year Site Reviews

The selected remedy for Area 3 is "Alternative III-2a, Excavation (To Accelerate Groundwater Cleanup), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls." Alternative III-2a: contains all the elements of Alternative III-2, plus soil removal to accelerate groundwater cleanup. Key components of Alternative III-2a consist of following:

- Soil Excavation and treatment/disposal at an off site treatment, storage, or disposal facility
- Wetlands Protection
- Institutional Controls
- Existing zoning that prohibits residential use of Area 3 property and proposed deed restrictions that prohibit potable use of Area 3 groundwater and residential use of flood plain property
- Environmental Monitoring
- Long-term groundwater monitoring
- Long-term surface water monitoring
- Institutional Control Inspections
- Five-year Site Reviews

In March 2004, an ESD was prepared for AOC 57. The ESD resulted from data collected during soil excavation activities at Area 2. The changes to the selected remedy for Area 2 were:

- Increased volume and cost of contaminated soil requiring removal to attain cleanup levels at Area 2;
- Inclusion of EPH and PCBs as COCs for Area 2 soil; and
- Inclusion of EPH as a COC for Area 2 groundwater.

The original ROD established risk-based cleanup levels for Area 2 at AOC 57 for the PCBs (Aroclor-1260), and lead. Concerns about the persistent separate phase petroleum waste observed during removal and investigation work in 2002-2003 resulted in the addition of C11-C22 aromatic hydrocarbons quantified by MADEP EPH Method as a COC. As a result of the addition of C11-C22 aromatic hydrocarbons as a COC, the ROD adopted the more stringent S3/GW-1 cleanup level of 200 mg/kg EPH

C11-C22 aromatic fraction for Area 2 soils. Subsequently, PCBs were added as a soil COC because of their association with the petroleum waste oil. Cleanup levels for Area 2 are presented in the tables below:

Table 10.4

Contaminants of Concern Cleanup Levels in Soil AOC 57 - Area 2

Contaminant of Concern	Final Cleanup Levels
PCB (Aroclor-1260)	3.5 mg/kg dry weight by USEPA Method 3540C/8082
Lead	600 mg/kg dry weight by USEPA Method 3050B/6010B
C_{11}-C_{22} Aromatic Hydrocarbons	200 mg/kg dry weight for EPH using MADEP method

Table 10.5

Contaminants of Concern Cleanup Levels in Groundwater AOC 57 - Area 2

Contaminant of Concern	Final Cleanup Levels
Arsenic	10 µg/L
1,4-DCB	5 µg/L
Tetrachloroethylene	5 µg/L
EPH C_{11}-C_{22} Aromatics	200 µg/L

The Area 3 soil cleanup objective was to remove organic material impacted by storm water runoff and wastes from vehicle maintenance at storage yards. The ROD established cleanup levels for one COC in soil, EPH C_{11}-C_{22} Aromatic Hydrocarbons, at AOC 57 Area 3, as presented in the table below:

Table 10.6

Contaminants of Concern Cleanup Levels in Soil AOC 57 - Area 3

Contaminant of Concern	Final Cleanup Levels
C_{11}-C_{22} Aromatic Hydrocarbons	930 mg/kg dry weight for EPH using MADEP method

The ROD identifies groundwater COCs at Area 3 as arsenic, 1-4-DCB, and PCE.

Table 10.7

Contaminants of Concern Cleanup Levels in Groundwater AOC 57 - Area 3

Contaminant of Concern	Final Cleanup Levels
Arsenic	10 µg/L
1,4-DCB	5 µg/L
Tetrachloroethylene	5 µg/L

10.4.2 Remedy Implementation

10.4.2.1 Soil Excavation and Treatment/Disposal at an Off-site Facility

The Army performed soil removal in January-February 2003 at AOC 57 Areas 2 and 3 under a Remedial Action Work Plan (RAWP) prepared to address the final ROD remedy for contaminated soils.

Area 3 was excavated to the target limits, and the planned volume of soil was removed within these

limits to depths ranging from 2 to 4-feet. All confirmatory samples met the ROD cleanup criterion for EPH. Area 3 was backfilled and the extent of removal was documented.

At Area 2, the ROD-based soil excavation was performed between January 2002 and February 2003. However, contamination appeared to extend beyond the assumed limits of contamination. In addition, petroleum waste persistently seeped into the excavation. The excavation was left partially open to observe and remove the oil sheen and globules using absorbent pads and a belt-skimmer product recovery system.

During 2003, the Army continued operation of the petroleum product recovery system at Area 2 following a winter shutdown. The Army conducted additional soil sampling to delineate the extent of contaminated soils, and to identify the source of the petroleum waste. Based on the additional soil data, a Work Plan Amendment was developed to complete remediation of the remaining contaminated soils. The Army executed the Work Plan Amendment, which included contaminated soil removal and removal of excavation water to allow access to contaminated soils beneath the groundwater table. The Army installed and operated a petroleum product recovery system in the open excavation and installed four collection sumps at Area 2 within a groundwater interception trench installed between the soil excavation area and the wetlands. Site restoration activities at AOC 57 Areas 2 and 3 were performed in October 2003. Transportation and disposal of remaining stockpiled contaminated soils were completed by the end of December 2003.

A final Interim Remedial Action Completion Report was prepared in September 2004. The report summarizes the work performed to complete remediation of contaminated soils at AOC 57 during 2002 and 2003. The following is a summary of the materials removed during the remedial activities:

- 4,361 tons of contaminated material was excavated from Area 2 and 197 tons were removed from Area 3. All contaminated soils were transported offsite for treatment/recycling in a thermal desorption process at Environmental Soils Management, Inc., in Loudon, NH;
- Twenty four 55-gallon drums containing absorbent materials and PPE were transported to Onyx facility, TX, for thermal destruction;
- Two 55-gallon drums (an estimated 80-gallons) containing petroleum-contaminated liquids from skimming operations;
- One 20 cy container of plastic liner co-mingled with contaminated soils;
- Two 30 cy trash containers of construction wastes and decontaminated liner/cover materials; and
- 94,000 gallons of contaminated water from the excavations were discharged to the Devens sewer system under a temporary discharge permit.

10.4.2.2 Wetland Protection

The removal contractor, Conti Environmental, Inc. (Conti), restored delineated wetlands that were damaged during the excavation activities in Areas 2 and 3. The remediation and restoration were completed in October 2003. Final restoration activities were performed in October 2003 following completion of the soil remedial actions.

A wetland monitoring plan was outlined in the LTMP prepared by USACE in March of 2004. The objectives of the wetland restoration and monitoring plan were to evaluate the restoration measures implemented during the first two growing seasons to ensure success and to identify and take

corrective actions, if any, based on the periodic monitoring. The key components of the Wetlands Monitoring Plan included: monitoring during construction, LTM, and compliance with performance standards presented in the LTMP. Wetlands within AOC 57 are part of the Lower Cold Spring Brook drainage and must be considered with any plans to restore Lower Cold Spring, Bowers and Nonacoicus Brooks.

Three years of wetlands monitoring and maintenance was performed by USACE from 2004 through 2006. By the end of 2006, the wetland areas of AOC 57 were found to meet performance standards and the Habitat LTMP Program was terminated. A two-year operation and maintenance phase was implemented by USACE from 2007 through 2008. The 2008 Final Annual Report, O&M Phase, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, DCL) Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3 (*USACE, 2009*) summarized the findings of the 2008 O&M activities, and concluded the wetlands monitoring, maintenance and reporting activities for AOC 57.

10.4.2.3 Institutional Controls

In accordance with the ROD, ICs that prohibit the use of groundwater as a potable source and residential use of flood plain property are currently in effect at AOC 57. ICs are included in the Lease in Furtherance of Conveyance (LIFOC) currently in affect for all leased parcels including AOC 57. The Army is currently is in the process of preparing a Finding of Suitability Transfer (FOST) to transfer the parcel to MassDevelopment for development as Rail Industrial land Trade-Related and Open Space property. The draft FOST details the administrative ICs that will be included with the Deed prior to transfer of the parcel.

10.4.2.4 Environmental Monitoring

The first long-term groundwater sampling round at AOC 57 was performed in December 2003 in accordance with the 2004 LTMP (USACE, 2004). Groundwater, surface water, and sump samples were collected semi-annually from 2003 through 2007. Beginning in 2008, groundwater and surface water at AOC 57 have been sampled annually in accordance with the 2008 revised comprehensive LTMMP (*HGL, 2008*). 2014

10.4.2.5 Assessment of Monitoring and Site Inspection Data

Groundwater and surface water monitoring, wetland inspection and ICs inspection data will continue to be reported in the Annual Reports. Data will continue to be evaluated for detection of COCs concentrations that exceed action levels at the downgradient sentry wells. Data at source area wells will also be evaluated to observe trends in contaminant concentrations.

The Draft Final Operating Properly and Successfully Demonstration for Area of Contamination 57 (USACE, 2010) concluded that the remedial actions selected for AOC 57 were operating properly and successfully, consistent with the provisions of CERCLA, Section 120(h)(3). This conclusion was based on the following lines of evidence:

- The remedy for AOC 57 has been implemented as designed;
- The remedy will achieve the RAOs delineated in the ROD;
- The remedy is functioning in such a manner that it is expected to adequately protect human health and the environment when completed; and

- ICs have been enacted to provide further protection to human health.

10.4.3 System Operation/Operations and Maintenance

Groundwater and surface water monitoring is being performed in accordance with the LTMMP (HGL, 2008b) for AOC 57. LTM activities from 2010 through 2014 at OU#9 included annual groundwater sampling, semi-annual well gauging, and inspection of sumps for petroleum sheen. Six groundwater monitoring wells are sampled annually, twelve monitoring wells are gauged annually, and four groundwater sumps are inspected for petroleum sheen or the presence of non-aqueous phase liquid (NAPL). The LTMMP has been revised in 2014 (LTMMP, Sovereign/HGL, 20144) to include evaluations and updates to the LTM programs at Devens.

10.5 Progress since Last Five-Year Review

Overall progress towards achievement of the RAOs and protection of human health and the environment at AOC 57 is assessed annually and reported in Annual O&M and Monitoring Reports.

Table 10.8
Protectiveness Determinations Statement from the 2010 FYR

OU#9	Protectiveness Determination	Protectiveness Statement
Site wide	Protective	*"The remedies at AOC 57 are protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Human health is currently not at risk at AOC 57 because ICs are in place and are effective in prohibiting the use of site groundwater and preventing exposure to contaminated soil. Remedial actions have greatly reduced risk to the environment, as indicated by long-term groundwater and surface water monitoring results. HASP and IDW handling procedures are in place and are being properly implemented during groundwater and surface water sampling. The HASP and IDW procedures are sufficient to control exposure risk to on-site workers. Current remedial action activity consists of the continued implementation of ROD components: the long-term groundwater monitoring program, utilizing ICs, annual reporting, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress."*

Table10.9
Status of Recommendations from the 2010 FYR

OU	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
#9	None	No "recommendations and/or follow up actions" were made in the 2010 FYR	Federal Facility	EPA/State	NA	Ongoing	NA

10.5.1 Remedy Implementation Activities

The findings of annual inspections at AOC 57 revealed no abnormalities or changes in land-use at the individual contributor sites and there was no evidence of residential development or changes in site use that would lead to increased exposure potential.

10.5.2 System O&M Activities

LTM activities from 2010 through 2014 at OU#9 included annual groundwater sampling, semi-annual well gauging, and inspection of sumps for petroleum sheen. Six groundwater monitoring wells are sampled annually, twelve monitoring wells are gauged annually, and four groundwater sumps are inspected for petroleum sheen or the presence of non-aqueous phase liquid (NAPL).

10.6 Five-Year Review Process

10.6.1 Administrative Components

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led by Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency.

The review, which began on 2/20/2015, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

10.6.2 Community Involvement

Activities to involve the community in the five-year review process were initiated with a meeting in January 2015 between the RPM and the BCT. A notice was published in the local newspapers, the "Lowell Sun" on 1/25/2015 and in the Regional paper on 1/30/2015, stating that there was a five-year review and inviting the public to submit any comments to the Base Realignment and Closure Division of the U.S. Army Garrison, Fort Devens. The results of the review and the report will be made available at the Site information repository located at The Devens Repository, Department of the Army, Base Realignment and Closure Division, U.S. Army Garrison Fort Devens, 30 Quebec Street, Unit 100,

Devens, MA 01434-4479

10.6.3 Document Review

This five-year review consisted of a review of relevant documents including previous Five-year reviews, LTM plans, remedial action reports, ESD reports, annual reports and monitoring data.

10.6.4 Data Review

Annual Reports present groundwater sampling data for Areas 2 and 3 at AOC 57. The 2010 though 2014 LTM data for AOC 57 were reviewed for this Five Year Report and are discussed below. Tables located in **Appendix K** summarize the AOC 57 COCs that have exceeded the monitoring criteria from the 2010 though 2014 sampling events.

The ROD/ESD identifies groundwater COCs for Areas 2 as arsenic, PCE, and EPH C11-C22 aromatics with cleanup goals of 10 µg/L, 5 µg/L, and 200 µg/L, respectively. Groundwater COCs for Area 3 are arsenic, PCE, and 1,4-DCB with cleanup goals of 10 µg/L, 5 µg/L, and 5 µg/L, respectively. A summary of the monitoring data from 2010 through 2014 is presented in Table 10.10 below.

Table 10.10
Summary of LTM Data 2010-2014

GROUNDWATER					
Well Number	**Spring 2010**	**Spring 2011**	**Spring 2012**	**Spring 2013**	**Spring 2014**
Arsenic - 10 µg/L Cleanup Goal					
57M-03-02X (AREA 2)	18	(7)	(8)	(3 J)	ND
57M-03-04X (AREA 2)	(7)	13	ND	ND	ND
57M-03-05X (AREA 2)	27	(7)	11	18	15
57M-95-03X (AREA 3)	23	58	36	60	60
57M-96-11X (AREA 3)	148	190	192	181	160
Trichloroethene - 5 µg/L Cleanup Goal					
57M-03-02X (AREA 2)	(1.2)	(4.5)	(4.9)	(4.38)	(4.19 J)
Tetrachloroethene - 5 µg/L Cleanup Goal					
57M-03-02X (AREA 2)	ND	(1.4)	(0.98)	(2.23)	(1.18)
EPH C_{11}-C_{22} Aromatics - 200 µg/L Cleanup Goal					
57M-03-05X (AREA 2)	ND	ND	ND	ND	ND
1,4-Dichlorobenzene - 5 µg/L Cleanup Goal					
57M-95-03X (AREA 3)	(1.4 J)	5.1	(2.4 J)	(3.13)	(3.27)
57M-96-11X (AREA 3)	(2.1 J)	(2.3 J)	(0.92 J)	(1.05 J)	(1.22)
SURFACE WATER					
Well Number	**Spring 2010**	**Spring 2011**	**Spring 2012**	**Spring 2013**	**Spring 2014**
Arsenic - 150 µg/L Water Quality Criteria					
57-AREA 2-SW-3 (AREA 2)	(4.8 J)	(5)	(2.0 J)	(4.0 J)	(6 B)
Iron - 1,000 µg/L Water Quality Criteria					
57-AREA 2-SW-2 (AREA 2)	1,400	(360 J)	(200)	(270)	3,300
57-AREA 2-SW-3 (AREA 2)	(150)	(150)	(170)	(380)	(120)
57-AREA 3-SW-1 (AREA 3)	(240)	20,000	8,300	10,000	10,000

Table Note:
Number in parentheses denotes that the concentration is below the cleanup goal.

The PCE and TCE concentrations in groundwater from all Area 2 and Area 3 groundwater and surface water samples collected from 2010 through 2014 were either below detection limits or below the cleanup goal of 5 µg/L (**Appendix K Figures 10.5 and 10.6**). EPH C11-C22 concentrations from Area 2 groundwater and surface water samples were all non-detect. The 1,4-DCB concentrations in Area 3 groundwater and surface water samples were either non-detect or below the cleanup goal of 5 µg/L, with one exception of a detection of 5.1 µg/L in the groundwater sample collected from well 57M -95-03X in 2011.

Total arsenic concentrations exceeded the 10 µg/L cleanup goal in Area 2 well 57M-03-05X ranging from 27 µg/L in 2010 to 15 µg/L in 2014. Total arsenic concentrations were also exceeded in two Area 3 wells 57M-95-03X and 57M-96-11X. These results remained somewhat consistent with minor fluctuations from 2010 through 2014. The results in groundwater well 57M-95-03X ranged from 23 µg/L in 2010 to 60 µg/L in 2014. The highest results were from downgradient well 57M-96-11X ranging from 148 µg/L in 2010 to 160 µg/L in 2014 with a high of 192 µg/L in 2012.

The total arsenic results in Area 2 monitoring wells convey a general downward trend (**Appendix K Figure 10.7**); yielding results close to or below the 10 µg/L GW-1 standard from October 2007 through June 2014. This, combined with an ORP decline from May 2009 to May 2010, indicated that a reducing groundwater environment was present in Area 2, thereby promoting enhanced metals desorption from the aquifer soils. However, according to the June 2011 through June 2014 ORP results, the groundwater has reverted to an oxidative state and a majority of Area 2 arsenic concentrations have fallen below the 10 µg/L GW-1 standard, indicating a resorption of dissolved arsenic by the soil matrix. Monitoring well 57M-03-05X is the only Area 2 location retaining an arsenic groundwater exceedance which may be due to surrounding soils with higher concentrations of naturally occurring arsenic relative to other portions of Area 2.

The total arsenic concentrations in groundwater underlying Area 3 was consistent with the previous LTM results (**Appendix K Figure 10.8**). The presence of arsenic above the clean-up goal appear to be related to high iron and manganese concentrations, low (below 50 millivolt) ORP readings, and low (below 1 mg/L) DO levels, which are associated with reducing conditions. Overall, Area 3 well 57M-96-11X consistently portrays an elevated arsenic concentration ranging from 12 to 27 times the GW-1 standard, whereas arsenic in well 57M-95-03X, with the exception of the anomaly in October 2004, has ranged from above the GW-1 standard to slightly below it. Furthermore, according to the June 2014 ORP results, the Area 3 groundwater continues to support a reductive environment, which would promote the mobilization of metals from native, arsenic-bearing soils.

As mentioned for the arsenic data, a comparison of the May 2010 ORP results to those from June 2011 through June 2014 indicates that the AOC 57 groundwater is divided. Area 2 appears to be reverting back to an oxidative state, thereby allowing the aquifer soils to slowly recapture and sequester iron and manganese. By comparison, the Area 3 groundwater appears to be maintaining a reductive environment, which promotes the dissolution of metals from native soils.

Groundwater sampling results indicate that ROD/ESD COC concentrations are generally steady, with some fluctuations over time. PCE results for groundwater samples at well 57M-03-02X have been under the 5 µg/L cleanup goal since 2003 with the exception of two minor exceedances. Surface

water sampling results indicate limited potential for off-site migration of ROD/ESD COCs via the groundwater to surface water discharge pathway.

The Army will continue to perform LTM until site conditions warrant discontinuation of sampling. As discussed in Section 4.8, optimizations to the long-term monitoring program including AOC 57 were recommended in the 2015 LTMMP (Sovereign/HGL, 2015).

10.6.5 Site Inspection

The ROD remedy includes LUCs to limit potential exposure to contaminated soil and groundwater under both existing and future site use. The controls ensure that exposure to any remaining contaminated soils beneath the site is controlled and the extraction of groundwater from the site for industrial or potable water supply is not permitted.

Existing land-use is also evaluated during the Five-Year Review process to ensure control requirements are being met. A site inspection was conducted on May 31, 2015. Annual inspections are conducted to ensure protectiveness of the selected remedial action and that performance objectives listed above were being met. Features that were inspected included the asphalt areas, access road, monitoring wells and piezometers. The overall condition of the site was satisfactory.

A summary of findings and observations are presented below and within the landfill inspection checklist included in **Appendix K** along with supporting photographs.

10.6.6 Interviews

The following individuals were interviewed in May and June 2015 as part of the five-year review:

- Mr. Daniel Groher, USACE, New England District;
- Fire Chief Joe LeBlanc, Devens Fire Department;
- Ms. Pamela Papineau, Ayer Board of Health
- Mr. Richard Doherty, PACE
- Mr. Ron Ostrowski, MassDevelopment; and,
- Mr. Neil Angus, MassDevelopment

As part of the FYR review process, interviews were conducted in March and April 2015 in accordance with the USEPA Five Year Review Guidance (2001) and summaries of each interview are provided in Appendix A. In general, comments related to the site were positive and supportive. The Devens Fire Chief did express a concern related to insufficient communication regarding site activities. When asked, he did indicate that the Fire Department was routinely contacted regarding invasive work related to potential hazardous materials and contaminants to provide notice and preparation in the event of the required emergency response condition. His general comment was that overall project communication could be improved.

Mr. Doherty of PACE indicated that the community appreciated receiving draft reports for review prior to final submittal.

10.7 Technical Assessment

This section of the 2015 FYR details responses to the key questions from the 2001 EPA Guidance on conducting FYRs as follows:

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

Responses are provided as follows:

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning as intended based on the long-term monitoring results and ICs implemented with no early indicators of remedy failure. Information to support this statement provided below.

10.7.1 Remedial Action Performance

Beginning in 2008, groundwater and surface water at AOC 57 have been sampled annually in accordance with the 2008 revised comprehensive LTMMP (HGL, 2008).

Based on the review of available data, ROD COC concentrations are generally decreasing or steady with some fluctuations over time. VOC results have generally been at or below cleanup goals since 2008. Arsenic results in Area 2 have decreased significantly over time to concentrations that are below or slightly above the cleanup goal. Arsenic results in Area 3 well 57M-95-03X have decreased significantly over time to concentrations that are slightly above the cleanup goal, although results in well 57M-96-11X remain steady at concentrations that are well above the cleanup goal.

10.7.2 System Operations/Operation and Maintenance (Long Term Groundwater Monitoring)

Groundwater monitoring is being performed in accordance with the LTMMP (*HGL, 2008b*) for both Areas 2 and 3. On-site IC inspections and interviews continue to confirm that there are no exposures to contaminated groundwater. Annual reports continue to provide data that support the effectiveness of ongoing remedy activities.

10.7.3 Opportunities for Optimization

The LTMMP has been revised in 2015 (*LTMMP, Sovereign/HGL, 2015*) to include updates to the LTM program. A report titled, Optimization Evaluation for LTMM at the Former Fort Devens Army Installation, is included as Appendix A of the revised LTMMP (*Sovereign/HGL, 2015*). This report presents the results of an optimization evaluation of the long-term monitoring (LTM) program at Devens, including AOC 57.

ROD COC concentrations are diminished, the remaining concentrations are steady, and there is limited potential for off-site migration of ROD COCs via the groundwater to surface water discharge pathway. Based on the previous remedial activities performed at OU#9 and evaluation of the available monitoring data through 2014, elimination of monitoring is recommended for Area 2 and reduced monitoring at Area 3. The site currently does not pose an exposure risk and is not expected to pose a risk in the future.

10.7.4 Early Indicators of Potential Remedy Problems

No early indicators of potential remedy failure were noted during this five year review.

10.7.5 Implementation of ICs and other measures

Per the ROD signed in September 2001, LUCs were established to limit the potential exposure to the contaminated soil and groundwater under both the existing and future site conditions. The controls ensure that exposure to any remaining contaminated soils beneath the site is controlled and the extraction of groundwater from the site for industrial or potable water supply is not permitted. These LUCs have been incorporated either in full or by reference into all deeds, easements, mortgages, leases, or any other instruments of transfer prior to the transfer of the property to MassDevelopment, until such time that soil and groundwater concentrations reach cleanup levels. There are no current or future plans for installation of potable water wells at either Area 2 or 3.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes, the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection and remedial activities are still valid. The ROD/ESD identified groundwater COCs for Area 2 as arsenic, PCE, and EPH C11-C22 aromatics with cleanup goals of 10 µg/L, 5 µg/L, and 200 µg/L, respectively. Groundwater COCs for Area 3 are arsenic, PCE, and 1,4-DCB with cleanup goals of 10 µg/L, 5 µg/L, and 5 µg/L, respectively.

10.7.6 Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance presented in the ROD were reviewed.

Excavation activities at AOC 57 were completed in October 2003. The RAOs for soil specified in the ROD have been permanently achieved. Because the cleanup goals for soil at AOC 57 were based on HHRA levels determined specifically for the site and the contaminated soils were removed, any changes to soil TBCs do not affect the protectiveness of the implemented remedy.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 µg/L) was selected as a groundwater cleanup goal. The MCL for arsenic has been revised to 10 µg/L in 2002. There have been no other changes to the COC MCLs since the previous five-year review. Because the remedy includes prohibiting the use of groundwater as drinking water, changes to groundwater standards do not affect the protectiveness of the implemented remedy.

Although iron and manganese are not listed in the AOC 57 ROD, USEPA Region I requested that these metals be included in the sampling events as a measure of the potential for natural attenuation. AOC 57 does not have a site-specific cleanup goal for manganese and iron, as they were not groundwater COCs in the 2001 ROD. AOC 57 manganese and iron concentrations in groundwater are compared to their background levels of 291 and 9,100 µg/L, respectively.

10.7.7 Changes in Exposure Pathways

The intent of the ROD was primarily to address petroleum contaminated soils and groundwater. The excavation and removal of contaminated soil from AOC 57 in 2002 and 2003 have eliminated the potential soil exposure pathways. Zoning restrictions prohibit residential use of the wetland areas of AOC 57. Land use at the site has not changed since the ROD. Potential future uses remain consistent with potential future uses evaluated in the risk assessment supporting the ROD. Current land use is in compliance with the proposed deed restrictions.

10.7.8 Changes in Toxicology and Other Contaminant Characteristics

Because the soil cleanup goals at AOC 57 were based on site-specific HHRA, changes in toxicity values for soil contaminants could have affected the soil cleanup goals. However, because the contaminated soil has already been removed, changes to soil contaminant toxicity do not affect the protectiveness of the implemented remedy.

10.7.9 Changes in Risk Assessment Methodology

While numerous methodologies and changes to default exposure have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No, No additional information has come to light that would call into question the protectiveness of the remedy was noted.

10.7.10 Summary of Technical Assessment

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the 2001 ROD and 2004 ESD. The changes in the toxicity factors for the contaminants of concern that were used in the HHRA and ERA have not impacted the conclusions of those assessments. There have been no significant changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy. The remedy continues to be protective of human health and the environment.

The LTMMP has been revised in 2015 (LTMMP, Sovereign/HGL, 2015) to include updates to the LTM program. A report titled, *Optimization Evaluation for LTMM at the Former Fort Devens Army Installation*, is included as Appendix A of the revised LTMMP (Sovereign/HGL, 2015). This reports presents the results of an optimization evaluation of the long-term monitoring (LTM) program at Devens, including OU#9 (AOC 57). This evaluation is summarized below.

Based on the previous remedial activities performed at the site and evaluation of the available monitoring data, elimination of monitoring is recommended for Area 2 and reduced monitoring at Area 3. The site currently does not pose an exposure risk and is not expected to pose a risk in the future.

Until full site closure is achieved, the following changes were recommended in the 2015 LTMMP to the LTM program at AOC 57:

- Use HydraSleeve™ technology to perform groundwater sampling at Area 3.
- Reduce surface water sampling to every 5 years at Area 3 to coincide with the five-year review and eliminate VOCs from the COC list.
- Reduce groundwater sampling to every 5 years at Area 3 to coincide with the five-year review and eliminate VOCs from the groundwater and COC list. Discontinue sampling of surface water and groundwater from all wells at Area 2.
- Decommission sumps at Area 2.

- Prepare technical memorandum for AOC 57 presenting site specific information that supports justification for site closure, and path forward.

The recommendation to discontinue sampling at Area 2, as noted above, will not be effective until after the 2015 sampling event and the technical memorandum noted above has been prepared, reviewed and approved by the regulators.

10.8 Issues

There are no issues with respect to protectiveness of the remedy as specified by the ROD.

10.9 Recommendations and Follow-up Actions

There are no recommendations pertaining to the protectiveness of the remedy as specified by the ROD.

10.10 Protectiveness Statement

The remedy at AOC 57 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled.

10.11 Next Review

The next five-year review for AOC 57 is required five years from the completion date of this review.

10.12 References

References are included in **Appendix A**.

APPENDIX A – REFERENCE MATERIALS

APPENDIX B – COMMUNITY INVOLVEMENT

APPENDIX C – Shepley's Hill Landfill

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APPENDIX B – COMMUNITY INVOLVEMENT

B.1 Newspaper Notices

510 Help Wanted General

PART-TIME CUSTOMER SERVICE REPRESENTATIVE

Providing quality customer service to incoming customer calls. Data entry required.
Looking to fill a position for the following days:

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Tuesday
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Thursday
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1:30 p.m. - 6:00 p.m.
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Lowell, MA 01854 -
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Fax # 978-970-4891
THE SUN

Public Notice

Public Hearing
Lowell Zoning Board of Appeals
Case No: ZB-2015-005
Petitioner: Kevin Tran
Location: 990 Middlesex St.
Petition: The applicant is seeking Variance relief to keep paving that was installed that brought the property out of compliance with landscaped open space requirements. The petitioner is seeking relief under Sec. 5.3.1 of the Zoning Ordinance.
The public hearing will be held on Monday, February 9, 2015 at 6:30 PM in the City Council Chambers, City Hall, 375 Merrimack Street, Lowell, MA 01852. The Zoning Board will consider this matter at the conclusion of the public hearing. Information relative to this project is available at the Office of the Lowell Zoning Board at the Department of Planning and Development, 375 Merrimack Street, City Hall 2nd Floor, Lowell, MA 01852, Monday through Friday, 9:00 a.m. to 5:00 p.m.
Lowell Zoning Board
William Bailey,
Chairperson

January 25, 2015
February 1, 2015

Public Hearing
Lowell Zoning Board of Appeals
Case No: ZB-2015-004
Petitioner: ID Sign Group, Inc.
Location: 22 Olde Canal Drive
Petition: The applicant is seeking Variance Approval to allow an oversized sign over the second entrance for South Bay Mental Health (pursuant to Art. 12: Table of Uses of the zoning ordinance.)
The public hearing will be held on Monday, February 9, 2015 at 6:30 PM in the City Council Chambers, City Hall, 375 Merrimack Street, Lowell, MA 01852. The Zoning Board will consider this matter at the conclusion of the public hearing. Information relative to this project is available at the Office of the Lowell Zoning Board at the Department of Planning and Development, 375 Merrimack Street, City Hall 2nd Floor, Lowell, MA 01852, Monday through Friday, 9:00 a.m. to 5:00 p.m.
Lowell Zoning Board
William Bailey,
Chairperson

January 25, 2015
February 1, 2015

510 Help Wanted General

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Public Notice

Public Hearing
Lowell Zoning Board of Appeals
Case No: ZB-2015-006
Petitioner: Medicine On Time
Location: 181 Stedman Street
Petition: Special Permit(s): to operate an adult day care facility at the above address, currently occupied by a commercial use (pursuant to Article 12: Table of Uses of the Zoning Ordinance)
The public hearing will be held on Monday February 9, 2015 at 6:30 PM in the City Council Chambers, City Hall, 375 Merrimack Street, Lowell, MA 01852. The Zoning Board will consider this matter at the conclusion of the public hearing. Information relative to this project is available at the Office of the Lowell Zoning Board at the Department of Planning and Development, 375 Merrimack Street, City Hall 2nd Floor, Lowell, MA 01852, Monday through Friday, 9:00 a.m. to 5:00 p.m.
Lowell Zoning Board
William Bailey,
Chairperson

January 25, 2015
February 1, 2015

Public Hearing
Lowell Zoning Board of Appeals
Case No: ZB-2015-003
Petitioner: Erin Yates
Location: 78 Central Street
Petition: Special Permit for renovation of existing lodging house to create 10 additional units (pursuant to Section 4.1.e of the Zoning Ordinance)
The public hearing will be held on Monday February 9, 2015 at 6:30 PM in the City Council Chambers, City Hall, 375 Merrimack Street, Lowell, MA 01852. The Zoning Board will consider this matter at the conclusion of the public hearing. Information relative to this project is available at the Office of the Lowell Zoning Board at the Department of Planning and Development, 375 Merrimack Street, City Hall 2nd Floor, Lowell, MA 01852, Monday through Friday, 9:00 a.m. to 5:00 p.m.
Lowell Zoning Board
William Bailey,
Chairperson

January 25, 2015
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OIL FILLED ELECTRIC RADIATOR HEATERS, $25
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2 SKI/SNOWBOARD HELMETS, Lg. & XL, $5 each.
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Public Notice

PUBLIC NOTICE FOR FIVE-YEAR REVIEW FORMER FORT DEVENS SUPERFUND SITE DEVENS, MASSACHUSETTS

The U.S. Army Corps of Engineers (USACE) is announcing the start of the fourth Five-Year Review of remedial actions taken at the former Fort Devens Federal Superfund Site, Devens, MA. The purpose of a Five-Year Review is to evaluate whether the cleanup methods put in place at the site are working as designed and continue to remain protective of human health and the environment as required by the Superfund law. It is anticipated that this Five-Year Review will be completed in September 2015. USACE invites the local community to take part in the review process by participating in a community interview; attending a Restoration Advisory Board (RAB) meeting; or submitting comments directly to the Department of the Army. Future RAB meetings are scheduled on April 16 and July 16, 2015 (at 7 PM) at the Devens Commerce Center, MassDevelopment Offices, 33 Andrews Parkway, Devens, MA 01434. USACE will be at the meetings to answer any questions or concerns on the Five-Year Review progress.
BACKGROUND: Camp Devens was established in 1917 as a temporary training area for soldiers during World War I. In 1932, the site was named Fort Devens and made a permanent installation with the primary mission of commanding, training, and providing logistical support for non-divisional troop units. After closure in 1996, portions of the property were retained by the Army for reserve forces training, while the remaining sections were transferred to new owners for reuse and redevelopment. The current and former facility is located in the towns of Ayer, Shirley, Lancaster, and Harvard. Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Devens was placed on the National Priorities List (NPL) on December 21, 1989, because of environmental contamination at several locations. The contamination at the former Fort Devens site is associated with historic underground storage tanks/fuel depots and contaminated soils containing petroleum products and chemicals. The principal threats to human health and the environment are primarily groundwater, soil, and sediment contamination. Since its placement on the NPL, long term monitoring and remediation activities have taken place at the contaminated sites, which have proved to be successful. More detailed information on this site can be found on the U.S. Environmental Protection Agency (EPA) web page at:
http://www.epa.gov/ne/superfund/sites/devens/
To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone.civ@mail.mil

January 25, 2015

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Public Notice

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To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone.civ@mail.mil

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This position requires experience performing lead qualification, outstanding, highly effective telephone skills, clear verbal communication, active listening and writing skills. High-volume out bound sales/telemarketing expertise, experience selling in a B2B environment is a plus. Must be computer literate and work well individually or in a team. Starting rate is dependent on experience.

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Safety Rail for Tub $25
Craftsmen Coveralls Large $20
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2 STEREO VCRs with remote, $15 each.
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OIL FILLED ELECTRIC RADIATOR HEATERS, $25
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BEDROOM SET, 7 pc, solid cherry sleigh, dresser, mirror, chest & nightstand. New in boxes. Sell $795. 603-235-1773

BENCH GRINDER, $25.
EXTENDABLE DESK LAMP, $10.
PROPANE TORCH KIT, $15.
Call 978-957-0698

GENERATOR, 10 HP, Generac, 5,00 watt, 6250 maximum watt, low oil shutoff, 5 gallon tank, circuit breaker, $250. Call 978-452-9030

GENERAL ELECTRIC IRON for clothes (1934), $20.
SMALL SQUIRREL CAGE, $10.
2 SKI/SNOWBOARD HELMETS, Lg. & XL, $5 each.
Call 978-342-4579

Hot Tub, Truckload (16 of them) at 55% off! Incl cover & warranty. Great opportunity to own one cheap! Can deliver. 603-427-2001

Kitchen cabinets, maple glazed! Never installed. Solid wood/dovetail. Can adapt to your kitchen. Cost $6500, sell $1595. 603-235-1695

New Craftsman 6 piece router bit set $25
New New England Patriots super bowl jacket, size M, $50
8 pc new in box Ryobi router bit $30.
Windham, NH 603-889-0299

SNOWBLOWER, Craftsman 24 inch, 5.5 hp, electric start, good condition. $295. Call 603-498-0647

WELDING TORCH
2 Healey arc, 1 circulator, remote control pedal. $200 or best offer. Call 978-455-7100 or 978-551-5984

754 Sporting Goods

SKIIS - 2 pairs - Rossignol SRX Sport & Dynastar MPI-TR; Great shape Best offer. 978-534-29.65

758 Wanted to Buy

BUYING:
BASEBALL CARD COLLECTIONS &
Old Sports Illustrated Mags 978-857-3005

RECORD ALBUMS, 45's, COINS, STERLING, SILVER DOLLARS, COMICS, OLD POSTCARDS, CLOCKS, FURNITURE & JEWELRY, WATCHES. 978-957-0143 or 978-614-5590

802 Apartments

PEPPERELL - Modern 2 bdrm apt, heat, H/W incl, new cabinets, stove, kitchen sink & counter. No pets. $850/month
508-479-3006
978-433-6246

TOWNSEND
Fantastic Opportunity!
3 BR, $900/mo. Lease to purchase with percentage of rental payment going toward down payment.
508-479-3006

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B.2 Public Participation Interviews

Property Owner or Lessee Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Robert Simeone
Title:	
Organization:	Army
Address:	
E-Mail:	robert.j.simeone.civ@mail.mil
Telephone:	978-796-2205

Are property owners and lessees aware of, and complying with, ICs?

Yes

Does the property owner have any plans to lease, sell or transfer the property? If so, what are their plans regarding the property's ICs?

Transfer of source area property at AOC 50, and AOC 57 behind Health Pro.

Are any covenants or easements relevant to the remedy held by the property owner in addition to those selected in the remedy decision documents?

All properties with the exception of 43G, AOC 50 and AOC57 have been transferred. Knows of no other transfer.

Does the property owner/lessee have any plans to build new structures or drill wells on the property?

No. Mass Development may have but Army is not owner of those properties.

General Public Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Dan Groher
Title:	
Organization:	USACE New England Region
Address:	Concord Road, Concord, MA
E-Mail:	Daniel.M.Groher@usace.army.mil
Telephone:	978-318-8404

What is your overall impression of the project at the Former Fort Devens Army Installation (Devens)?

Highest quality of work

What effects has cleanup at Devens had on the surrounding community?

Minimal to his knowledge.

Are you aware of any community concerns regarding the site and cleanup conducted at Devens?

No

Are you familiar with the various processes that Devens is utilizing to contain the contamination on site?

yes

Do you feel comfortable in the process that Devens is utilizing to keep the contaminants from migrating off site?

yes

Do you feel informed about the site's activities and progress?

Yes

Do you have any other comments, suggestions or recommendations regarding the work conducted at Devens?

No. c

General Public Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Joe LeBlanc
Title:	Fire Cheif
Organization:	Devens Fire Department
Address:	182 Jackson Road
E-Mail:	jleblanc@massdevelopment.com
Telephone:	978-772-4600

What is your overall impression of the project at the Former Fort Devens Army Installation (Devens)?

Doesn't get to see it. Only involved if an incident occurs. Doesn't always know what Army does all the time. Gets his information from Ron Ostrowski.

What effects has cleanup at Devens had on the surrounding community?

No complaints, but he's removed for all activities at the Army sites.

Are you aware of any community concerns regarding the site and cleanup conducted at Devens?

No

Are you familiar with the various processes that Devens is utilizing to contain the contamination on site?

Yes. Aware of Moor Airfield, Parker Charter school, any clean up asks Ron, only involved if there is UXO.

Do you feel comfortable in the process that Devens is utilizing to keep the contaminants from migrating off site?

(no answer)

Do you feel informed about the site's activities and progress?

Yes. He is kept informed by Devens Enterprise Commission

Do you have any other comments, suggestions or recommendations regarding the work conducted at Devens?

No

General Public Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Neil Argus
Title:	
Organization:	Devens DPW
Address:	99 Buena Vista Street
E-Mail:	
Telephone:	978-772-8831 ext 3334

What is your overall impression of the project at the Former Fort Devens Army Installation (Devens)?

Extensive, well managed, excellent oversight.

What effects has cleanup at Devens had on the surrounding community?

Only issue is Shepley's Landfill, feedback he has received from the public

Are you aware of any community concerns regarding the site and cleanup conducted at Devens?

Only Shepley's is problem.

Are you familiar with the various processes that Devens is utilizing to contain the contamination on site?

Yes.

Do you feel comfortable in the process that Devens is utilizing to keep the contaminants from migrating off site?

Yes

Do you feel informed about the site's activities and progress?

Yes. Ron Ostrowski keeps them informed.

Do you have any other comments, suggestions or recommendations regarding the work conducted at Devens?

No.

Property Owner or Lessee Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Neil Argus
Title:	
Organization:	Devens DPW
Address:	99 Buena Vista Street
E-Mail:	
Telephone:	978-772-8831 ext 3334

Are property owners and lessees aware of, and complying with, ICs?

Yes

Does the property owner have any plans to lease, sell or transfer the property? If so, what are their plans regarding the property's ICs?

Just completed evaluation for Sovereign at AOC 57. The property owners are aware. If the owners change then they (Devens) make them aware.

Are any covenants or easements relevant to the remedy held by the property owner in addition to those selected in the remedy decision documents?

No

Does the property owner/lessee have any plans to build new structures or drill wells on the property?

No plans now. Possible company looking to purchase land at AOC 57, but nothing is done yet. It would be for parking.

General Public Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Pam Papineau
Title:	Health Agent
Organization:	Ayer Board of Health
Address:	
E-Mail:	
Telephone:	978-772-3552

What is your overall impression of the project at the Former Fort Devens Army Installation (Devens)?

Good

What effects has cleanup at Devens had on the surrounding community?

From the community at public hearings and implementing LUCs. Residents are concerned in general. Fear misunderstanding the arsenic. Where is it, is it on the surface, general public thinks they are not getting enough information from the Army. There have been allegations of cancer.

Are you aware of any community concerns regarding the site and cleanup conducted at Devens?

People in the area really didn't understand what is going on.

Are you familiar with the various processes that Devens is utilizing to contain the contamination on site?

Yes.

Do you feel comfortable in the process that Devens is utilizing to keep the contaminants from migrating off site?

Yes. She has been to all the RAB meetings. She has done research before joining the BOH, she feels informed.

Do you feel informed about the site's activities and progress?

Yes.

Do you have any other comments, suggestions or recommendations regarding the work conducted at Devens?

General public has resentment towards the Army. They (Army) needs to get more information out to the people. Make it easy to understand. The town of Ayer feels like they are the dump site for the Army.

Regulatory Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Pam Papineau
Title:	Health Agent
Organization:	Ayer Board of Health
Address:	
E-Mail:	
Telephone:	978-772-3552

Authorities from State/local government agencies or federal facilities

Have any breaches of the Institutional Controls (ICs) occurred, complaints been filed, or unusual activities been noted at the site (e.g., citizens are consuming fish at a contaminated sediment site)? If so, how were they addressed?
No

Has the federal agency (for a federal facility site) reported on the status of the ICs or LUCs as required?
Doesn't know.

What type of monitoring is currently being conducted or has been conducted to determine IC compliance (e.g., follow-up inspections)
Doesn't know

Are ICs being enforced? What is the enforcement plan in the event of an IC breach?
Doesn't know

Are there any new developments, either constructed or planned, in the area of which the entity is aware?
Not that she knows of. But it would be caught with a building permit. The BOH reviewd the building permits.

Has land use changed or is it anticipated to change (e.g., housing developments, either constructed or planned, exist in the area)?
Doesn't know

What procedures are in place for EPA and PRPs to receive notice of any proposed changes to the ICs?
Doesn't know

Does the entity have an IC tracking system or other applicable database (e.g., GIS maps) to keep information about ICs?

Doesn’t know

Can the ICs or engineering controls be registered in the state’s one-call system? o How has the IC process been working and are there any suggestions for improvement?

Doesn’t know

From: Chaffin, David (DEP)
To: Elizabeth Anderson
Subject: RE: 5 year review
Date: Monday, March 23, 2015 12:56:31 PM
Attachments: image001.jpg

For Use In Intra-Agency Policy Deliberations

_____

I appreciate the invitation, but I believe it is not necessary to interview me because I will be commenting on the FYR document. Please let me know if this will cause any difficulties.

_____

David Chaffin
Massachusetts Department of Environmental Protection
617-348-4005
Follow MassDEP on Twitter: twitter.com/MassDEP
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Visit our web site: mass.gov/dep

From: Elizabeth Anderson [mailto:EAnderson@hsenv.com]
Sent: Thursday, March 19, 2015 10:52 AM
To: Chaffin, David (DEP)
Subject: 5 year review

Hi David

I hope all is well. I would like to set up some time to conduct my 5 year review site survey questionnaire with you. Please let me know when you have some time available.

Thank you

Elizabeth Anderson, PE
Senior Engineer

H&S Environmental, Inc.
160 East Main Street, Suite 2F
Westborough, MA 01581
Office: 508.366.7442
Cell: 508.277.8721
www.hsenv.com

From: Keating, Carol
To: Elizabeth Anderson
Subject: RE: Devens 5 Year Reviews
Date: Thursday, March 19, 2015 11:57:54 AM

Hi Elizabeth,

Typically, EPA does not participate in the FYR interviews (or at least I haven't in my 22 years with the agency). For consistency, I think it's best to abstain from the Devens FYR interview as well.

Thanks and best of luck!

Carol A. Keating
Remedial Project Manager
Federal Facilities Superfund Section
Office of Site Remediation and Restoration

U.S. EPA Region 1
5 Post Office Square
Suite 100 - OSRR7-3
Boston, MA 02109-3912
(617) 918-1393

From: Elizabeth Anderson [mailto:EAnderson@hsenv.com]
Sent: Thursday, March 19, 2015 11:06 AM
To: Keating, Carol
Subject: Devens 5 Year Reviews

Good Morning Carol

As part of the five year review, we are conducting interviews to discuss the institutional controls at the Devens Facility. Please let me know at your earliest convenience when I may call you.

Thank you

Elizabeth Anderson, PE
Senior Engineer

H&S Environmental, Inc.
160 East Main Street, Suite 2F
Westborough, MA 01581
Office: 508.366.7442
Cell: 508.277.8721
www.hsenv.com

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Richard Doherty
Title:	
Organization:	Engineering & Consulting Resources, Inc.
Address:	
E-Mail:	Ecr10@verizon.net
Telephone:	978-500-3199

What is your overall impression of the project at the Former Fort Devens Army Installation (Devens)?

The Army has made lots of progress. They have been working at this for a long time. The simple sites have been cleaned up and the more complex ones remain.

What effects has cleanup at Devens had on the surrounding community?

I'm not sure. I have no response.

Are you familiar with the various processes that Devens is utilizing to contain the contamination on site?

Yes.

Do you feel comfortable in the process that Devens is utilizing to keep the contaminants from migrating off site?

For some sites, yes, for other sites no. For sites that are a no, the MNA at petroleum sites is not working. Mr. Doherty believes a more aggressive approach is necessary. Mr. Doherty indicated a fundamental disagreement with the Army's assertion that the primary source of arsenic at Shepley's Hill is naturally-occurring.

Do you feel informed about the site's activities and progress?

Yes. Bob Simeone has been very forthcoming with information in the past. It was a big effort. EPA and MADEP are doing a great job. It's really appreciated.

Do you have any other comments, suggestions or recommendations regarding the work conducted at Devens? No.

General Public Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Ron Ostrowski
Title:	
Organization:	MassDevelopment
Address:	33 Andrews Parkway, Devens
E-Mail:	
Telephone:	978-784-2900

What is your overall impression of the project at the Former Fort Devens Army Installation (Devens)?

The Army is doing a fine job. The only thing remaining is Shepley's Hill.

What effects has cleanup at Devens had on the surrounding community?

Its had a positive effect.

Are you aware of any community concerns regarding the site and cleanup conducted at Devens?

Nothing major. Only PACE who is engaged and participates/gives opinions. PACE is reliable.

Are you familiar with the various processes that Devens is utilizing to contain the contamination on site?

Yes.

Do you feel comfortable in the process that Devens is utilizing to keep the contaminants from migrating off site?

Yes

Do you feel informed about the site's activities and progress?

Yes.

Do you have any other comments, suggestions or recommendations regarding the work conducted at Devens?

No. Army is doing a good job.

Property Owner or Lessee Questionnaire

FIVE YEAR REVIEW SITE SURVEY	
Former Fort Devens Army Installation	
Name:	Ron Ostrowski
Title:	
Organization:	MassDevelopment
Address:	33 Andrews Parkway, Devens
E-Mail:	
Telephone:	978-784-2900

Are property owners and lessees aware of, and complying with, ICs?

Yes

Does the property owner have any plans to lease, sell or transfer the property? If so, what are their plans regarding the property's ICs?

Nothing yet.

Are any covenants or easements relevant to the remedy held by the property owner in addition to those selected in the remedy decision documents?

No. Nothing new, no properties sold and no new deed language.

Does the property owner/lessee have any plans to build new structures or drill wells on the property?

There is a potential building at the airfield. They are planning to put it in off the AOC 50 plume. They need to excavate to install two piers for the speed testing equipment. This has been presented to the BCT.

APPENDIX C – Shepley's Hill Landfill

C.1 Shepley's Hill

Figures

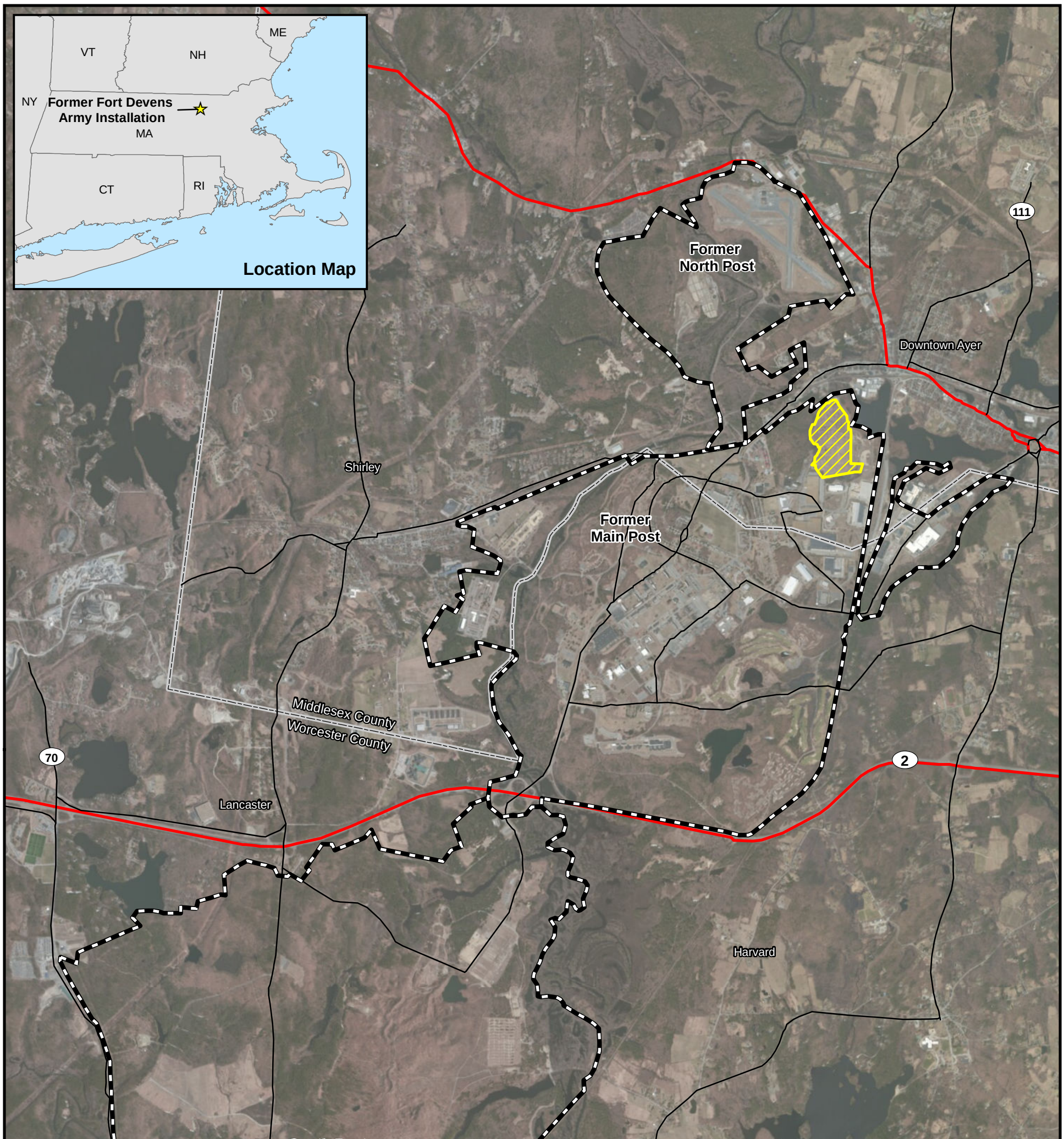


Figure 2.1
Site Location
Former Fort Devens
Shepley's Hill Landfill

References: HGL. LTMMP 2012.
Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- Highway
- Major Road
- County Line
- Former Fort Devens Boundary
- Shepley's Hill Landfill

2015 Five-Year Review
Former Fort Devens Army Installation

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

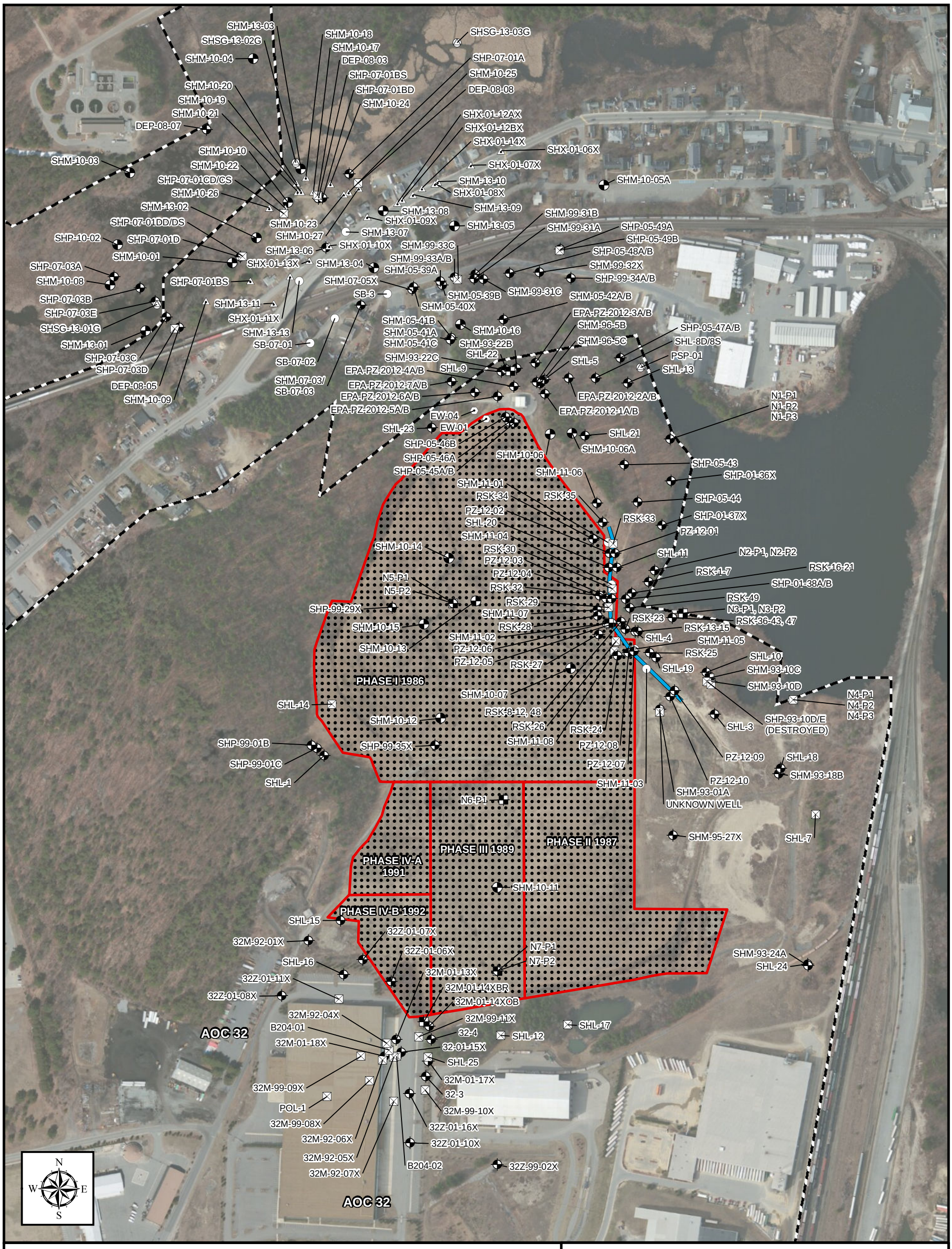
0 1,750 3,500
Feet

Date: 04/16/2015

Figure 2.1

H&S

File: NIA_SHL_2015_Figure3_1.mxd



Legend

- Overburden Monitoring Well/Piezometer
- Monitoring Well - Destroyed
- Groundwater Profiling Location/Monitoring Well
- Groundwater Profiling Location
- Bedrock Monitoring Well
- Extraction Well
- Soil Boring
- Stream Gauge
- Barrier Wall
- PZ-12-07 Well/Boring/Gauge Identification
- Edge of Membrane Cap
- Former Fort Devens Boundary

References: HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 2.2
Northern Impact Area and Shepley's Hill Landfill Site Plan

2015 Five-Year Review
Northern Impact Area

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

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160 East Main Street, Suite 2F, Westborough, MA 01581

0 200 400
Feet

Date: 04/16/2015

Figure 2.2

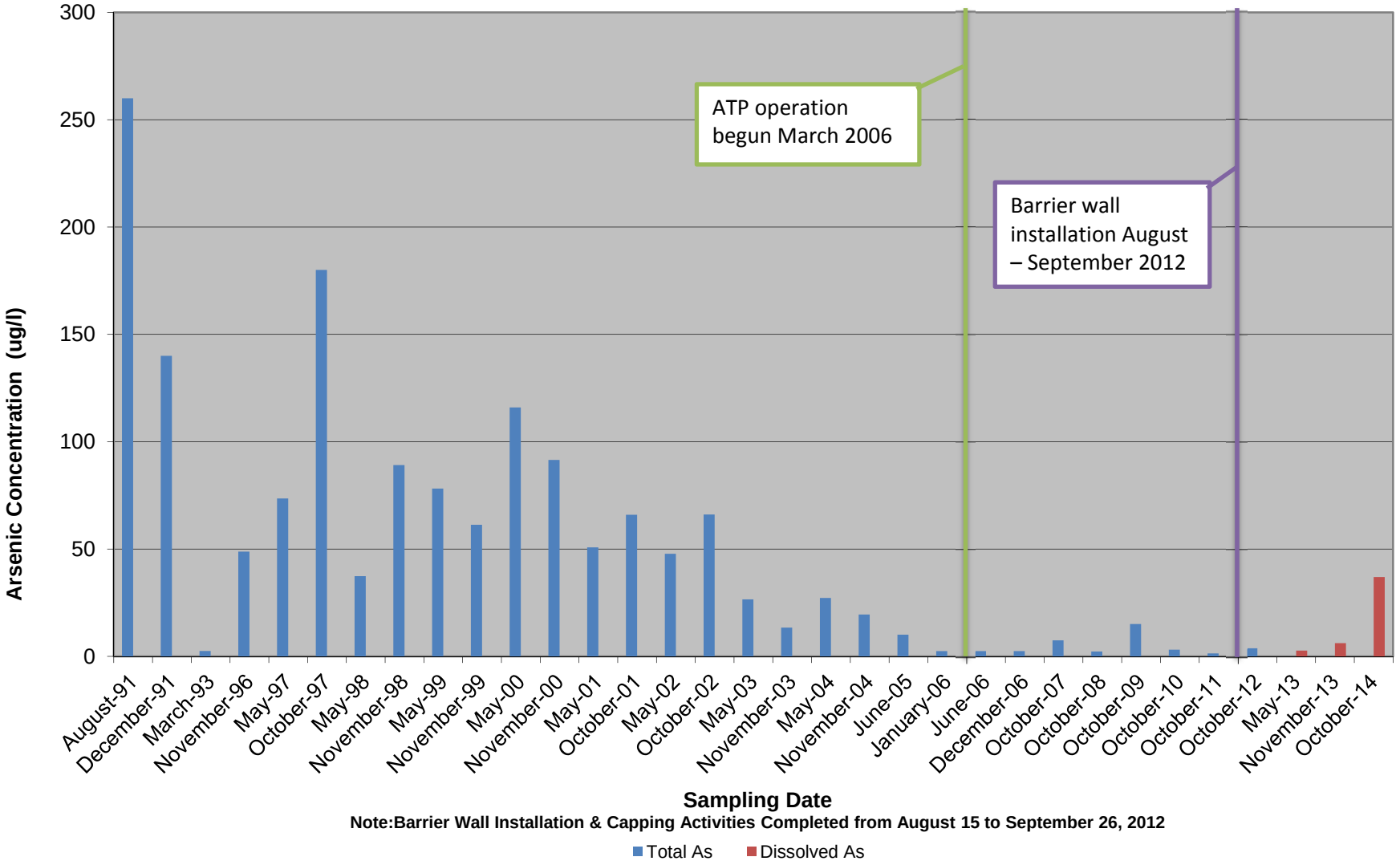
File: NIA_SHL_2015_Figure3_2.mxd

C.2 Shepley's Hill

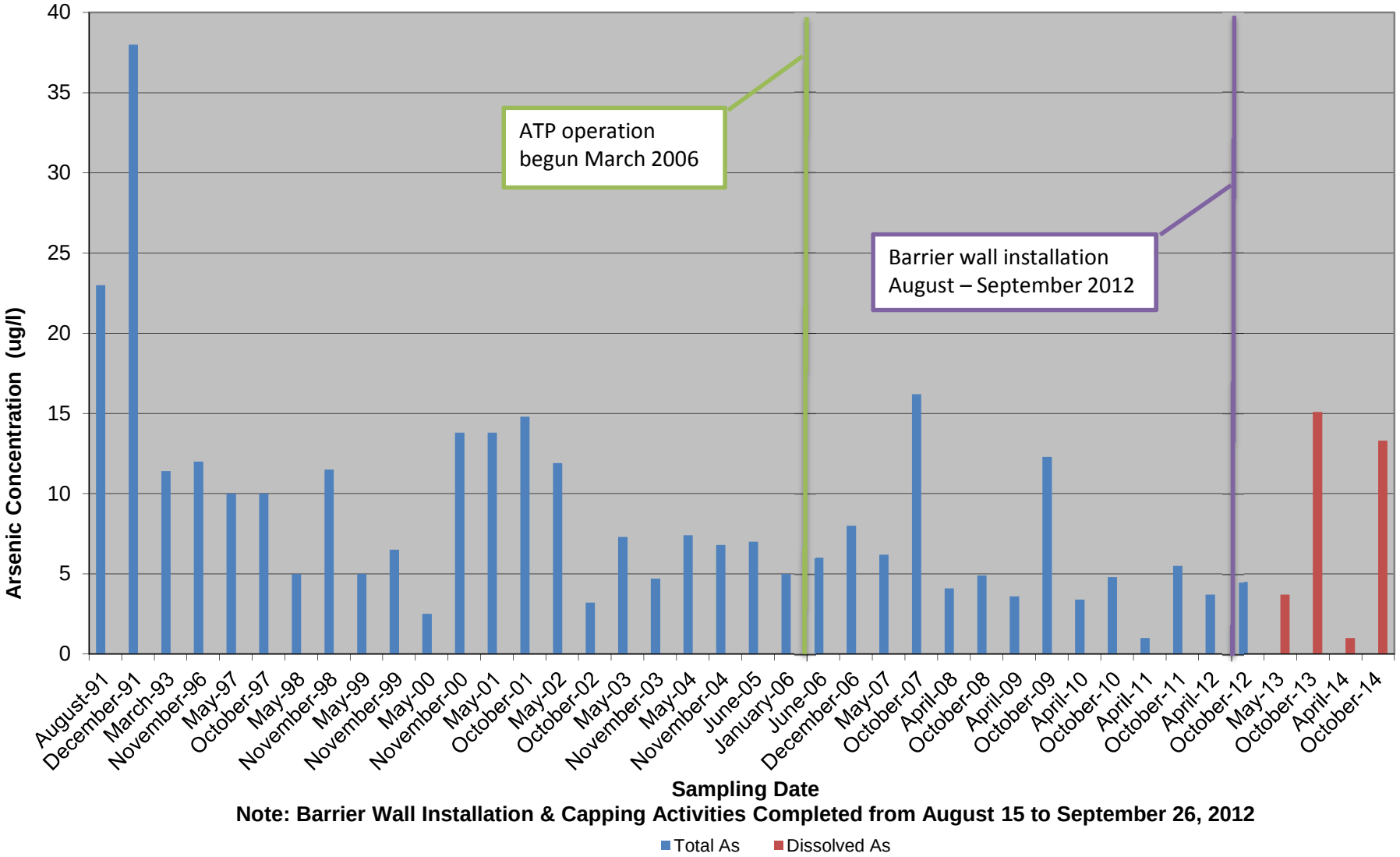
Tables

ARSENIC TRENDS
(1991 – 2014)

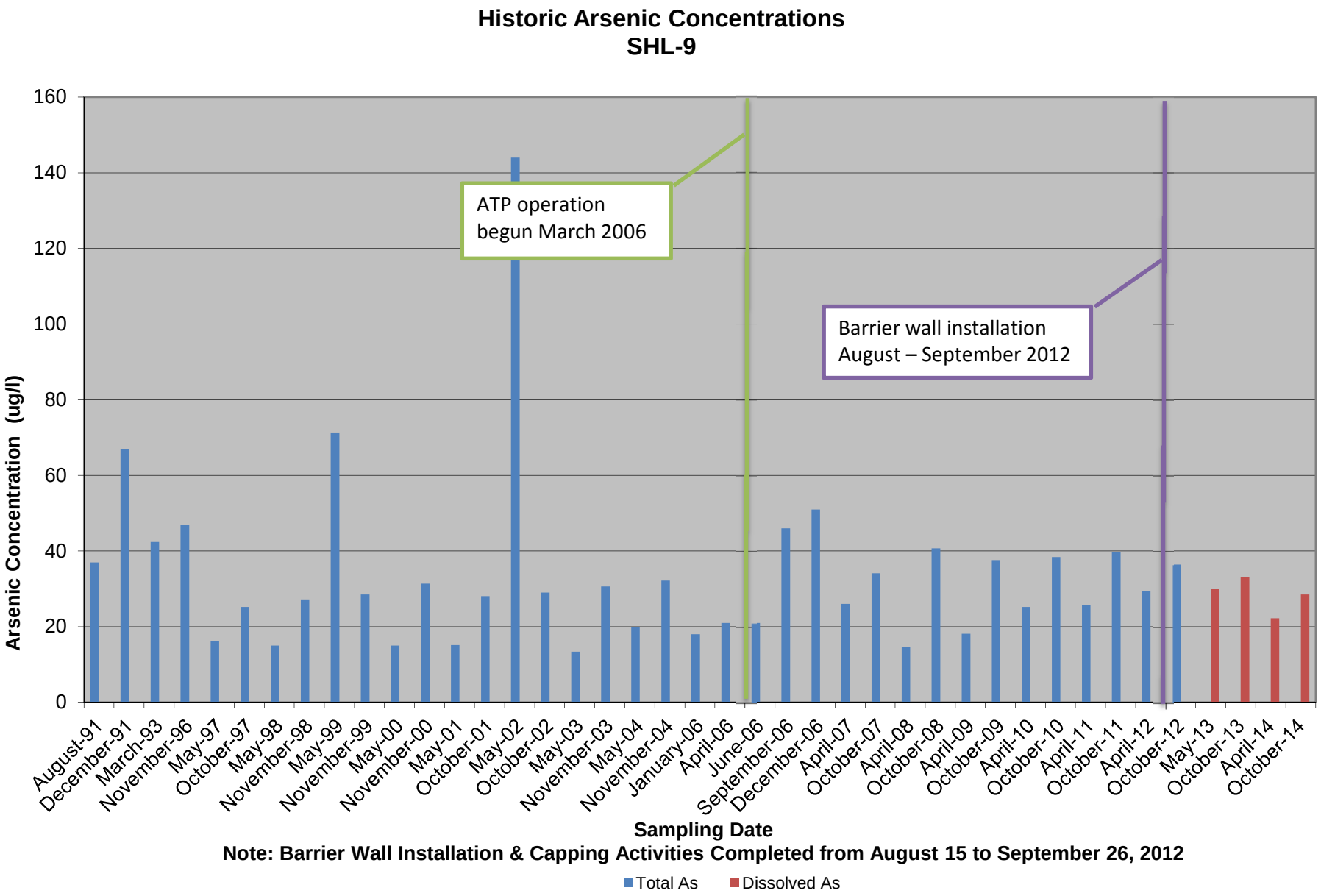
Historic Arsenic Concentrations
SHL-4

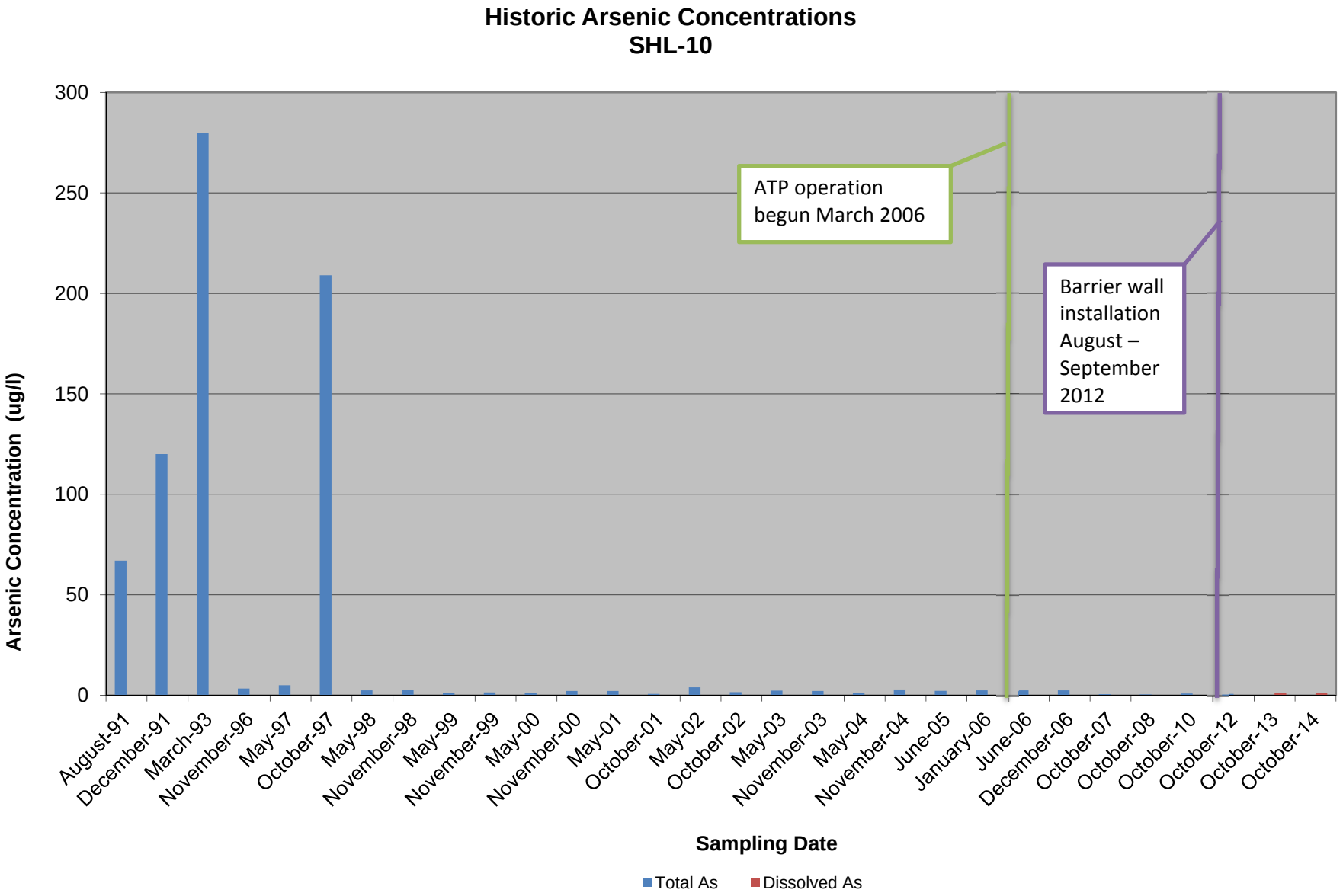


Historic Arsenic Concentrations
SHL-5

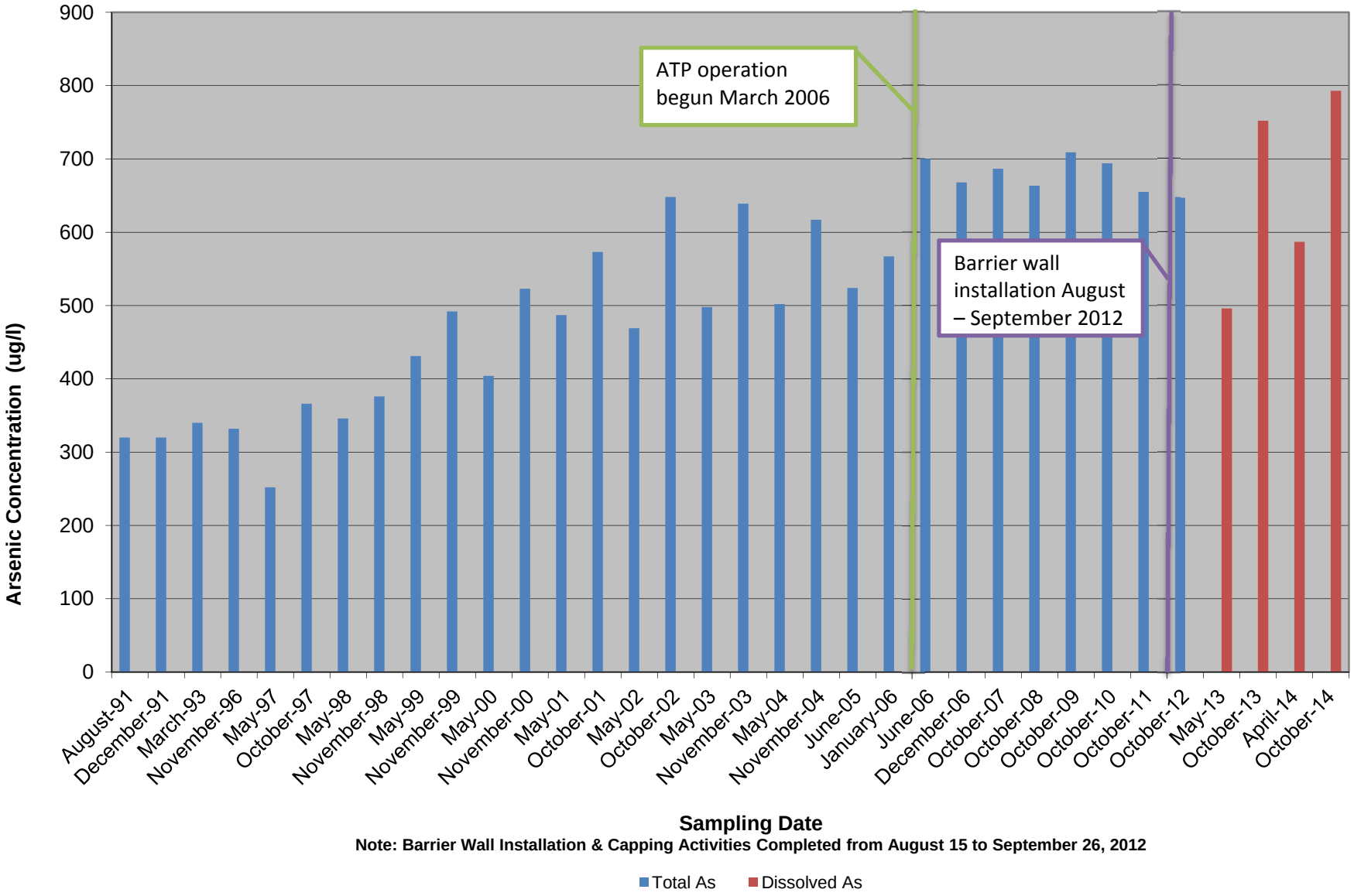


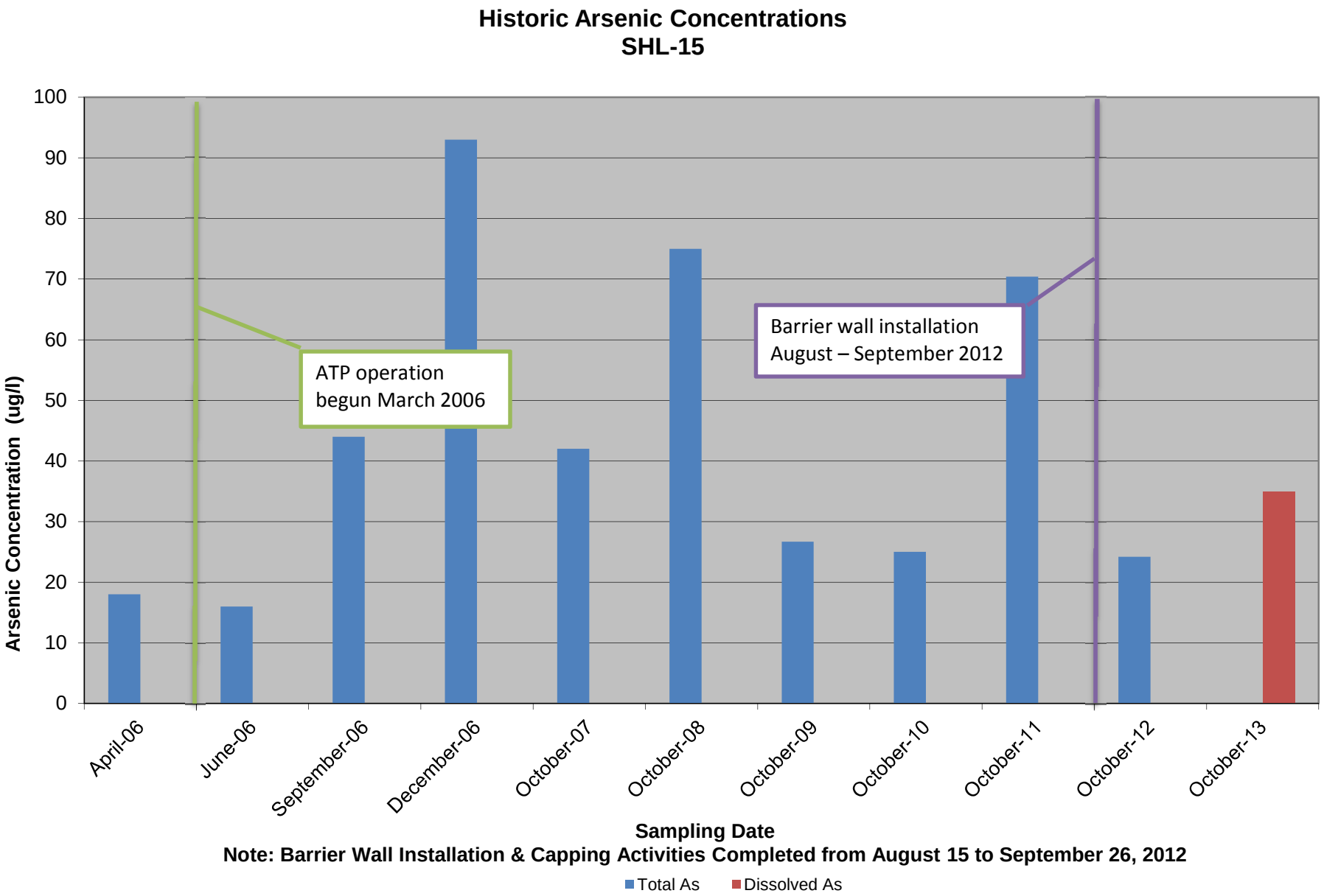
Note: Barrier Wall Installation & Capping Activities Completed from August 15 to September 26, 2012


Historic Arsenic Concentrations
SHL-9
Arsenic Concentration (ug/l)
160
140
120
100
80
60
40
20
0
ATP operation
begun March 2006
Barrier wall installation
August – September 2012
August-91
December-91
March-93
November-96
May-97
October-97
May-98
November-98
May-99
November-99
May-00
November-00
May-01
October-01
May-02
October-02
May-03
November-03
May-04
November-04
January-06
April-06
June-06
September-06
December-06
April-07
October-07
April-08
October-08
April-09
October-09
April-10
October-10
April-11
October-11
April-12
October-12
May-13
October-13
April-14
October-14
Sampling Date
Note: Barrier Wall Installation & Capping Activities Completed from August 15 to September 26, 2012
Total As
Dissolved As

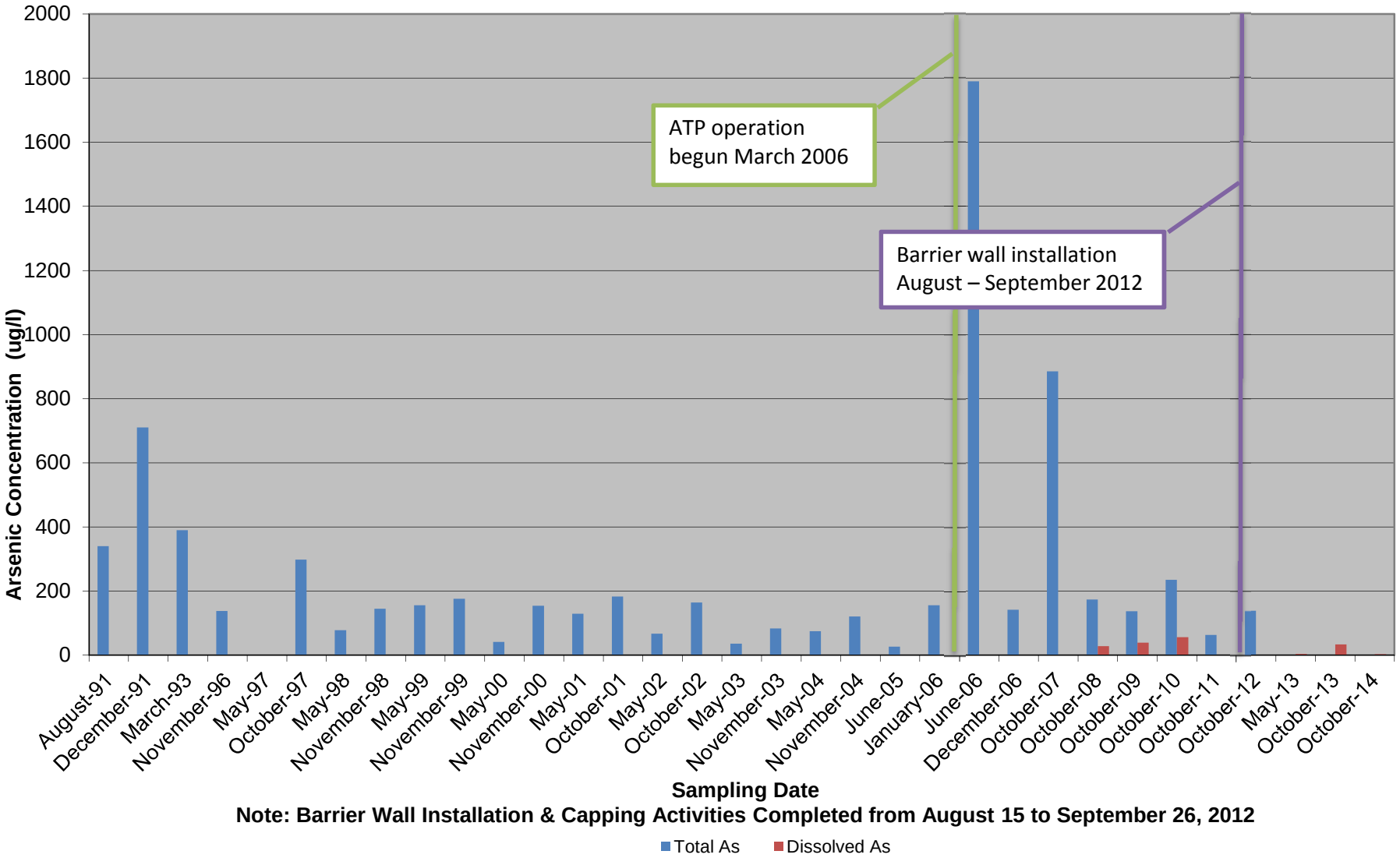

Historic Arsenic Concentrations
SHL-10
Arsenic Concentration (ug/l)
300
250
200
150
100
50
0
ATP operation begun March 2006
Barrier wall installation August – September 2012
August-91
December-91
March-93
November-96
May-97
October-97
May-98
November-98
May-99
November-99
May-00
November-00
May-01
October-01
May-02
October-02
May-03
November-03
May-04
November-04
June-05
January-06
June-06
December-06
October-07
October-08
October-10
October-12
October-13
October-14
Sampling Date
Total As
Dissolved As

Historic Arsenic Concentrations
SHL-11



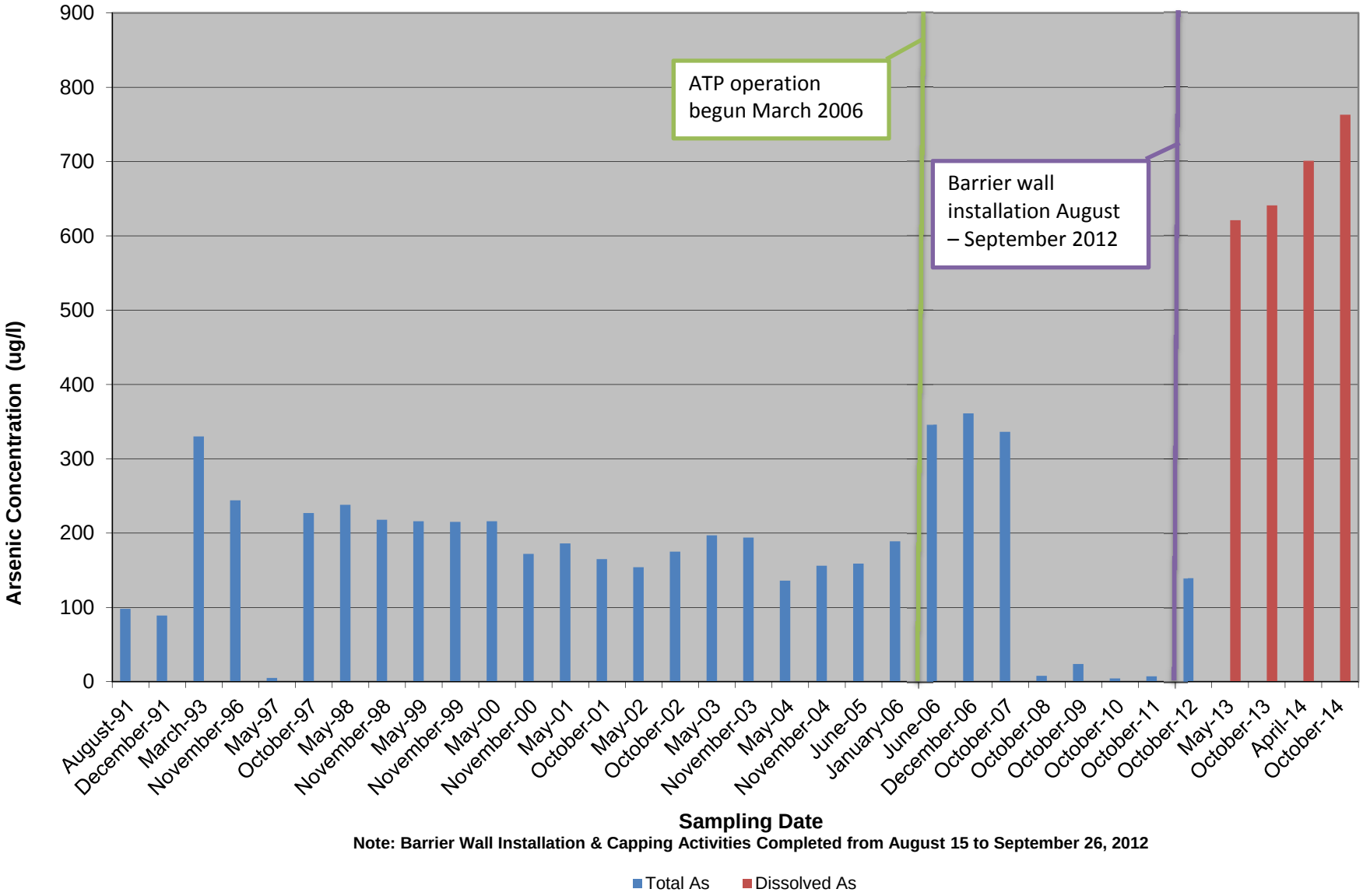

Historic Arsenic Concentrations
SHL-15
Arsenic Concentration (ug/l)
100
90
80
70
60
50
40
30
20
10
0
ATP operation
begun March 2006
Barrier wall installation
August – September 2012
April-06
June-06
September-06
December-06
October-07
October-08
October-09
October-10
October-11
October-12
October-13
Sampling Date
Note: Barrier Wall Installation & Capping Activities Completed from August 15 to September 26, 2012
Total As
Dissolved As

Historic Arsenic Concentrations
SHL-19



Note: Barrier Wall Installation & Capping Activities Completed from August 15 to September 26, 2012

Historic Arsenic Concentrations
SHL-20



Note: Barrier Wall Installation & Capping Activities Completed from August 15 to September 26, 2012

GROUNDWATER ANALYTICAL RESULTS

(2010 - 2014)

Key for Tables

General Terms

AP	atmospheric pressure
bgs	below ground surface
BOD_5	biological oxygen demand
BP	barometric pressure
CENAE	U.S. Army Corps of Engineers (USACE), New England District
CGI	combustible gas indicator
CH_4	methane
Co.	Company
CO	carbon monoxide
CO_2	carbon dioxide
DP	Direct push soil gas survey point
ECC	Environmental Chemical Corporation
EPH	extractable petroleum hydrocarbons
ft	feet
GEM	Landtec GEM 500 (instrument)
GP	Temporary gas point at select downgradient monitoring well locations
H_2S	hydrogen sulfide
Hg	mercury
in	inches
ISTMX	Industrial Scientific TMX412 (instrument)
LEL	Lower explosive limit
LGP	Landfill gas well point
lpm	liters per minute
LTMMP	Long-term Monitoring and Maintenance Plan
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
NA	Not analyzed
No.	number

NOAA	National Oceanic and Atmospheric Administration
NS	Not sampled
O_2	oxygen
ORP	Oxidation-reduction potential
PID	photoionization detector
ppm	parts per million
ROD	Record of Decision
sec	Second
SHL	Shepley Hill Landfill
T	temperature
V	Landfill gas vent
VOC	volatile organic compounds

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate
R	Rejected due to serious deficiencies in associated QC. The presence or absence of the analyte cannot be verified.
EJ	Detected result reported at a concentration above the calibrated range of the instrument and is considered an estimate.

GROUNDWATER MONITORING WELL RESULTS
Shepley's Hill Landfill, Devens Massachusetts

			Arsenic		Calcium		Iron		Magnesium		Manganese		Potassium		Sodium																
Well ID	**Sample ID**	**Date**	**Total (ug/L)**	**Dissolved (ug/L)**	**Total (ug/L)**	**Dissolved (ug/L)**	**Total (ug/L)**	**Dissolved (ug/L)**	**Total (ug/L)**	**Dissolved (ug/L)**	**Total (ug/L)**	**Dissolved (ug/L)**	**Total (ug/L)**	**Dissolved (ug/L)**	**Total (ug/L)**	**Dissolved (ug/L)**	Turbidity NTU	DO mg/L	pH	Temp Celcius	Spec Cond uS/cm	ORP mV	**Alkalinity mg CaCO3/L**	**Ammonia mg/l**	**Nitrite mg/l**	**Nitrate mg/l**	**Nitrogen (Nitrite +Nitrate) mg/l**	**Sulfide mg/l**	**COD mg/l**	**TOC mg/l**	**Chloride mg/l**	**Sulfate mg/l**	**DOC mg/l**	**DIC mg/l**	**Notes**
SHL-4	SHL-4-101607	10/16/2007	7.5	NA	35000	NA	1800	NA	7000	NA	631	NA	4900	NA	13000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-4-101410	10/14/2010	3.1	NA	36000	NA	180	NA	4600	NA	255	NA	7500	NA	14000	NA	0.03	0.46	6.01	12.20	334	47	110	NA	NA	<0.10	NA	NA	NA	NA	25	7.2	NA	NA	
	SHL-4-101111	10/7/2011	1.4	NA	8100	NA	30 J	NA	2000	NA	31	NA	1800 J	NA	2100	NA	0	1.44	5.65	12.55	82	274	32	NA	NA	0.33	NA	NA	NA	NA	1.6	2.3	NA	NA	
	SHL-4-101612	10/16/2012	3.8	NA	18000	NA	880	NA	2900	NA	125	NA	4000.0	NA	2800	NA	0.84 B	0.34	5.69	13.55	162	47	55	NA	NA	0.02 J	NA	NA	NA	NA	13	0.65 J	NA	NA	
	SHL-4-052413	5/24/2013	NA	2.6	NA	30500	NA	57.8 J	NA	4300 J	NA	481	NA	4460 J	NA	18200	0.36	0.27	6.1	10.39	278	107.1	123	1.4	0.004 U	0.079 U	NA	1.4 U	NA	NA	12.8	14.6	2.4	NA	
	DUP-02-052413	5/24/2013	NA	2.7	NA	30900	NA	59.6 J	NA	4300 J	NA	478	NA	4440 J	NA	18600	NA	NA	NA	NA	NA	NA	129	8.9	0.004 U	0.079 U	NA	1.4 U	NA	NA	13.3	15.1	2.5	NA	
	SHL-4-111913	11/19/2013	NA	6.2	NA	28300	NA	637	NA	3860 J	NA	1830	NA	5910	NA	45700	0.06	0.33	6.13	11.52	427	35.2	112	1.3	0.0051 U	0.24	NA	1.5 U	NA	NA	18	69.3	3.3	NA	
	SHL-4-100814	10/8/2014	NA	37	NA	25800	NA	8030 J	NA	3410 J	NA	2480 J	NA	4620 J	NA	15300	11.7	0.3	6.2	17.71	239	4.2	114	0.065 U	NA	NA	0.075 J	1.3 U	NA	NA	6	14.8	2.7	NA	
SHL-5	SHL-5-101807	10/18/2007	16.2	NA	9400	NA	6300	NA	1700	NA	362	NA	1900 J	NA	1400 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-5-042210	4/22/2010	3.4	NA	7400	NA	1200	NA	1200	NA	237	NA	1400 J	NA	2200	NA	0.56	0.09	5.86	7.21	90	-254	25	NA	NA	0.053 J	NA	NA	NA	NA	3.6	<1.0	NA	NA	
	SHL-5-101110	10/11/2010	4.8	NA	15000	NA	610	NA	2100	NA	425	NA	2400 J	NA	3300	NA	0.44	0.34	5.39	13.90	123	108	20	NA	NA	<0.10	NA	NA	NA	NA	2.9	2.1	NA	NA	
	SHL-5-040511	4/5/2011	1	NA	6400	NA	170	NA	1000	NA	157	NA	<2500	NA	1600 J	NA	0.2	0.34	5.78	4.28	60	85.2	12	NA	NA	0.14	NA	NA	NA	NA	3.7	2.2	NA	NA	
	SHL-5-101111	10/11/2011	5.5	NA	9100	NA	700	NA	1200	NA	193	NA	1500 J	NA	2800	NA	1	0.14	5.28	15.15	78	130	33	NA	NA	<0.10	NA	NA	NA	NA	0.6	1.1	NA	NA	
	SHL-5041012	4/10/2012	3.7	NA	7700	NA	1500	NA	1100	NA	233 J	NA	1200 J	NA	2100	NA	2100	0.54	5.54	7.73	84	111.8	24	NA	NA	0.040 J	NA	NA	NA	NA	3.3	<1.7	NA	NA	
	SHL-5-101512	10/15/2012	4.5	NA	11000	NA	1000	NA	1600	NA	310	NA	1700 J	NA	2600	NA	4.1	0.49	5.42	13.98	99	82.4	37	NA	NA	0.07 J	NA	NA	NA	NA	2.9	4.7	NA	NA	
	SHL-5-052113	5/21/2013	NA	3.7	NA	10900	NA	999	NA	1500 J	NA	286	NA	1390	NA	2140	3.36	0.36	5.59	10.81	100	82.9	23.2	0.18	0.004 U	0.079 U	NA	1.4 U	NA	NA	16.2	4.5 U	4.1	NA	
	SHL-5-102213	10/22/2013	NA	15.1	NA	11500	NA	2380	NA	1650 J	NA	429	NA	1780 J	NA	3590 J	0.90	0.86	5.73	13.75	88	-89.4	43.8	NA	0.0051 U	0.059 U	NA	NA	NA	NA	4.3	0.87 J	NA	NA	
	SHL-5-042214	4/22/2014	NA	2.0 U	NA	7390	NA	282	NA	849 J	NA	159	NA	1500	NA	36200	1.63	0.43	5.87	6.33	235	141.4	27.4	0.11	NA	NA	0.050 U	1.3 U	NA	NA	62.7	4.5 J	5.1	NA	
	SHL-5-101314	10/13/2014	NA	13.3	NA	9530	NA	8390	NA	2500 U	NA	320	NA	2500 U	NA	28800	1.27	0.18	5.98	13.05	205	4.7	41.4	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	35	5.6 J	10.3	NA	
SHL-8S	SHL-8S-101807	10/18/2007	22.6	NA	3600	NA	80	NA	660	NA	56	NA	1300 J	NA	5900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-8S-0422210	4/22/2010	0.6	NA	5600	NA	<50	NA	960	NA	<10	NA	1300 J	NA	6200	NA	0.01	2.39	6.28	9.85	101	-91	20	NA	NA	0.17	NA	NA	NA	NA	6.7	6.6	NA	NA	
	SHL-8S-101110	10/11/2010	<0.5	NA	6000	NA	<50	NA	1000	NA	3.8 J	NA	1300 J	NA	6300	NA	0.47	1.72	6.15	10.20	78	145	20	NA	NA	<0.10	NA	NA	NA	NA	7.5	5.0	NA	NA	
	SHL-8S-040511	4/5/2011	<0.5	NA	6200	NA	50	NA	1100	NA	16	NA	1300 J	NA	6100	NA	0	4.37	6.15	10.24	77	138	21	NA	NA	0.22	NA	NA	NA	NA	6.4	6.1	NA	NA	
	SHL-8S-100611	10/6/2011	<0.5	NA	6700	NA	60	NA	1200	NA	14	NA	1400 J	NA	6200	NA	0	2.24	6.06	10.38	82	175	21	NA	NA	<0.10	NA	NA	NA	NA	7.1	5.4	NA	NA	
	SHL-8S-041012	4/10/2012	0.6	NA	6000	NA	30 J	NA	970	NA	32 J	NA	1300 J	NA	6100	NA	<580	6.9	6.21	9.98	97	139.8	20	NA	NA	0.16	NA	NA	NA	NA	5200	<4.0	NA	NA	
	SHL-8S-101512	10/15/2012	<0.5	NA	5200	NA	30 J	NA	960	NA	35	NA	1100 J	NA	4900	NA	1.1 B	4.56	6.37	12.55	51	110.1	19	NA	NA	0.15	NA	NA	NA	NA	7.4	4.3	NA	NA	
	SHL-8S-052813	5/28/2013	NA	0.93 J	NA	6800	NA	<100	NA	<5000	NA	<15	NA	<5000	NA	5970	1.33	5.94	6.4	10.32	74	146.2	22.1	0.081 J	0.004 U	0.24	NA	1.4 U	NA	NA	6.0	6.2	16.2	NA	
	SHL-8S-102213	10/22/2013	NA	2.0 U	NA	6730	NA	30 U	NA	1180 J	NA	2.5 U	NA	1330 J	NA	6060	0.7	2.49	6.2	10.77	75	230	17.5	NA	0.0051 U	0.18	NA	NA	NA	NA	6.8	6.4 J	NA	NA	
	SHL-8S-042214	4/22/2014	NA	2.0 U	NA	6880	NA	79.4 J	NA	1200 J	NA	6.1 J	NA	1410 J	NA	6050	0.62	5.53	6.54	10.07	77	160.8	26.3	0.066 U	NA	NA	0.26	1.3 U	NA	NA	6.3	6.0 J	0.55 J	NA	
	SHL-8S-100914	10/9/2014	NA	2.0 U	NA	7040	NA	50 U	NA	2500 U	NA	83.1	NA	2500 U	NA	6020	1.5	0.53	6.06	10.82	84	127.8	25.1	0.065 U	NA	NA	0.17	1.3 U	NA	NA	5.0	7.8 J	0.59 J	NA	
SHL-8D	SHL-8D-101807	10/18/2007	11.8	NA	18000	NA	22 J	NA	2600	NA	80	NA	970 J	NA	9100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-8D-042210	4/22/2010	0.6	NA	12000	NA	17 J	NA	1800	NA	<10	NA	<2500	NA	7400	NA	0.03	1.50	6.28	10.25	167	-121	36	NA	NA	0.16	NA	NA	NA	NA	12	7.5	NA	NA	
	SHL-8D-101110	10/11/2010	<0.5	NA	8800	NA	<50	NA	1200	NA	13	NA	970 J	NA	7300	NA	0.98	3.65	6.02	11.31	102	14.3	23	NA	NA	<0.10	NA	NA	NA	NA	9.6	8.0	NA	NA	
	SHL-8D-040511	4/5/2011	<0.5	NA	11000	NA	<50	NA	1400	NA	<10	NA	950 J	NA	9200	NA	0	3.47	6.13	10.18	0.124	88	20	NA	NA	0.08 J	NA	NA	NA	NA	19	7.0	NA	NA	
	DUP-040511	4/5/2011	<0.5	NA	6300	NA	40 J	NA	1100	NA	14	NA	1400 J	NA	6200	NA	0	3.47	6.13	10.18	0.124	88	21	NA	NA	0.22	NA	NA	NA	NA	6.3	5.7	NA	NA	
	SHL-8D-100611	10/6/2011	<0.5	NA	8100	NA	60	NA	1100	NA	<10	NA	<2500	NA	7400	NA	0	5.39	6.13	10.55	91	43	22	NA	NA	<0.10	NA	NA	NA	NA	7.9	7.6	NA	NA	
	SHL-8D-041112	4/11/2012	<0.5	NA	14000	NA	<50	NA	1700	NA	<10	NA	<2500	NA	8000	NA	<130	0.83	5.89	9.45	164	89.6	5	NA	NA	0.09 J	NA	NA	NA	NA	12	<5.8	NA	NA	
	SHL-8D-101512	10/15/2012	<0.5	NA	10000	NA	<50	NA	1600	NA	4 J	NA	810 J	NA	7500	NA	1.2 B	2.19	6.17	12.99	92	60.5	18	NA	NA	0.05 J	NA	NA	NA	NA	24	6.4	NA	NA	
	SHL-8D-052113	5/21/2013	NA	0.72 J	NA	9730	NA	30 U	NA	1490 J	NA	2.5 U	NA	1070 J	NA	14800	0.32	1.67	6.12	13.65	138	48.7	27.6	0.081 U	0.004 U	0.089 J	NA	1.4 U	NA	NA	30.2	6.2	0.64 U	NA	
	SHL-8D-102213	10/22/2013	NA	2.0 U	NA	8190	NA	30 U	NA	1260 J	NA	2.5 U	NA	759 J	NA	7350	0.00	3.25	6.21	11.08	90	83.9	13.1	NA	0.0051 U	0.087 J	NA	NA	NA	NA	11.8	7.5 J	NA	NA	
	SHL-8D-042214	4/22/2014	NA	2.0 U	NA	9790	NA	30 U	NA	1590 J	NA	2.5 U	NA	1010 J	NA	13700	0.15	2.08	5.92	10.88	147	146.6	11.0	0.066 U	NA	NA	0.057 U	1.3 U	NA	NA	28.2	6.3 J	0.73 J	NA	
	SHL-8D-100914	10/9/2014	NA	2.0 U	NA	11900	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	17300	0.6	0.77	5.88	10.89	204	101.8	16.4	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	42.5	7.2 J	0.41 J	NA	
SHL-9	DUP02-101607	10/16/2007	33.5	NA	27000	NA	11000	NA	1700	NA	518	NA	2500	NA	4100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-9-042110	4/21/2010	25.2	NA	20000	NA	6300	NA	1600	NA	447	NA	2000 J	NA	3900	NA	4.1	0.12	6.58	8.38	204	-74	580	NA	NA	0.066 J	NA	NA	NA	NA	6.3	6.6	NA	NA	
	SHL-9-101210	10/12/2010	38.4	NA	23000	NA	11000	NA	1900	NA	442	NA	2400 J	NA	6700	NA	0.89	0.21	6.35	10.20	204	-70	770	NA	NA	<0.10	NA	NA	NA	NA	7.3	4.3	NA	NA	
	SHL-9-040611	4/6/2011	25.7	NA	21000	NA	7500	NA	1600	NA	467	NA	2000 J	NA	4600	NA	24	0.27	6.48	7.65	0.16	-38.7	580	NA	NA	<0.10	NA	NA	NA	NA	3.4	<6.8	NA	NA	
	SHL-9-100711	10/7/2011	39.8	NA	23000	NA	9500	NA	1900	NA	409	NA	2600	NA	5900	NA	-55	0.27	6.26	11.78	223	-55.1	670	NA	NA	<0.10	NA	NA	NA	NA	14	7.8	NA	NA	
	SHL-9-041012	4/10/2012	29.5	NA	23000	NA	9500	NA	1900	NA	354 J	NA	2400 J	NA	7000	NA	4600	0.34	6.2	8.47	268	-19.3	860	NA	NA	0.040 J	NA	NA	NA	NA	5.0	4.4	NA	NA	
	SHL-9-101712	10/17/2012	36.4	NA	24000	NA	8300	NA	2100	NA	357	NA	2500	NA	6500	NA	0.72 B	0.36	6.94	9.12	210	-80.3	85	NA	NA	0.17	NA	NA	NA	NA	4.4	6.8	NA	NA	
	SHL-9-052813	5/28/2013	NA	30.0	NA	25400	NA	9590 J	NA	1440 J	NA	497	NA	2470 J	NA	6560	1.71	0.27	6.51	9.04	199	-54.1	88.4	0.61	0.15	0.15	NA	1.4 U	NA	NA	5.5	4.5 U	4.6	NA	
	SHL-9-102313	10/23/2013	NA	33.1	NA	26300	NA	8890	NA	2520 J	NA	439	NA	2550 J	NA	6280	0.58	0.22	6.52	10.87	160	-76.4	63.5	NA	0.0051 U	0.25	NA	NA	NA	NA	22.7	2.1 J	NA	NA	
	SHL-9-042314	4/23/2014	NA	22.2	NA	26200	NA	9530	NA	2360 J	NA	533	NA	2560 J	NA	7330	20.0	0.71	6.28	7.41	211	5.3	62.4	0.066 U	NA	NA	0.050 U	1.3 U	NA	NA	24.2	6.7 J	4.8	NA	
	SHL-9-100914	10/9/2014	NA	28.5	NA	26900	NA	9820	NA	2790 J	NA	469	NA	2660 J	NA	8320	7.51	0.11	6.45	9.67	183	-42.1	55.6	0.43	NA	NA	0.10	1.3 U	NA	NA	36.5	8.5 J	4.5	NA	
SHL-10	SHL-10-101607	10/16/2007	0.59 J	NA	5800	NA	45 J	NA	790	NA	14	NA	830 J	NA	1200 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-10-101410	10/14/2010	0.9	NA	11000	NA	<50	NA	1500	NA	<10	NA	1700 J	NA	1200 J	NA	1	9.16	6.51	12.8	89	136.9	31	NA	NA	0.35	NA	NA	NA	NA	1.3	6.0	NA	NA	
	SHL-10-101612	10/16/2012	0.7	NA	86000	NA	<50	NA	1100	NA	<10	NA	1300 J	NA	1200 J	NA	0.36 B	0.87	6.89	9.75	73	59.1	26	NA	NA	0.35	NA	NA	NA	NA	1.1	4.2	NA	NA	
	SHL-10-052213	5/22/2013	NA	1.2	NA	8260	NA	30.0 J	NA	877 J	NA	2.5 U	NA	1320 J	NA	1220 J	1.22	10.05	6.62	11.46	55	149.8	24.3	0.081 U	0.004 U	0.18	NA	1.4 U	NA	NA	5.8	4.6 J	1.6	NA	
	SHL-10-100814	10/8/2014	NA	2.0 U	NA	12500	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	8.11	8.68	6.54	10.9	76	173.6	33.8	0.065 U	NA	NA	0.31	1.3 U	NA	NA	2.8	9.8 J	0.57 J	NA	
SHL-11	SHL-11-101607	10/16/2007	686.5	NA	34000	NA	48000	NA	5200	NA	2320	NA	9500	NA	23000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-11-101310	10/13/2010	694	NA	39000	NA	60000	NA	5300	NA	2620	NA	9100	NA	21000	NA	0.72	0.24	6.38	12.66	580	-70	230	NA	NA	<0.10	NA	NA	NA	NA	19	6.1	NA	NA	
	SHL-11-100611	10/6/2011	654.9	NA	42000	NA	50000	NA	5600	NA	2250	NA	9200	NA	15000	NA	4	0.3	6.2	13.13	597	-41.2	240	NA	NA	<0.16	NA	NA	NA	NA	15	1.6	NA	NA	
	SHL-11-101512	10/15/2012	647.0	NA	35000	NA	34000	NA	5500	NA	1540	NA	6800	NA	16000	NA	79	0.35	6.71	14.82	365	-108.2	200	NA	NA	0.15	NA	NA	NA	NA	20	19	NA	NA	
	SHL-11-052313	5/23/2013	NA	496	NA	47800	NA	19800	NA	6490	NA	2430	NA	6480	NA	24400	8.5	0.18	6.75	12.24	462	-96.0	160	2.5	0.004 U	0.30	NA	1.4 U	NA	NA	41.2	19.5	2.1	NA	
	SHL-11-102213	10/22/2013	NA	752	NA	45000	NA	27600	NA	5900	NA	3610	NA	8470	NA	27300	0.43	0.42	6.54	12.75	530	-97.6	164	NA	0.0051 U	0.34	NA	NA	NA	NA	42.7	20.2	NA	NA	
	SHL-11-042314	4/23/2014	NA	587	NA	47600	NA	25100	NA	6810	NA	3950	NA	7700	NA	24300	4.94	0.26	6.45	10.27	390	-54.9	157	2.3	NA	NA	0.35	1.3 U	NA	NA	47.7	20.0	1.9	NA	
	SHL-11-100814	10/8/2014	NA	793	NA	64100	NA	44700	NA	8720	NA	4320	NA	10100	NA	44900	5.51	0.44	6.61	12.39	623	-90.3	242	0.065 U	NA	NA	0.089 J	1.3 U	NA	NA	42.5	69.5	2.8	NA	
SHL-13	SHL-13-101807	10/18/2007	1.6	NA	6900	NA	110	NA	1500	NA	503	NA	980 J	NA	24000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-13-101110	10/11/2010	<0.5	NA	11000	NA	<50	NA	2000	NA	11	NA	1300 J	NA	45000	NA	3.08	2.54	5.62	15.52	317	169	19	NA	NA	<0.10	NA	NA	NA	NA	82	6.5	NA	NA	
	SHL-13-100611	10/6/2011	2.8	NA	8700	NA	520	NA	1900	NA	179	NA	920 J	NA	36000	NA	0	0.25	5.72	14.61	0.273	42	18	NA	NA	0.05 U	NA	NA	NA	NA	66	4.7	NA	NA	
	SHL-13-101512	10/15/2012	1.0	NA	10000	NA	400	NA	1800	NA	484	NA	1300 J	NA	30000	NA	0.23 B	0.67	5.91	16.26	254	61.5	23	NA	NA	0.28	NA	NA	NA	NA	61	5.5	NA	NA	
	SHL-13-102213	10/22/2013	NA	2.0 U	NA	11300	NA	43.3 J	NA	2290 J	NA	29.6	NA	1360 J	NA	40100	0.2	0.35	6.08	13.87	269	127	23	NA	0.0051 U	0.059 U	NA	NA	NA	NA	61	8.0 J	NA	NA	
SHL-15	SHL-15-101607	10/16/2007	42	NA	21000	NA	3400	NA	2800	NA	570	NA	4900	NA	7600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-15-101410	10/14/2010	25	NA	26000	NA	2800	NA	3400	NA	342	NA	5300	NA	8400	NA	1	0.21	5.73	11.49	241	-0.3	70	NA	NA	0.68	NA	NA	NA	NA	11	20	NA	NA	
	SHL-15-100611	10/6/2011	70.4	NA	25000	NA	8200	NA	2300	NA	512	NA	4600	NA	2100	NA	0.9	0.27	6.17	12.36	403	66.1	140	NA	NA	1.8	NA	NA	NA	NA	22	14	NA	NA	
	SHL-15-101612	10/16/2012	24.2	NA	29000	NA	3200	NA	3800	NA	271	NA	7100	NA	1200	NA	1.3	3.27	5.98	13.11	348	-18.7	84	NA	NA	0.58	NA	NA	NA	NA	26	14	NA	NA	
	SHL-15-102213	10/22/2013	NA	34.9	NA	27000	NA	6610	NA	3340 J	NA	437	NA	6480	NA	12100	2.08	0.31	5.91	13.48	266	-23.6	90.9	NA	0.0051 U	0.56	NA	NA	NA	NA	16.7	10.1	NA	NA	
SHL-19	SHL-19-101607	10/16/2007	8.851	NA	24000	NA	50000	NA	3800	NA	2700	NA	3600	NA	4200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-19-101410	10/14/2010	234.8	NA	25000	NA	23000	NA	3500	NA	3260	NA	3700	NA	2800	NA	40	0.57	5.86	11.03	240	22	80	NA	NA	<0.10	NA	NA	NA	NA	2.2	22	NA	NA	
	SHL-19-100711	10/7/2011	62.9	NA	11000	NA	7700	NA	1900	NA	1460	NA	2800	NA	2100	NA	13	3.66	4.97	13.12	107	128	38	NA	NA	0.22	NA	NA	NA	NA	1.2	13	NA	NA	
	SHL-19-101612	10/16/2012	138.3	NA	21000	NA	10000	NA	3800	NA	1060	NA	3400	NA	3200	NA	79	0.27	5.67	10.52	194	22	66	NA	NA	0.18	NA	NA	NA	NA	2.3	22	NA	NA	
	DUP-101612	10/16/2012	133.0	NA	21000	NA	10000	NA	3800	NA	1070	NA	3500	NA	3300	NA	59	NA	NA	NA	NA	NA	66	NA	NA	0.17	NA	NA	NA	NA	2.3	22	NA	NA	
	SHL-19-052413	5/24/2013	NA	3.8	NA	18300	NA	1460	NA	3150 J	NA	580	NA	2710 J	NA	2930 J	17.0	1.01	5.86	10.83	137	98.9	55.3	0.094 J	0.004 U	0.32	NA	1.4 U	NA	NA	1.0	12.6	1.8	NA	
	SHL-19-102413	10/24/2013	NA	33.6	NA	22200	NA	8380	NA	3670 J	NA	1630	NA	3260 J	NA	2970 J	123	0.5	6.76	11.54	110	-85.9	64.6	NA	0.0051 U	0.4	NA	NA	NA	NA	2.8	16.6	NA	NA	
	SHL-19-100814	10/8/2014	NA	3.1 J	NA	17500	NA	5640	NA	2770 J	NA	2210 J	NA	2790 J	NA	3380 J	30.7	0.52	6.09	12.78	180	29.6	62.1	0.065 U	NA	NA	0.33	1.3 U	NA	NA	2.5	18.4	2.4	NA	
SHL-20	SHL-20-101607	10/16/2007	3.362	NA	66000	NA	7200	NA	9300	NA	6540	NA	6100	NA	28000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-20-101310	10/13/2010	4.4	NA	43000	NA	250	NA	5900	NA	544	NA	7300	NA	21000	NA	1.71	0.20	6.43	12.04	395	88	140	NA	NA	1.2	NA	NA	NA	NA	20	8.8	NA	NA	
	SHL-20-100611	10/6/2011	7.3	NA	40000	NA	350	NA	5700	NA	820	NA	6400	NA	18000	NA	1.6	0.27	6.17	12.36	403	66.1	140	NA	NA	1.8	NA	NA	NA	NA	22	14	NA	NA	
	SHL-20-101512	10/15/2012	139.2	NA	36000	NA	1800	NA	4900	NA	3000	NA	7000.0	NA	15000	NA	16	2.43	6.36	12.74	277	50.1	120	NA	NA	0.34	NA	NA	NA	NA	22	22	NA	NA	
	SHL-20-052213	5/22/2013	NA	621	NA	32700	NA	17700	NA	3890 J	NA	2150	NA	7240	NA	24900	0.54	0.19	6.75	12.18	414	-85.6	111	5.3	0.004 U	0.37	NA	1.4 U	NA	NA	35.7	30.5	1.4	NA	
	SHL-20-102213	10/22/2013	NA	632	NA	22200	NA	38500	NA	2530 J	NA	1590	NA	8310	NA	22100	4.10	1.87	6.51	12.80	443	-93.6	81	NA	0.006 J	0.39	NA	NA	NA	NA	49.7	23.0	NA	NA	
	DUP-102213	10/22/2013	NA	641	NA	22200	NA	38900	NA	2510 J	NA	1590	NA	8310	NA	22200	NA	NA	NA	NA	NA	NA	81	NA	0.0051 U	0.37	NA	NA	NA	NA	49.7	23.1	NA	NA	
	SHL-20-042314	4/23/2014	NA	701	NA	27400	NA	40700 J	NA	4540 J	NA	1760	NA	7770	NA	24300	6.31	0.85	6.21	10.96	499	-58.7	120	1.8	NA	NA	0.26	1.3 U	NA	NA	50.2	26.0	1.6	NA	
	SHL-20-100814	10/8/2014	NA	763	NA	38200	NA	52500	NA	7160	NA	1700	NA	8160	NA	27400	2.43	0.43	6.4	12.94	620	-87.8	153	0.065 U	NA	NA	0.078 J	1.3 U	NA	NA	61	4.0 J	2.0	NA	
	Duplicate-100814	10/8/2014	NA	750	NA	37600	NA	52200	NA	7020	NA	1690	NA	7650	NA	27200	2.43	0.43	6.4	12.94	620	-87.8	153	0.065 U	NA	NA	0.091 J	1.3 U	NA	NA	60	4.0 J	2.5	NA	

GROUNDWATER MONITORING WELL RESULTS
Shepley's Hill Landfill, Devens Massachusetts

Well ID	Sample ID	Date	Arsenic		Calcium		Iron		Magnesium		Manganese		Potassium		Sodium		Turbidity	DO	pH	Temp	Spec Cond	ORP	Alkalinity	Ammonia	Nitrite	Nitrate	Nitrogen (Nitrite +Nitrate)	Sulfide	COD	TOC	Chloride	Sulfate	DOC	DIC	Notes
			Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	NTU	mg/L		Celcius	uS/cm	mV	mg CaCO3/L	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
SHL-21	SHL-21-101607	10/16/2007	0.81 J	NA	5100	NA	40 J	NA	580	NA	4.6 J	NA	1000 J	NA	2600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-21-101310	10/13/2012	0.9	NA	4700 J	NA	<50	NA	500	NA	<10	NA	890 J	NA	2500	NA	1	9.01	5.59	11.85	46	178.3	12	NA	NA	<0.10	NA	NA	NA	NA	1.4	6.0	NA	NA	
	SHL-21-101512	10/15/2012	1.1	NA	5300	NA	<50	NA	700	NA	6 J	NA	970 J	NA	2200	NA	1.8	4.97	6.26	11.32	39	185.9	18	NA	NA	0.09 J	NA	NA	NA	NA	5.1	NA	NA	NA	
SHL-22	SHL-22-101607	10/16/2007	55.1	NA	100000	NA	370	NA	13000	NA	4320	NA	5400	NA	34000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-22-042110	4/21/2010	69.6	NA	100000	NA	580	NA	12000	NA	6670	NA	4800	NA	30000	NA	0.05	0.10	6.77	9.19	933	-40	340	NA	NA	0.066 J	NA	NA	NA	NA	21	5.9	NA	NA	
	SHL-22-101210	10/12/2010	46.5	NA	110000	NA	430	NA	13000	NA	7510	NA	4600	NA	31000	NA	0.03	0.31	6.47	9.75	783	-14.1	380	NA	NA	<0.10	NA	NA	NA	NA	23	5.9	NA	NA	
	DUP-01-101210	10/12/2010	49.0	NA	111000	NA	480	NA	13000	NA	12000	NA	4600	NA	31000	NA	0.03	0.31	6.47	9.75	783	-14.1	370	NA	NA	0.12	NA	NA	NA	NA	22	5.8	NA	NA	
	SHL-22-040611	4/6/2011	57.9	NA	110000	NA	650	NA	13000	NA	8020	NA	4900	NA	31000	NA	0	0.22	6.67	8.16	0.75	-43.6	370	NA	NA	<210	NA	NA	NA	NA	22	<5.3	NA	NA	
	SHL-22-100711	10/7/2011	45.7	NA	110000	NA	580	NA	13000	NA	8280	NA	4700	NA	28000	NA	0	0.27	6.54	11.06	776	15.3	380	NA	NA	<0.10	NA	NA	NA	NA	22	5.3	NA	NA	
	SHL-22-041012	4/10/2012	41.9	NA	100000	NA	610	NA	12000	NA	8180 J	NA	5000	NA	29000	NA	2000 J	2.13	6.42	8.8	981	-20.6	380	NA	NA	0.066 J	NA	NA	NA	NA	22	<2.2	NA	NA	
	DUP-01012	4/10/2012	43.6	NA	110000	NA	600	NA	12000	NA	8340 J	NA	5000	NA	29000	NA	1300 J	2.13	6.42	8.8	981	-20.6	380	NA	NA	0.40 J	NA	NA	NA	NA	20	<1.4	NA	NA	
	SHL-22-101712	10/17/2012	16.5	NA	100000	NA	340	NA	12000	NA	8570	NA	4500	NA	2600	NA	0.85 B	0.45	6.72	9.76	705	-20.2	360	NA	NA	<0.10	NA	NA	NA	NA	21	6.0	NA	NA	
	SHL-22-052813	5/28/2013	NA	34.1	NA	114000	NA	453	NA	14400	NA	9200	NA	5070	NA	27800	0.91	1.28	6.68	9.22	492	18.7	400	0.27	0.004 U	0.079 U	NA	1.4 U	NA	NA	19.5	5.8	2.2	NA	
	DUP-052813	5/28/2013	NA	33.3	NA	114000	NA	440	NA	14100	NA	8580	NA	<5000	NA	27300	NA	NA	NA	NA	NA	NA	396	0.28	0.004 U	0.079 U	NA	1.4 U	NA	NA	20.5	5.5	2.2	NA	
	SHL-22-102313	10/23/2013	NA	53.1	NA	114000	NA	615	NA	13700	NA	9700	NA	4790 J	NA	27400	0.00	0.39	6.7	10.6	511	-6.9	388	NA	0.0051 U	0.059 U	NA	NA	NA	NA	20.2	6.6 J	NA	NA	
	DUP02-102313	10/23/2013	NA	54.3	NA	112000	NA	610	NA	13500	NA	10300	NA	4830 J	NA	26700	NA	NA	NA	NA	NA	NA	389	NA	0.0051 U	0.059 U	NA	NA	NA	NA	19.7	6.6 J	NA	NA	
	SHL-22-042414	4/24/2014	NA	49.2	NA	106000	NA	564	NA	13200	NA	9430	NA	4510 J	NA	27300	0.18	0.16	6.71	8.19	757	7.1	393	0.11	NA	NA	0.050 U	1.3 U	NA	NA	19.7	5.9 J	2.2	NA	
	SHL-22-100914	10/9/2014	NA	44.5	NA	97100	NA	436	NA	12300	NA	8820	NA	4230 J	NA	25700	1.99	0.31	6.67	10.21	526	5.8	378	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	19.5	7.2 J	1.8	NA	
	DUP-100914	10/9/2014	NA	39.6	NA	97300	NA	405	NA	12400	NA	8740	NA	4190 J	NA	25700	1.99	0.31	6.67	10.21	526	5.8	377	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	19	7.1 J	2	NA	
SHL-23	SHL-22-101707	10/17/2007	0.73 J	NA	2800	NA	210	NA	250	NA	14	NA	990 J	NA	1000 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHL-23	8/12/2010	NA	0.14 J	NA	2230	NA	16.9 J	NA	163	NA	6.87	NA	990	NA	1400	NA	10.06	6.45	10.42	25	209.8	4.3	0.0496 J	<0.002	0.07	NA	<0.10	<7.0	NA	1.3	4.9	<1.0	< 8	Test Kit (Filtered) < 5
	SHL-23-101310	10/13/2010	<0.5	NA	2500	NA	28 J	NA	180	NA	8.5 J	NA	1000 J	NA	1500 J	NA	1	10.43	4.98	11.53	31	264.1	4.3	NA	NA	<0.10	NA	NA	NA	NA	1.9	5.5	NA	NA	
	SHL-23-101512	10/15/2012	<0.5	NA	2300	NA	20 J	NA	190	NA	0.011	NA	980 J	NA	1600 J	NA	1.1 B	11.55	5.32	11.31	24	290.1	4.8	NA	NA	0.08 J	NA	NA	NA	NA	2.1	4.8	NA	NA	
	DUP-101512	10/15/2012	<0.5	NA	2300	NA	20 J	NA	190	NA	9.0 J	NA	980 J	NA	1600 J	NA	1.2 B	NA	NA	NA	NA	NA	4.7	NA	NA	0.07 J	NA	NA	NA	NA	2.1	4.8	NA	NA	
N5-P1	N-5,P-1-101210	10/12/2010	3488	NA	81000	NA	20000	NA	10000	NA	7010	NA	4400	NA	19000	NA	1	0.31	6.06	12.27	1353	-61.8	300	NA	NA	<0.10	NA	NA	NA	NA	20	<11	NA	NA	
	N-5,P-1-101011	10/10/2011	4942	NA	62000	NA	40000	NA	8100	NA	6440	NA	5200	NA	14000	NA	2	0.18	6.6	12.71	548	-60	280	NA	NA	0.10	NA	NA	NA	NA	16	9.5	NA	NA	
	N-5,P-1-101812	10/18/2012	2286	NA	83000	NA	6500	NA	11000	NA	671	NA	3900	NA	17000	NA	18	0.55	6.79	11.67	386	-100	270	NA	NA	0.10	NA	NA	NA	NA	20	11	NA	NA	
	N-5,P-1-101812	10/22/2013	NA	2500	NA	89500	NA	7520	NA	11600	NA	8570	NA	4330 J	NA	17300	0.46	0.57	6.73	13.56	620	-69.5	313	NA	0.0051 U	0.059 U	NA	NA	NA	NA	17.7	11	NA	NA	
	N5-P1-100814	10/8/2014	NA	327	NA	56900	NA	563	NA	7580	NA	2010	NA	2500 U	NA	9430	0.61	0.25	7.2	13.75	303	-108.3	230	0.076 U	NA	NA	0.050U	1.3 U	NA	NA	19.5	16.8	2.4	NA	
N5-P2	N-5,P-2-101210	10/12/2010	24.5	NA	150000	NA	70000	NA	13000	NA	422	NA	16000	NA	18000	NA	1	0.35	6.43	12.08	519	-60.7	700	NA	NA	<0.10	NA	NA	NA	NA	14	1.0	NA	NA	
	N-5,P-2-101011	10/10/2011	27.4	NA	150000	NA	72000	NA	13000	NA	476	NA	16000	NA	15000	NA	2	0.17	6.2	12.83	1080	-32	690	NA	NA	0.14	NA	NA	NA	NA	14	1.0	NA	NA	
	N-5,P-2-101712	10/17/2012	26.1	NA	140000	NA	66000	NA	12000	NA	421	NA	1500	NA	15000	NA	82	1.21	6.25	14.87	850	-132.4	640	NA	NA	0.09 J	NA	NA	NA	NA	13	<2.0	NA	NA	
	N-5,P-2-102213	10/22/2013	NA	21.2	NA	162000	NA	75400	NA	14400	NA	459	NA	15400	NA	15200	3.36	0.72	6.34	14.15	1271	-71.6	652	NA	0.0051 U	0.46	NA	NA	NA	NA	15.3	0.67 J	NA	NA	
SHM-93-10C	SHM-93-10C-101607	10/16/2007	9.8	NA	72000	NA	140	NA	4000	NA	67	NA	5200	NA	9200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-93-10C-101410	10/14/2010	8.7	NA	70000	NA	26 J	NA	3600	NA	38	NA	4700	NA	8300	NA	1	0.3	7.31	12.1	469	-30.7	170	NA	NA	<0.10	NA	NA	NA	NA	23	1.9	NA	NA	
	SHL-93-10C-101612	10/16/2012	8.1	NA	66000	NA	30 J	NA	3600	NA	6 J	NA	4800	NA	8400	NA	1.0 B	1.23	7.28	9.45	434	16.3	180	NA	NA	<0.10	NA	NA	NA	NA	23	18	NA	NA	
SHM-93-22B	SHM-93-22B-042110	4/21/2010	947.5	NA	73000	NA	48000	NA	11000	NA	6210	NA	9200	NA	27000	NA	5.2	0.11	6.71	8.10	953	-125	380	NA	NA	0.13	NA	NA	NA	NA	22	4.4	NA	NA	
	DUP-042110	4/21/2010	980.3	NA	73000	NA	48000	NA	10000	NA	6220	NA	9100	NA	27000	NA	140	0.11	6.71	8.10	953	-125	350	NA	NA	0.13	NA	NA	NA	NA	21	3.9	NA	NA	
	SHM-93-22B-101110	10/11/2010	827.6	NA	80000	NA	37000	NA	11000	NA	8280	NA	8000	NA	28000	NA	1.18	0.29	6.52	9.52	745	-83.2	350	NA	NA	<0.10	NA	NA	NA	NA	24	3.7	NA	NA	
	SHM-93-22B-040611	4/6/2011	1039	NA	80000	NA	45000	NA	11000	NA	8620	NA	8500	NA	29000	NA	8.6	0.23	6.57	6.96	749	-78.8	330	NA	NA	<0.17	NA	NA	NA	NA	26	<3.5	NA	NA	
	SHM-93-22B-101111	10/11/2011	1072	NA	79000	NA	38000	NA	11000	NA	8540	NA	9000	NA	26000	NA	5	0.16	6.36	11.13	704	-63	330	NA	NA	0.12	NA	NA	NA	NA	23	3.6	NA	NA	
	SHM-93-22B-041012	4/10/2012	1271	NA	74000	NA	35000	NA	10000	NA	8100 J	NA	9500	NA	26000	NA	95000	0.37	6.25	8.73	908	-59.8	340 J	NA	NA	0.090 J	NA	NA	NA	NA	19	<1.9	NA	NA	
	SHM-93-22B-101712	10/17/2012	879	NA	74000	NA	23000	NA	10000	NA	9020	NA	8100	NA	2800	NA	39	0.55	6.54	10.83	415	-141.4	340	NA	NA	0.14	NA	NA	NA	NA	22	4.4	NA	NA	
	SHM-93-22B-052813	5/28/2013	NA	1150	NA	77800	NA	30000	NA	12200	NA	9680	NA	8480	NA	28300	71.0	0.22	6.57	8.92	471	80.4	337	1.3	0.004 U	0.36	NA	1.4 U	NA	NA	21.5	45.U	2.9	NA	
	SHM-93-22B-102313	10/23/2013	NA	1150	NA	78200	NA	31300	NA	11300	NA	9450	NA	8040	NA	28900	1.2	0.39	6.59	10.17	485	1.8	334	NA	0.0051 U	0.26	NA	NA	NA	NA	20.7	4.4 J	NA	NA	
	SHM-93-22B-042414	4/24/2014	NA	997	NA	73400	NA	28300 J	NA	10800	NA	10600 J	NA	7360	NA	29900	0.5	0.14	6.48	7.63	734	-66.3	329	0.54	NA	NA	0.050 U	1.3 U	NA	NA	22.2	2.9 J	2.8	NA	
	SHM-93-22B-100814	10/8/2014	NA	690	NA	73200	NA	19300	NA	10700	NA	11700	NA	7320	NA	30100	3.4	0.29	6.51	10.27	503	-43.8	338	0.12	NA	NA	0.055 J	1.3 U	NA	NA	20.5	4.9 J	2.7	NA	
SHM-93-22C	SHM-93-22C-101607	10/16/2007	72.5	NA	89000	NA	1700	NA	15000	NA	494	NA	4800	NA	25000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	DUP01-101607	10/16/2007	72	NA	87000	NA	1600	NA	14000	NA	478	NA	4600	NA	24000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-93-22C-042110	4/21/2010	14.6	NA	34000	NA	280	NA	3400	NA	105	NA	4700	NA	9300	NA	2.2	1.10	8.23	11.33	321	-38	110	NA	NA	0.29	NA	NA	NA	NA	10	6.1	NA	NA	
	SHM-93-22C-101210	10/12/2010	15.8	NA	39000	NA	290	NA	3600	NA	58	NA	4500	NA	10000	NA	1.05	0.58	7.82	10.86	286	-103.1	110	NA	NA	<0.10	NA	NA	NA	NA	12	5.8	NA	NA	
	SHM-93-22C-040611	4/6/2011	13.9	NA	45000	NA	350	NA	3500	NA	36	NA	4200	NA	9000	NA	0	0.78	8.84	9.93	284	-1	120	NA	NA	<0.23	NA	NA	NA	NA	10	<6.0	NA	NA	
	SHM-99-22C-100511	10/5/2011	13.9	NA	40000	NA	380	NA	3100	NA	84	NA	3700	NA	7900	NA	1	0.14	7.5	12.07	282	-42	120	NA	NA	0.21	NA	NA	NA	NA	8.4	6.1	NA	NA	
	SHM-93-22C-041112	4/11/2012	25.4	NA	41000	NA	980	NA	3500	NA	136	NA	4200	NA	9400	NA	1600	1.26	7.46	8.17	361	-105.3	120	NA	NA	<0.10	NA	NA	NA	NA	9.9	<6.6	NA	NA	
	SHM-93-22C-101712	10/17/2012	21.7	NA	39000	NA	590	NA	3400	NA	140	NA	4000	NA	9000	NA	0.30 B	0.41	8.04	8.4	140	-163.1	120	NA	NA	0.07 J	NA	NA	NA	NA	10	6.9	NA	NA	
	SHM-99-22C-052813	5/28/2013	NA	19.7	NA	40000	NA	568	NA	<5000	NA	140	NA	<5000	NA	9550	3.37	0.45	7.83	10.73	196	-145.7	133	0.081 U	0.004 U	0.079 U	NA	1.4 U	NA	NA	10.0	7.5	3.6	NA	
	SHM-99-22C-102313	10/23/2013	NA	25.1	NA	41900	NA	555	NA	3920 J	NA	154	NA	4170 J	NA	9830	0.31	0.40	7.79	10.87	198	-164.8	137	NA	0.0051 U	0.059 U	NA	NA	NA	NA	11.3	7.0 J	NA	NA	
	SHM-99-22C-042414	4/24/2014	NA	31.9	NA	40500	NA	397	NA	4020 J	NA	145	NA	3820 J	NA	10000	0.82	0.17	7.77	8.94	294	-89.5	140	0.066 U	NA	NA	0.050 U	1.3 U	NA	NA	11.3	6.3 J	3.5	NA	
	SHM-03-22C-100814	10/8/2014	NA	45.6	NA	97100	NA	519	NA	12300	NA	8800	NA	4230 J	NA	25300	0.73	0.25	6.65	10.92	743	18.2	375	19.5	NA	NA	0.050 U	1.3 U	NA	NA	19.5	7.9 J	2.4	NA	
SHM-96-5B	SHM-96-5B-101707	10/17/2007	750	NA	81000	NA	5000	NA	12000	NA	11400	NA	9200	NA	28000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-96-5B-010808	1/8/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-96-5B-042210	4/22/2010	1504 J	NA	70000 J	NA	21000 J	NA	11000	NA	9840 J	NA	8600	NA	24000	NA	0.18	0.16	6.51	10.22	883	-278	330 J	NA	NA	0.073 J	NA	NA	NA	NA	19	4.4	NA	NA	
	SHM-96-5B-101110	10/11/2010	846.2	NA	81000	NA	9300	NA	11000	NA	11500	NA	7900	NA	27000	NA	0.24	0.13	6.34	11.16	685	-35	320	NA	NA	<0.10	NA	NA	NA	NA	21	4.5	NA	NA	
	SHM-96-5B-040511	4/5/2011	2030	NA	71000	NA	30000	NA	11000	NA	9510	NA	<8500	NA	23000	NA	1	0.19	6.54	10.15	681	-60	340	NA	NA	0.23	NA	NA	NA	NA	17	3.8	NA	NA	
	SHM-96-5B-100611	10/6/2011	1895	NA	80000	NA	17000	NA	12000	NA	11000	NA	8600	NA	26000	NA	4.4	0.38	6.15	12.86	702	-19.8	310	NA	NA	<0.10	NA	NA	NA	NA	20	4.1	NA	NA	
	SHM-96-5B-041012	4/10/2012	1681	NA	76000	NA	19000	NA	10000	NA	10300 J	NA	9000	NA	28000	NA	42000	0.25	6.35	9.83	869	-43	330	NA	NA	0.060 J	NA	NA	NA	NA	18	<1.6	NA	NA	
	SHM-96-5B-101512	10/15/2012	1376	NA	66000	NA	13000	NA	10000	NA	9160	NA	7100	NA	22000	NA	52	0.69	6.56	14.74	475	-71.6	320	NA	NA	0.11	NA	NA	NA	NA	18	5.4	NA	NA	
	SHM-96-5B-052113	5/21/2013	NA	1400	NA	75300	NA	20000	NA	12700	NA	9670	NA	7970	NA	23700	9.01	0.36	6.42	10.75	652	-43.7	315	2.3	0.004 U	0.079 U	NA	1.4 U	NA	NA	18.7	5.4	2.7	NA	
	SHM-96-5B-102213	10/22/2013	NA	1660	NA	76500	NA	24700	NA	11600	NA	9980	NA	8000	NA	24000	0.58	1.31	6.55	11.55	560	-69.0	315	NA	0.0051 U	0.31	NA	NA	NA	NA	17.7	5.0 J	NA	NA	
	SHM-96-5B-042214	4/22/2014	NA	1340	NA	73300	NA	17100	NA	11500	NA	9810	NA	7760	NA	24000	4.61	0.73	6.21	10.14	642	-29.4	345	0.066 U	NA	NA	0.27	1.3 U	NA	NA	18.2	4.5 J	2.4	NA	
	DUP-042214	4/22/2014	NA	1390	NA	75000	NA	17600	NA	11900	NA	10400	NA	7810	NA	24600	NA	NA	NA	NA	NA	NA	333	0.066 U	NA	NA	0.28	1.3 U	NA	NA	18.2	4.5 J	2.2	NA	
	SHM-96-5B-100914	10/9/2014	NA	991	NA	72600	NA	13100	NA	11100	NA	10500	NA	6630	NA	24800	0.41	0.12	6.53	12.11	484	-54.8	318	1.3	NA	NA	0.097 J	1.3 U	NA	NA	17	5.7 J	2.7	NA	
SHM-96-5C	SHM-96-5C-101707	10/17/2007	61.1	NA	69000	NA	60000	NA	11000	NA	3980	NA	13000	NA	30000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-96-5C-042210	4/22/2010	31.2	NA	75000	NA	15000	NA	9300	NA	6860	NA	13000	NA	36000	NA	0.19	0.14	6.31	9.84	1008	-267	30	NA	NA	0.1	NA	NA	NA	NA	34	<1.0	NA	NA	
	SHM-96-5C-101110	10/11/2010	26.4	NA	71000	NA	15000	NA	8600	NA	7160	NA	13000	NA	34000	NA	0.49	0.12	6.19	10.55	712	-51	310	NA	NA	<0.10	NA	NA	NA	NA	31	2.0	NA	NA	
	SHM-96-5C-040511	4/5/2011	35	NA	70000	NA	22000	NA	9500	NA	8890	NA	14000	NA	32000	NA	15	0.20	6.33	9.38	744	-32.2	340	NA	NA	0.22	NA	NA	NA	NA	28	1.6	NA	NA	
	SHM-96-5C-100611	10/6/2011	24.5	NA	70000	NA	13000	NA	9700	NA	8140	NA	14000	NA	31000	NA	4.6	0.22	6.16	12.15	721	-3.1	310	NA	NA	<0.60	NA	NA	NA	NA	28	1.7	NA	NA	
	SHM-96-5C-041012	4/10/2012	8.7	NA	67000	NA	4400	NA	9300	NA	13600 J	NA	18000	NA	33000	NA	6600	0.11	6	9.48	885	32.7	310	NA	NA	<0.100	NA	NA	NA	NA	27	<2.0	NA	NA	
	SHM-96-5C-101712	10/17/2012	7.7	NA	66000	NA	1100	NA	9800	NA	15000	NA	15000	NA	29000	NA	0.62 B	0.84	6.3	11.96	396	-71.0	300	NA	NA	<0.10	NA	NA	NA	NA	27	2.6	NA	NA	
	SHM-96-5C-052813	5/28/2013	NA	10.4	NA	68800	NA	2200	NA	11800	NA	12600	NA	14100	NA	29700	4.82	0.18	6.29	9.98	482	-64.9	318	3.8	0.004 U	0.079 U	NA	1.4 U	NA	NA	24.0	4.5 U	3.8	NA	
	SHM-96-5C-102213	10/22/2013	NA	5.5	NA	67300	NA	609	NA	9910	NA	12900	NA	17400	NA	32300	0.10	1.41	6.21	11.63	529	-20.1	315	NA	0.0051 U	0.059 U	NA	NA	NA	NA	19.2	3.4 J	NA	NA	
	SHM-96-5C-042214	4/22/2014	NA	10.9	NA	63000	NA	3980	NA	10200	MA	10400	NA	16400	NA	29200	3.66	0.16	6.18	9.79	618	7.8	326	0.20	NA	NA	0.067 J	1.3 U	NA	NA	20.2	2.6 J	3.8	NA	
	SHM-96-5C-100914	10/9/2014	NA	17.7	NA	63800	NA	7300	NA	10200	NA	8310	NA	12700	NA	28100	0.35	0.07	6.39	11.75	466	-28.1	302	4.50	NA	NA	0.11	1.3 U	NA	NA	18.0	3.5 J	2.8	NA	
SHP-99-29X	SHP-99-29X-101807	10/18/2007	2953	NA	11000	NA	44000	NA	990	NA	10400	NA	530 J	NA	2600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-99-29X-102907	10/29/2007	2800	NA	12000	11000	42000	41000	980	960	10000	10000	700	NA	2800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-99-29X-101210	10/12/2010	3156	NA	12000	NA	44000	NA	1100	NA	9310	NA	<2500	NA	3200	NA	1	0.13	5.67	11.90	270	-8.8	130	NA	NA	<0.10	NA	NA	NA	NA	2.5	4.9	NA	NA	
	SHP-99-29X-101112	10/11/2012	1457	NA	11000	NA	50000	NA	1300	NA	4210	NA	2100 J	NA	2900	NA	6	0.27	5.54	12.07	287	-1	110	NA	NA	0.17	NA	NA	NA	NA	4.1	3.0 J	NA	NA	
	SHP-99-29X-101712	10/17/2012	2739	NA	8400	NA	32000	NA	760	NA	5510	NA	<2500	NA	2200	NA	3.6	0.29	5.82	11.32	191	-75.7	92	NA	NA	0.13	NA	NA	NA	NA	1.6	4.8	NA	NA	
	SHP-99-29X-102213	10/22/2013	NA	2760	NA	9970	NA	43300	NA	889 J	NA	6430	NA	638 J	NA	2500 J	4.29	0.90	6.02	13.10	230	-48.3	101	NA	0.0051 U	0.16	NA	NA	NA	NA	2.3	5.6 J	NA	NA	
	SHP-99-29X-100714	10/7/2014	NA	3000	NA	12500	NA	49100	NA	2500 U	NA	8510	NA	2500 U	NA	2630 J	13.2	0.13	5.92	11.60	180	-17.8	120	0.50	NA	NA	1.50	1.3 U	NA	NA	3.0	7.8 J	1.5	NA	

GROUNDWATER MONITORING WELL RESULTS
Shepley's Hill Landfill, Devens Massachusetts

Well ID	Sample ID	Date	Arsenic		Calcium		Iron		Magnesium		Manganese		Potassium		Sodium		Turbidity	DO	pH	Temp	Spec Cond	ORP	Alkalinity	Ammonia	Nitrite	Nitrate	Nitrogen	Sulfide	COD	TOC	Chloride	Sulfate	DOC	DIC	Notes
			Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	NTU	mg/L		Celcius	uS/cm	mV	mg CaCO3/L	mg/l	mg/l	mg/l	(Nitrite +Nitrate) mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
SHP-99-31A	SHP-99-31A-101707	10/17/2007	22.7	NA	12000	NA	12000	NA	800	NA	798	NA	680 J	NA	13000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-99-31A-011008	1/10/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-99-31A-101310	10/13/2010	17.4	NA	15000	NA	13000	NA	1200	NA	675	NA	1000 J	NA	16000	NA	0.24	0.11	5.83	13.63	241	6.4	32	NA	NA	<0.10	NA	NA	NA	NA	46	5.6	NA	NA	
	SHP-99-31A-100511	10/5/2011	18.4	NA	11000	NA	8100	NA	790	NA	427	NA	<2500	NA	9700	NA	1.8	0.28	5.55	15.55	151	3.2	38	NA	NA	<0.10	NA	NA	NA	NA	3	6.6	NA	NA	
	SHP-99-31A-101812	10/18/2012	17.7	NA	16000	NA	11000	NA	1500	NA	519	NA	840 J	NA	15000	NA	2.2	0.42	5.78	13.71	169	-6.0	22	NA	NA	0.07 J	NA	NA	NA	NA	46	15	NA	NA	
	SHP-99-31A-102313	10/23/2013	NA	14.2	NA	10600	NA	4210	NA	971 J	NA	311	NA	500 U	NA	11900	3.79	1.02	5.83	12.48	145	41.9	15.3	NA	0.0051 U	0.059 U	NA	NA	NA	NA	25.7	9.7 J	NA	NA	
	DUP01-102313	10/23/2013	NA	14.6	NA	10600	NA	4250	NA	960 J	NA	308	NA	500 U	NA	11900	NA	NA	NA	NA	NA	NA	15.3	NA	0.0051 U	0.059 U	NA	NA	NA	NA	25.7	9.7 J	NA	NA	
SHP-99-31B	SHP-99-31B-101707	10/17/2007	85.5	NA	44000	NA	28000	NA	5100	NA	1210	NA	6800	NA	16000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-99-31B-011008	1/10/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-99-31B	8/12/2010	NA	28.8	NA	16500	NA	14600	NA	1930	NA	478	NA	3860	NA	8460	NA	0.19	6.03	10.74	186	33.9	86	4.1	<0.002	<0.01	NA	<0.10	11 J	NA	4	3	6.5	28	Test Kit (Filtered) 5
	SHP-99-31B-101310	10/13/2010	39.2	NA	18000	NA	11000	NA	1800	NA	481		3400	NA	5800	NA	0.19	0.15	6.27	10.58	211	-71	86	NA	NA	<0.10	NA	NA	NA	NA	3.4	3.8	NA	NA	
	SHP-99-31B-100511	10/5/2011	59.3	NA	17000	NA	10000	NA	1700	NA	460	NA	3000	NA	4600	NA	0.19	0.22	6.22	11.8	201	-46	83	NA	NA	<0.10	NA	NA	NA	NA	3.3	4.1	NA	NA	
	SHP-99-31B-101812	10/18/2012	60.1	NA	17000	NA	9400	NA	1800	NA	405	NA	3000	NA	3700	NA	1.3	0.31	6.31	10.42	175	-85.0	73	NA	NA	0.09 J	NA	NA	NA	NA	2.3	5.3	NA	NA	
	SHP-99-31B-102313	10/23/2013	NA	61.6	NA	16900	NA	9460	NA	1880 J	NA	448	NA	3030 J	NA	3510 J	1.02	2.42	6.56	11.15	176	-57.7	63.5	NA	0.0051 U	0.20	NA	NA	NA	NA	4.3	7.6 J	NA	NA	
SHP-99-31C	SHP-99-31C-101707	10/17/2007	292.1	NA	86000	NA	44000	NA	13000	NA	4050	NA	16000	NA	38000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-99-31C-011008	1/10/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-99-31C-101310	10/13/2010	239.4	NA	87000	NA	22000	NA	11000	NA	5250	NA	8500	NA	32000	NA	0.25	0.16	6.46	10.61	811	-80	350	NA	NA	<0.10	NA	NA	NA	NA	30	3.5	NA	NA	
	SHM-99-31C-100511	10/5/2011	244	NA	90000	NA	22000	NA	12000	NA	6040	NA	7900	NA	31000	NA	1.9	0.27	6.5	11.61	809	-59.2	340	NA	NA	<.300	NA	NA	NA	NA	27	3.9	NA	NA	
	SHP-99-31C-101812	10/18/2012	206.4	NA	83000	NA	17000	NA	11000	NA	5450	NA	7200	NA	30000	NA	19	0.64	6.75	13.81	641	-117.1	310	NA	NA	0.12	NA	NA	NA	NA	28	5.2	NA	NA	
	SHP-99-31C-102313	10/23/2013	NA	205	NA	90900	NA	16400	NA	12800	NA	6160	NA	7220	NA	30600	3.71	0.23	6.7	11.13	737	-95.7	348	NA	0.0051 U	0.22	NA	NA	NA	NA	32.2	5.7 J	NA	NA	
	SHM-99-31C-101314	10/13/2014	NA	180	NA	77800	NA	15800	NA	11200	NA	5060	NA	7200	NA	28800	4.22	0.17	6.71	10.85	634	-78.4	315	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	24.5	6.0 J	4.2	NA	
SHM-99-32X	SHP-99-32X-101707	10/17/2007	206.2	NA	78000	NA	60000	NA	11000	NA	3480	NA	12000	NA	34000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-99-32X-011008	1/10/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-99-32X-101310	10/13/2010	173.4	NA	100000	NA	25000	NA	14000	NA	8600	NA	6600	NA	38000	NA	0.42	0.16	6.51	10.49	879	-77	390	NA	NA	<0.10	NA	NA	NA	NA	39	3.9	NA	NA	
	SHM-99-32X-100411	10/4/2011	172.8	NA	98000	NA	24000	NA	13000	NA	10100	NA	6200	NA	38000	NA	5	0.33	6.42	11.54	825	-36	380	NA	NA	.040 J	NA	NA	NA	NA	32	2.4	NA	NA	
	DUP01-100411	10/4/2011	174.6	NA	100000	NA	25000	NA	13000	NA	10400	NA	6400	NA	39000	NA	5	0.33	6.42	11.54	825	-36	380	NA	NA	<0.10	NA	NA	NA	NA	32	2.5	NA	NA	
	SHM-99-32X-101712	10/17/2012	130.6	NA	87000	NA	23000	NA	12000	NA	10700	NA	5800	NA	34000	NA	28	0.63	6.54	10.52	469	-136.4	370	NA	NA	0.14	NA	NA	NA	NA	36	2.8	NA	NA	
	DUP-101712	10/17/2012	134.4	NA	86000	NA	23000	NA	12000	NA	10700	NA	5800	NA	35000	NA	24	NA	NA	NA	NA	NA	360	NA	NA	0.31	NA	NA	NA	NA	36	2.5	NA	NA	
	SHM-99-32X-102313	10/23/2013	NA	107	NA	83700	NA	18400	NA	11500	NA	10900	NA	5250	NA	33400	0.37	0.17	6.45	11.17	704	-77.9	342	NA	0.0051 U	0.27	NA	NA	NA	NA	32.2	2.9 J	NA	NA	
	SHM-99-32X-101314	10/13/2014	NA	93.5	NA	73400	NA	16800	NA	10000	NA	9670	NA	4590 J	NA	32300	17.39	1.89	6.64	11.19	462	-83	280	0.41	NA	NA	0.059 J	1.3 U	NA	NA	32.5	4.9 J	2.1	NA	
	Dup-101314	10/13/2014	NA	94.9	NA	73100	NA	17000	NA	10200	NA	9620	NA	4630 J	NA	32400	17.39	1.89	6.64	11.19	462	-83	287	0.42	NA	NA	0.055 J	1.3 U	NA	NA	32.5	4.8 J	2.1	NA	
SHP-01-36X	SHP-01-36X-101607	10/16/2007	16.7	NA	8900	NA	6900	NA	1700	NA	309	NA	1500 J	NA	25000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-01-36X-101410	10/14/2010	14.2	NA	9700	NA	2300	NA	1600	NA	168	NA	1000 J	NA	25000	NA	1	0.12	6.5	15.80	218	-78	24	NA	NA	<0.10	NA	NA	NA	NA	40	9.2	NA	NA	
	SHP-01-36X-101011	10/10/2011	30.8	NA	10000	NA	2700	NA	2000	NA	53	NA	<2500	NA	24000	NA	1	0.18	5.82	19.76	208	-43	28	NA	NA	<0.10	NA	NA	NA	NA	46	4.3	NA	NA	
	SHP-01-36X-101612	10/16/2012	17.8	NA	15000	NA	2600	NA	2600	NA	83	NA	1800 J	NA	33000	NA	23	0.36	6.52	15	379	-73.4	40	NA	NA	0.07 J	NA	NA	NA	NA	63	5.1	NA	NA	
	SHP-01-36X-111913	11/19/2013	NA	4.8	NA	17400	NA	75.2 J	NA	2540 J	NA	23.4	NA	2230 J	NA	42000	0.63	7.07	6.42	6.79	351	118.8	24.2	0.093 J	0.0051 U	0.064 J	NA	1.5 U	NA	NA	75.5	23.7	NA	2.8	
	SHP-01-36X-100914	10/9/2014	NA	10.8	NA	14700	NA	535	NA	2800 J	NA	67.8	NA	2500 U	NA	47700	2.99	0.32	6.27	17.35	329	39.2	26.2	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	110	8.1 J	3.1	NA	
SHP-01-37X	SHP-01-37X-101607	10/16/2007	26.6	NA	10000	NA	8200	NA	1600	NA	588	NA	2200 J	NA	28000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-01-37X-101410	10/14/2010	22.5	NA	12000	NA	6700	NA	1700	NA	761	NA	1500 J	NA	32000	NA	0.29	0.42	6.21	16.68	300	-43	44	NA	NA	<0.10	NA	NA	NA	NA	60	<1.0	NA	NA	
	SHP-01-37X-101612	10/16/2012	10.2	NA	11000	NA	3900	NA	2200	NA	321	NA	1600 J	NA	29000	NA	1.6	0.38	6.4	14.67	287	-105.8	37	NA	NA	0.42	NA	NA	NA	NA	62	3.0	NA	NA	
	SHP-01-37X-111913	11/19/2013	NA	4.7	NA	28700	NA	1430	NA	2840 J	NA	569	NA	3970 J	NA	42500	0.43	3.12	5.64	6.85	433	123.3	4.4 J	0.087 J	0.0051 U	0.059 U	NA	1.5 U	NA	NA	75.5	78.1	2.0 U	NA	
	SHP-01-37X-100914	10/9/2014	NA	8.5	NA	9970	NA	3410	NA	2500 U	NA	158	NA	2500 U	NA	45200	0.1	1.8	6.22	17.13	350	28	12	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	80	8.0 J	3.1	NA	
SHP-01-38A	SHP-01-38A-101607	10/16/2007	781.4	NA	32000	NA	37000	NA	5400	NA	848	NA	12000	NA	24000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHP-01-38A-101410	10/14/2010	651.8	NA	28000	NA	28000	NA	3500	NA	716	NA	8300	NA	20000	NA	1	0.91	6.37	12.81	433	-70	140	NA	NA	<0.10	NA	NA	NA	NA	28	18	NA	NA	
	SHP-01-38A-101211	10/12/2011	557.9	NA	38000	NA	31000	NA	4500	NA	892	NA	11000	NA	19000	NA	3	0.21	5.95	13.44	500	-39	200	NA	NA	<0.08	NA	NA	NA	NA	24	11	NA	NA	
	SHP-01-38A-101512	10/15/2012	660.6	NA	33000	NA	3000	NA	4200	NA	710	NA	8700	NA	22000	NA	30	0.36	6.19	12.84	499	-73.1	180	NA	NA	0.15	NA	NA	NA	NA	44	18	NA	NA	
	SHP-01-38A-052313	5/23/2013	NA	412	NA	11800	NA	10200	NA	1260 J	NA	254	NA	4390 J	NA	8320	4.3	0.12	6.66	10.79	156	-70.1	64.1	2.9	0.004 U	0.35	NA	1.4 U	NA	NA	5.3	6.3	2.1	NA	
	SHP-01-38A-111913	11/19/2013	NA	247	NA	39800	NA	17900	NA	2450 J	NA	2200	NA	8410	NA	23000	0.31	1.25	6.14	12.33	435	-20.7	79.2	1.2	0.0051 U	1.1	NA	1.5 U	NA	NA	7	115	2.2	NA	
	SHP-01-38A-100914	10/9/2014	NA	263	NA	17100	NA	23500	NA	2500 U	NA	2490	NA	6140	NA	20600	0.37	0.16	6.23	14.12	256	-47	93.7	0.065 U	NA	NA	0.14	1.3 U	NA	NA	10.5	49.2	19.8	NA	
SHP-01-38B	SHP-01-38B-052313	5/23/2013	NA	900	NA	53400	NA	47100	NA	8140	NA	2240	NA	9270	NA	23500	0.0	0.30	6.62	10.78	583	-109.1	190	5.2	0.004 U	0.26	NA	1.4 U	NA	NA	51.7	4.5 U	3.6	NA	
SHM-05-39A	SHM-05-39A-101707	10/17/2007	2.415	NA	29000	NA	52000	NA	38000	NA	1250	NA	8200	NA	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-39A-010908	1/9/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-39A	8/12/2010	NA	236	NA	16600	NA	24500	NA	1860	NA	680	NA	6530	NA	12300	NA	0.35	6.45	11.37	263	-52.9	100	4.01	<0.002	0.009 J	NA	<0.10	11 J	NA	7.1	6	2.9	27	Test Kit (Filtered) 100
	SHM-05-39A-101310	10/13/2012	246.3	NA	18000	NA	26000	NA	1900	NA	744	NA	6000	NA	10000	NA	0.17	0.2	6.63	11.29	297	-92	110	NA	NA	<0.10	NA	NA	NA	NA	13	4.3	NA	NA	
	SHM-05-39A-100411	10/4/2011	227.1	NA	16000	NA	17000	NA	1600	NA	541	NA	5500	NA	6600	NA	2	0.16	6.62	12.05	213	-66	87	NA	NA	<0.10	NA	NA	NA	NA	3.6	3.8	NA	NA	
	SHL-05-39A-101612	10/16/2012	76.3	NA	14000	NA	3900	NA	1400	NA	52	NA	4900	NA	13000	NA	40	0.37	6.28	14.29	149	69.6	50	NA	NA	2.1	NA	NA	NA	NA	17	4.8	NA	NA	
	SHL-05-39A-102413	10/24/2013	NA	146	NA	15800	NA	14700	NA	1770 J	NA	575	NA	5290	NA	5080	0.35	0.23	6.7	11.9	133	-94.3	51.5	NA	0.0051 U	0.3	NA	NA	NA	NA	19.2	4.0 J	NA	NA	
SHM-05-39B	SHM-05-39B-101707	10/17/2007	3.094	NA	99000	NA	10000	NA	14000	NA	5920	NA	9300	NA	47000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-39B-010908	1/9/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-39B-101310	10/13/2010	162	NA	92000	NA	3200	NA	12000	NA	5510	NA	7000	NA	130000	NA	3.54	0.19	6.75	12.93	896	-68.1	300	NA	NA	<0.10	NA	NA	NA	NA	130 J	4.0 J	NA	NA	
	DUP-02-101310	10/13/2010	174.7	NA	91000	NA	3300	NA	11000	NA	5450	NA	6600	NA	120000	NA	3.54	0.19	6.75	12.93	896	-68.1	300	NA	NA	0.36	NA	NA	NA	NA	190	6.2	NA	NA	
	SHM-05-39B-100511	10/5/2011	308.1	NA	100000	NA	5000	NA	13000	NA	6130	NA	6500	NA	60000	NA	3	0.11	6.85	13.12	919	-66	420	NA	NA	<0.10	NA	NA	NA	NA	93 J	3.2	NA	NA	
	DUP02-100511	10/5/2011	311.4	NA	100000	NA	5100	NA	13000	NA	6250	NA	6600	NA	60000	NA	3	0.11	6.85	13.12	919	-66	350	NA	NA	<0.10	NA	NA	NA	NA	39	1.8	NA	NA	
	SHM-05-39B-101612	10/16/2012	364.4	NA	100000	NA	6100	NA	14000	NA	6320	NA	6400	NA	40000	NA	55	1.67	6.91	15.3	1365	-126.7	420	NA	NA	0.08 J	NA	NA	NA	NA	37	1.97 J	NA	NA	
	SHM-05-39B-102413	10/24/2013	NA	113	NA	16500	NA	9580	NA	1660 J	NA	1230	NA	3040 J	NA	61900	0.97	0.40	6.93	10.76	278	-95.3	71.2	NA	0.0051 U	0.16	NA	NA	NA	NA	88.7	3.8 J	NA	NA	
SHM-05-40X	SHM-05-40X-101807	10/18/2007	4445	NA	50000	NA	58000	NA	7500	NA	1330	NA	7300	NA	19000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-40X-103107	10/31/2007	4058	2620	51000	48000	57900	43500	7800	7300	1427	1244	7600	7560	20000	19900	7.89	1.62	6.71	11.02	565	-134.1	220	NA	NA	N	NA	0.1 U	NA	0.5 U	13	1.7	NA	NA	
	SHM-05-40X-100710	10/7/2010	3637	NA	34000	NA	35000	NA	4900	NA	828	NA	5600	NA	14000	NA	0.34	0.22	6.47	10.68	409	-106.1	160	NA	NA	0.14	NA	NA	NA	NA	12	5.8	NA	NA	
	SHM-05-40X100511	10/5/2011	3703	NA	29000	NA	30000	NA	3800	NA	804	NA	5500	NA	13000	NA	4.1	0.24	6.48	10.52	3.95	-77.3	159	NA	NA	<0.10	NA	NA	NA	NA	11	4.2	NA	NA	
	SHM-05-40X-101712	10/17/2012	2974	NA	32000	NA	3000	NA	4800	NA	0.829	NA	5400	NA	13000	NA	40	0.19	6.71	10.62	374	-133.2	150	NA	NA	0.15	NA	NA	NA	NA	9.7	5.9	NA	NA	
	SHM-05-40X-102413	10/24/2013	NA	3100	NA	37500	NA	28800	5610	NA	911	NA	NA	6590	NA	15100	2.21	0.32	6.87	10.62	253	-136.3	165	NA	0.0053 J	0.28	NA	NA	NA	NA	13.3	4.8 J	NA	NA	
	SHM-05-40X-101314	10/13/2014	NA	3070	NA	39200	NA	40800	NA	6420	NA	1080	NA	7720	NA	13800	8.65	0.39	6.85	10.5	334	-130.2	178	0.065 U	NA	NA	0.053 U	1.3 U	NA	NA	12	5.4 J	5.8	NA	
SHM-05-41A	SHM-05-41A-101707	10/17/2007	24.9	NA	8200	NA	3400	NA	1700	NA	356	NA	1800 J	NA	3400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-41A-010908	1/9/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-41A-042110	4/21/2010	26.9	NA	9200	NA	2900	NA	1400	NA	388	NA	2100 J	NA	2100	NA	0.15	0.09	6.6	9.53	121	-34	37	NA	NA	0.075 J	NA	NA	NA	NA	1.4	7.9	NA	NA	
	SHM-05-41A-100710	10/7/2010	66.7	NA	10000	NA	4900	NA	1600	NA	395	NA	2000 J	NA	1800 J	NA	0.67	0.26	6.09	10.18	95	1.3	31	NA	NA	0.053 J	NA	NA	NA	NA	3.0	7.3	NA	NA	
	SHM-05-41A-040411	4/4/2011	20.9	NA	10000	NA	2800	NA	1600	NA	539	NA	<2500	NA	1900 J	NA	2.7	0.32	6.46	8.44	100	1.8	37	NA	NA	0.13	NA	NA	NA	NA	2.5	6.7	NA	NA	
	SHM-05-41A-100411	10/4/2011	18.4	NA	12000	NA	3200	NA	1900	NA	636	NA	2000 J	NA	2100	NA	3.9	0.48	5.76	10.99	107	44.9	41	NA	NA	<0.10	NA	NA	NA	NA	2.2	5.2	NA	NA	
	SHM-05-41A-04112	4/11/2012	15.5	NA	8500	NA	2400	NA	1300	NA	424	NA	1600 J	NA	2200	NA	1200	0.52	6.2	9.56	111	18.4	30	NA	NA	0.020 J	NA	NA	NA	NA	3.0	<6.2	NA	NA	
	SHM-05-41A-101712	10/17/2012	10.3	NA	97000	NA	2300	NA	1500	NA	592	NA	1600 J	NA	2000	NA	1.4	0.35	6.25	12.98	90	-33.5	34	NA	NA	0.08 J	NA	NA	NA	NA	2.0	6.1	NA	NA	
	SHM-05-41A-052213	5/22/2013	NA	12.3	NA	9930	NA	5530	NA	1440 J	NA	569	NA	1630 J	NA	2610 J	3.79	0.76	6.27	10.43	101	17.6	33.2	0.081 U	0.004 U	0.079 U	NA	1.4 U	NA	NA	3.3	7.9	1.2	NA	
	SHM-05-41A-102313	10/23/2013	NA	12.5	NA	9230	NA	4560	NA	1390 J	NA	534	NA	1660 J	NA	2680 J	0.66	0.35	6.42	10.17	69	-18.0	40.5	NA	0.0051 U	0.059 U	NA	NA	NA	NA	2.8	5.8 J	NA	NA	
	SHM-05-41A-042314	4/23/2014	NA	9.7	NA	9430	NA	6240	NA	1410 J	NA	576	NA	1710 J	NA	12400	6.28	0.72	6.22	9.27	172	45.3	35.0	0.066 U	NA	NA	0.069 J	1.3 U	NA	NA	21.2	4.9 J	1.9	NA	
	SHM-05-41A-100914	10/9/2014	NA	14.2	NA	9350	NA	8040	NA	2500 U	NA	552	NA	2500 U	NA	2930 J	0.42	0.08	6.39	10.94	81	-20.0	38.2	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	3.5	6.8 J	1.5	NA	

GROUNDWATER MONITORING WELL RESULTS
Shepley's Hill Landfill, Devens Massachusetts

Well ID	Sample ID	Date	Arsenic		Calcium		Iron		Magnesium		Manganese		Potassium		Sodium		Turbidity	DO	pH	Temp	Spec Cond	ORP	Alkalinity	Ammonia	Nitrite	Nitrate	Nitrogen (Nitrite +Nitrate)	Sulfide	COD	TOC	Chloride	Sulfate	DOC	DIC	Notes
			Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	NTU	mg/L		Celcius	uS/cm	mV	mg CaCO3/L	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
SHM-05-41B	SHM-05-41B-101707	10/17/2007	2591	NA	48000	NA	100000	NA	6000	NA	1770	NA	12000	NA	14000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-41A-010908	1/9/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	DUP-010908	1/9/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-041B	8/9/2010	1440	1130	16000	14500 J	35200	28000	2400	2080	736	656 J	10000	8770 J	14900	12800 J	NA	0.32	6.43	11.75	310	42.6	NA	NA	NA	NA	NA	NA	NA	NA	2.6	32	Test Kit (Filtered) 500
	SHM-05-41B-042110	4/21/2010	1372	NA	14000	NA	32000	NA	2000	NA	662	NA	8600	NA	11000	NA	9.6	0.08	6.74	9.6	392	-124	120	NA	NA	0.12	NA	NA	NA	7.0	5	NA	NA	
	SHM-05-41B-100710	10/7/2010	1036	NA	12000	NA	27000	NA	1700	NA	605	NA	8400	NA	7500	NA	1.64	0.35	6.65	10.29	259	-86.8	100	NA	NA	0.10	NA	NA	NA	2.9	5.3	NA	NA	
	SHM-05-41B-040411	4/4/2011	1045	NA	12000	NA	27000	NA	1800	NA	605	NA	9000	NA	5900	NA	0.5	0.16	6.73	8.44	266	-80.4	120	NA	NA	0.23	NA	NA	NA	1.5	5.7	NA	NA	
	SHM-05-41B-100411	10/4/2011	1369	NA	9900	NA	26000	NA	1400	NA	494	NA	8700	NA	5600	NA	5.8	0.35	6.29	10.92	209	-61.2	83	NA	NA	<0.10	NA	NA	NA	1.5	3.5	NA	NA	
	SHM-05-41B-04112	4/11/2012	770.8	NA	6800	NA	13000	NA	1000	NA	304	NA	6700	NA	5000	NA	8400	0.14	6.44	10.02	199	-57.2	66	NA	NA	NA	NA	NA	NA	3.0	<3.3	NA	NA	
	SHM-05-41B-101712	10/17/2012	859.5	NA	13000	NA	26000	NA	2100	NA	629	NA	8500	NA	3500	NA	41	0.22	6.58	12.23	259	-150.1	100	NA	NA	0.16	NA	NA	NA	3.1	4.1	NA	NA	
	SHM-05-41B-52213	5/22/2013	NA	812	NA	18400	NA	32300	NA	3450 J	NA	780	NA	9330	NA	5150	3.03	0.26	6.55	9.98	302	-94.0	97.2	0.16	0.004 U	0.40	NA	1.4 U	NA	5.8	8.7	2.8	NA	
	SHM-05-41B-102313	10/23/2013	NA	716	NA	12700	NA	21400	NA	2430 J	NA	583	NA	7500	NA	3780 J	4.49	0.46	6.88	10.05	155	-120.4	81	NA	0.0051 U	0.26	NA	NA	NA	4.3	4.7 J	NA	NA	
	SHM-05-41B-042314	4/23/2014	NA	678	NA	17000	NA	25900	NA	3200 J	NA	766	NA	7690	NA	3350	15.0	0.47	6.6	9.33	245	-37.7	87.6	0.066 U	NA	NA	0.31	1.3 U	NA	3.8	5.2 J	2.3	NA	
	DUP-042314	4/23/2014	NA	704	NA	17700	NA	27100	NA	3330 J	NA	800	NA	7980	NA	3310 J	15.0	0.47	6.6	9.33	245	-37.7	86.5	0.066 U	NA	NA	0.35	1.3 U	NA	4.3	5.2 J	2.2	NA	
	SHM-05-41B-100914	10/9/2014	NA	638	NA	17400	NA	24300	NA	2780 J	NA	752	NA	6690	NA	3140 J	10.7	0.41	6.76	10.49	195	-93.0	97	4.6	NA	NA	0.050 U	1.3 U	NA	2.5	5.3 J	1.7	NA	
SHM-05-41C	SHM-05-41C-101707	10/17/2007	684.5	NA	97000	NA	18000	NA	13000	NA	3260	NA	4200	NA	36000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-41C-010908	1/9/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-41C-042110	4/21/2010	896	NA	92000	NA	18000	NA	11000	NA	2860	NA	3500	NA	34000	NA	0.8	0.11	7.17	10.06	963	-167	350	NA	NA	0.079 J	NA	NA	NA	30	<1.0	NA	NA	
	SHM-05-41C-100710	10/7/2010	787	NA	97000	NA	19000	NA	12000	NA	3100	NA	3500	NA	33000	NA	0.43	0.29	7.01	10.71	753	-132	350	NA	NA	0.11	NA	NA	NA	29	<1.0	NA	NA	
	SHM-05-41C-040411	4/4/2011	749.8	NA	98000	NA	16000	NA	12000	NA	3170	NA	<3700	NA	100000	NA	19	0.28	7.03	8.67	1132	-99	250	NA	NA	0.18	NA	NA	NA	130	2.9	NA	NA	
	SHM-05-41C-100411	10/4/2011	917	NA	98000	NA	19000	NA	11000	NA	3240	NA	3600	NA	33000	NA	4.8	0.36	6.28	11.14	775	-88.7	340	NA	NA	<0.10	NA	NA	NA	28	.30 J	NA	NA	
	SHM-05-41C-041112	4/11/2012	764.8	NA	94000	NA	18000	NA	11000	NA	3160	NA	3700	NA	35000	NA	150000	0.19	7	9.2	929	-116.8	330	NA	NA	<0.10	NA	NA	NA	30	<2.1	NA	NA	
	SHM-05-41C-101812	10/18/2012	782.2	NA	95000	NA	17000	NA	12000	NA	3190	NA	3500	NA	33000	NA	170	0.7	6.93	9.02	714	-164.5	350	NA	NA	0.08 J	NA	NA	NA	28	0.81 J	NA	NA	
	SHM-05-41C-052113	5/21/2013	NA	709	NA	102000	NA	14700	NA	13400	NA	2530	NA	3490 J	NA	118000	2.7	0.26	6.98	11.50	1081	-98.5	375	0.081 U	0.004 U	0.45	NA	1.4 U	NA	153	4.5 U	3.9	NA	
	SHM-05-41C-102313	10/23/2013	NA	890	NA	106000	NA	16200	NA	13000	NA	2940	NA	3580 J	NA	33700	0.44	0.93	7.16	10.08	511	-165.9	364	NA	0.0051 U	0.28	NA	NA	NA	28.7	1.4 J	NA	NA	
	SHM-05-41C-042314	4/23/2014	NA	1490	NA	82900	NA	17600	NA	11300	NA	1660	NA	3130 J	NA	305000	4.91	0.57	7.14	9.46	1905	-121.7	378	0.066 U	NA	NA	0.23	1.3 U	NA	437	4.2 J	4.5	NA	
	SHM-05-41C-100914	10/9/2014	NA	946	NA	93700	NA	16000	NA	12600	NA	2540	NA	3030 J	NA	77300	0.42	0.14	7.13	10.97	6.99	-152.2	368	4.5	NA	NA	0.28	0.080 J	NA	NA	2.6 J	4.1	NA	
SHM-05-42A	SHM-05-42A-101707	10/17/2007	1.01 J	NA	5600	NA	180	NA	1200	NA	8.1 J	NA	1900 J	NA	1000 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-42A	8/12/2010	NA	1.25	NA	6700	NA	388	NA	1160	NA	140	NA	1470	NA	2040	NA	1.20	6.50	10.39	61	89.5	18	0.0189 J	<0.002	<0.01	NA	<0.10	<7.0	NA	1.6	5.6	<1.0	9.4	Test Kit (Filtered) < 5
	SHM-05-42A-042210	4/22/2010	2.5	NA	5200	NA	1200	NA	980	NA	153	NA	1200 J	NA	1900 J	NA	3.5	5.11	6.08	9.63	0.071	-95	160	NA	NA	0.12	NA	NA	NA	2.0	5.8	NA	NA	
	SHM-05-42A-101310	10/13/2010	1.2	NA	7600	NA	250	NA	1300	NA	138	NA	1600 J	NA	2000	NA	1	0.31	5.75	9.82	70	102.7	230	NA	NA	<0.10	NA	NA	NA	2.2	5.9	NA	NA	
	SHM-05-42A-040511	4/5/2011	1.1	NA	7100	NA	200	NA	1100	NA	105	NA	<2500	NA	<2500	NA	0	0.16	6.05	8.76	70	95.2	210	NA	NA	0.12	NA	NA	NA	2.3	6.4	NA	NA	
	SHM-05-42A-100711	10/7/2011	0.8	NA	6200	NA	100	NA	1000	NA	15	NA	1600 J	NA	1600 J	NA	0.08	1.95	5.23	10.27	61	156.3	190	NA	NA	0.24	NA	NA	NA	1.8	4.5	NA	NA	
	SHM-05-42A-041112	4/11/2012	2.3	NA	5400	NA	500	NA	880	NA	29	NA	1600 J	NA	1600 J	NA	2700	6.09	5.6	9	63	186.2	170	NA	NA	0.11	NA	NA	NA	2.7	<3.8	NA	NA	
	SHM-05-42A-101812	10/18/2012	0.7	NA	8100	NA	45 J	NA	1400	NA	42 J	NA	2200 J	NA	2100	NA	0.73 B	0.54	6.04	9.87	66	125.5	23	NA	NA	<0.10	NA	NA	NA	3.3	4.3	NA	NA	
	SHM-05-42A-052213	5/22/2013	NA	0.89 J	NA	6420	NA	224	NA	981 J	NA	103	NA	2060 J	NA	2350 J	0.00	0.38	6.06	9.61	62	86.2	23.2	0.081 U	0.004 U	0.079 U	NA	1.4 U	NA	2.8	5.6	0.65 J	NA	
	SHM-05-42A-102313	10/23/2013	NA	2.0 U	NA	6520	NA	111	NA	976 J	NA	66	NA	1880 J	NA	2420 J	0.28	2.53	6.09	7.97	61	73.2	23	NA	0.0051 U	0.11	NA	NA	NA	2.8	6.3 J	NA	NA	
	SHM-05-42A-042314	4/23/2014	NA	2.0 U	NA	8100	NA	961	NA	1160 J	NA	193	NA	2020 J	NA	2860 J	0.88	0.23	5.86	9.16	62	101.2	23.0	0.066 U	NA	NA	0.053 J	1.3 U	NA	4.3	7.5 J	3.1	NA	
	SHM-05-42A-100914	10/9/2014	NA	2.0 U	NA	11000	NA	130	NA	2500 U	NA	130	NA	2500 U	NA	3160 J	2.20	0.09	5.81	10.57	73	123.7	34.9	0.065 U	NA	NA	0.050 U	1.3 U	NA	5.5	7.6 J	0.87 J	NA	
SHM-05-42B	SHM-05-42B-101707	10/17/2007	304.4	NA	77000	NA	94000	NA	12000	NA	1700	NA	20000	NA	39000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-42B-010908	1/9/2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-05-42B-042210	4/22/2010	72.2	NA	56000	NA	37000	NA	7800	NA	2540	NA	11000	NA	26000	NA	6	0.19	6.52	9.77	863	-272	290	NA	NA	0.13	NA	NA	NA	23	5.2	NA	NA	
	SHM-05-42B-101310	10/13/2010	197.2	NA	56000	NA	47000	NA	7300	NA	2710	NA	11000	NA	24000	NA	1	0.53	6.52	9.89	691	-64.6	300	NA	NA	<0.10	NA	NA	NA	25	3.9	NA	NA	
	SHM-05-42B	4/1/2011	188.9	NA	59000	NA	61000	NA	8500	NA	3070	NA	12000	NA	29000	NA	0	0.25	6.44	8.79	759	-63	340	NA	NA	0.29	NA	NA	NA	32	3.3	NA	NA	
	SHM-05-42B-100711	10/7/2011	230	NA	59000	NA	61000	NA	9000	NA	2790	NA	11000	NA	32000	NA	0.3	0.26	6.36	10.42	755	-44.1	330	NA	NA	0.12	NA	NA	NA	31	3.4	NA	NA	
	SHM-05-42B-041112	4/11/2012	238.7	NA	51000	NA	58000	NA	7200	NA	2520	NA	10000	NA	30000	NA	37000	0.54	6.45	9.55	895	-59	320	NA	NA	0.60 J	NA	NA	NA	26	<2.4	NA	NA	
	SHM-05-42B-101812	10/18/2012	240.6	NA	57000	NA	52000	NA	9000.0	NA	2600	NA	9900 J	NA	31000	NA	48	0.69	6.53	10.17	643	-116.8	300	NA	NA	0.21	NA	NA	NA	25	3.2	NA	NA	
	SHM-05-42B-052213	5/22/2013	NA	238	NA	66000	NA	51100	NA	11300	NA	2900	NA	9310	NA	28000	1.2	0.37	6.58	9.92	655	-49.9	318	9.5	0.004 U	0.28	NA	1.4 U	NA	27.7	4.5 U	3.4	NA	
	SHM-05-42B-102313	10/23/2013	NA	232	NA	60900	NA	43200	NA	9300	NA	3280	NA	8820	NA	27500	0.96	0.16	6.48	10.79	654	-105.7	313	NA	0.0051 U	0.18	NA	NA	NA	20.7	3.3 J	NA	NA	
	SHM-05-42B-042314	4/23/2014	NA	229	NA	65900	NA	38000	NA	10100	NA	6110	NA	8550	NA	28900	3.08	0.14	6.43	9.36	643	-36.9	308	0.066 U	NA	NA	0.40	1.3 U	NA	17.7	2.0 J	3.9	NA	
	SHM-05-42B-100914	10/9/2014	NA	215	NA	63500	NA	34300	NA	9150	NA	6450	NA	7650	NA	25100	3.4	0.1	6.6	10.69	498	-78.6	293	3.8	NA	NA	0.055 J	1.3 U	NA	17	1.5 J	2.9	NA	
	Duplicate-100914	10/9/2014	NA	213	NA	62400	NA	34200	NA	9120	NA	6460	NA	7630	NA	25100	3.4	0.1	6.6	10.69	498	-78.6	293	3.8	NA	NA	0.058 J	1.3 U	NA	17.5	2.8 J	2.5	NA	
SHP-05-045A	SHP-05-045A	8/9/2010	36.4	33.7	NA	NA	21600	22100	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.30	6.20	13.97	294	-32.2	NA	NA	NA	NA	NA	NA	NA	NA	3.6	48	Test Kit (Filtered) 10
SHP-05-046B	SHP-05-046B	8/9/2010	50.6	81.4	NA	NA	26800	34800	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.81	5.71	12.93	662	3	NA	NA	NA	NA	NA	NA	NA	NA	14	150	Test Kit (Filtered) 80
SHM-07-03	SHM-07-03	10/31/2007	44.4 J	<0.5	9300	8300	10700	73 J	2900	830	494.4	210.9	2200 J	1060 J	4100	3210	NA	NA	NA	NA	NA	NA	21.2	<0.075	0.006 J	<0.05	NA	<0.1	<20	NA	6.4	24	NA	NA	
	SHM-07-03	8/12/2010	NA	0.29 J	NA	6580	NA	53.8	NA	550	NA	9.68	NA	841	NA	11600	NA	6.61	5.81	12.25	81	133.9	18	0.0239 J	<0.002	0.59	NA	<0.10	<7.0	NA	8.2	10	<1.0	12	Test Kit (Filtered) < 5
	DUP2-081210	8/12/2010	NA	0.77	NA	6860	NA	58	NA	568	NA	9.66	NA	893	NA	12100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-07-03-052813	5/28/2013	NA	1.0	NA	5930	NA	<100	NA	<5000	NA	<15	NA	<5000	NA	23800	12.02	4.82	5.81	12.84	147	139.2	16.6	0.081 U	0.004 U	0.87	NA	1.4 U	NA	28.5	6.4	1.3	NA	
SHM-07-05X	SHM-07-05	10/31/2007	14.7	NA	21000	NA	391	NA	2900	NA	81.1	NA	15000	NA	32000	NA	5.01	1.85	7.61	11.1	429	19	46	0.278	0.01 J	<0.05	NA	<0.1	<20	NA	60	12	NA	NA	
	SHM-07-05	8/12/2010	NA	3180	NA	21500	NA	22500	NA	2990	NA	544	NA	4530	NA	11500	NA	0.40	6.45	11.43	256	-21.5	94	2.42	0.01 J	0.06	NA	<0.10	<7.0	NA	8.9	8.1	2	24	Test Kit (Filtered) > 500
	DUP-081210	8/12/2010	NA	3220	NA	21700	NA	22700	NA	2960	NA	545	NA	4540	NA	11500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SHM-10-01	SHM-10-01-071310	7/13/2010	1.16 J	0.68 J	42400	42700	508	373	3700	3680	10500 J	10600	2300	2290	9340	9160	3.34	0.18	6.19	12.38	297	63.5	130	0.264	< 0.002	< 0.01	NA	< 0.1	11 J	1.3	12	6.8	NA	NA	
	SHM-10-01	8/12/2010	NA	3.51 J	NA	41600	NA	886	NA	3530	NA	10700	NA	2230	NA	11100	NA	0.49	6.61	11.86	291	42.2	130	0.241	<0.002	<0.01	NA	<0.10	<7.0	NA	14	7.0	1.5	31	Test Kit (Filtered) < 5
	SHM-10-01-090810	9/8/2010	8.15	7.87	43100	43500	1740	1680	3680	3780	10200	10300	2220	2280	8880	8770	0.15	0.12	6.31	12.68	299	11.3	140	0.344	< 0.002	< 0.01	NA	< 0.1	12 J	1.6	11	8.7	1.6	37	
	SHM-10-01-102412	10/24/2012	NA	1.4	NA	21500	NA	210	NA	1900 J	NA	NA	NA	1800 J	NA	7200	0.95	0.40	6.39	11.51	143	48.3	88.6	0.10 U	<0.010	0.1 U	NA	2.0 U	NA	NA	8.5	6.2 U	NA	NA	
	SHM-10-01-052913	5/29/2013	NA	1.3	NA	18900	NA	124	NA	1690 J	NA	5970 J	NA	1770 J	NA	6900	0.00	0.16	6.53	10.58	160	51.2	72.9	0.26	0.004 U	0.079 U	NA	1.4 U	NA	NA	4.0	6.5	5.3	NA	
SHM-10-02	SHM-10-02-071510	7/15/2010	0.74	0.43 J	113000	117000	1190	881	15700	16100	2110	2180	3880	4010	49500	53300	3.47	0.45	6.42	12.24	836	80.8	250	0.248	< 0.002	< 0.01	NA	< 0.1	< 7	2.4	160	20	NA	NA	
	Dup-071510	7/15/2010	0.59	0.45 J	114000	117000	1170	890	15600	16100	2130	2170	3980	4000	51400	53100	NA	NA	NA	NA	NA	NA	250	0.231	< 0.002	< 0.01	NA	< 0.1	< 7	2.5	160	21	NA	NA	
	SHM010-02-090710	9/7/2010	1.11	1.07	115000 J	114000 J	973	843	16000	16000	2190	2190	4020	4040	48100	50700	0.64	0.87	5.94	12.45	881	-258.3	260	0.238	< 0.002	< 0.01	NA	< 0.1	< 7	2.6	120	19	2.5	62	
	SHM-10-02-102212	10/22/2012	NA	1.1	NA	133000	NA	100 UJ	NA	18200	NA	NA	NA	4100 J	NA	37400	1.78	0.48	6.52	12.18	726	40.2	448	0.13 J	<0.010	0.10 U	NA	2.0 U	NA	NA	61.5	7.4 U	NA	NA	
	Duplicate-102212	10/22/2012	NA	<1.0	NA	135000 b	NA	60.7 J	NA	18500	NA	NA	NA	4100 J	NA	37600 Q	1.78	0.48	6.52	12.18	726	40.2	448	0.65	<0.010	<0.11	NA	<2.0	NA	NA	60.0	7.2	NA	NA	
	SHM-10-02-052913	5/29/2013	NA	1.5	NA	137000	NA	33.7 J	NA	20100	NA	2450	NA	4300 J	NA	41200	1.04	0.2	6.53	11.37	537	73.2	444	0.35	0.004 U	0.079 U	NA	1.4 U	NA	NA	61.5	8.8	3.8	NA	
SHM-10-03	SHM-10-03-071410	7/14/2010	2.36	0.78 J	112000	109000	1630	866	12900	12600	122	153	6490	6000	474000	473000	31.7	1.47	6.60	16.09	3331	75.7	96	0.035 J	0.02	0.52	NA	< 0.1	25	0.64	1000	38	NA	NA	
	DUP-071410	7/14/2010	4.59	0.5 J	112000	111000	2440	843	13000	127000	151	134	6580	6060	483000	474000	NA	NA	NA	NA	NA	NA	95	0.0269 J	0.02	0.51	NA	< 0.1	47	0.73	1000	36	NA	NA	
	SHM-10-03-090710	9/7/2010	1.47 J	0.51 J	153000	157000	1420	1030	18200	18500	72.8	44	6920	6880	536000	536000	13.4	1.72	6.31	11.93	3341	148.1	78	0.0392 J	< 0.002	0.55	NA	< 0.1	43	0.66	1100	39	< 1	26	
	DUP-090710	9/7/2010	1.51 J	0.71 J	149000	154000	1480	1040	17700	18000	70.2	51.7	6670	6840	510000	526000	NA	NA	NA	NA	NA	NA	75	0.0204 J	< 0.002	0.6	NA	< 0.1	31	0.66	1100	39	NA	NA	
	SHM-10-03-102312	10/23/2012	NA	1.0 U	NA	129000	NA	79 J	NA	15200	NA	NA	NA	6000	NA	359000	21.9	1.45	6.51	13.75	2230	-3.6	57.2	0.10 U	<0.010	0.47	NA	2.0 U	NA	NA	900	38.2	NA	NA	
	SHM-10-03-052413	5/24/2013	NA	1.5	NA	145000	NA	50.6 J	NA	17200	NA	37	NA	6270	NA	432000	3.68	0.61	6.54	11.49	1981	61.5	71.8	0.081 U	0.004 J	0.47	NA	1.4 U	NA	NA	870	35.4	0.72 J	NA	
	DUP-01-052413	5/24/2013	NA	1.5	NA	136000	NA	131	NA	16100	NA	194	NA	6190	NA	405000	NA	NA	NA	NA	NA	NA	66.3	0.081 U	0.004 U	0.47	NA	1.4 U	NA	NA	870	39.7	0.64 U	NA	
SHM-10-04	SHM-10-04-071410	7/14/2010	1.62	0.64	60300 J	57800	3800 J	5190	12300 J	11800	2190	2500	4230	5220	33400 J	35400	17.7	0.23	6.37	10.82	630	9.9	99	0.0666 J	0.11	3.8	NA	< 0.1	13 J	2.7	74	84	NA	NA	
	SHM-10-04-090710	9/7/2010	1.0 J	0.79 J	72100	72800	1880	1650	14500	14600	3210	3100	4050	3990	35800	35200	4.28	0.23	5.99	12.1	656	43.7	100	0.0585 J	0.5	3.7	NA	< 0.1	< 7	2.6	92	87	2.7	43	
	SHM-10-04-102212	10/22/2012	NA	1.0 U	NA	57100	NA	100 U	NA	12600	NA	NA	NA	3200 J	NA	37500	4.15	0.27	5.89	11.64	460	65	81.4	0.10 U	0.023	6.6	NA	2.0 U	NA	NA	82.5	70.9	NA	NA	
	SHM-10-04-052913	5/29/2013	NA	1.0	NA	61500	NA	<100	NA	13700	NA	622	NA	<5000	NA	39300	1.67	0.16	6.01	10.18	382	180.1	99.5	0.13	0.012	6.5	NA	1.4 U	NA	NA	83.0	81.7	1.9	NA	
	DUP-052913	5/29/2013	NA	0.95 J	NA	61200	NA	<100	NA	14000	NA	660	NA	<5000	NA	39000	NA	NA	NA	NA	NA	NA	93.9	0.13	0.013	6.9	NA	1.4 U	NA	NA	82.0	82.3	1.7	NA	
SHM-10-05A	SHM-10-05A-071510	7/15/2010	4.7	4.6	14200	14500	1970	1880	1660	1670	590	620	1990	1990	22800	23900	5.12	1.42	6.29	19.06	186	31.7	43	0.0184 J	0.01 J	0.38	NA	< 0.1	< 7	0.93	34	10	NA	NA	
	SHM-10-05A-090810	9/8/2010	5.68	5.21	14100	14200	790	677	1600	1600	105	122	1770	1830	19600	19700	8.92	3.2	5.27	20.2	200	-29	36	0.0335 J	< 0.002	0.46	NA	< 0.1	55	0.96	29	11	< 1	20	
	SHM-10-05A-102312	10/23/2012	NA	3.0	NA	15300	NA	68 J	NA	1800 J	NA	NA	NA	1700 J	NA	16100	4.3	4.84	6.04	14.43	208	164.8	42.1	0.10 U	<0.010	1.2	NA	2.0 U	NA	NA	30.5	8	NA	NA	
	SHM-10-05 (EPA)	10/24/2012	<20	NA	16000	NA	5700	NA	2100	NA	21	NA	1400	NA	20000	NA	NA	NA	NA	NA	NA	NA	48	NA	NA	NA	NA	NA	NA	NA	4.0	3.3	NA	NA	
	SHM-10-05A-052213	5/22/2013	NA	3.1	NA	13800	NA	30 U	NA	1720 J	NA	16.1	NA	1610 J	NA	18900	2.47	1.31	6.26	13.51	145	158.1	38.7	0.081 U	0.004 U	0.62	NA	1.4 U	NA	NA	30.7	7.2	0.79 J	NA	
	DUP-052213	5/22/2013	NA	3.1	NA	14100	NA	30 U	NA	1720 J	NA	15.4	NA	1580 J	NA	19400	NA	NA	NA	NA	NA	NA	38.7	0.081 U	0.004 U	0.64	NA	1.4 U	NA	NA	30.7	7.3	0.69 J	NA	

GROUNDWATER MONITORING WELL RESULTS
Shepley's Hill Landfill, Devens Massachusetts

Well ID	Sample ID	Date	Arsenic		Calcium		Iron		Magnesium		Manganese		Potassium		Sodium		Turbidity	DO	pH	Temp	Spec Cond	ORP	Alkalinity	Ammonia	Nitrite	Nitrate	Nitrogen (Nitrite +Nitrate)	Sulfide	COD	TOC	Chloride	Sulfate	DOC	DIC	Notes
			Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	NTU	mg/L		Celcius	uS/cm	mV	mg CaCO3/L	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
SHM-10-06	SHM-10-06-070810	7/8/2010	2210 J	1680 J	40900	41000 J	130000 J	117000	7360	7140	724	699	11700	11800	18200	17900	21.4	0.55	6.62	21.74	754	-93.8	360	5.5	< 0.002	0.03	NA	< 0.1	29	4.8	17	0.89	NA	NA	
	DUP-070810	7/8/2010	2520	1520	46500	41100	149000	117000	8400	7200	829	712	13100	12300	20700	19000	NA	NA	NA	NA	NA	NA	370	5.58	< 0.002	0.033	NA	< 0.1	25	4.7	17	0.84	NA	NA	
	SHM-10-06-090810	9/8/2010	2580	2710	48200	50300	144000	145000	8270	8800	9.54	9.63	13500	13800	22800	23700	3.72	2.83	6.16	11.59	783	-64.3	300	5.13	< 0.002	0.13	NA	< 0.1	33	4.2	15	0.49 J	5	93	
	SHM-10-06-102312	10/23/2012	NA	2300	NA	36100	NA	111000	NA	6300	NA	NA	NA	11300	NA	17200	3.38	1.18	6.57	15.78	587	-122.1	184	6.1	<0.010	0.13	NA	2.0 U	NA	NA	16.5	5.0 U	NA	NA	
	SHM-10-06 (EPA)	10/23/2012	1900	NA	37000	NA	110000	NA	6600	NA	1900	NA	11000	NA	22000	NA	NA	NA	NA	NA	NA	NA	117	NA	NA	NA	NA	NA	NA	NA	14	0.99	NA	NA	
	SHM-10-06-052313	5/23/2013	NA	1980	NA	36100	NA	107000	NA	6500	NA	1890	NA	11500	NA	17000	4.66	0.86	6.60	13.22	473	-120.7	227	8.5	0.004 U	0.29	NA	1.4 U	NA	NA	16.2	4.5 U	3.7	NA	
	SHM-10-06-100814	10/8/2014	NA	1900	NA	37900	NA	92000	NA	7270	NA	2080	NA	9960	NA	16500	3.49	0.41	6.73	11.45	515	-119.3	238	0.065 U	NA	NA	0.079 J	1.3 U	NA	NA	18	4.8 J	2.9	NA	
SHM-10-06A	SHM-10-06A-070710	7/7/2010	64.8	61	15700	15300 J	20900 J	19900 J	2090	2030	1650 J	1620	4700	4520	7490	7260	5.38	1.49	6.51	19.74	209	-22.6	100	2.69	< 0.002	0.03 J	NA	< 0.1	16 J	3.4	3.4	2.5 B	NA	NA	
	DUP-070710	7/7/2010	65.1	60.1	15800	15500	21200	20200	2080	2070	1660	1650	4740	4680	7640	7560	NA	NA	NA	NA	NA	NA	97	2.59	< 0.002	0.032 J	NA	< 0.1	20	3.3	3.4	2.9 B	NA	NA	
	SHM-1--06A-090910	9/9/2010	102	94.2	33000	33300	44600	42900	4940	4640	3940	4080	8130	7640	13200	13200	40.6	0.39	5.94	10.65	431	-157.3	190	3.9	< 0.002	< 0.01	NA	< 0.1	17 J	4	11	3.2	3.3	58	
	DUP-090910	9/9/2010	102	83	31800	25300	42700	32300	4810	3280	3820	3130	7970	5990	12900	9240	NA	NA	NA	NA	NA	NA	150	5.05	< 0.002	< 0.01	NA	< 0.1	19 J	4.4	11	3.2	NA	NA	
	SHM-10-06A-102412	10/24/2012	NA	72	NA	13200	NA	19900	NA	2600 J	NA	NA	NA	3600 J	NA	5800	13.91	0.63	5.9	10.98	190	-203	67	0.10 U	<0.010	0.24	NA	2.0 U	NA	NA	4.5	5.9 U	NA	NA	
	SHM-10-06A (EPA)	10/24/2012	80	NA	14000	NA	20000	NA	2700	NA	2100	NA	3100	NA	9400	NA	NA	NA	NA	NA	NA	NA	46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-10-06A-052213	5/22/2013	NA	72.8	NA	9380	NA	11400	NA	1700 J	NA	1430	NA	3060 J	NA	3860 J	3.67	0.55	6.57	12.60	90	-12.3	48.6	1.5	0.004 U	0.52	NA	1.4 U	NA	NA	1.8	4.5 U	1.9	NA	
	SHM-10-06A-112013	11/20/2013	NA	22.9	NA	8330	NA	3410	NA	933 J	NA	1960	NA	3430 J	NA	2940 J	0.44	0.22	6.49	9.34	107	-61.6	53.9	1.1	0.0051 U	0.14	NA	1.5 U	NA	NA	1.5	2.1 J	1.8	NA	
	SHM-10-06A-100714	10/7/2014	NA	95.6	NA	18900	NA	27800	NA	3030 J	NA	3480	NA	3800 J	NA	5850	4.63	0.41	6.19	11.77	199	-25.1	119	1.1	NA	NA	0.38	1.3 U	NA	NA	10.0	2.7 J	5.4	NA	
SHM-10-07	SHM-10-07-052710	5/27/2010	816 J	818 J	62200 J	60600 J	75800 J	70600 J	12200	9590	3230 J	3110 J	17900	16000	36400	35100 J	237	0.15	6.97	13.43	751	-195	300	6.02	< 0.002	0.008 J	NA	< 0.1	45	3.6	48	8.6	NA	NA	
	DUP-052710	5/27/2010	827	825	62600	61100	75800	71800	12100	9660	3280	3130	18100	16100	36900	35700	NA	NA	NA	NA	NA	NA	280	5.78	< 0.002	0.013 J	NA	< 0.1	58	3.5	48	9.3	NA	NA	
	SHM-10-07-090910	9/9/2010	979	918	47400	43200	62300	56800	6360	5610	2050	1940	13200	11400	26400	24400	15.4	0.43	6.54	12.39	635	-105.6	240	5.6	< 0.002	< 0.01	NA	< 0.1	29	3.8	41	2.3	3.5	52	
	SHM-10-07-102212	10/22/2012	NA	1100	NA	43700	NA	69000	NA	5300	NA	NA	NA	11400	NA	23900	21.3	0.13	6.45	12.10	516	-86	191	6.2	<0.010	0.16	NA	2.0 U	NA	NA	46.5	5.0 U	NA	NA	
	SHM-10-07 (EPA)	10/22/2012	990	NA	48000	NA	66000	NA	5700	NA	2200	NA	11000	NA	29000	NA	NA	NA	NA	NA	NA	NA	143	NA	NA	NA	NA	NA	NA	NA	58	0.14	NA	NA	
	SHM-10-07-052313	5/23/2013	NA	1210	NA	56000	NA	94900	NA	6700	NA	2670	NA	13300	NA	28500	4.60	1.23	6.5	12.03	561	-109.6	243	7.6	0.004 U	0.26	NA	1.4 U	NA	NA	61.7	5.6	3.5	NA	
	SHM-10-07-100714	10/7/2014	NA	861	NA	39700	NA	53330	NA	4820 J	NA	2150	NA	10100	NA	26300	44.00	0.27	6.8	12.23	634	-92.8	162	6.1	NA	NA	0.082 J	1.3 U	NA	NA	55	1.9 J	2.8	NA	
SHM-10-08	SHM-10-08-071510	7/15/2010	2.72	0.73 J	160000	152000	2610	1310 J	21100	19900 J	910	885 J	5370	4590	44300 J	44500	7.15	0.21	6.73	10.95	917	33.7	480	< 0.017	< 0.002	< 0.01	NA	< 0.1	<7	4	71	15	NA	NA	
	SHM-10-08-090710	9/7/2010	1.4	1.55	182000	195000	1270	1260	23600	25000	359	376	5240	5470	46400	NA	1.37	3.61	6.19	12.1	1079	-233	500	0.084	< 0.002	< 0.01	NA	< 0.1	17 J	4.1	79	15	3.8	110	
	SHM-10-08-102212	10/22/2012	NA	1.9	NA	137000	NA	37 J	NA	16800	NA	NA	NA	4500 J	NA	35900	0.0	0.40	6.63	11.59	713	45.1	459	0.10 U	<0.010	0.10 U	NA	2.0 U	NA	NA	53.5	7.8 U	NA	NA	
	SHM-10-08-052113	5/21/2013	NA	1.9	NA	152000	NA	42.8 J	NA	19500	NA	242	NA	4800 J	NA	40200	1.7	0.49	6.73	11.86	721	7.8	499	0.18	0.004 U	0.079 U	NA	1.4 U	NA	NA	55.7	10.4	3.2	NA	
SHM-10-10	SHM-10-10-071310	7/13/2010	2.0 J	1.25 J	95100	92800	1020	799	12100	11900	24600	24200	3580	3600	26500	26100	4.52	0.85	6.61	12.10	658	28.7	350	0.155	< 0.002	< 0.01	NA	< 0.1	29	3.6	19	0.56 J	NA	NA	
	DUP-071310	7/13/2010	1.34 J	1.13 J	92400	94600	925	804	11800	12100	24100	24800	3490	3610	26500	27500	NA	NA	NA	NA	NA	NA	350	0.145	< 0.002	< 0.01	NA	< 0.1	40	3.6	18	0.38 J	NA	NA	
	SHM-10-10	8/12/2010	NA	3.62 J	NA	83800	NA	1180	NA	10700	NA	22000	NA	3590	NA	28500	NA	0.76	6.57	11.27	622	-9.1	320	0.201	<0.002	<0.01	NA	<0.10	25	NA	23	0.79 J	3.9	70	
	SHM-10-10-090810	9/8/2010	2.57 J	2.4 J	107000	96800	833	700	13200	12000	27400	25200	3750	3410	29600	27100	0.71	0.16	6.55	13.13	617	63.3	320	0.148	< 0.002	< 0.01	NA	< 0.1	55	3.7	17	0.34 J	3.8	76	
	DUP-090810	9/8/2010	2.58 J	6.66	96300	101000	825	929	11900	12600	27400	25800	3380	3560	26600	28500	NA	NA	NA	NA	NA	NA	330	0.168	< 0.02	0.019 J	NA	< 0.1	45	3.9	17	0.26 J	NA	NA	
	SHM-10-10-102412	10/24/2012	NA	1.0	NA	74500	NA	180	NA	8100	NA	NA	NA	2700 J	NA	21300	3.25	0.28	6.55	12.06	464	37.6	295	0.10 U	<0.010	0.10 U	NA	2.0 U	NA	NA	21	5.0 U	NA	NA	
	Duplicate	10/24/2012	NA	1.1	NA	75200	NA	179	NA	8260	NA	NA	NA	2830 J	NA	21400 Q	NA	NA	NA	NA	NA	NA	305	<0.10	<0.010	<0.11	NA	<2.0	NA	NA	21	<5.0	NA	NA	
	SHM-10-10-052913	5/29/2013	NA	1.7	NA	83000	NA	82.5 J	NA	9460	NA	26400	NA	3040 J	NA	32100	0.46	3.07	6.62	11.22	579	48.8	343	0.25	0.004 U	0.079 U	NA	1.4 U	NA	NA	18.5	4.5 U	2.9	NA	
	SHM-10-10-112013	11/20/2013	NA	2.0 J	NA	77900	NA	48.7 J	NA	8500	NA	23300	NA	3050 J	NA	22900	0.39	0.36	6.53	11.98	557	75.2	256	0.55	0.0051 U	0.060 J	NA	1.5 U	NA	NA	61	2.9 J	15.8	NA	
	SHM-10-10-101014	10/10/2014	NA	2.6 J	NA	85800	NA	50 U	NA	10800	NA	25800	NA	4100 J	NA	31000	0.98	0.26	6.57	12.08	484	78.8	327	0.066 J	NA	NA	0.050 U	1.3 U	NA	NA	44	4.0 J	3.5	NA	
SHM-10-11	SHM-10-11	8/30/2010	356	342 J	23900	21200 J	60600	55700	2770	2530	2490	2320	5410	5150	12400	11800	4.05	1.68	6.12	13.19	419	-32	160	2.79	<0.002	0.019 J	NA	<0.10	22	NA	24	19	3.3	62	
	SHM-10-11-101910	10/19/2010	470	463	21900	22200	60500	61000	2840	2900	2160	2260	5310	5390	12700	13000	4.28	0.41	6.28	11.57	4.14	-42.1	140	3.13	0.01 J	< 0.01	NA	< 0.10	19	NA	23	19 J	3.4	71	
	SHM-10-11-102312	10/23/2012	NA	440	NA	20900	NA	56100	NA	2700 J	NA	NA	NA	4700 J	NA	12600	1.1	1.78	6.27	11.18	304	-34	76.7	3.4	<0.010	0.19	NA	2.0 U	NA	NA	26	29.3	NA	NA	
	SHM-10-11(EPA)	10/23/2012	460	NA	22000	NA	56000	NA	3000	NA	2200	NA	4400	NA	17000	NA	NA	NA	NA	NA	NA	NA	67	NA	NA	NA	NA	NA	NA	NA	25	28	NA	NA	
	SHM-10-11-052313	5/23/2013	NA	460	NA	22500	NA	65100	NA	3160 J	NA	2510	NA	4820 J	NA	14300	2.01	0.80	6.15	11.25	287	-46.1	102	3.9	0.004 U	0.31	NA	1.4 U	NA	NA	21.2	30.3	2.9	NA	
	DUP-052313	5/23/2013	NA	464	NA	22500	NA	64400	NA	2990 J	NA	2480	NA	4730 J	NA	13700	NA	NA	NA	NA	NA	NA	126	3.8	0.004 U	0.24	NA	1.4 U	NA	NA	21.2	31.6	2.8	NA	
	SHM-10-11-111913	11/19/2013	NA	432	NA	23400	NA	60400	NA	2630 J	NA	2400	NA	4880 J	NA	13900	0.45	0.33	6.41	10.63	421	-43.5	121	3.9	0.0051 U	0.088 J	NA	1.5 U	NA	NA	30	34.7	2.7	NA	
	DUPLICATE-111913	11/19/2013	NA	444	NA	24100	NA	60500	NA	2690 J	NA	2450	NA	4990 J	NA	14200	NA	NA	NA	NA	NA	NA	130	3.9	0.0051 U	0.11	NA	1.5 U	NA	NA	29.5	35	2.7	NA	
SHM-10-12	SHM-10-12	8/30/2010	2880	3560	25000	33000	78600	104000	1940	2500	5400	7000	5480	7040	7090	8780	8.43	3.55	6.04	14.41	460	-34.9	240	3.7	<0.002	0.035 J	NA	<0.10	31	NA	3.7	1.7	4.1	110	
	DUP-083010	8/30/2010	3210	3410	27900	30600	89700	96000	2190	2360	6120	6520	6190	6480	7880	8610	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-10-12-102010	10/20/2010	2980	3120	29000	29000	88700	90000	2180	2200	6070	6200	482-	4900	5220	5060	1.6	0.32	5.93	10.92	432	-14.5	240	3.8	< 0.02	< 0.01	NA	< 0.10	33	NA	4.4	1.4	4.3	130	
	DUP-102010	10/20/2010	3160	3000	29200	28300	90900	87400	2240	2120	6320	6030	4940	4670	5210	4870	NA	NA	NA	NA	NA	NA	230	3.61	< 0.002	< 0.01	NA	< 0.10	41	NA	4.4	1.3	4.5	140	
	SHM-10-12-102312	10/23/2012	NA	4100	NA	21900	NA	78600	NA	1800 J	NA	NA	NA	4300 J	NA	3500 J	0.2	0.29	5.74	11.49	322	8.4	131	4.3	<0.010	0.14	NA	2.0 U	NA	NA	2.5	<5.0	NA	NA	
	SHM-10-12 (EPA)	10/23/2012	3100	NA	23000	NA	76000	NA	1900	NA	5700	NA	4100	NA	7200	NA	NA	NA	NA	NA	NA	NA	65	NA	NA	NA	NA	NA	NA	NA	3.5	1.8	NA	NA	
	SHM-10-12 D (EPA)	10/23/2012	3100	NA	23000	NA	77000	NA	1900	NA	5800	NA	4100	NA	7300	NA	NA	NA	NA	NA	NA	NA	65	NA	NA	NA	NA	NA	NA	NA	3.5	1.8	NA	NA	
	SHM-10-12-052313	5/23/2013	NA	3580	NA	29700	NA	56300	NA	2720 J	NA	6450	NA	3630 J	NA	5440	4.36	0.26	6.09	11.84	302	-44.9	171	3.2	0.004 U	0.41	NA	1.4 U	NA	NA	7.3	7.9	23.9	NA	
	SHM-10-12-111913	11/19/2013	NA	3570	NA	25300	NA	89600	NA	2090 J	NA	6270	NA	4390 J	NA	4090 J	0.16	0.72	6.35	10.49	428	-19.3	210	3.5	0.0051 U	0.41	NA	1.5 U	NA	NA	4	3.8 J	3.5	NA	
	SHM-10-12-100714	10/7/2014	NA	3510	NA	24500	NA	84100	NA	2500 U	NA	6970	NA	4140 J	NA	3830 J	0.43	0.31	6.02	13.99	368	-29.1	191	3.9	NA	NA	0.078 J	1.3 U	NA	NA	3.5	4.0 J	3.9	NA	
SHM-10-13	GP-10-13-090110	9/1/2010	619 J	575	68000	61400	88600	84100	10500	9900	1900	1850 J	12500	12200	15300	14500	18.8	2.76	6.32	13.57	782	-68.6	380	9.7	< 0.002	0.01 J	NA	< 0.1	33	NA	18	< 0.12	5.6	140	
	SHM-10-13-101910	10/19/2010	700	672	67200	65000	95500	94600	9840	10100	2100	2060	12300	12500	15600	15900	12	0.12	6.27	12.48	743	-52.5	360	9.36	0.01 J	< 0.01	NA	< 0.10	36	NA	21	< 0.12	8.7	140	
	DUP-101910	10/19/2010	648	674	60300	64200	87500	94700	8720	9920	1960	2090	11000	12200	13900	16100	NA	NA	NA	NA	NA	NA	360	9.13	< 0.002	< 0.01	NA	< 0.10	36	NA	20	0.25 J	6.8	150	
	SHM-10-13-102312	10/23/2012	NA	670	NA	76300	NA	68800	NA	9500	NA	NA	NA	10500	NA	14900	14.2	0.11	6.42	12.49	597	-44.5	296	9.1	<0.010	0.19	NA	2.0 U	NA	NA	17	5.3 U	NA	NA	
	SHM-10-13 (EPA)	10/23/2012	630	NA	80000	NA	66000	NA	9800	NA	2200	NA	10000	NA	18000	NA	NA	NA	NA	NA	NA	NA	240	NA	NA	NA	NA	NA	NA	NA	18.0	0.11 J	NA	NA	
	SHM-10-13-052313	5/23/2013	NA	565	NA	65500	NA	83400 J	NA	8960	NA	1130	NA	11600	NA	14600	14.4	0.22	6.35	12.59	571	-91.7	292	9.0	0.004 U	0.14	NA	1.4 U	NA	NA	19.7	4.5 U	5.1	NA	
	SHM-10-13-100714	10/7/2014	NA	532	NA	72600	NA	55700	NA	9530	NA	1670	NA	11400	NA	19200	3.05	0.20	6.56	11.83	527	-112.2	266	6.9	NA	NA	0.13	1.3 U	NA	NA	24.5	22	4.7	NA	
SHM-10-14	SHM-10-14-090210	9/2/2010	4280	4100	69300	55300	75200	73000	4310	4150	4700	4720	18800	17600 J	15500	15200	34.7	0.18	6.35	14.48	645	-87.4	360	3.96	< 0.002	< 0.01	NA	< 0.10	43	NA	6.3	3.7	8.7	120	
	SHM-10-14-101910	10./19/10	5990 J	5860	70800	57900	98300	92700	3980	3720	4350 J	4180	11400	101000	8500	8080	34.5	0.36	6.35	11.99	693	-38.6	320	5.28	0.01 J	0.08	NA	< 0.10	62	NA	4.8	0.67 J	62	140	
	SHM-10-14-102312	10/23/2012	NA	6200 J	NA	43100	NA	94400	NA	3300 J	NA	NA	NA	6700	NA	5100	4.88	0.13	6.26	12.4	445	-41	194	3.0	<0.010	0.15	NA	2.0 U	NA	NA	5.0	5.0 U	NA	NA	
	SHM-10-14 (EPA)	10/23/2012	5900	NA	44000	NA	87000	NA	3300	NA	3900	NA	6200	NA	9000	NA	NA	NA	NA	NA	NA	NA	124	NA	NA	NA	NA	NA	NA	NA	4.5	1.1	NA	NA	
	SHM-10-14-052313	5/23/2013	NA	5540	NA	44300	NA	83100	NA	3420 J	NA	2800	NA	7020	NA	5610	10.08	0.20	6.24	11.43	467	-67.0	241	7.4	0.004 U	0.19	NA	1.4 U	NA	NA	5.8	6.4	21.3	NA	
	SHM-10-14-100814	10/8/2014	NA	5380	NA	47300	NA	92100	NA	3620 J	NA	2810	NA	7130	NA	5590	4.56	0.19	6.30	13.73	482	-76.1	283	0.065 U	NA	NA	0.074 J	1.3 U	NA	NA	5.5	1.8 J	23.2	NA	
SHM-10-15	GP-10-15-090110	9/1/2010	7930	8110	61300	61500	62500	63300	7700	7880	10400	10700	6910	6880	13700	13900	16.3	0.25	6.21	16.02	503	-52.7	210	2.67	0.01	<0.01	NA	<0.10	33	NA	5.7	3.8	4.2	82	
	SHM-10-15-090110	9/1/2010	7930	8110	61300	61500	62500	63300	7700	7880	10400	10700	6910	6880	13700	13900	16.3	0.25	6.21	16.02	503	-52.7	240	2.26	< 0.002	< 0.01	NA	< 0.10	22	NA	11.0	8.4	3.2	NA	
	DUP-090110	9/1/2010	7610	6460	58500	46800	58700	48900	7470	6050	9900	8240	6390	5200	13100	11200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-10-15-102010	10/20/2010	6090	6230	51200	51800	50400	52000	6440	6530	8440	8680	5350	5500	11600	12400	59.5	0.36	5.94	11.95	510	-10.9	230	2.15	0.01 J	< 0.01	NA	< 0.10	64	NA	12.0	10	4	95	
	SHM-10-15-102312	10/23/2012	NA	7000	NA	46800	NA	46600	NA	5800	NA	NA	NA	5100	NA	10400	5.1	0.2	6.43	11.98	376	-49	172	2.2	<0.010	0.12	NA	2.0 U	NA	NA	10.0	9.5 U	NA	NA	
	Duplicate-102312	10/23/2012	NA	7810	NA	45400 b	NA	44900	NA	5690	NA	NA	NA	4920 J	NA	10300 Q	NA	NA	NA	NA	NA	NA	213	2.5	<0.010	0.19	NA	<2.0	NA	NA	11.0	9.7	NA	NA	
	SHM-10-15 (EPA)	10/23/2012	5800	NA	49000	NA	45000	NA	6100	NA	8000	NA	4700	NA	14	NA	NA	NA	NA	NA	NA	NA	147	NA	NA	NA	NA	NA	NA	NA	9.5	10	NA	NA	
	SHM-10-15-052413	5/24/2013	NA	1090	NA	77200	NA	8290	NA	<5000	NA	1960	NA	6450	NA	6720	11.97	0.49	6.37	15.1	440	-73.9	196	1.4	0.004 U	0.079 U	NA	1.4 U	NA	NA	7.5	7.4	3.4	NA	
	SHM-10-15-112013	11/20/2013	NA	5740	NA	48800	NA	47400	NA	6030	NA	8210	NA	5070	NA	10700	10.31	0.38	6.51	10.41	48	-65.9	210	2.8	0.0051 U	0.28	NA	1.5 U	NA	NA	9.5	10.9	2.8	NA	
	SHM-10-15-100714	10/7/2014	NA	5870 J	NA	50100	NA	46500 J	NA	6190	NA	8530 J	NA	4860 J	NA	10600	29.7	0.08	6.45	12.26	351	-90.8	207	2.0	NA	NA	0.078 J	1.3 U	NA	NA	9.0	11.6	2.6	NA	
SHM-10-16	SHM-10-16-090210	9/2/2010	487	495	69700	73900	50200	53100	13800	14100	1710	1790	14600	15500	30800	31400	78.5	0.17	6.98	11.4	784	-233.8	330	3.31	< 0.002	< 0.01	NA	< 0.1	36	NA	31	2.9	5.3	91	
	DUP-090210	9/2/2010	542	489	76800	70700	55100	51100	15000	13500	1860	1680	15800	14700	33400	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	SHM-10-16-102010	10/20/2010	1180	1090	73200	68100	51800	46900	13100	12000	1250	1150	12500	11800	31500	30700	34.6	0.34	6.77	10.63	793	-129.2	320	3.34	< 0.002	< 0.01	NA	< 0.10	57	NA	28	3.2	10	100	
	SHM-10-16-102312	10/23/2012	NA	1600	NA	71200	NA	41700	NA	11100	NA	NA	NA	9800	NA	25300	0.65	0.26	6.64	10.15	533	-86.2	281	4.3	<0.010	0.14	NA	2.0 U	NA	NA	24.5	6.8 U	NA	NA	
	SHM-10-16 (EPA)	10/24/2012	1500	NA	74000	NA	<40	NA	12000	NA	<20	NA	9500	NA	31000	NA	NA	NA	NA	NA	NA	NA	247	NA	NA	NA	NA	NA	NA	NA	24	3	NA	NA	
	SHM-10-16-052813	5/28/2013	NA	1350	NA	72900	NA	42700	NA	11600	NA	1280	NA	10600	NA	26500	0.08	0.15	6.71	9.39	632	-128.0	309	5.4	0.004 U	0.18	NA	1.4 U	NA	NA	21	4.7 J	3.8	NA	
	SHM-10-16-112013	11/20/2013	NA	1530	NA	78800	NA	44500	NA	11800	NA	1480	NA	10300	NA	29400	0.84	0.19	6.75	9.39	677	-115.6	312	3.2	0.0051 U	0.25	NA	1.5 U	NA	NA	24	2.9 J	3.7	NA	
SHM-11-02	SHM-11-02-102212	10/22/2012	NA	7.1	NA	82700	NA	2000	NA	5900	NA	NA	NA	4700 J	NA	18000	19.6	0.21	7.32	14.43	468	-135	228	0.10 U	<0.010	0.15	NA	2.0 U	NA	NA	42	15.9	NA	NA	
	SHM-11-02-112013	11/20/2013	NA	3.2 J	NA	32900	NA	2470	NA	2960 J	NA	146	NA	7470	NA	21300	21.3	0.3	8.38	10.82	241	-279.2	92.4	0.087 U	0.0051 U	0.34	NA	1.5 U	NA	NA	35	9.9 J	37.9	NA	
	SHM-11-02-042414	4/24/2014	NA	2.0 U	NA	12400	NA	1270	NA	1810 J	NA	268	NA	7630	NA	18800	22.7	0.79	7.23	10.77	196	-118.3	51.5	0.066 U	NA	NA	0.050 U	1.3 U	NA	NA	34.7	5.3 J	42.0	NA	
	SHM-11-02-100714	10/8/2014	NA	2.0 U	NA	34000	NA	5030	NA	6030	NA	224	NA	5630	NA	20400	19	0.06	7.91	15.44	351	-289	109	0.075 J	NA	NA	0.084 J	1.3 U	NA	NA	40.5	1.2 J	20.8	NA	
SHM-11-06	SHM-11-06-102212	10/22/2012

GROUNDWATER MONITORING WELL RESULTS
Shepley's Hill Landfill, Devens Massachusetts

Well ID	Sample ID	Date	Arsenic		Calcium		Iron		Magnesium		Manganese		Potassium		Sodium		Turbidity	DO	pH	Temp	Spec Cond	ORP	Alkalinity	Ammonia	Nitrite	Nitrate	Nitrogen (Nitrite +Nitrate)	Sulfide	COD	TOC	Chloride	Sulfate	DOC	DIC	Notes
			Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	Total (ug/L)	Dissolved (ug/L)	NTU	mg/L		Celcius	uS/cm	mV	mg CaCO3/L	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
PZ-12-01	PZ-12-01-052813	5/28/2013	NA	441	NA	54500	NA	27100	NA	7200	NA	3930	NA	<5000	NA	27400	4.19	0.23	6.50	12.41	421	-86.3	201	1.4	0.004 U	0.32	NA	1.4 U	NA	NA	38.0	13.6	2.4	NA	
PZ-12-02	PZ-12-02-052113	5/21/2013	NA	627	NA	50900	NA	58600	NA	5760	NA	1330	NA	11100	NA	20500	4.58	0.15	6.37	12.33	665	-87.0	213	12.1	0.004 U	0.46	NA	1.4 U	NA	NA	42.2	4.5 U	2.8	NA	
PZ-12-03	PZ-12-03-052413	5/24/2013	NA	659	NA	59500	NA	40100	NA	8110	NA	2950	NA	8340	NA	45500	1.94	0.23	6.6	12.21	563	-105.4	227	2.9	0.004 U	0.51	NA	1.4 U	NA	NA	52.7	20.8	3.3	NA	
PZ-12-04	PZ-12-04-052413	5/24/2013	NA	610	NA	40900	NA	56300	NA	5160	NA	1310	NA	10500	NA	24900	4.29	0.29	6.53	13.29	447	-86.9	171	6.4	0.004 U	0.38	NA	1.4 U	NA	NA	50.7	5.0	3.5	NA	
PZ-12-05	PZ-13-05-052213	5/22/2013	NA	741	NA	47000	NA	67700	NA	5140	NA	1710	NA	9110	NA	16500	0.87	0.31	6.46	12.24	571	-99.6	188	0.081 U	0.004 U	0.34	NA	1.4 U	NA	NA	31.2	4.5 U	2.4	NA	
PZ-12-06	PZ-12-06-052413	5/24/2013	NA	244	NA	67300	NA	54600	NA	8140	NA	1350	NA	17100	NA	21800	2.9	1.57	6.23	13.02	700	-71.6	293	14.9	0.004 U	0.32	NA	1.4 U	NA	NA	51.0	10.4	29.5	NA	
PZ-12-07	PZ-12-07-052413	5/24/2013	NA	484	NA	24600	NA	29000	NA	2980 J	NA	1620	NA	3300 J	NA	9640	18	0.29	6.41	11.54	276	-390	105	1.1	0.004 U	0.5	NA	1.4 U	NA	NA	6.3	12.7	2.2	NA	
PZ-12-08	PZ-12-08-052413	5/24/2013	NA	1.9	NA	14000	NA	174	NA	2570 J	NA	361	NA	2810 J	NA	6580	9.2	2.68	5.90	10.63	125	131.7	46.4	0.087 J	0.004 U	0.95	NA	1.4 U	NA	NA	5.8	7.4	6.9	NA	
PZ-12-09	PZ-12-09-052113	5/21/2013	NA	1.1	NA	20000	NA	30 U	NA	2550 J	NA	176	NA	2460	NA	11200	3.46	3.83	6.34	13.24	187	112.6	55.3	0.081 U	0.004 U	0.34	NA	1.4 U	NA	NA	4.3	27.0	1.1	NA	
PZ-12-10	PZ-12-10-052213	5/22/2013	NA	0.69 J	NA	5370	NA	30 U	NA	845 J	NA	2.5 U	NA	1490 J	NA	1060 J	1.1	10.37	5.88	10.19	43	191.3	15.5	0.081 U	0.004 U	0.19	NA	1.4 U	NA	NA	1.8	4.5 U	2.0	NA	
SHM-13-01	SHM-13-01-112113	11/21/2013	NA	2.2 J	NA	3750 J	NA	30 U	NA	415 J	NA	7.4 J	NA	801 J	NA	31100	0.31	6.48	6.46	10.15	163	165.1	25.3	0.087 U	0.0051 U	0.46	NA	1.5 U	NA	NA	32	11.9	0.82 J	NA	
	DUPLICATE-112113	11/21/2013	NA	2.2 J	NA	3810 J	NA	30 U	NA	402 J	NA	7.6 J	NA	818 J	NA	31700	NA	NA	NA	NA	NA	NA	26.4	0.087 U	0.0051 U	0.45	NA	1.5 U	NA	NA	33	11.7	0.75 J	NA	
SHM-13-02	SHM-13-02-052913	5/29/2013	NA	2.5	NA	44200	NA	30 U	NA	3970 J	NA	7960	NA	3690 J	NA	10600	0.22	0.16	7.23	11.5	311	-107.7	160	0.13	0.004 U	0.079 U	NA	1.4 U	NA	NA	9.5	6.5	33.6	NA	
	SHM-13-02-112113	11/21/2013	NA	2.7 J	NA	40600	NA	250	NA	3740 J	NA	9490	NA	2390 J	NA	12300	1.84	0.1	6.99	10.89	24	-17	161	0.14	0.0051 U	0.059 U	NA	1.5 U	NA	NA	8	5.7 J	1.9	NA	
	SHM-13-02-101014	10/10/2014	NA	2.6 J	NA	64700	NA	261	NA	6340	NA	15800	NA	2600 J	NA	17200	0.26	0.22	6.72	12.04	430	-8.6	220	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	31	5.0 J	1.6	NA	
SHM-13-03	SHM-13-03-052913	5/29/2013	NA	318	NA	97700	NA	13600	NA	15000	NA	6740	NA	9460	NA	35400	1.20	0.14	6..56	11.72	730	-99.2	372	0.71	0.004 U	0.35	NA	1.4 U	NA	NA	39	5.6	4.4	NA	
	SHM-13-03-112013	11/20/2013	NA	137	NA	112000	NA	11200	NA	15300	NA	9640	NA	6970	NA	34700	0.54	0.4	6.5	10.26	563	-41.8	391	0.2	0.0051 U	0.059 U	NA	1.5 U	NA	NA	38	5.0 J	4.3	NA	
	SHM-13-03-042314	4/23/2014	NA	120	NA	71000	NA	6770	NA	9690	NA	7990	NA	5190	NA	27100	0.22	0.16	6.1	9.27	433	-12.5	287	0.066 U	NA	NA	0.050 U	1.3 U	NA	NA	24.2	4.7 J	7.3	NA	
	SHM-13-03-101014	10/10/2014	NA	80.8	NA	98400	NA	7590	NA	13600	NA	12100	NA	5710	NA	33400	0.69	0.13	6.53	12.63	557	-57.7	390	0.81	NA	NA	0.050 U	1.3 U	NA	NA	37.5	4.7 J	3.7	NA	
	Dup-101014	10/10/2014	NA	82.1	NA	98300	NA	7760	NA	13800	NA	11900	NA	5780	NA	33800	0.69	0.13	6.53	12.63	557	-57.7	393	0.81	NA	NA	0.050 U	1.3 U	NA	NA	37.0	4.8 J	3.8	NA	
SHM-13-04	SHM-13-04-052813	5/28/2013	NA	2060	NA	33100	NA	40900	NA	<5000	NA	2130	NA	<5000	NA	80200	3.63	0.71	6.46	11.7	717	-73.6	39.8	1.2	0.020	0.57	NA	1.4 U	NA	NA	200	10	1.8	NA	
	SHM-13-04-042414	4/24/2014	NA	61.1	NA	16000	NA	334	NA	1670 J	NA	238	NA	2800 J	NA	106000	2.18	3.21	6.35	10.57	866	92.4	29.6	0.54	NA	NA	0.60	1.3 U	NA	NA	167	10.0	0.92 J	NA	
	SHM-13-04-101314	10/13/2014	NA	693	NA	11100	NA	6410	NA	2500 U	NA	392	NA	2690 J	NA	68700	2.31	2.04	6.48	11.94	464	-13.2	41.4	0.065 U	NA	NA	0.31	1.3 U	NA	NA	110	12.5	1.6	NA	
SHM-13-05	SHM-13-05-052813	5/28/2013	NA	8.9	NA	111000	NA	597	NA	22800	NA	4680	NA	11000	NA	42400	2.05	0.27	6.88	11.14	629	-136.0	423	0.70	0.004 U	0.079 U	NA	1.4 U	NA	NA	37	12.3	4.7	NA	
	SHM-13-05-112113	11/21/2013	NA	6.8	NA	116000	NA	1860	NA	19800	NA	5720	NA	8910	NA	40000	2.11	0.44	7.94	10.27	44	-154.6	425	0.095 J	0.0051 U	0.059 U	NA	1.5 U	NA	NA	41.5	11.4	4.5	NA	
	SHM-13-05-101314	10/13/2014	NA	11	NA	118000	NA	4580	NA	19800	NA	5940	NA	8050	NA	38600	1.11	0.44	6.88	11.04	686	-159.0	455	0.59	NA	NA	0.050 U	1.3 U	NA	NA	36.0	8.4 J	3.6	NA	
SHM-13-06	SHM-13-06-061313	6/13/2013	NA	3180 J	NA	21400	NA	19700 J	NA	1440 J	NA	1830	NA	3210 J	NA	16300	4.07	0.14	7.16	12.43	287	-154.4	84	2.1	0.004 U	0.22	NA	1.4 U	NA	NA	19	6.4	1.0	NA	
	SHM-13-06-112113	11/21/2013	NA	2540	NA	18600	NA	39900 J	NA	1911 J	NA	2490	NA	3920 J	NA	59400	1.24	0.25	6.84	11.33	587	-119.4	33	2.8	0.0051 U	0.24	NA	1.5 U	NA	NA	145	11.4	1.5	NA	
	SHM-13-06-042414	4/24/2014	NA	2850	NA	12500	NA	25000	NA	1260 J	NA	1820	NA	3030 J	NA	49600	2.51	0.28	6.94	11.71	446	-104.3	61.3	0.066 U	NA	NA	0.25	1.3 U	NA	NA	69.7	8.9 J	1.5	NA	
	SHM-13-06-101314	10/13/2014	NA	2360	NA	14400	NA	25400	NA	2500 U	NA	1570	NA	3410 J	NA	78700	1.23	0.1	7.04	11.99	569	-145.6	45.8	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	130.0	9.9 J	1.1	NA	
SHM-13-07	SHM-13-07-112113	11/21/2013	NA	1340	NA	20900	NA	30000	NA	2720 J	NA	2710	NA	5310	NA	126000	4.7	0.14	6.8	12.5	773	-97.4	45	2.4	0.0052 J	0.26	NA	1.5 U	NA	NA	225	12.1	1.6	NA	
	SHM-13-07-042414	4/24/2014	NA	1280	NA	34300	NA	39200	NA	4220 J	NA	3660	NA	4580 J	NA	82500	26.8	0.29	6.84	10.97	734	-106.1	30.7	3.0	NA	NA	0.41	1.3 U	NA	NA	212	7.7 J	1.2	NA	
	SHM-13-07-101014	10/10/2014	NA	962	NA	16600	NA	25200	NA	2500 U	NA	2160	NA	4970 J	NA	106000	4.9	0.15	6.9	12.82	787	-126.3	62.1	2.8	NA	NA	0.050 U	1.3 U	NA	NA	165	16	8.8	NA	
SHM-13-08	SHM-13-08-061313	6/13/2013	NA	928	NA	23200	NA	35900	NA	3540 J	NA	941	NA	8360	NA	14200	2.92	0.74	6.84	12.75	378	-122.4	141	6.1	0.004 U	0.32	NA	1.4 U	NA	NA	8.5	7.3	2.8	NA	
	DUPLICATE-061313	6/13/2013	NA	972	NA	23200	NA	36600	NA	3580 J	NA	958	NA	8530	NA	14400	NA	NA	NA	NA	NA	NA	140	6.2	0.004 U	0.40	NA	1.4 U	NA	NA	8.5	7.4	2.8	NA	
	SHM-13-08-112113	11/21/2013	NA	994	NA	23200	NA	35400	NA	4080 J	NA	826	NA	8600	NA	11600	0.98	0.24	6.84	11.32	323	-131.1	116	5.1	0.0051 U	0.15	NA	1.5 U	NA	NA	8	3.7 J	3.2	NA	
	SHM-13-08-042414	4/24/2014	NA	1040	NA	30400	NA	50600	NA	4940 J	NA	1170	NA	9510	NA	15000	1.14	0.38	6.89	11.26	439	-123.8	173	2.9	NA	NA	0.32	1.3 U	NA	NA	14.8	4.9 J	3.8	NA	
	DUP-042414	4/24/2014	NA	1030	NA	31700	NA	51300	NA	4950 J	NA	1180	NA	9490	NA	15200	NA	NA	NA	NA	NA	NA	174	2.9	NA	NA	0.34	1.3 U	NA	NA	14.3	4.8 J	3.5	NA	
	SHM-13-08-101314	10/13/2014	NA	978	NA	26100	NA	52200 J	NA	3780 U	NA	1160	NA	12300	NA	85700	0.39	0.16	6.9	11.81	733	-146.1	140	8.9	NA	NA	0.071 J	1.3 U	NA	NA	130	6.5 J	3.6	NA	
SHM-13-14S	SHM-13-14S	2/19/2014	NA	2.0 U	NA	22200	NA	241	NA	2720 J	NA	55.5	NA	3600 J	NA	63900	1.97	0.59	5.88	6.53	440	96.3	58.0	0.60	NA	NA	1.5	1.3 U	NA	NA	91.0	9.6 J	1.2	NA	
	SHM-13-14S-101014	10/10/2014	NA	2.0 U	NA	21100	NA	94. 1 J	NA	2900 J	NA	86.9	NA	3570 J	NA	62700	0.88	0.45	5.87	12.82	320	139.4	75.2	0.065 U	NA	NA	0.5	1.3 U	NA	NA	100.0	8.1 J	1.9	NA	
SHM-13-14D	SHM-13-14D	2/19/2014	NA	7.9	NA	10100	NA	11800	NA	1170 J	NA	1190	NA	4340 J	NA	55200	26.0	0.09	6.85	9.18	349	-82	81.0	1.8	NA	NA	0.22	1.3 U	NA	NA	48.0	12.3	1.9	NA	
	SHM-13-14D-101014	10/10/2014	NA	9.6	NA	24900	NA	20900	NA	2960 J	NA	2910	NA	7520	NA	178000	1.2	0.19	6.75	12.4	1233	-79.6	43.6	3.3	NA	NA	0.071 J	1.3 U	NA	NA	320.0	7.2 J	1.3	NA	
SHM-13-15	SHM-13-15	2/19/2014	NA	3.8 J	NA	86900	NA	623	NA	12700	NA	4860	NA	5450	NA	29200	42.3	0.44	6.59	9.16	642	-172.7	273	0.68	NA	NA	0.050 U	1.3 U	NA	NA	46.0	7.7 J	2.9	NA	
	DUP	2/19/2014	NA	3.9 J	NA	86900	NA	633	NA	12700	NA	4870	NA	5390	NA	29200	NA	NA	NA	NA	NA	NA	278	0.65	NA	NA	0.050 U	1.3 U	NA	NA	46.5	5.2 J	2.9	NA	
	SHM-13-15-101014	10/10/2014	NA	8.1	NA	80400	NA	1050	NA	11700	NA	4480	NA	5080	NA	30700	0.23	0.15	6.56	13.35	704	20.4	315	0.94	NA	NA	0.050 U	1.3 U	NA	NA	37.5	5.5 J	2.8	NA	
SHP-13-03	SHP-13-03-042314	4/23/2014	NA	7.9	NA	19200	NA	115	NA	2690 J	NA	1400	NA	2520 J	NA	59900	NA	5.6	8.79	13.13	434	-106.0	51.5	0.066 U	NA	NA	0.050 U	1.3 U	NA	NA	113	6.4 J	4.0	NA	
EPA-PZ-2012-1A	EPA-PZ012-1A-101314	10/13/2014	NA	2.0 U	NA	19700	NA	121	NA	2500 U	NA	937	NA	2500 U	NA	4450	0.36	0.38	5.93	10.09	145	109	40.3	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	21.5	5.1 J	2.2	NA	
	Duplicate-101314	10/13/2014	NA	2.0 U	NA	19900	NA	119	NA	2500 U	NA	941	NA	2500 U	NA	4380 J	0.36	0.38	5.93	10.09	145	109	40.3	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	21.5	4.8 J	1.4	NA	
EPA-PZ-2012-1B	EPA-PZ012-1B-101314	10/13/2014	NA	160	NA	73800	NA	21500	NA	10400	NA	6900	NA	8320	NA	29300	28.2	0.14	6.54	10.92	587	-58.8	304	0.074 J	NA	NA	0.050 U	1.3 U	NA	NA	16.5	3.8 J	2.4	NA	
EPA-PZ-2012-2A	EPA-PZ012-2A-101414	10/14/2014	NA	2.0 U	NA	4090 J	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	0.69	5.63	5.89	10.64	40	223.4	7.6	0.065 U	NA	NA	0.086 J	1.3 U	NA	NA	1.5	7.7 J	1.2	NA	
EPA-PZ-2012-2B	EPA-PZ012-2B-101414	10/14/2014	NA	2.0 U	NA	29900	NA	51.7 J	NA	4750 J	NA	5910	NA	7060	NA	14300	0.55	0.56	6.37	11.5	298	112.9	152	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	11.5	3.5 J	2.2	NA	
EPA-PZ-2012-3A	EPA-PZ012-3A-100814	10/8/2014	NA	21.2	NA	20700	NA	19200	NA	3350 J	NA	730	NA	4760 J	NA	10200	0	0.5	5.86	11.68	299	0.4	108	0.065 U	NA	NA	0.071 J	1.3 U	NA	NA	15.0	1.2 J	8.4	NA	
EPA-PZ-2012-3B	EPA-PZ20123B-100914	10/9/2014	NA	3830	NA	52700	NA	62100	NA	9120	NA	5930	NA	8300	NA	18200	12.1	0.21	6.7	11.18	658	-113.9	265	0.065U	NA	NA	0.11	1.3 U	NA	NA	15.5	48.6	2.5	NA	
EPA-PZ-2012-4A	EPA-PZ012-4A-100814	10/8/2014	NA	4.8	NA	55400	NA	16500	NA	8300	NA	2740	NA	5050	NA	23700	0.47	0.03	6.03	13.04	690	-26.8	45.8	0.065 U	NA	NA	0.085 J	1.3 U	NA	NA	145.0	10.4	6.3	NA	
EPA-PZ-2012-4B	EPA-PZ-2012-4B-100614	10/6/2014	NA	2680	NA	39700	NA	76800	NA	7020	NA	784	NA	9200	NA	12800	3.33	0.35	6.6	12.92	578	-118.5	208	4.9	NA	NA	0.12	1.3 U	NA	NA	15.5	4.9 J	2.6	NA	
	SHL-Duplicate-100614	10/6/2014	NA	2970	NA	41000	NA	79300	NA	7510	NA	876	NA	9430	NA	13300	3.33	0.35	6.6	12.92	578	-118.5	203	4.9	NA	NA	0.33	1.3 U	NA	NA	15.5	2.2 J	3.6	NA	
EPA-PZ-2012-5A	EPA-PZ2012-5A-101414	10/14/2014	NA	2.0 U	NA	4600 J	NA	6450	NA	2500 U	NA	85.6	NA	2500 U	NA	5360	2.68	0.07	5.57	11.27	93	71.1	24	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	16.5	7.2 J	6	NA	
EPA-PZ-2012-5B	EPA-PZ2012-5B-101414	10/14/2014	NA	3.2 J	NA	73400	NA	471	NA	10000	NA	11900	NA	7070	NA	30400	0.01	0.16	6.44	11.01	598	34.3	311	0.071 J	NA	NA	0.050 U	1.3 U	NA	NA	6.5	3.6 J	1.9	NA	
EPA-PZ-2012-6A	EPA-PZ2012-6A-100914	10/9/2014	NA	2.0 U	NA	22000	NA	50 U	NA	2500 U	NA	7.5 U	NA	2850 J	NA	31400	0.97	7.4	6.28	9.37	323	177.3	31.6	0.32	NA	NA	0.68	1.3 U	NA	NA	41.0	21.9	0.87 J	NA	
EPA-PZ-2012-6B	EPA-PZ2012-6B-100914	10/9/2014	NA	515	NA	13300	NA	18000	NA	2500 U	NA	1020	NA	2500 U	NA	2500 U	0.73	0.54	6.94	9.84	158	-123.2	49.1	0.14	NA	NA	0.050 U	1.3 U	NA	NA	1.5	3.7 J	9.5	NA	
EPA-PZ-2012-7A	EPA-PZ2012-7A-101414	10/14/2014	NA	2.0 U	NA	17800	NA	50 U	NA	2500 U	NA	121	NA	3800 J	NA	105000	1.04	1.8	6.6	13.19	604	97	60	0.065 U	NA	NA	0.22	1.3 U	NA	NA	150.0	9.3 J		NA	
EPA-PZ-2012-7B	EPA-PZ2012-7B-101414	10/14/2014	NA	1250	NA	15600	NA	34800	NA	2500 U	NA	1460	NA	3030 J	NA	3140 J	3.18	0.2	6.67	12.9	229	-92.9	77.4	0.065 U	NA	NA	0.050 U	1.3 U	NA	NA	0.77 U	4.9 J	2.4	NA	
RB	RB-112013	9/6/2010	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-112113	11/21/2013	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Rinse Blank	2/19/2014	NA	2.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-042214	4/22/2014	NA	2.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-042314	4/23/2014	NA	2.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-042414	4/24/2014	NA	2.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-100614	10/6/2014	NA	2.0 U	NA	2500 U	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-100714	10/7/2014	NA	2.0 U	NA	2500 U	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-100814	10/8/2014	NA	2.0 U	NA	2500 U	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-100914	10/9/2014	NA	2.0 U	NA	2500 U	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-101014	10/10/2014	NA	2.0 U	NA	2500 U	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-101314	10/13/2014	NA	2.0 U	NA	2500 U	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RB-101414	10/14/2014	NA	2.0 U	NA	2500 U	NA	50 U	NA	2500 U	NA	7.5 U	NA	2500 U	NA	2500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Notes:

NA: Not Applicable
ug/L: micrograms per liter
mg/l: miligrams per liter
J: Estimated Results
B: Analyte was detected in the associated me
Q: Absoulte value of concentration is greater
b: Absoulte value of concentration is greater

LANDFILL GAS MONITORING RESULTS

(2010-2014)

2010 Shepley Hill LF
LGP Sampling Data

Date: 1/6/2010 Weather: Sunny, 25, 12" of snow on cap, BP @ 29.39 Field Team: Fred Santos & Dave Reault

		Initial Readings									Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (GEM)
1015	01-01X	0	20.1	0	0	0	0.6	0	2	83	0	20	0	0	0	0.7	0	29.39
1020	09-01X-A	0	20.1	0	0	0	0.5	0	2	157	0	19.9	0	0	0	0.8	0	29.39
1025	09-01X-B	0	20.1	0	0	0	0.3	0	2	259	0	19.7	0	0	0	1.2	0	29.39
1030	01-02X	0	20.4	0	0	0	0.3	0	2	83	0	19.3	0	0	0	1.7	0	29.39
1035	09-02X	0	20.4	0	0	0	0.2	0	2	204	0	19.4	0	0	0	1.8	0	29.39
1040	01-03X	0	20.5	0	0	0	0.2	0	2	83	0	19.9	0	0	0	1.1	0	29.39
1045	09-03X	0	20.5	0	0	0	0.2	0	2	167	0	19.9	0	0	0	1.5	0	29.39
1050	01-04X	0	20.4	0	0	0	0.4	0	2	83	0	20.3	0	0	0	0.4	0	29.39
1055	09-04X	0	20.5	0	0	0	0.2	0	2	120	0	20.3	0	0	0	0.5	0	29.39
1100	05-05X	0	14.3	0	67	0	9.2	3.4	2	93	0	14	0	0	0	7.8	0	29.39
1105	09-05X	0	9.1	0	25	0	16.7	1.2	2	167	0	3.6	0	28	0	17.5	1.4	29.39
1110	05-06X	0	18	0	0	0	1.8	0	2	93	0	15	0	0	0	2.8	0	29.39
1115	09-06X	0	16.9	0	0	0	5.9	0	2	120	0	10.8	0	0	0	5.6	0	29.39
1120	05-07X	0	15.1	0	0	0	3.7	0	2	65	0	14.7	0	0	0	5.2	0	29.39
1125	05-08X	0	16.5	0	0	0	4.5	0	2	93	0	3.1	0	0	0	17.3	0	29.39
1130	09-08X	0	6.4	0	41	0	17.1	1.9	2	185	0	0.9	0	77	0	19.3	3.9	29.39
1135	05-09X	0	11.2	0	22	0	7.7	1.1	2	93	0	8.3	0	0	0	9.6	0	29.39
1140	09-09X	0	4.4	0	29	0	12.9	1.5	2	185	0	1.2	0	28	0	15.8	1.4	29.39
1300	05-10X	0	14.8	0	0	0	2.6	0	2	93	0	11	0	0	0	8.7	0	29.31
1305	09-10X	0	13.1	0	0	0	7.4	0	2	148	0	10.9	0	0	0	8.1	0	29.31
1310	05-11X	0	16.8	0	0	0	4.2	0	2	83	0	6.6	0	0	0	10.9	0	29.31
1315	09-11X	0	5.6	0	72	0	14.7	3.7	2	139	0	16.3	0	21	0	1.7	1	29.31
1320	05-13X	0	20.3	0	0	0	1.9	0	2	56	0	17.5	0	0	0	1.1	0	29.31
1325	05-14X	0	13.8	0	0	0	4	0	2	93	0	8.5	0	0	0	5.8	0	29.31
1330	09-15X	0	19.1	0	0	0	3.5	0	2	111	0	16.1	0	0	0	6.6	0	29.31

Gas Well ID	Depth to Groundwater (ft)	Screened Interval (ft)	Screen Length (ft)	End of Boring (ft)
LGW-09-14X	7.19	2-12	10	13

*** ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane was detected.**

2010 Shepley Hill LF
LGP Sampling Data

Date: 1/12/2010 Weather: Clear, 28, windy, BP @ 29.89 Field Team: Dave Reault

		Initial Readings									Post Purge Readings							
Time	**Well**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 ppm**	**CH4 %**	**Purge Rate (lpm)**	**Purge Time (sec)**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 %**	**CH4 %**	**BP (GEM)**
1235	09-05X	0	14.9	0	5	0	7.8	0.3	2	167	0	6.3	0	0	0	13.7	0	29.89
1302	09-08X	0	13.1	0	11	0	13	0.6	2	185	0	0	0	21	0	18.6	1.1	29.89
1308	09-09X	0	13.2	0	3	0	9.3	0.2	2	185	0	1.6	0	0	0	14.8	0	29.89
1319	09-11X	0	8.4	0	4	0	12.5	0.2	2	139	0	13	0	0	0	9.3	0	29.89

2011 Shepley's Hill Landfill Landfill Gas Sampling Data

Date: 10/18/2011 Weather: Cloudy, 45 F Field Team: Dave C, Fred R

		Initial Readings									Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP
0950	LGP-01-01X	0	21.3	0	0	0	0.9	0	2	83	0	21.3	0	0	0	1.0	0	29.51
1030	LGP-09-01XA	0	21.2	0	0	0	1.1	0	2	157	0	21.1	0	0	0	1.1	0	29.55
1020	LGP-09-01XB	0	22	0	0	0	0.7	0	2	259	0	21.1	0	0	0	1.0	0	29.51
1030	LGP-01-02X	0	19	0	0	0	3.4	0	2	83	0	19.5	0	0	0	2.8	0	29.52
1035	LGP-09-02X	0	20.1	0	0	0	2.2	0	2	204	0	19.1	0	0	0	3.2	0	29.54
1053	LGP-01-03X	0	20.6	0	0	0	1.5	0	2	83	0	20.5	0	0	0	1.7	0	29.55
1059	LGP-09-03X	0	20.1	0	0	0	2.0	0	2	167	0	20.1	0	0	0	2.0	0	29.49
1110	LGP-01-04X	0	20.9	0	0	0	1.1	0	2	83	0	21.0	0	0	0	1.1	0	29.81
1114	LGP-09-04X	0	20.7	0	0	0	1.3	0	2	120	0	20.7	0	0	0	1.2	0	29.79
1121	GV-1	0	21.9	0	0	0	0	0	4	167	0	21.8	0	0	0	0	0	29.80
1130	GV-2	0	21.8	0	0	0	0	0	4	167	0	21.7	0	0	0	0	0	29.78
1149	GV-4	0	21.6	0	0	0	0	0	4	167	0	21.4	0	0	0	0	0	29.71
1203	GV-3	0	21.5	0	0	0	0	0	4	167	0	21.6	0	0	0	0	0	29.76
1211	GV-6	0	21.7	0	0	0	0	0	4	167	0	21.5	0	0	0	0	0	29.80
1225	GV-9	0	21.3	0	0	0	0	0	4	167	0	21.2	0	0	0	0	0	29.65
1239	GV-10	0	21.1	0	0	0	0	0	4	167	0	21.1	0	0	0	0	0	29.62
1317	GV-7	0	21.2	0	0	0	0.1	0	4	167	0	21.0	0	0	0	0.1	0	29.71
1252	GV-11	0	20.9	0	0	0	0.2	0	4	167	0	20.9	0	2.0	0	0.2	0.1	29.67
1305	GV-8	0	20.3	0	1.0	0.8	0	0	4	167	0	20.3	0	0	0	0.5	0	29.70
1140	GV-5	0	21.7	0	0	0	0	0	4	167	0	21.8	0	0	0	0	0	29.77

2011 Shepley's Hill Landfill Landfill Gas Sampling Data

Date: 10/21/2011 Weather: Clear Sky, 50 F Field Team: Dave Comeau

		Initial Readings									Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP
0948	LGP-05-05X	0	6.5	0	>100	0	17.6	13.9	2	93	0	16.5	0	0	0	7.0	0	29.07
0955	LGP-09-05X	0	21.5	0	0	0	0	0	2	167	0	14.9	0	3	0	8.7	0.1	29.07
1002	LGP-05-06X	0	14.1	0	0	0	4.5	0	2	93	0	6.5	0	0	0	7.4	0	29.07
1010	LGP-09-06X	0	2.6	0	0	0	10.4	0	2	120	0	21.5	0	0	0	0	0	29.07
1015	LGP-05-07X	0	11.7	0	>100	0	9.0	4.7	2	65	0	11.4	0	0	0	9.5	0	29.07
1025	LGP-05-08X	0	17.8	0	46	0	4.3	2.3	2	93	0	1.4	0	69	0	18.1	3.4	29.07
1035	LGP-09-08X	0	21.7	0	0	0	0	0	2	185	0	2.5	0	>100	0	17.2	5.85	29.07
1110	LGP-05-09X	0	3.3	0	>100	0	13.7	8.8	2	93	0	0.0	0	>100	0	16.5	6.0	29.07
1115	LGP-09-09X	0	21.3	0	0	0	0	0	2	185	0	1.7	0	>100	0	16.0	7.1	29.07
1135	LGP-05-10X	0	15.2	0	>100	0	7.0	5.2	2	93	0	9.8	0	38	0	12.2	1.9	29.07
1128	LGP-09-10X	0	19.1	0	47	0	3.1	2.0	2	148	0	0.1	0	>100	0	23.5	14.2	29.07
1140	LGP-05-11X	0	5.9	0	>100	0	13.6	5.3	2	83	0	20.6	0	0	0	2.1	0	29.07
1145	LGP-09-11X	0	0.1	0	>100	0	24.7	29.5	2	139	0	0.0	0	>100	0	24.7	26.5	29.07
1225	LGP-05-13X	0	18.2	0	2	0	3.1	0	2	56	0	12.8	0	0	0	6.3	0	29.07
1216	LGP-05-14X	0	21.3	0	0	0	0.1	0	2	93	0	4.4	0	62	0	4.8	3.1	29.07
1230	LGP-09-15X	0	11.2	0	0	0	6.3	0	2	111	0	4.0	0	0	0	11.0	0	29.07
1208	GV-13	0	21.6	0	0	0	0	0	4	167	0	21.5	0	0	0	0	0	29.07
1250	GV-12	0	21.4	0	0	0	0	0	4	167	0	21.4	0	0	0	0	0	29.07
1157	GV-14	0	21.7	0	0	0	0	0	4	167	0	21.7	0	0	0	0	0	29.07
1040	GV-15	0	21.5	0	0	0	0	0	4	375	0	21.4	0	0	0	0	0	29.07
0900	GV-16	0	21.9	0	0	0	0	0	4	375	0	21.5	0	0	0	0	0	29.07
0920	GV-17	0	21.4	0	0	0	0	0	4	375	0	21.1	0	0	0	0	0	29.07
0935	GV-18	0	21.1	0	0	0	0	0	4	375	0	21.4	0	0	0	0	0	29.07

ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane readings were detected.

Gas Well ID	Depth to Groundwater (ft)	Screened Interval (ft)	Screen Length (ft)	End of Boring (ft)
LGW-09-14X	5.39	2-12	10	13

Annual Landfill Gas Monitoring
Shepley's Hill Landfill
Devens, Massachusetts
October 2012

Date: 10-26-12 **Weather: Sunny, 60 F** **Field Team: Jonathan Chaffee / Bill Borowiec**

		Initial Readings									Post Purge Readings							
ID	Time	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Purge Rate (lpm)	Purge Time (sec)	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Bar. Pres.("Hg)
GV-1	12:54	0.2	8.6	0	16	0	9.5	0.8	4	167	0.5	8.0	0	23	0	10.8	1.1	29.87
GV-2	13:05	0.4	9.9	0	87	0	9.6	4.3	4	167	0.6	4.0	0	>100	0	15.4	9.3	29.87
GV-3	13:22	0.0	20.9	0	0	0	0.0	0.0	4	167	0.0	20.9	0	0	0	0.0	0.0	29.87
GV-4	13:15	0.6	7.4	0	72	0	10.4	3.4	4	167	0.5	11.3	0	39	0	6.8	1.9	29.87
GV-5	13:55	1.5	13.4	0	1	0	5.2	0.0	4	167	0.2	14.0	0	0	0	4.8	0.0	29.87
GV-6	13:31	0.4	5.8	0	>100	0	12.8	7.5	4	167	0.7	5.7	0	85	0	11.4	4.2	29.87
GV-7	14:15	0.5	1.1	0	>100	2	12.1	6.6	4	167	0.4	1.2	0	63	0	11.1	3.2	29.87
GV-8	14:05	0.7	10.1	0	1	0	7.0	0.1	4	167	0.1	9.1	0	0	1	7.4	0.0	29.87
GV-9	13:40	0.6	3.0	0	99	0	11.7	4.9	4	167	1.2	3.2	0	>100	0	18.1	22.0	29.87
GV-10	14:22	0.3	2.8	0	50	2	10.5	2.6	4	167	0.2	4.0	0	30	2	9.5	1.5	29.87
GV-11	14:30	0.2	11.8	0	9	0	5.2	0.5	4	167	0.1	11.3	0	16	0	5.1	0.8	29.87
GV-12	14:40	0.1	0.9	0	>100	0	9.3	6.1	4	167	0.2	1.0	0	>100	1	10.1	6.5	29.87
GV-13	15:51	1.5	19.4	0	77	0	2.0	3.8	4	167	0.5	18.1	0	>100	0	3.7	5.2	29.77
GV-14	15:37	0.6	20.9	0	>100	0	15.7	29.5	4	167	0.5	3.0	0	>100	0	19.7	34.9	29.87
GV-15	15:27	1.0	1.5	0	>100	4	22.5	24.3	4	375	0.4	1.5	0	>100	1	22.6	23.9	29.87
GV-16	14:50	0.3	1.2	0	>100	2	20.3	14.1	4	375	0.4	2.2	0	>100	2	20.3	13.7	29.87
GV-17	15:02	0.0	3.3	0	>100	2	22.7	20.7	4	375	0.3	2.7	0	>100	2	22.9	20.9	29.87
GV-18	15:15	0.5	5.3	0	>100	4	25.8	34.6	4	375	0.4	0.8	0	>100	3	26.3	35.5	29.87
LGP-01-01X	7:55	0.0	20.9	0	0	0	0.7	0.0	2	83	0.0	20.3	0	0	0	0.7	0.0	29.88
LGP-09-01XA	8:00	0.0	20.3	0	0	0	0.8	0.0	2	157	0.0	20.4	0	0	0	0.8	0.0	29.89
LGP-09-01XB	8:06	0.1	20.9	0	0	0	0.9	0.0	2	259	0.0	20.9	0	0	0	0.9	0.0	29.89
LGP-01-02X	8:26	0.0	19.8	0	0	0	1.4	0.0	2	83	0.0	20.2	0	0	0	1.5	0.0	29.89
LGP-09-02X	8:20	0.1	19.6	0	0	0	1.7	0.0	2	204	0.0	19.7	0	0	0	1.7	0.0	29.89
LGP-01-03X	8:47	0.0	20.2	0	0	0	1.1	0.0	2	83	0.0	20.2	0	0	0	1.1	0.0	29.91
LGP-09-03X	8:40	0.4	19.8	0	0	0	1.4	0.0	2	167	0.0	19.9	0	0	0	1.5	0.0	29.91
LGP-01-04X	8:54	0.0	20.5	0	0	0	0.8	0.0	2	83	0.0	20.9	0	0	0	0.8	0.0	29.91
LGP-09-04X	9:00	0.0	20.4	0	0	0	0.8	0.0	2	120	0.0	20.4	0	0	0	0.9	0.0	29.91
LGP-05-05X	9:10	0.3	14.4	0	3	0	7.1	0.2	2	93	0.0	12.4	0	0	0	9.7	0.0	29.91
LGP-09-05X	9:18	2.5	10.6	0	30	0	14.4	1.5	2	167	0.2	9.3	0	0	0	13.0	0.0	29.91
LGP-05-06X	9:37	0.0	17.5	0	0	0	0.0	0.0	2	93	0.0	15.9	0	0	0	4.9	0.0	29.91
LGP-09-06X	9:28	0.2	10.2	0	0	0	8.6	0.0	2	120	0.0	10.9	0	0	0	8.4	0.0	29.91
LGP-05-07X	9:45	0.1	15.4	0	0	0	7.7	0.0	2	65	0.0	13.2	0	0	0	6.8	0.0	29.91
LGP-05-08X	9:55	0.8	9.8	0	0	0	4.4	0.0	2	93	0.0	7.7	0	0	0	13.5	0.0	29.91
LGP-09-08X	10:05	0.8	5.6	0	0	1	3.8	0.0	2	185	0.1	2.2	0	4	0	18.6	0.2	29.91

Annual Landfill Gas Monitoring
Shepley's Hill Landfill
Devens, Massachusetts
October 2012

		Initial Readings									Post Purge Readings							
ID	Time	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Purge Rate (lpm)	Purge Time (sec)	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Bar. Pres.("Hg)
LGP-05-09X	10:15	0.1	13.8	0	0	0	7.2	0.0	2	93	0.0	13.2	0	0	0	7.9	0.0	29.91
LGP-09-09X	10:25	0.4	17.5	0	0	0	1.0	0.0	2	185	0.1	7.3	0	4	0	13.1	0.0	29.91
LGP-05-10X	10:51	0.1	14.6	0	0	0	4.6	0.0	2	93	0.1	10.1	0	0	0	10.5	0.0	29.89
LGP-09-10X	11:00	0.1	17.2	0	0	0	9.5	0.0	2	148	0.1	7.0	0		0	14.4	0.0	29.89
LGP-05-11X	10:35	0.2	15.9	0	0	0	12.6	0.0	2	83	0.0	9.8	0	0	0	10.8	0.0	29.91
LGP-09-11X	10:41	1.0	1.5	0	54	0	10.5	0.8	2	139	0.2	0.8	0	3	0	18.8	0.1	29.91
LGP-05-13X	11:21	0.0	18.0	0	0	0	5.4	0.0	2	56	0.0	13.3	0	0	0	6.8	0.0	29.88
LGP-05-14X	11:30	0.0	6.1	0	0	0	13.3	0.0	2	93	0.0	8.5	0	0	0	13.4	0.0	29.88
LGP-09-15X	11:39	0.1	15.9	0	0	0	6.6	0.0	2	111	0.0	13.7	0	0	0	7.0	0.0	29.88

Notes:
VOC = Volatile Organic Compounds
O_2 = Oxygen
LEL = Lower Explosive Limit
CO = Carbon Monoxide
CO_2 = Carbon Dioxide
CH_4 = Methane
H_2S = Hydrogen Sulfide
"Hg = inches of Mercury
lpm = Liters per minute
sec = Seconds
ppm = Parts per million
% = Percentage

Annual Landfill Gas Monitoring
Shepley's Hill Landfill
Devens, Massachusetts
November 2013

Date: 11-13-12 **Weather: Sunny, 40 Degrees F** **Field Team: Jonathan Chaffee / Matt Bedford**

		Initial Readings									Post Purge Readings							
ID	**Time**	**VOC (ppm)**	**0_2 (%)**	**H_2S (ppm)**	**LEL (%)**	**CO (ppm)**	**$C0_2$ (%)**	**CH_4 (%)**	**Purge Rate (lpm)**	**Purge Time (sec)**	**VOC (ppm)**	**0_2 (%)**	**H_2S (ppm)**	**LEL (%)**	**CO (ppm)**	**$C0_2$ (%)**	**CH_4 (%)**	**Bar. Pres.("Hg)**
GV-1	8:46	0.0	20.9	0	0	0	0.1	0.0	4	167	0.0	20.9	0	0	0	0.2	0.0	29.98
GV-2	8:56	0.0	20.9	0	0	0	0.1	0.0	4	167	0.0	20.9	0	0	0	0.1	0.0	29.98
GV-3	9:09	0.1	20.9	0	0	0	0.1	0.0	4	167	0.0	20.9	0	0	0	0.1	0.0	29.98
GV-4	9:18	0.0	20.9	0	0	0	0.1	0.0	4	167	0.0	20.9	0	0	0	0.1	0.0	29.98
GV-5	9:48	0.0	20.9	0	0	0	0.1	0.0	4	167	0.0	20.9	0	0	0	0.1	0.0	29.98
GV-6	9:29	0.0	20.9	0	0	0	0.1	0.0	4	167	0.0	20.9	0	0	0	0.1	0.0	29.98
GV-7	9:57	0.0	20.7	0	0	0	0.1	0.0	4	167	0.0	20.5	0	0	0	0.1	0.0	29.98
GV-8	10:04	0.0	20.3	0	0	0	0.1	0.0	4	167	0.0	20.2	0	0	0	0.1	0.0	29.98
GV-9	9:39	0.0	20.9	0	0	0	0.1	0.0	4	167	0.0	20.9	0	0	0	0.1	0.0	29.98
GV-10	10:22	0.0	20.7	0	0	0	0.2	0.0	4	167	0.0	20.6	0	0	0	0.1	0.0	29.98
GV-11	10:14	0.0	20.6	0	0	0	0.1	0.0	4	167	0.0	20.6	0	0	0	0.2	0.0	29.98
GV-12	11:00	0.0	20.4	0	0	0	0.2	0.0	4	167	0.0	20.6	0	0	0	0.2	0.0	29.98
GV-13	11:11	0.1	20.6	0	0	0	0.4	0.0	4	167	0.0	20.5	0	6	0	0.4	0.0	29.98
GV-14	12:30	0.2	11.2	0	>100	0	6.3	7.9	4	167	0.3	8.1	0	>100	0	8.3	10.3	29.91
GV-15	14:39	0.3	6.4	0	75	0	10.5	7.9	4	375	0.2	4.8	0	>100	0	11.4	8.6	29.91
GV-16	10:45	0.0	20.8	0	0	0	0.3	0.0	4	375	0.0	20.0	0	0	0	0.3	0.0	29.98
GV-17	10:30	0.0	20.5	0	0	0	0.3	0.0	4	375	0.0	20.0	0	0	0	0.3	0.0	29.98
GV-18	14:23	0.2	5.9	0	>100	0	15.5	16.2	4	375	0.2	3.2	0	>100	0	17.9	18.9	29.91
LGP-01-01X	7:36	0.0	20.8	0	0	0	0.4	0.0	2	83	0.0	20.9	0	0	0	0.5	0.0	29.98
LGP-09-01XA	7:42	0.0	20.9	0	0	0	0.7	0.0	2	157	0.0	20.9	0	0	0	0.7	0.0	29.98
LGP-09-01XB	7:50	0.2	20.9	0	0	0	0.2	0.0	2	259	0.0	20.9	0	0	0	1.0	0.0	29.98
LGP-01-02X	8:02	0.0	20.9	0	0	0	0.9	0.0	2	83	0.0	20.8	0	0	0	0.9	0.0	29.98
LGP-09-02X	8:07	0.2	20.9	0	0	0	1.1	0.0	2	204	0.1	20.6	0	0	0	1.3	0.0	29.98
LGP-01-03X	8:15	0.0	20.8	0	0	0	0.9	0.0	2	83	0.0	20.7	0	0	0	0.9	0.0	29.98
LGP-09-03X	8:20	0.1	20.7	0	0	0	1.2	0.0	2	167	0.0	20.6	0	0	0	1.3	0.0	29.98
LGP-01-04X	8:27	0.0	20.9	0	0	0	0.5	0.0	2	83	0.0	20.9	0	0	0	0.5	0.0	29.98
LGP-09-04X	8:33	0.1	20.9	0	0	0	0.6	0.0	2	120	0.0	20.8	0	0	0	0.7	0.0	29.98
LGP-05-05X	14:10	0.2	17.1	0	13	0	7.6	0.4	2	93	0.1	18.1	0	2	0	5.6	0.0	29.91
LGP-09-05X	14:15	0.8	10.4	0	42	0	14.2	2.4	2	167	0.1	11.4	0	0	0	13.0	0.0	29.91
LGP-05-06X	14:01	0.1	18.7	0	2	0	2.6	0.0	2	93	0.1	19.7	0	2	0	2.7	0.0	29.91
LGP-09-06X	14:06	0.1	15.5	0	1	0	5.8	0.0	2	120	0.1	15.7	0	1	0	5.8	0.0	29.91
LGP-05-07X	13:55	0.1	19.8	0	1	0	2.0	0.0	2	65	0.0	19.6	0	0	0	2.7	0.0	29.91
LGP-05-08X	13:42	0.1	17.7	0	0	0	5.2	0.0	2	93	0.0	14.1	0	0	0	8.6	0.0	29.91
LGP-09-08X	13:48	0.2	7.7	0	7	0	14.6	0.2	2	185	0.1	1.8	0	3	0	18.7	0.0	29.91

Annual Landfill Gas Monitoring
Shepley's Hill Landfill
Devens, Massachusetts
November 2013

		Initial Readings									Post Purge Readings							
ID	Time	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Purge Rate (lpm)	Purge Time (sec)	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Bar. Pres.("Hg)
LGP-05-09X	13:27	0.0	16.9	0	0	0	6.0	0.0	2	93	0.0	18.1	0	0	0	5.4	0.0	29.91
LGP-09-09X	13:32	0.2	11.9	0	0	0	10.2	0.0	2	185	0.0	5.2	0	0	0	15.0	0.0	29.91
LGP-05-10X	13:15	0.0	20.2	0	0	0	1.9	0.0	2	93	0.0	19.0	0	0	0	4.1	0.0	29.91
LGP-09-10X	13:20	0.1	15.0	0	0	0	8.3	0.0	2	148	0.0	14.3	0	0	0	8.9	0.0	29.91
LGP-05-11X	13:02	0.1	19.2	0	0	0	2.8	0.0	2	83	0.1	16.1	0	0	0	6.5	0.0	29.91
LGP-09-11X	13:10	0.4	12.2	0	0	0	9.1	0.0	2	139	0.1	14.0	0	0	0	8.7	0.0	29.91
LGP-05-13X	12:43	0.1	19.5	0	0	0	1.6	0.0	2	56	0.0	19.8	0	0	0	2.4	0.0	29.91
LGP-05-14X	12:53	0.1	15.2	0	0	0	7.2	0.0	2	93	0.0	14.2	0	0	0	8.7	0.0	29.91
LGP-09-15X	11:25	0.0	16.4	0	0	0	5.8	0.0	2	111	0.0	16.4	0	0	0	5.9	0.0	29.98

Notes:
VOC = Volatile Organic Compounds
O_2 = Oxygen
LEL = Lower Explosive Limit
CO = Carbon Monoxide
CO_2 = Carbon Dioxide
CH_4 = Methane
H_2S = Hydrogen Sulfide
"Hg = inches of Mercury
lpm = Liters per minute
sec = Seconds
ppm = Parts per million
% = Percentage

Annual Landfill Gas Monitoring
Shepley's Hill Landfill
Devens, Massachusetts
November 2013

Date: 10/17/14 **Weather: Partly Sunny, 70 Degrees F** **Field Team: Matt Bedford, Mykel Mendes**

		Initial Readings									Post Purge Readings							
ID	Time	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	rge Rate (l	rge Time (s	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Bar. Pres.("Hg)
GV-1	14:49	0.0	21.0	0.0	0.0	0.0	0.0	0.0	4	167	0.0	18.4	0.0	3.0	4.0	1.9	0.1	29.32
GV-2	14:40	0.0	20.8	1.0	0.0	0.0	0.1	0.0	4	167	0.0	15.2	0.0	68.0	4.0	5.1	3.5	--
GV-3	14:25	0.0	20.7	0.0	0.0	0.0	0.0	0.0	4	167	0.0	20.9	0.0	0.0	0.0	0.0	0.0	--
GV-4	14:33	0.0	18.0	0.0	21.0	5.0	2.5	1.0	4	167	0.2	1.8	0.0	100.0	0.0	14.3	8.1	--
GV-5	14:02	0.0	6.9	0.0	0.0	5.0	6.7	0.0	4	167	0.0	5.9	0.0	0.0	5.0	7.9	0.0	--
GV-6	14:14	70.1	2.6	0.0	>100	3.0	14.3	8.0	4	167	0.1	0.5	0.0	>100	0.0	17.5	9.4	--
GV-7	13:47	0.0	2.9	0.0	>100	0.0	11.4	7.6	4	167	0.0	0.6	0.0	>100	0.0	13.8	8.2	29.32
GV-8	13:54	0.0	6.7	0.0	15.0	6.0	6.6	0.8	4	167	0.0	5.8	0.0	9.0	6.0	7.7	0.4	--
GV-9	14:10	0.2	1.0	0.0	>100	0.0	16.8	9.1	4	167	0.2	0.3	0.0	0.0	0.0	18.7	17.0	--
GV-10	13:30	0.0	1.9	0.0	55.0	0.0	11.6	2.7	4	167	0.0	1.3	0.0	54.0	0.0	12.1	2.7	--
GV-11	13:37	0.0	13.3	0.0	5.0	4.0	4.9	0.2	4	167	0.0	6.9	0.0	2.0	6.0	5.0	1.0	--
GV-12	12:55	0.0	12.6	1.0	14.0	2.0	5.3	0.7	4	167	0.0	4.9	0.0	24.0	5.0	7.4	1.2	29.32
GV-13	10:01	0.0	20.9	0.0	0.0	0.0	0.1	0.0	4	167	0.0	20.7	0.0	0.0	0.0	0.2	0.0	--
GV-14	10:12	0.0	20.1	0.0	29.0	30.0	1.6	1.7	4	167	0.2	17.1	0.0	100.0	0.0	4.4	6.1	--
GV-15	10:56	0.0	15.2	1.0	25.0	5.0	5.0	1.3	4	375	0.0	20.7	0.0	0.0	0.0	0.1	0.0	--
GV-16	13:04	0.0	1.2	0.0	100.0	0.0	19.5	15.8	4	375	0.1	0.7	0.0	100.0	0.0	20.2	17.0	--
GV-17	13:16	0.0	0.2	97.0	100.0	0.0	24.6	27.5	4	375	0.1	0.0	0.0	100.0	0.0	25.0	28.4	29.32
GV-18	11:12	0.0	20.8	0.0	0.0	0.0	0.1	0.0	4	375	0.0	20.7	0.0	0.0	0.0	0.1	0.0	--
LGP-01-01X	15:00	0.0	20.4	0.0	0.0	0.0	0.6	0.0	2	83	0.0	20.6	0.0	0.0	0.0	0.6	0.0	--
LGP-09-01XA	15:03	0.4	20.6	0.0	0.0	0.0	0.6	0.0	2	157	0.0	20.7	0.0	0.0	0.0	0.6	0.0	--
LGP-09-01XB	15:02	0.7	20.5	0.0	0.0	0.0	0.6	0.0	2	157	0.0	20.6	0.0	0.0	0.0	0.6	0.0	--
LGP-01-02X	15:18	0.0	20.2	0.0	0.0	0.0	0.8	0.0	2	83	0.0	20.2	0.0	0.0	0.0	0.9	0.0	--
LGP-09-02X	15:20	0.0	20.2	0.0	0.0	0.0	1.0	0.0	2	204	0.0	20.3	1.0	0.0	0.0	1.1	0.0	--
LGP-01-03X	15:29	0.0	20.2	0.0	0.0	0.0	0.8	0.0	2	83	0.0	20.2	0.0	0.0	0.0	0.8	0.0	--
LGP-09-03X	15:31	0.5	20.1	0.0	0.0	0.0	1.0	0.0	2	167	0.0	20.8	0.0	0.0	0.0	0.3	0.0	--
LGP-01-04X	15:38	0.0	20.5	0.0	0.0	0.0	0.5	0.0	2	83	0.0	20.5	0.0	0.0	0.0	0.5	0.0	29.32
LGP-09-04X	15:40	0.1	20.6	0.0	0.0	0.0	0.5	0.0	2	120	0.0	20.5	0.0	0.0	0.0	0.5	0.0	--
LGP-05-05X	11:43	0.0	2.5	1.0	100.0	0.0	17.1	12.2	2	93	0.2	0.0	1.0	100.0	0.0	29.7	30.1	29.33
LGP-09-05X	11:45	0.3	1.7	1.0	100.0	0.0	20.2	16.0	2	167	0.3	0.0	1.0	100.0	0.0	30.1	33.5	--
LGP-05-06X	11:34	0.0	17.2	0.0	0.0	0.0	3.0	0.0	2	93	0.0	16.5	0.0	0.0	5.0	3.6	0.0	--
LGP-09-06X	11:32	0.5	6.9	7.0	0.0	5.0	6.2	0.0	2	120	0.0	6.6	1.0	0.0	5.0	6.5	0.0	--
LGP-05-07X	11:25	0.1	1.1	0.0	100.0	0.0	20.6	10.4	2	65	0.2	0.0	0.0	100.0	0.0	21.9	8.4	29.33
LGP-05-08X	11:38	0.3	3.8	20.0	17.0	1.0	13.2	0.9	2	93	0.2	0.0	0.0	69.0	4.0	19.8	3.4	29.33
LGP-09-08X	10:40	0.4	1.0	0.0	21.0	5.0	17.2	1.1	2	185	0.3	0.0	0.0	90.0	4.0	20.3	4.4	--

Annual Landfill Gas Monitoring
Shepley's Hill Landfill
Devens, Massachusetts
November 2013

Date: 10/17/14 **Weather: Partly Sunny, 70 Degrees F** **Field Team: Matt Bedford, Mykel Mendes**

		Initial Readings									Post Purge Readings							
ID	Time	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	rge Rate (l	rge Time (s	VOC (ppm)	0_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	$C0_2$ (%)	CH_4 (%)	Bar. Pres.("Hg)
LGP-05-09X	8:46	0.0	5.8	0.0	0.0	0.0	9.0	0.0	2	93	0.0	0.5	0.0	0.0	0.0	16.7	0.0	29.40
LGP-09-09X	8:49	0.0	20.7	0.0	0.0	0.0	0.1	0.0	2	185	0.0	0.2	0.0	28.0	6.0	18.5	1.4	--
LGP-05-10X	9:07	0.0	2.3	0.0	10.0	0.0	16.4	8.0	2	93	0.0	0.0	0.0	100.0	0.0	21.4	14.0	29.40
LGP-09-10X	9:09	0.0	1.2	0.0	100.0	0.0	19.8	14.0	2	148	0.1	0.0	0.0	100.0	0.0	23.1	20.5	--
LGP-05-11X	9:20	0.1	3.1	0.0	44.0	5.0	13.2	2.2	2	83	0.0	0.0	0.0	100.0	0.0	19.8	8.7	29.40
LGP-09-11X	9:22	0.0	16.1	0.0	26.0	5.0	12.6	1.9	2	139	0.2	20.5	0.0	1.0	3.0	0.9	0.2	--
LGP-05-13X	9:35	0.0	1.3	0.0	56.0	4.0	14.3	2.0	2	56	0.1	0.0	0.0	100.0	0.0	15.3	6.7	29.40
LGP-05-14X	9:44	0.0	5.6	0.0	100.0	5.0	8.8	0.6	2	93	0.0	0.0	0.0	37.0	5.0	15.5	1.9	
LGP-09-15X	9:53	0.0	16.7	1.0	0.0	60.0	5.1	0.0	2	111	0.0	16.4	0.0	0.0	0.0	5.6	0.0	29.40

Notes:
VOC = Volatile Organic Compounds
O_2 = Oxygen
LEL = Lower Explosive Limit
CO = Carbon Monoxide
CO_2 = Carbon Dioxide
CH_4 = Methane
H_2S = Hydrogen Sulfide
"Hg = inches of Mercury
lpm = Liters per minute
sec = Seconds
ppm = Parts per million
% = Percentage

C.3 Shepley's Hill Site

Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens SHL	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring ATP Barrier Wall		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Site is in good condition. No signs of cap failure or erosion.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☒	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview		
Name of Interviewer:	Elizabeth Anderson	
Name of Interviewee:	N/A - previously conducted	
Date:		
Position: Owner ☐ Manager ☐ Other: Please Specify ☒		
Location: Site ☐ Office ☐ Phone: ☒ Telephone #		
Item	**Check One**	**Comments**
Are there any extraction wells at the property?	Yes ☐ No ☒	Two extraction wells exist for the ATP.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No ☒	No specific construction plans are known. In the last 5 years the Barrier Wall was installed at Red Cove/Plow Shop Pond.
Are there any issues with site access for monitoring?	Yes ☐ No ☒	.

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____





Riprap at barrier wall



Fence along Plow Shop Pond



ATP at SHL



SHL Landfill facing ATP

C.4 Shepley's Hill

ARARs

TABLE 8
SUMMARY OF COVER SYSTEM PERFORMANCE STANDARDS

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

MASSACHUSETTS SOLID WASTE REGULATIONS 310 CMR 19.000	RCRA SUBTITLE C 40 CFR 264	RCRA SUBTITLE D 40 CFR 258	MASSACHUSETTS HAZARDOUS WASTE REGULATIONS 310 CMR 30.000	HOW COMPLIANCE IS ACHIEVED BY EXISTING COVER
Minimize percolation of water into landfill.	Minimize migration of liquids through landfill.	Minimize infiltration through landfill.	Minimize migration of liquids through landfill.	Geomembrane installations such as the existing one at Shepley's Hill Landfill have a permeability of 10 E -7 centimeters per second or less that minimizes infiltration and migration of liquid into landfilled waste. Sloped surface promotes runoff and minimizes infiltration. Vegetation promotes evapotranspiration.
	Have a permeability less than or equal to bottom liner or subsoils.	Have a permeability less than or equal to bottom liner or subsoils or less than 10 E-5 centimeters per second, whichever is less.	Have a permeability less than or equal to bottom liner.	Existing geomembrane permeability is less than that of sands underlying landfill. There is no bottom liner.
Promote drainage of precipitation.	Promote drainage and minimize erosion.		Promote drainage and minimize erosion of cover.	The existing cover is sloped to promote drainage and vegetated to prevent erosion.
Minimize erosion of final cover.		Minimize erosion of final cover.		The existing cover is sloped and vegetated to minimize erosion.
	Function with minimum maintenance.		Function with minimum maintenance.	The existing cover was constructed in a manner to minimize maintenance. Monitoring and maintenance of cover systems to maintain integrity is normal practice.
Facilitate gas venting.				The existing collection piping and riser system facilitate gas venting. Analysis of gas samples from vents confirms that they function.

(continued)

TABLE 8
SUMMARY OF COVER SYSTEM PERFORMANCE STANDARDS

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

MASSACHUSETTS SOLID WASTE REGULATIONS 310 CMR 19.000	RCRA SUBTITLE C 40 CFR 264	RCRA SUBTITLE D 40 CFR 258	MASSACHUSETTS HAZARDOUS WASTE REGULATIONS 310 CMR 30.000	HOW COMPLIANCE IS ACHIEVED BY EXISTING COVER
Minimize percolation of water into landfill.	Minimize migration of liquids through landfill.	Minimize infiltration through landfill.	Minimize migration of liquids through landfill.	Geomembrane installations such as the existing one at Shepley's Hill Landfill have a permeability of 10 E -7 centimeters per second or less that minimizes infiltration and migration of liquid into landfilled waste. Sloped surface promotes runoff and minimizes infiltration. Vegetation promotes evapotranspiration.
Accommodate settling and subsidence to continue to meet performance standards.	Accommodate settling and subsidence to maintain cover integrity.		Accommodate settling and subsidence to maintain cover integrity.	Landfill materials were compacted and graded during construction of the existing cap to accommodate settling. Maintenance actions are possible to maintain cover integrity if or when settling occurs.
Ensure isolate of wastes from environment.				The existing cover isolates wastes from potential terrestrial receptors by covering them with soil and lowers groundwater to elevations interpreted to be below waste.

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Floodplains	Floodplain Management Executive Order No. 11988, [40 CFR Part 6, App. A]	Applicable	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	To the extent that any activity associated with this alternative takes place in the floodplain, the activity will be altered to comply with the law.
	Wetlands	Protection of Wetlands Executive Order No. 11990	Applicable	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	To the extent that any activity associated with this alternative takes place in wetlands, the activity will be altered to comply with the law.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Surface Waters Endangered Species	Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302]	Applicable	Actions which affect species/habitat require consultation with U.S. Department of the Interior, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the NCP.	No off-site remedial actions performed for this alternative. On-site actions would be minimal and would include agency consultation prior to implementation.
	Endangered Species	Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]	Applicable	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	To minimize impact, landfill cover maintenance would be performed after nesting areas of the Grasshopper Sparrow have been identified.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Floodplains Wetlands	Massachusetts Wetland Protection Act and Regulations [MGL c. 131 s. 40; 310 CMR 10.00]	Applicable	Wetlands and land subject to flooding are protected under this Act and these regulations. Activities that will remove, dredge, fill, or alter protected areas (defined as areas within the 100-year floodplain) are subject to regulation and must file a Notice of Intent with the municipal conservation commission and obtain a Final Order of Conditions before proceeding with the activity. A Determination of Applicability or Notice of Intent must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	If remedial activities alter more than 5,000 square feet of protected area, the affected area will be restored within two growing seasons.
	Endangered Species	Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00]	Applicable	Actions must be conducted in a manner which minimizes the impact to Massachusetts listed endangered species and species listed by the Massachusetts Natural Heritage Program.	To minimize impacts, landfill cover maintenance would be performed after nesting areas of the Grasshopper Sparrow have been identified.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Area of Critical Environmental Concern	Areas of Critical Environmental Concern [301 CMR 12.00]	Relevant and Appropriate	An Area of Critical Environmental Concern is of regional, state, or national importance or contains significant ecological systems with critical inter-relationships among a number-of-components. An eligible area must contain features from four or more of the following groups: (1) fishery habitats; (2) coastal feature; (3) estuarine wetland; (4) inland wetland; (5) inland surface water; (6) water supply area (i.e., aquifer recharge area); (7) natural hazard area (i.e., floodplain); (8) agricultural area; (9) historical/archeological resources; (10) habitat resource (i.e., for endangered wildlife; or (11) special use areas.	Activities must be controlled to minimize impacts to nesting areas of the Grasshopper Sparrow.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50-191.51]	Relevant and Appropriate	The National Primary Drinking Water Regulation establishes MCLs and non-zero Maximum Contaminant Level Goals for several common organic and inorganic contaminants. These MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	MCLs will be used to evaluate the performance of this alternative. If MCLs are exceeded, the remedy will be re-evaluated.
State Regulatory Authority	Surface water	Massachusetts Surface Water Quality Standards [314 CMR 4.00]	Applicable	Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained and protected and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation.	Discharges associated with remedial actions will be controlled/monitored to ensure that surface waters meet standards.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I. Groundwaters assigned to this class are fresh groundwaters designated as a source of potable water supply.	MCLs will be used to evaluate the performance of this alternative. If MCLs are exceeded, the remedy will be re-evaluated.
	Groundwater	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.00]	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	MMCLs will be used to evaluate the performance of this alternative. If MMCLs are exceeded, the remedy will be re-evaluated.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Air	Massachusetts Ambient Air Quality Standards [310 CMR 6.00]	Relevant and Appropriate	Regulations specify primary and secondary ambient air quality standards to protect public health and welfare for certain pollutants	Ambient Air Quality Standards will be used to evaluate the performance of this alternative. If standards are exceeded, the remedy will be re-evaluated.
	Air	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Relevant and Appropriate	Regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations.	Ambient Air Quality Standards will be used to evaluate the performance of this alternative. If standards are exceeded, the remedy will be re-evaluated.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Solid waste landfill construction, operation, closure, and post-closure	Resource Conservation and Recovery Act (RCRA) [Subtitle D, 40 CFR 258]	Relevant and Appropriate	RCRA Subtitle D regulates the generation, transport, storage, treatment, and disposal of solid wastes. Regulations at 40 CFR 258 govern preparedness and prevention, closure, and post-closure at municipal solid waste landfills.	Performance of this alternative will be evaluated to determine compliance with the substantive requirements of federal solid waste regulations. If the substantive requirements are not met at the appropriate time, the remedy will be re-evaluated.
	Hazardous waste landfill construction, operation, closure, and post-closure	Resource Conservation and Recovery Act (RCRA) [Subtitle C, 40 CFR 260,264]	Relevant and Appropriate	RCRA Subtitle C regulates the generation, transport, storage, treatment, and disposal of hazardous wastes. Regulations at 40 CFR 264 govern preparedness and prevention, closure, and post-closure at landfills.	Performance of this alternative will be evaluated to determine compliance with the substantive requirements of federal hazardous waste regulations. If the substantive requirements are not met at the appropriate time, the remedy will be re-evaluated.
State Regulatory Authority	Solid waste landfill construction, operation, closure, and post-closure.	Massachusetts Solid Waste Management Regulations [310 CMR 19.000]	Applicable	These regulations outline the requirements for construction, operation, closure, and post-closure at solid waste management facilities in the Commonwealth of Massachusetts.	This alternative includes components to meet closure and post-closure requirements at Shepley's Hill Landfill.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Hazardous waste landfill construction, operation, closure, and post-closure	Massachusetts Hazardous Waste Regulations [310 CMR 30.00]	Relevant and Appropriate	Regulates handling, storage, treatment, disposal, and record keeping at hazardous waste facilities.	Performance of this alternative will be evaluated to determine compliance with the substantive requirements of Massachusetts hazardous waste regulations. If the substantive requirements are not met at the appropriate time, the remedy will be re-evaluated.

APPENDIX D –Devens Consolidated Landfill

D.1 Devens Consolidated Landfill

Figures



Figure 3.1
Site Location
Former Fort Devens Army Installation

References: HGL. LTMMP 2012.
Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

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

-- Report Name --
Former Fort Devens Army Installation

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 1,750 3,500
Feet

Date: 04/14/2015

Figure 3.1

H&S



Figure 3.2
Site Layout
Devens Consolidation Landfill

Legend

- LTM Sample Well
- LTM Well - Gauge Only
- Gas Vent
- LFM-03-07 Well/Vent Identification

Notes:
Gas vent locations were approximated based upon the locations displayed in Figure 2 of USACE New England District's Devens Consolidation Landfill 2004 Annual Report.

LTM = long term monitoring

References:
HGL. LTMMP 2012.

-- Report Name --
Devens Consolidation Landfill

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 60 120
Feet

Date:
04/14/2015

Figure
3.2

H&S

D.2 Devens Consolidated Landfill

Tables

Table 3.3
Groundwater Analytical Results
Devens Consolidation Landfill
May 2010

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	200	50,000	µg/L	3.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	70	50,000	µg/L	2.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Extractable Petroleum Hydrocarbons (EPH-04-01)	C_9-C_{18} Aliphatics	700	50,000	µg/L	105	U	106	U	100	U	108	U	103	U
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	105	U	106	U	100	U	108	U	103	U
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	105	U	106	U	100	U	108	U	103	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	4,4'-DDE	0.05	400	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	Aldrin	0.5	20	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	alpha-BHC	500	NS	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	beta-BHC	100	NS	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	delta-BHC	100	NS	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	Endosulfan I	0.1	NS	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	Endrin	2	5	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	Endrin aldehyde[5]	100	NS	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	Endrin ketone[6]	100	NS	µg/L	0.040	U	0.043	U	0.040	U	0.042	U	0.042	U
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	Heptachlor	0.4	1	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	Methoxychlor	40	10	µg/L	0.202	U	0.213	U	0.200	U	0.210	U	0.210	U
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.021	U	0.020	U	0.021	U	0.021	U
	Toxaphene[7]	100	NS	µg/L	0.505	U	0.532	U	0.500	U	0.526	U	0.526	U

Table 3.3
Groundwater Analytical Results
Devens Consolidation Landfill
May 2010

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
ICP TOTAL METALS (SW6010B)	Arsenic	10	900	µg/L	5	U	5	U	2.5	J	2.4	J	3.3	J
	Barium	2,000	50,000	µg/L	4.6	J	12		12		10	U	13	
	Cadmium	5	4	µg/L	4	U	4	U	4	U	4	U	4	U
	Chromium	100	300	µg/L	10	U	10	U	10	U	7	J	4	J
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	70		80		120		230	
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U	10	U
	Manganese	291	NS	µg/L	10	U	10	U	2.4	J	8.6	J	4.4	J
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U	7	U
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
WET CHEMISTRY TDS (E160.1)	Solids, Total Dissolved	NS	NS	mg/L	270		250		280		320		480	
ANIONS (E300)	Chloride	NS	NS	mg/L	100		110		120		90		210	
	Sulfate	NS	NS	mg/L	17		20		20		24		29	
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.41		0.64		0.64		0.29		1.1	
ALKALINITY, TOTAL (SM2320B)	Alkalinity as $CaCO_3$	NS	NS	mg/L	81		70		72		160		82	
CYANIDE (E335.2)	Cyanide, Total	0.2	0.03	mg/L	0.0011	J	0.005	U	0.005	U	0.005	U	0.0001	J
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	20	U	20	U	20	U	9.2	J
FIELD PARAMETERS	Temperature, initial	NS	NS	° Celsius	10.51		14.13		NA		10.84		14.70	
	Temperature, final	NS	NS	° Celsius	9.80		10.64		NA		9.61		11.85	
	pH	NS	NS	Std units	6.71		6.23		NA		7.87		6.37	
	Specific Conductance	NS	NS	µS/cm	515		538		NA		605		827	
	ORP[8]/Eh	NS	NS	mV	-232.2		-223		NA		-223.20		-249.8	
	Dissolved Oxygen	NS	NS	mg/L	8.71		4.86		NA		8.75		9.16	
	Turbidity	NS	NS	NTU	2.22		1.7		NA		3.48		2.0	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

[8] The ORP value was not corrected to SHE.

Table 3.4
Groundwater Analytical Results
Devens Consolidation Landfill
October 2010

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	200	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
Extractable Petroleum Hydrocarbons (EPH-04-01)	C_9-C_{18} Aliphatics	700	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	100	U	100	U	100	U	100	U	100	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.041	U	0.041	U	0.044	U	0.041	U
	4,4'-DDE	0.05[8]	400	µg/L	0.040	U	0.041	U	0.041	U	0.044	U	0.041	U
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.041	U	0.041	U	0.044	U	0.041	U
	Aldrin	0.5	20	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	alpha-BHC	500	NS	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	beta-BHC	100	NS	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	delta-BHC	100	NS	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.041	U	0.041	U	0.044	U	0.041	U
	Endosulfan I	0.1	NS	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.041	U	0.041	U	0.044	U	0.041	U
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.041	U	0.041	U	0.044	U	0.041	U
	Endrin	2	5	µg/L	0.040	U	0.041	U	0.041	U	0.044	U	0.041	U
	Endrin aldehyde[5]	100	NS	µg/L	0.040	UJ	0.041	U	0.041	U	0.044	U	0.041	U
	Endrin ketone[6]	100	NS	µg/L	0.040	UJ	0.041	U	0.041	U	0.044	U	0.041	U
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	Heptachlor	0.4	1	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	Methoxychlor	40	10	µg/L	0.200	U	0.206	U	0.206	U	0.217	U	0.206	U
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.021	U	0.021	U	0.022	U	0.021	U
	Toxaphene[7]	100	NS	µg/L	0.500	U	0.515	U	0.515	U	0.543	U	0.515	U

Table 3.4
Groundwater Analytical Results
Devens Consolidation Landfill
October 2010

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
ICP TOTAL METALS (SW6010B)	Arsenic	10	900	µg/L	5	U	4.6	J	3.4	J	5	U	2.5	J
	Barium	2,000	50,000	µg/L	6.4	J	17		17		2.5	J	11	
	Cadmium	5	4	µg/L	4	U	4	U	4	U	4	U	4	U
	Chromium	100	300	µg/L	10	U	10	U	10	U	4	J	2	J
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	480		460		90		730	
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U	10	U
	Manganese	291	NS	µg/L	10	U	12		12		8.3	J	10	
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U	7	U
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
WET CHEMISTRY TDS (E160.1)	Solids, Total Dissolved	NS	NS	mg/L	340		440		490		550		460	
ANIONS (E300)	Chloride	NS	NS	mg/L	120		170		170		200		170	
	Sulfate	NS	NS	mg/L	24		30	J	20	J	29		33	
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.54		0.49	J	1.2	J	0.71		0.98	
ALKALINITY, TOTAL (SM2320B)	Alkalinity as $CaCO_3$	NS	NS	mg/L	100		84		81		180		100	
CYANIDE (E335.2)	Cyanide, Total	0.2	0.03	mg/L	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	24	U	20	U	22	U	20	U
FIELD PARAMETERS	Temperature, initial	NS	NS	° Celsius	10.97		10.43		NA		11.94		14.15	
	Temperature, final	NS	NS	° Celsius	11.34		10.74		NA		11.65		12.83	
	pH	NS	NS	Std units	6.35		6.05		NA		7.25		6.38	
	Specific Conductance	NS	NS	µS/cm	625		730		NA		948		784	
	ORP[8]/Eh	NS	NS	mV	163.6		180.6		NA		165.3		109	
	Dissolved Oxygen	NS	NS	mg/L	7.9		5.6		NA		6.41		5.35	
	Turbidity	NS	NS	NTU	0.39		2.76		NA		3.72		13.9	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

NR= pre-landfill results: Not recorded in 2003 Remedial Action Closure Report.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Regulatory Standard is for total xylenes.

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP Standar; listed value is from the 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[8] Toxaphene: no current MCP standard: listed value is from 1995 MCP.

[9] The ORP value was not corrected to SHE.

Table 3.5
Leachate Analytical Results - Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2010 - Annual Sampling Event
				Date Sampled: 10/14/2010
Total metals	Arsenic	mg/L	0.3	0.005 U
	Cadmium	mg/L	0.038	0.005 U
	Chromium	mg/L	2.0	0.01 U
	Copper	mg/L	1.0	0.010 U
	Lead	mg/L	0.25	0.010 U
	Nickel	mg/L	1.0	0.0038 J
	Silver	mg/L	0.0146	0.007 U
	Zinc	mg/L	0.75	0.050 U
	Mercury	mg/L	0.001	0.0010 U
TSS	Total Suspended Solids	mg/L	400	33 J
TTO	Total Toxic Organics	mg/L	5	0.00054 J
pH *grab sample*	pH	standard units	5.5 – 9.5	6.9

Note:

*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

Table 3.6
Groundwater Analytical Results
Devens Consolidation Landfill
July 2011

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	200	50,000	µg/L	50.0	R	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	700	50,000	µg/L	100	U	100	U	100	U	100	UJ	100	U
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	100	U	100	U	100	U	100	UJ	100	U
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	100	U	100	U	100	U	100	UJ	100	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDE	0.05	400	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Aldrin	0.5	20	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-BHC	500	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	beta-BHC	100	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	delta-BHC	100	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan I	0.1	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin	2	5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin aldehyde[5]	100	NS	µg/L	0.019	J	0.040	U	0.040	U	0.040	U	0.019	J
	Endrin ketone[6]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor	0.4	1	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Methoxychlor	40	10	µg/L	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Toxaphene[7]	100	NS	µg/L	0.500	U	0.500	U	0.500	U	0.500	U	0.500	U

Table 3.6
Groundwater Analytical Results
Devens Consolidation Landfill
July 2011

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Metals (SW6010B)	Arsenic	10	900	µg/L	5	U	5	U	5	U	5	U	5	U
	Barium	2,000	50,000	µg/L	5	J	14		11		10	U	11	
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U	5	U
	Chromium	100	300	µg/L	10	U	10	U	10	U	3	J	10	U
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	50	J	70		150		20	J
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U	10	U
	Manganese	291	NS	µg/L	10	U	10	U	2	J	19		10	U
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U	7	U
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Dissolved Solids (SM2540C)	TDS	NS	NS	mg/L	260		300		290		360		410	
Anions (E300.0)	Chloride	NS	NS	mg/L	99	J	95	J	98	J	100	J	150	J
	Sulfate	NS	NS	mg/L	16		17		18		19		24	
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.43		0.51		0.52		0.34		0.96	
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	NS	NS	mg/L	77		87		87		160		93	
Total Cyanide (SM4500CN-CE)	Cyanide, Total	0.2	0.03	mg/L	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	8.0	J	34		20	U	22		20	U
Field Parameters	Temperature, initial	NS	NS	° Celsius	10.56		10.95		NA		10.97		13.59	
	Temperature, final	NS	NS	° Celsius	10.10		10.84		NA		10.99		13.09	
	pH	NS	NS	Std units	6.10		5.56		NA		6.91		5.84	
	Specific Conductance	NS	NS	µS/cm	440		282		NA		352		596	
	ORP[8]/Eh	NS	NS	mV	150.1		238		NA		85.50		372.9	
	Dissolved Oxygen	NS	NS	mg/L	8.82		6.33		NA		7.67		8.03	
	Turbidity	NS	NS	NTU	0.00		3.1		NA		1.68		0.59	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

[8] The ORP value was not corrected to SHE.

Table 3.7
Groundwater Analytical Results
Devens Consolidation Landfill
October 2011

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	200	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
Extractable Petroleum Hydrocarbons (EPH-04-01)	C_9-C_{18} Aliphatics	700	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	100	U	100	U	100	U	100	U	100	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDE	0.05[8]	400	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Aldrin	0.5	20	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-BHC	500	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	beta-BHC	100	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	delta-BHC	100	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan I	0.1	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin	2	5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin aldehyde[5]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin ketone[6]	100	NS	µg/L	0.040	UJ	0.040	UJ	0.040	UJ	0.040	UJ	0.040	UJ
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor	0.4	1	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Methoxychlor	40	10	µg/L	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Toxaphene[7]	100	NS	µg/L	0.500	U	0.500	U	0.500	U	0.500	U	0.500	U

Table 3.7
Groundwater Analytical Results
Devens Consolidation Landfill
October 2011

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
ICP TOTAL METALS (SW6010B)	Arsenic	10	900	µg/L	2	J	3	J	5	U	2	J	4	J
	Barium	2,000	50,000	µg/L	5	J	10		10		10	U	10	
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U	5	U
	Chromium	100	300	µg/L	10	U	10	U	10	U	10	U	10	U
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	20	J	40	J	30	J	50	U
	Lead	15	10	µg/L	3	J	2	J	3	J	3	J	3	J
	Manganese	291	NS	µg/L	10	U	10	U	10	U	3	J	10	U
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U	7	U
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
WET CHEMISTRY TDS (E160.1)	Solids, Total Dissolved	NS	NS	mg/L	250		270		280		450		370	
ANIONS (E300)	Chloride	NS	NS	mg/L	92	J	100	J	95	J	170	J	140	J
	Sulfate	NS	NS	mg/L	21	J	20	J	19	J	26	J	30	J
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.76		0.42		0.42		0.51		0.93	
ALKALINITY, TOTAL (SM2320B)	Alkalinity as $CaCO_3$	NS	NS	mg/L	82		94		94		160		97	
CYANIDE (E335.2)	Cyanide, Total	0.2	0.03	mg/L	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	20	U	20	U	20	U	20	U
FIELD PARAMETERS	Temperature, initial	NS	NS	° Celsius	12.24		11.59		NA		12.19		14.53	
	Temperature, final	NS	NS	° Celsius	12.08		11.15		NA		12.13		14.68	
	pH	NS	NS	Std units	6.03		6.16		NA		7.40		6.14	
	Specific Conductance	NS	NS	µS/cm	360		496		NA		676		447	
	ORP[8]/Eh	NS	NS	mV	142.2		-255.1		NA		99.1		121.5	
	Dissolved Oxygen	NS	NS	mg/L	7.4		5.7		NA		7.78		5.26	
	Turbidity	NS	NS	NTU	2.57		2.40		NA		0.70		0.46	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

NR= pre-landfill results: Not recorded in 2003 Remedial Action Closure Report.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Regulatory Standard is for total xylenes.

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP Standar; listed value is from the 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[8] Toxaphene: no current MCP standard: listed value is from 1995 MCP.

[9] The ORP value was not corrected to SHE.

Table 3.8
Leachate Analytical Results - Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2011 - Annual Sampling Event
				Date Sampled: 10/12/2011
Total metals	Arsenic	mg/L	0.3	0.010 J
	Cadmium	mg/L	0.038	0.004 J
	Chromium	mg/L	2.0	0.05 U
	Copper	mg/L	1.0	0.028 J
	Lead	mg/L	0.25	0.042 J
	Nickel	mg/L	1.0	0.024 J
	Silver	mg/L	0.0146	0.035 U
	Zinc	mg/L	0.75	0.140 J
	Mercury	mg/L	0.001	0.0002 U
TSS[1]	Total Suspended Solids	mg/L	400	5.0 U
TTO	Total Toxic Organics	mg/L	5	All Results were "U" or "UJ" qualified
TPH	Total Petroleum Hydrocarbons	mg/L	100	0.299 J
pH	pH	standard units	5.5 – 9.5	6.8

Note:

*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

[1] An exceedance for TSS was noted on January 4, 2012 (4,100 µg/L) in the completion of the Annual Industrial Pretreatment Self Monitoring Report for the Devens Consolidation Landfill. The noted exceedance required a follow-up re-sampling. The TSS re-sample result was below the reporting limit and below the 400 mg/L limitation, as detailed in the above table. Based on the re-sample TSS data, no additional corrective actions were necessary and the Devens Consolidation Landfill is operating within permit requirements.

Table 3.9
Groundwater Analytical Results
Devens Consolidation Landfill
May 2012

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	200	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	700	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	100	U	100	U	100	U	100	U	100	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDE	0.05	400	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Aldrin	0.5	20	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	beta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	delta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan I	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin	2	5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin aldehyde[5]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin ketone[6]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor	0.4	1	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Methoxychlor	40	10	µg/L	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Toxaphene[7]	100	NS	µg/L	0.500	UJ	0.532	UJ	0.538	UJ	0.556	UJ	0.500	UJ

Table 3.9
Groundwater Analytical Results
Devens Consolidation Landfill
May 2012

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Metals (SW6010B)	Arsenic	10	900	µg/L	5	U	2	J	5	U	5	U	5	U
	Barium	2,000	50,000	µg/L	3	J	10		10		10	U	8	J
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U	5	U
	Chromium	100	300	µg/L	10	U	10	U	10	U	2	J	10	U
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	20	J	30	J	100		50	U
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U	10	U
	Manganese	291	NS	µg/L	10	U	10	U	10	U	14		10	U
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U	7	U
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Dissolved Solids (SM2540C)	TDS	NS	NS	mg/L	160		240		270		360		330	
Anions (E300.0)	Chloride	NS	NS	mg/L	30		63		65		100		87	
	Sulfate	NS	NS	mg/L	16	J	16	J	16	J	17	J	26	J
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.22	U	0.38		0.38		0.50		1.0	
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	NS	NS	mg/L	82		110		110		140		110	
Total Cyanide (SM4500CN-CE)	Cyanide, Total	0.2	0.03	mg/L	0.002	J	0.002	J	0.005	U	0.005	U	0.005	U
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	20	U	20	U	20	U	20	U
Field Parameters	Temperature, initial	NS	NS	° Celsius	11.49		11.51				9.38		12.72	
	Temperature, final	NS	NS	° Celsius	10.45		11.37				9.23		12.46	
	pH	NS	NS	Std units	6.25		6.51				7.73		6.52	
	Specific Conductance	NS	NS	µS/cm	277		458		NA		706		631	
	ORP[8]/Eh	NS	NS	mV	135.5		106.4				73.70		105.6	
	Dissolved Oxygen	NS	NS	mg/L	11.39		5.63				8.19		8.46	
	Turbidity	NS	NS	NTU	0.33		3.02				1.22		0.00	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

[8] The ORP value was not corrected to SHE.

Table 3.10
Groundwater Analytical Results
Devens Consolidation Landfill
October 2012

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07[9]	Qual
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U		
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U		
	C_9-C_{10} Aromatics	200	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U		
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U		
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	NS	
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	Naphthalene	140	20,000	µg/L	4.0	U	4.0	U	4.0	U	4.0	U		
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	700	50,000	µg/L	100	U	100	U	100	U	100	U		
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	100	U	100	U	100	U	100	U	NS	
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	100	U	100	U	100	U	100	U		
Organochlorine Pesticides (SW8081B)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	4,4'-DDE	0.05	400	µg/L	0.040	U	0.040	U	0.008	J	0.040	U		
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Aldrin	0.5	20	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	alpha-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	beta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	delta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endosulfan I	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endrin	2	5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endrin aldehyde[5]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endrin ketone[6]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Heptachlor	0.4	1	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Methoxychlor	40	10	µg/L	0.200	U	0.022	J	0.020	J	0.200	U		
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Toxaphene[7]	100	NS	µg/L	0.500	U	0.500	U	0.500	U	0.500	U		

Table 3.10
Groundwater Analytical Results
Devens Consolidation Landfill
October 2012

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07[9]	Qual
Metals (SW6010C)	Arsenic	10	900	µg/L	5	U	5	U	5	U	5	U	NS	
	Barium	2,000	50,000	µg/L	5	J	12		11		10	U		
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U		
	Chromium	100	300	µg/L	10	U	10	U	10	U	2	J		
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U		
	Iron	9,100	NS	µg/L	50	U	110		90		120			
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U		
	Manganese	291	NS	µg/L	10	U	6	J	5	J	22			
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U		
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U		
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	NS	
Total Dissolved Solids (SM2540C)	Solids, Total Dissolved	NS	NS	mg/L	230		340		290		480		NS	
Anions (E300.0)	Chloride	NS	NS	mg/L	53		90		90		150		NS	
	Sulfate	NS	NS	mg/L	19		16		16		26			
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.49		0.38		0.38		0.71		NS	
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	NS	NS	mg/L	120		110		110		180		NS	
Total Cyanide (SM4500CN-CE)	Cyanide, Total	0.2	0.03	mg/L	0.002	J	0.004	J	0.005	U	0.006		NS	
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	11	J	15	J	11	J	NS	
Field Parameters	Temperature, initial	NS	NS	° Celsius	11.93		11.80				12.22			
	Temperature, final	NS	NS	° Celsius	11.99		11.65				12.15			
	pH	NS	NS	Std units	6.29		6.44				7.08			
	Specific Conductance	NS	NS	µS/cm	425		347		NA		541		NS	
	ORP[8]/Eh	NS	NS	mV	196.3		195.9				245.2			
	Dissolved Oxygen	NS	NS	mg/L	6.13		5.11				6.55			
	Turbidity	NS	NS	NTU	0.00		3.90				2.11			

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP Standar; listed value is from the 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Toxaphene: no current MCP standard: listed value is from 1995 MCP.

[8] The ORP value was not corrected to SHE.

[9] Well LFM-03-07 was not sampled due to inadequate water.

Table 3.11
Leachate Analytical Results - Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2012 - Annual Sampling Event
				Date Sampled: 10/19/2012
Total metals	Arsenic	mg/L	0.3	0.005 U
	Cadmium	mg/L	0.038	0.005 U
	Chromium	mg/L	2.0	0.01 U
	Copper	mg/L	1.0	0.010 U
	Lead	mg/L	0.25	0.010 U
	Nickel	mg/L	1.0	0.025 U
	Silver	mg/L	0.0146	0.007 U
	Zinc	mg/L	0.75	0.015 J
	Mercury	mg/L	0.001	0.0002 U
TSS	Total Suspended Solids	mg/L	400	5.0 UJ
TTO	Total Toxic Organics	mg/L	5	0.0027 J
pH	pH	standard units	5.5 – 9.5	7.0

Note:

*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

Table 3.12
Groundwater Analytical Results
Devens Consolidation Landfill
June 2013

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Q	LFM-99-05A	Q	LFM-99-05A Duplicate	Q	LFM-99-06A	Q	LFM-03-07	Q
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	200	50,000	µg/L	50.0	UJ	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	700	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	100	U	100	U	100	U	100	U	100	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDE	0.05	400	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Aldrin	0.5	20	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	beta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	delta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan I	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin	2	5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin aldehyde[5]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin ketone[6]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor	0.4	1	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Methoxychlor	40	10	µg/L	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Toxaphene[7]	100	NS	µg/L	0.500	U	0.500	U	0.500	U	0.500	U	0.500	U

Table 3.12
Groundwater Analytical Results
Devens Consolidation Landfill
June 2013

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Q	LFM-99-05A	Q	LFM-99-05A Duplicate	Q	LFM-99-06A	Q	LFM-03-07	Q
Metals (SW6010B)	Arsenic	10	900	µg/L	5	U	5	U	5	U	3	J	5	U
	Barium	2,000	50,000	µg/L	3	J	10		9.9	J	10	U	7	J
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U	5	U
	Chromium	100	300	µg/L	10	U	10	U	10	U	3	J	10	U
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	50	U	50	U	230		50	U
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U	10	U
	Manganese	291	NS	µg/L	10	U	10	U	10	U	17		10	U
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U	7	U
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Dissolved Solids (SM2540C)	TDS	NS	NS	mg/L	110		250		250		320		270	
Anions (E300.0)	Chloride	NS	NS	mg/L	26.8		85.3		85.4		62.1		82.1	
	Sulfate	NS	NS	mg/L	13.5		16.6		16.8		23.7		23.5	
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.069	J	0.43		0.42		0.43		0.87	
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	NS	NS	mg/L	41.2		93.3		94.8		175		84.1	
Total Cyanide (SM4500CN-CE)	Cyanide, Total	0.2	0.03	mg/L	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	15	J	13	J	8.5	J	8.5	J	18	J
Field Parameters	Temperature, initial	NS	NS	° Celsius	10.32		11.13		NA		10.50		12.22	
	Temperature, final	NS	NS	° Celsius	9.83		11.00				9.80		11.53	
	pH	NS	NS	Std units	5.87		6.30				7.07		5.76	
	Specific Conductance	NS	NS	µS/cm	175		333				537		483	
	ORP[8]/Eh	NS	NS	mV	303.3		219.6				259.70		284.3	
	Dissolved Oxygen	NS	NS	mg/L	8.65		6.73				12.92		8.34	
	Turbidity	NS	NS	NTU	0.00		2.40				3.35		0.25	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

[8] The ORP value was not corrected to SHE.

Table 3.13
Groundwater Analytical Results
Devens Consolidation Landfill
October 2013

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Q	LFM-99-05A	Q	LFM-99-05A Duplicate	Q	LFM-99-06A	Q	LFM-03-07[9]	Q
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	NS	
	C_9-C_{12} Aliphatics	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U		
	C_9-C_{10} Aromatics	200	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U		
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U		
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U		
	Naphthalene	140	20,000	µg/L	4.0	U	4.0	U	4.0	U	4.0	U		
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	700	50,000	µg/L	100	U	100	U	100	U	100	U	NS	
	C_{19}-C_{36} Aliphatics	14,000	50,000	µg/L	100	U	100	U	100	U	100	U		
	C_{11}-C_{22} Aromatics	200	5,000	µg/L	100	U	100	U	100	U	100	U		
Organochlorine Pesticides (SW8081B)	Hexachlorobenzene	1	6,000	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	NS	
	4,4'-DDD	0.2	50	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	4,4'-DDE	0.05	400	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	4,4'-DDT	0.3	1	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Aldrin	0.5	20	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	alpha-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	alpha-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	beta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	delta-BHC	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Dieldrin	0.1	0.5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endosulfan I	NS	NS	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Endosulfan II[3]	10	2	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endrin	2	5	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endrin aldehyde[5]	100	NS	µg/L	0.040	U	0.040	U	0.040	U	0.040	U		
	Endrin ketone[6]	100	NS	µg/L	0.040	UJ	0.040	UJ	0.040	UJ	0.040	U		
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	gamma-Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Heptachlor	0.4	1	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Heptachlor epoxide	0.2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Methoxychlor	40	10	µg/L	0.200	U	0.200	U	0.200	U	0.200	U		
	Total Chlordane[2]	2	2	µg/L	0.020	U	0.020	U	0.020	U	0.020	U		
	Toxaphene[7]	100	NS	µg/L	0.500	U	0.500	U	0.500	U	0.500	U		

Table 3.13
Groundwater Analytical Results
Devens Consolidation Landfill
October 2013

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Q	LFM-99-05A	Q	LFM-99-05A Duplicate	Q	LFM-99-06A	Q	LFM-03-07[9]	Q
Metals (SW6010C)	Arsenic	10	900	µg/L	5	U	5	U	5	U	4	J	NS	
	Barium	2,000	50,000	µg/L	7	J	12		12		10	U		
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U		
	Chromium	100	300	µg/L	10	U	10	U	10	U	20			
	Copper	NS	NS	µg/L	10	U	10	U	2	J	2	J		
	Iron	9,100	NS	µg/L	50	U	80		100		600			
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U		
	Manganese	291	NS	µg/L	10	U	3	J	5	J	110			
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U		
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U		
Mercury (SW7470A)	Mercury	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	NS	
Total Dissolved Solids (SM2540C)	Solids, Total Dissolved	NS	NS	mg/L	360	J	320		310		460		NS	
Anions (E300.0)	Chloride	NS	NS	mg/L	128		102		104		132		NS	
	Sulfate	NS	NS	mg/L	26.2		20.6		20.6		27.7			
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.51		0.47		0.54		0.77		NS	
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_{3)}$	NS	NS	mg/L	100	J	102		102		186		NS	
Total Cyanide (SM4500CN-CE)	Cyanide, Total	0.2	0.03	mg/L	0.005	U	0.005	U	0.001	U	0.005	U	NS	
COD (E410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	20	U	20	U	20	U	NS	
Field Parameters	Temperature, initial	NS	NS	° Celsius	11.16		11.14				10.76			
	Temperature, final	NS	NS	° Celsius	11.37		11.21				11.26			
	pH	NS	NS	Std units	6.45		6.46				7.50			
	Specific Conductance	NS	NS	µS/cm	606		380		NA		530		NS	
	ORP[8]/Eh	NS	NS	mV	101.8		145.4				63.9			
	Dissolved Oxygen	NS	NS	mg/L	24.73		7.08				7.01			
	Turbidity	NS	NS	NTU	0.79		3.70				2.30			

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP Standar; listed value is from the 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Toxaphene: no current MCP standard: listed value is from 1995 MCP.

[8] The ORP value was not corrected to SHE.

[9] Well LFM-03-07 was not sampled due to inadequate water.

Table 3.14
Leachate Analytical Results - Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2013 - Annual Sampling Event
				Date Sampled: 10/25/2013
Total metals	Arsenic	mg/L	0.3	0.05 U
	Cadmium	mg/L	0.038	0.05 U
	Chromium	mg/L	2.0	0.10 U
	Copper	mg/L	1.0	0.021 J
	Lead	mg/L	0.25	0.100 U
	Nickel	mg/L	1.0	0.250 U
	Silver	mg/L	0.0146	0.070 U
	Zinc	mg/L	0.75	0.500 U
	Mercury	mg/L	0.001	0.0002 U
TSS	Total Suspended Solids	mg/L	400	26
TTO	Total Toxic Organics	mg/L	5	0.00556 J
pH	pH	standard units	5.5 – 9.5	7.3

Note:

* **TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

Table 3.15
Groundwater Analytical Results
Devens Consolidation Landfill
June 2014

Method	Analyte	Units	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	LFM-99-02B	Q	LFM-DUP (LFM-99-02B Duplicate)	Q	LFM-99-05A	Q	LFM-99-06A	Q	LFM-03-07	Q
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	µg/L	70	50,000	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	µg/L	140	20,000	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000	50,000	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics	µg/L	200	5,000	100	U	100	U	100	U	100	U	100	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	µg/L	1	6,000	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	4,4'-DDD	µg/L	0.2	50	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDE	µg/L	0.05	400	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	4,4'-DDT	µg/L	0.3	1	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Aldrin	µg/L	0.5	30	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-BHC	µg/L	NS	NS	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	alpha-Chlordane[2]	µg/L	2	2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	beta-BHC	µg/L	NS	NS	0.020	UJ	0.020	U	0.020	U	0.020	U	0.020	U
	delta-BHC	µg/L	NS	NS	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Dieldrin	µg/L	0.1	0.5	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan I	µg/L	NS	NS	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Endosulfan II[3]	µg/L	10	2	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endosulfan sulfate[4]	µg/L	0.1	NS	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin	µg/L	2	5	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin aldehyde[5]	µg/L	100	NS	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
	Endrin ketone[6]	µg/L	100	NS	0.040	UJ	0.040	U	0.040	U	0.040	U	0.040	U
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	µg/L	0.2	4	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	gamma-Chlordane[2]	µg/L	2	2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor	µg/L	0.4	1	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Heptachlor epoxide	µg/L	0.2	2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Methoxychlor	µg/L	40	10	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
	Total Chlordane[2]	µg/L	2	2	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
	Toxaphene[7]	µg/L	100	NS	0.500	U	0.500	U	0.500	U	0.500	U	0.500	U

Table 3.15
Groundwater Analytical Results
Devens Consolidation Landfill
June 2014

Method	Analyte	Units	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	LFM-99-02B	Q	LFM-DUP (LFM-99-02B Duplicate)	Q	LFM-99-05A	Q	LFM-99-06A	Q	LFM-03-07	Q
Metals (SW6010C)	Arsenic, Total	µg/L	10	900	3	U	6	U	5	U	3	J	3	U
	Barium, Total	µg/L	2,000	50,000	8	J	14		13		10	U	14	
	Cadmium, Total	µg/L	5	4	5	U	5	U	5	U	5	U	5	U
	Chromium, Total	µg/L	100	300	10	U	21	J	10	U	10	U	10	U
	Copper, Total	µg/L	NS	NS	10	U	10	U	10	U	10	U	10	U
	Iron, Total	µg/L	NS	NS	50	U	780	J	260	J	80		20	J
	Lead, Total	µg/L	15	10	10	U	10	U	2	J	10	U	10	U
	Manganese, Total	µg/L	NS	NS	10	U	29		20		24		10	U
	Selenium, Total	µg/L	50	100	10	U	10	U	10	U	10	U	10	U
	Silver, Total	µg/L	100	7	7	U	7	U	7	U	7	U	7	U
Mercury (SW7470A)	Mercury	µg/L	2	20	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Dissolved Solids (SM2540C)	TDS	mg/L	NS	NS	440		350		380		370		580	
Anions (SM4500, ASTM516-90,02)	Chloride	mg/L	NS	NS	186		121		119		81.8		222	
	Sulfate	mg/L	NS	NS	17.9		25.8		25.3		37.6		36.9	
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	mg/L	NS	NS	0.52		0.53		0.6		0.64		0.99	
Total Alkalinity (SM2320B)	Alkalinity as $CaCO_3$	mg/L	NS	NS	69.2		92.3		91.7		170.0		90.1	
Total Cyanide (SM4500CN-CE)	Cyanide, Total	mg/L	0.2	0.03	0.001	J	0.005	U	0.002	J	0.001	J	0.001	J
COD (E410.4)	Chemical Oxygen Demand	mg/L	NS	NS	4.1	J	20	U	20	U	20	U	11	J
Field Parameters	Temperature, Initial	°Celcius	NS	NS	14.19				11.58		11.74		14.3	
	Temperature, Final	°Celcius	NS	NS	11.73				10.47		11.75		12.84	
	pH	Std units	NS	NS	6.00				4.83		7.36		6.27	
	Specific Conductance	µS/cm	NS	NS	717		NA		607		667		911	
	ORP[2]/Eh	mV	NS	NS	200.3				235.6		129.5		198.7	
	Dissolved Oxygen	mg/L	NS	NS	9.13				5.36		8.15		8.38	
	Turbidity	NTU	NS	NS	0.69				18.9		2.84		0.8	

Notes:
NS - No standard
NA - Not analyzed

[1] GW-1 or GW-3 standard effective June 2014.
[2] The ORP value was not corrected to SHE.
[3] Endosulfan II: MCP standard is for endosulfan.
[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.
[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.
[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.
[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.
[8] The ORP value was not corrected to SHE.

Table 3.16
Groundwater Analytical Results
Devens Consolidation Landfill
October 2014

Method	Analyte	Units	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	LFM-99-02B	Q	LFM-DUP (LFM-99-02B Duplicate)	Q	LFM-99-05A	Q	LFM-99-06A	Q	LFM-RB	Q	LFM-TRIP BLANK	Q
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics	µg/L	300	50,000	50	U	50	U	50	U	50	U	50	U	50	U
	C_9-C_{12} Aliphatics	µg/L	700	50,000	50	U	50	U	50	U	50	U	50	U	50	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50	U	50	U	50	U	50	U	50	U	50	U
	Methyl tert-butyl ether	µg/L	70	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	m,p -Xylenes	µg/L	10,000	5,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	o -Xylene	µg/L	10,000	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Naphthalene	µg/L	140	20,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000	50,000	100	U	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics	µg/L	200	5,000	100	U	100	U	100	U	100	U	100	U	100	U
Organochlorine Pesticides (SW8081A)	Hexachlorobenzene	µg/L	1	6,000	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	4,4'-DDD	µg/L	0.2	50	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	4,4'-DDE	µg/L	0.05	400	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	4,4'-DDT	µg/L	0.3	1	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Aldrin	µg/L	0.5	30	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	alpha-BHC	µg/L	NS	NS	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	alpha-Chlordane[2]	µg/L	2	2	0.054	U	0.051	U	0.051	U	0.051	U	0.051	U	NA	
	beta-BHC	µg/L	NS	NS	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	delta-BHC	µg/L	NS	NS	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Dieldrin	µg/L	0.1	0.5	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Endosulfan I	µg/L	NS	NS	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Endosulfan II[3]	µg/L	10	2	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Endosulfan sulfate[4]	µg/L	0.1	NS	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Endrin	µg/L	2	5	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Endrin aldehyde[5]	µg/L	100	NS	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Endrin ketone[6]	µg/L	100	NS	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	µg/L	0.2	4	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	gamma-Chlordane[2]	µg/L	2	2	0.054	U	0.051	U	0.051	U	0.051	U	0.051	U	NA	
	Heptachlor	µg/L	0.4	1	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Heptachlor epoxide	µg/L	0.2	2	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Methoxychlor	µg/L	40	10	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Total Chlordane[2]	µg/L	2	2	0.011	U	0.010	U	0.010	U	0.010	U	0.010	U	NA	
	Toxaphene[7]	µg/L	100	NS	0.27	U	0.25	U	0.25	U	0.25	U	0.25	U	NA	

Table 3.16
Groundwater Analytical Results
Devens Consolidation Landfill
October 2014

Method	Analyte	Units	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	LFM-99-02B	Q	LFM-DUP (LFM-99-02B Duplicate)	Q	LFM-99-05A	Q	LFM-99-06A	Q	LFM-RB	Q	LFM-TRIP BLANK	Q
Metals (SW6010C)	Arsenic, Total	µg/L	10	900	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	NA	
	Barium, Total	µg/L	2,000	50,000	25	U	25	U	25	U	25	U	25	U	NA	
	Cadmium, Total	µg/L	5	4	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	NA	
	Chromium, Total	µg/L	100	300	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	NA	
	Copper, Total	µg/L	NS	NS	13	U	13	U	13	U	13	U	13	U	NA	
	Iron, Total	µg/L	NS	NS	50	U	50	U	50	U	50	U	50	U	NA	
	Lead, Total	µg/L	15	10	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	NA	
	Manganese, Total	µg/L	NS	NS	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	NA	
	Selenium, Total	µg/L	50	100	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	NA	
	Silver, Total	µg/L	100	7	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	NA	
Mercury (SW7470A)	Mercury	µg/L	2	20	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	NA	
Total Dissolved Solids (SM2540C)	TDS	mg/L	NS	NS	404		438		408		524		7	U	NA	
Anions (SM4500, ASTM516-90,02)	Chloride	mg/L	NS	NS	160		160		160		165		0.77	U	NA	
	Sulfate	mg/L	NS	NS	22.8		21.5		21.5		26.1		1.9	U	NA	
Nitrate/Nitrite (E353.2)	Nitrate/Nitrite (as N)	mg/L	NS	NS	0.36		0.45		0.46		0.76		0.05	U	NA	
Total Alkalinity (SM2320B)	Alkalinity as $CaCO_3$	mg/L	NS	NS	103		80.3		77.0		181.0		4.7	U	NA	
Total Cyanide (SM4500CN-CE)	Cyanide, Total	mg/L	0.2	0.03	0.0041	U	0.0041	U	0.0041	U	0.0041	U	0.0041	U	NA	
COD (E410.4)	Chemical Oxygen Demand	mg/L	NS	NS	10	U	10	U	10	U	10	U	10	U	NA	
Field Parameters	Temperature, Initial	°Celcius	NS	NS	10.93		NA		10.76		10.81		NA		NA	
	Temperature, Final	°Celcius	NS	NS	10.93		NA		10.79		10.81		NA		NA	
	pH	Std units	NS	NS	6.51		NA		6.43		7.63		NA		NA	
	Specific Conductance	µS/cm	NS	NS	759		NA		462		675		NA		NA	
	ORP[2]/Eh	mV	NS	NS	113.3		NA		181		82.7		NA		NA	
	Dissolved Oxygen	mg/L	NS	NS	6.65		NA		5.79		6.59		NA		NA	
	Turbidity	NTU	NS	NS	0.88		NA		3.21		2.7		NA		NA	

Notes:
NS - No standard
NA - Not analyzed
* Results for contaminants of concern that are not present in this table were non-detect

[1] GW-1 or GW-3 standard effective June 2014
[2] The ORP value was not corrected to SHE.

Table 3.17
Leachate Analytical Results - Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2014 - Annual Sampling Event
				Date Sampled: 10/23/2014
Total metals	Arsenic	mg/L	0.3	0.1 U
	Cadmium	mg/L	0.038	0.002 U
	Chromium	mg/L	2.0	0.005 U
	Copper	mg/L	1.0	0.013 U
	Lead	mg/L	0.25	0.0025 U
	Nickel	mg/L	1.0	0.02 U
	Silver	mg/L	0.0146	0.0025 U
	Zinc	mg/L	0.75	0.01 U
	Mercury	mg/L	0.001	0.00015 U
TSS	Total Suspended Solids	mg/L	400	11.0
TTO	Total Toxic Organics	mg/L	5	0.20012 J
pH	pH	standard units	5.5 – 9.5	7.0 **

Note:

*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

** Analysis performed past the required 15 minutes of collection time/holding time

Table 3.18
Historical Devens Consolidation Landfill Groundwater Data
LFM-99-02B

Method/Analyte	Units	MCP GW-1 Standard	MCP GW-3 Standard	2-Jun-03	Qual	25-Nov-03	Qual	18-May-04	Qual	20-Oct-04	Qual	27-May-05	Qual	22-May-06	Qual	24-May-07	Qual	27-Jun-08	Qual	23-Oct-08	Qual	05-May-09	Qual	23-Oct-09	Qual	27-Jan-10	Qual	05-May-10	Qual	14-Oct-10	Qual	01-Jul-11	Qual	12-Oct-11	Qual	15-May-12	Qual	19-Oct-12	Qual	12-Jun-13	Qual	25-Oct-13	Qual	19-Jun-14	Qual	23-Oct-14	Qual
Extractable Petroleum Hydrocarbons (EPH)																																															
Naphthalene	µg/L	140	20,000	1.0	U	5.1	U	2.4	U	2.1	U	10.0	U	0.2	U	0.46	U	0.412	U	0.430	U	10	U	0.400	U	NA		0.419	U	0.400	U	0.400	U	0.400	U	0.400	U	0.148	J	0.400	U	0.400	U	0.400	U	1.000	U
Pesticides																																															
Aldrin	µg/L	0.5	20	0.0064	U	0.0067	U	0.0076	U	0.0076	U	0.05	UJ	0.05	U	0.0217	U	0.021	UJ	0.021	UJ	0.200	UJ	0.200	UJ	NA		0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.011	U
Dieldrin	µg/L	0.1	0.5	0.013	U	0.0013	U	0.015	U	0.014	U	0.1	U	0.05	U	0.0435	U	0.043	UJ	0.042	UJ	0.040	UJ	0.040	UJ	NA		0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.011	U
alpha-Chlordane[1]	µg/L	2	2	0.0064	U	0.0067	U	0.0076	U	0.071	U	0.05	U	0.05	U	0.0217	U	0.021	UJ	0.021	UJ	0.020	UJ	0.020	UJ	NA		0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.054	U
gamma-Chlordane[1]	µg/L	2	2	0.0064	U	0.0053	J	0.0076	U	0.071	U	0.05	U	0.05	U	0.0217	U	0.021	UJ	0.021	UJ	0.020	UJ	0.020	UJ	NA		0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.054	U
gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isoner or Lindane)	µg/L	0.2	4	0.0064	U	0.0067	U	0.0076	U	0.0076	U	0.05	U	0.05	U	0.0217	U	0.021	UJ	0.021	UJ	0.020	UJ	0.020	UJ	NA		0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.011	U
Metals (Total)																																														
Arsenic	µg/L	10	900	5.0	U	50.0	U	5.0	U	5.0	U	4.2	U	2.5	U	5.0	U	5.0	U	5.0	U	5	U	5.0	J	5	U	5	U	5	U	5	U	2	J	5	U	5	U	5	U	5	U	3	U	3	U
Chromium	µg/L	100	300	28		1.7	J	0.96	J	1.07	J	12.0	U	10.0	U	10.0	U	10	U	10	U	5	U	NA		40		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5	U
Iron	µg/L	NS	NS	NA		100	U	17	J	100	U	38.0	U	50.0	U	50.0	U	50	U	28	J	50	U	32	J	380		50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Lead	µg/L	15	10	5.0	U	8.5	J	5.0	U	5.0	U	3.1		2.5	U	10.0	U	10	U	10	U	10	J	10	U	10	U	10	U	10	U	10	U	3	J	10	U	10	U	10	U	10	U	10	U	2.5	U
Manganese	µg/L	NS	NS	NA		2.4	J	1.5	J	12.7	J	5.2	J	10.0	U	1.1	J	10	U	10	U	10	U	10	U	9.1	J	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	7.5	U
Zinc	µg/L	5,000	900	NA		5.9	J	7.1	J	5.57	J	1.6	U	NA		7.4	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Wet Chemistry																																														
Total Cyanide	mg/L	0.2	0.03	0.01	U	0.004	J	0.01	U	0.005	J	0.01	U	0.05	U	0.01	UJ	0.005	U	0.005	U	0.005	U	0.005	U	NA		0.0011	J	0.005	U	0.005	U	0.005	U	0.002	J	0.002	J	0.005	U	0.005	U	0.0001	J	0.0041	U
Nitrate/Nitrite (as N)	mg/L	NS	NS	0.21		1.4		0.66		0.796		0.36	J	0.45		0.5		0.43	J	1.9		0.92		0.64	U	NA		0.41		0.54		0.43		0.76		0.22	U	0.49		0.069	J	0.51		0.52		0.36	
Chemical Oxygen Demand (COD)	mg/L	NS	NS	170		50.0	U	15	J	50.0	U	20.0	U	10.0	U	20.0	U	20	U	12	J	20	U	20	U	NA		20	U	20	U	8.0	J	20	U	20	U	20	U	15	J	20	U	4.1	J	10	U
Water Quality Parameters																																														
pH	std units	NS	NS	6.20		6.38		6.09		6.38		5.97		6.32		6.15		6.32		7.00		5.57		6.17		6.22		6.71		6.35		6.10		6.03		6.25		6.29		5.87		6.45		6.00		6.51	
Oxidation-Reduction Potential (ORP[2])	mV	NS	NS	NA		204.7		243.3		308.4		266.3		223.6		200.8		160.7		55.2		215.4		311.3		113		-232.2		163.6		150.1		142.2		135.5		196.3		303.3		101.8		200.3		113.3	
Turbidity	NTU	NS	NS	NA		0.40		0.80		0.55		0.37		0.18		0.00		2.80		2.0		0.0		3.8		0.0		2.2		0.39		0.00		2.57		0.33		0.00		0.00		0.79		0.69		0.88	

Notes:

[1] Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers, including the alpha and gamma chlordane isomers, found in technical chlordane).

[2] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 3.18
Historical Devens Consolidation Landfill Groundwater Data
LFM-99-05A

Method / Analyte	Units	MCP GW-1 Standard	MCP GW-3 Standard	2-Jun-03	Qual	25-Nov-03	Qual	18-May-04	Qual	20-Oct-04	Qual	27-May-05	Qual	22-May-06	Qual	24-May-07	Qual	27-Jun-08	Qual	23-Oct-08	Qual	05-May-09	Qual	23-Oct-09	Qual	27-Jan-10	Qual	05-May-10	Qual	14-Oct-10	Qual	01-Jul-11	Qual	12-Oct-11	Qual	15-May-12	Qual	19-Oct-12	Qual	12-Jun-13	Qual	25-Oct-13	Qual	19-Jun-14	Qual	23-Oct-14	Qual
Extractable Petroleum Hydrocarbons (EPH)																																													
Naphthalene	µg/L	20	20000	1.0	U	5.1	U	2.4	U	2.1	U	10.0	U	0.2	BJ	0.421	U	0.408	U	0.430	U	0.4	U	0.421	U	NA		0.426	U	0.400	U	0.400	U	0.400	U	0.400	U	0.400	U	0.400	U	0.400	U	4.000	U	1.000	U
Pesticides																																													
Aldrin	µg/L	0.5	20	0.0064	U	0.0067	U	0.0072	U	0.0072	U	0.05	U	0.05	U	0.0215	U	0.020	UJ	0.021	U	0.022	U	0.022	U	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.010	U
Dieldrin	µg/L	0.1	0.5	0.013	U	0.013	U	0.014	U	0.014	U	0.1	U	0.05	U	0.043	U	0.040	UJ	0.042	U	0.044	U	0.044	U	NA		0.043	U	0.041	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.010	U
alpha-Chlordane[1]	µg/L	2	2	0.0064	U	0.0067	U	0.0072	U	0.0072	U	0.05	U	0.05	U	0.0215	U	0.020	UJ	0.021	U	0.022	UJ	0.022	UJ	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U	0.200	U	0.200	U	0.200	U	0.020	U	0.051	U
gamma-Chlordane[1]	µg/L	2	2	0.0064	U	0.0067	U	0.0072	U	0.0072	U	0.05	U	0.05	U	0.0215	U	0.020	UJ	0.021	U	0.022	U	0.022	U	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.051	U
gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isoner or Lindane)	µg/L	0.2	4	0.0064	U	0.0067	U	0.0072	U	0.0072	U	0.05	U	0.05	U	0.0215	U	0.020	UJ	0.021	U	0.022	U	0.022	U	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.010	U
Metals (Total)																																													
Arsenic	µg/L	10	900	7.5		6.9	J	5.0	U	5.0	U	4.2	J	2.5	U	2.4	J	5.0	U	5.0	U	2	J	5.0	U	5	U	5	U	4.6	J	5	U	3	J	5	U	5.0	U	5	U	5.0	U	5	U	3	U
Chromium	µg/L	100	300	10.0	U	1.6	J	7.7	J	1.37	J	6	J	10.0	U	10.0	U	10	U	10	U	20		NA		40		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5	U
Iron	µg/L	NS	NS	NA		96	J	130		33.3	J	666		93.2		70		50	U	70		510		20	J	380		70		480		50	J	20	J	50	U	110		50	U	80		260	J	50	U
Lead	µg/L	15	10	9.3		9.5	J	5.0	U	5.0	U	2.9	U	2.5	U	10.0	U	10	U	10	U	2	J	10	U	10	U	10	U	10	U	10	U	2	J	10	U	10	U	10	U	10	U	2	J	2.5	U
Manganese	µg/L	NS	NS	NA		3.6	J	8.5	J	2.1	J	33.9		10.0	U	3.9	J	10	U	2.4	J	21		10	U	9.1	J	10	U	12.0		10	U	10	U	10	U	6.0	J	10	U	3.0	J	20		7.5	U
Zinc	µg/L	900	900	NA		6.6	J	8.5	J	5.05	J	1.8	J	NA		3.6	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Wet Chemistry																																													
Total Cyanide	mg/L	0.01	0.03	0.01	U	0.004	J	0.01	U	0.009	J	0.01	U	0.05	U	0.01	UJ	0.005	U	0.005	UJ	0.002	J	0.005	U	NA		0.005	U	0.005	U	0.005	U	0.005	U	0.002	J	0.004	J	0.005	U	0.005	U	0.0020	J	0.0041	U
Nitrate/Nitrite (as N)	mg/L	NS	NS	1.6		1.4		1.4		1.34		1		0.4		0.46		0.60	J	0.57		0.55		0.46	J	NA		0.64		0.49	J	0.51		0.42		0.38		0.38		0.43		0.47		0.6		0.46	
Chemical Oxygen Demand (COD)	mg/L	NS	NS	100		50.0	U	13	J	12	J	20.0	U	10.0	U	11.0	U	20	U	20	U	8.1	J	20	U	NA		20	U	24	U	34		20	U	20	U	11	J	13	J	20	U	20	U	10	U
Water Quality Parameters																																													
pH	std units	NS	NS	6.10		6.11		5.97		5.84		6.17		6.24		5.81		6.09		6.93		6.08		5.89		6.37		6.23		6.05		5.56		6.16		6.51		6.44		6.3		6.46		4.83		6.43	
Oxidation-Reduction Potential (ORP[4])	mV	NS	NS	NA		231.2		199.2		154.7		141.3		205.9		220.0		116.1		61.8		122		173.7		68.7		-223		180.6		238		-255.1		106.4		195.9		219.6		145.4		235.6		181	
Turbidity	NTU	NS	NS	NA		4.43		2.59		2.50		26.2		2.51		3.60		0.58		2.33		4.1		4.67		6.2		1.7		2.8		3.1		2.40		3.02		3.90		2.4		3.70		18.90		3.21	

Notes:

[1] Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers, including the alpha and gamma chlordane isomers, found in technical chlordane)

[2] MCP Standard: Concentrations are compared to the more stringent or lower value of the Massachusetts Contingency Plan GW-1 or GW-3

[3] Arsenic: EPA's MCL for As in drinking water was reduced January 23, 2006 from 50 ug/L to 10 ug/L.

[4] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 3.18
Historical Devens Consolidation Landfill Groundwater Data
LFM-99-07/LFM-03-07

Method/Analyte	Units	MCP GW-1 Standard	MCP GW-3 Standard	LFM-99-07										LFM-03-07																																	
				2-Jun-03	Qual	25-Nov-03	Qual	18-May-04	Qual	20-Oct-04	Qual	27-May-05	Qual	22-May-06	Qual	24-May-07	Qual	27-Jun-08	Qual	23-Oct-08	Qual	05-May-09	Qual	23-Oct-09	Qual	05-May-10	Qual	14-Oct-10	Qual	01-Jul-11	Qual	12-Oct-11	Qual	15-May-12	Qual	10/19/2012[5]	Qual	12-Jun-13	Qual	25-Oct-13[5]	Qual	19-Jun-14	Qual	23-Oct-14[5]	Qual
Extractable Petroleum Hydrocarbons (EPH)																																															
Naphthalene	µg/L	140	20,000	1.0	U	5.4	U	2.4	U	2.2	U	10.0	U	0.2	BJ	0.46	U	0.417	U	0.426	U	10	U	NA		0.412	U	0.400	U	0.400	U	0.400	U	0.400	U	NS		0.400	U	NS		4.000	U	NS	
Pesticides																																															
Aldrin	µg/L	0.5	20	0.0064	U	0.0071	U	0.0067	U	0.007	U	0.05	U	0.05	U	0.02	U	0.024	UJ	0.021	U	0.023	U	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U			0.020	U			0.020	U		
Dieldrin	µg/L	0.1	0.5	0.013	U	0.014	U	0.013	U	0.014	U	0.1	U	0.05	U	0.04	U	0.048	UJ	0.043	U	0.046	U	NA		0.042	U	0.041	U	0.040	U	0.040	U	0.040	U			0.040	U			0.040	U		
alpha-Chlordane[1]	µg/L	2	2	0.0064	U	0.0071	U	0.0067	U	0.007	U	0.05	U	0.05	U	0.02	U	0.024	UJ	0.021	U	0.023	UJ	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U			0.020	U			0.020	U		
gamma-Chlordane[1]	µg/L	2	2	0.0064	U	0.0071	U	0.0067	U	0.007	U	0.05	U	0.05	U	0.02	U	0.024	UJ	0.021	U	0.023	U	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U	NS		0.020	U	NS		0.020	U	NS	
gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isoner or Lindane)	µg/L	0.2	4	0.0064	U	0.0071	U	0.0067	U	0.007	U	0.05	U	0.05	U	0.02	U	0.024	UJ	0.021	U	0.023	U	NA		0.021	U	0.021	U	0.020	U	0.020	U	0.020	U			0.020	U			0.020	U		
Metals (Total)																																															
Arsenic	µg/L	10	900	7.9		**29**	**J**	5.0	U	1.7	J	4.2	U	2.5	U	2.3	J	5.0	U	5.0	U	5.0	U	NA		3.3	J	2.5	J	5	U	4	J	5	U			5	U			3	U		
Chromium	µg/L	100	300	10.0	U	35		8.1	J	5.38	J	7.4	J	10.0	U	10.0	U	10	U	10	U	2	J	NA		4	J	2	J	10	U	10	U	10	U			10	U			10	U		
Iron	µg/L	NS	NS	NA		17,000	J	620		25.0	U	630		50.0	U	50.0	U	50	U	50	U	50	U	NA		230		730		20	J	50	U	50	U	NS		50	U	NS		20	J	NS	
Lead	µg/L	15	10	13		**17**	**J**	5.0	U	5.0	U	2.9	U	2.5	U	10.0	U	10	U	10	U	1.9	J	NA		10	U	10	U	10	U	3	J	10	U			10	U			10	U		
Manganese	µg/L	NS	NS	NA		200	J	14	J	10.1	J	22.8		10.0	U	0.7	J	10	U	10	U	10	U	NA		4.4	J	10		10	U	10	U	10	U			10	U			10	U		
Zinc	µg/L	5,000	900	NA		42		6.2	J	5.95	J	1.6	U	NA		1.7	U	NA		NA		NA		NA		NA		NA		NA		NA		NA				NA				NA			
Wet Chemistry																																															
Total Cyanide	mg/L	0.2	0.03	0.01	U	0.004	J	0.01	U	0.010 B; 0.0050 JB		0.01	U	0.05	U	0.01	UJ	0.005	U	0.005	UJ	0.005	U	NA		0.0001	J	0.005	U	0.005	U	0.005	U	0.005	U			0.005	U			0.0010	J		
Nitrate/Nitrite (as N)	mg/L	NS	NS	1.3		2.0		0.90		1.80		1.20		1.47		0.93		1.3	J	0.94		1.0		NA		1.1		0.98		0.96		0.93		1		NS		0.87		NS		0.99		NS	
Chemical Oxygen Demand (COD)	mg/L	NS	NS	86		26	J	18	J	50.0	U	31; 20	U	10.0	U	18	UJ	12	J	20	U	20	U	NA		9.2	J	20	U	20	U	26	U	20	U			18	J			11	J		
Water Quality Parameters																																															
pH	std units	NS	NS	6.0		6.27		5.54		6.15		6.15		6.22		6.06		8.14		5.97		5.96		NA		6.37		6.38		5.84		6.14		6.52				5.76				6.27			
Oxidation-Reduction Potential (ORP[4])	mV	NS	NS			365.5		345.3		279		237.5		230.3		169.0		130		146		125.1		NA		-249.8		109		372.9		121.5		105.6		NS		284.3		NS		198.70		NS	
Turbidity	NTU	NS	NS			10.9		3.52		11.7		0.25		0.49		0.50		2.00		3.40		3.18		NA		2.00		13.9		0.59		0.46		0.00				0.25				0.80			

Notes:

[1] Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers, including the alpha and gamma chlordane isomers, found in technical chlordane).

[2] MCP Standard: Concentrations are compared to the more stringent or lower value of the Massachusetts Contingency Plan GW-1 or GW-3 standards [310 CMR 40.0974(2)].

[3] Arsenic: EPA's MCL for As in drinking water was reduced January 23, 2006 from 50 ug/L to 10 ug/L.

[4] The ORP value was not corrected to SHE.

[5] Well LFM-03-07 was not sampled due to inadequate water.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

D.3 Devens Consolidated Landfill Site

Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens DCL	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Leachate Collection System		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Site is in good condition. No signs of cap failure or erosion.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview

Name of Interviewer: Elizabeth Anderson

Name of Interviewee: N/A - previously conducted

Date:

Position:

Owner ☐

Manager ☐

Other: Please Specify ☒ _____

Location:

Site ☐

Office ☐

Phone: ☒

Telephone #

Item	Check One	Comments
Are there any extraction wells at the property?	Yes ☐ No ☒	The leachate pump system has a wet well, no extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No ☒	No specific construction plans are known. A recommendation is being made to discharge to surface water/dention basin instead of sewer for leachate.
Are there any issues with site access for monitoring?	Yes ☐ No ☒	.

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____



Toe of DCL, roadway and riprap



Leachate collection system



DCL slope, cap in good condition, riprap at toe



Leachate pump piping

D.4 OU#2 Devens Consolidated Landfill

ARARs

TABLE B.1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Floodplains	Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]	Applicable AOC 9 AOC 11 AOC 40	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modifiation/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Drum removal and hot-spot sediment removal will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary.
	Wetlands	Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Applicable AOC 9 AOC 11 AOC 40	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Drum removal and hot-spot sediment removal will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary.
	Wetlands, Aquatic Ecosystem	Clean Water Act, Dredge or Fill Requirements Section 404 [40 CFR Part 230]	Relevant and Appropriate AOC 9 AOC 11 AOC 40	Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands.	The removal of drums/sediments will be designed to minimize placement or fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.

TABLE B.1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Surface Waters, Endangered Species, Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et. seq.]	Relevant and Appropriate AOC 9 AOC 11 AOC 40 SA 13	Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildfire Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan.	To the extent necessary, action will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions.
	Endangered Species	Endangered Species Act [50 CFR Parts 17.11-17.12]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	This act requires action to avoid jeopardizing the continued existence of listed endangered or threaten species or modification of their habitat.	The protection of endangered species and their habitats will be considered during excavation activities and cover installation.
	Atlantic Flyway, Wetlands, Surface Waters	Migratory Bird Treaty Act [16 USC 703 et seq.]	Relevant and Appropriate AOC 11	The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial actions will be performed to protect migratory birds, their nests, and eggs.

TABLE B.1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.
	Endangered Species	Massachusetts Endangered Species Regulations [321 CMR 8.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	The protection of state listed endangered species (in particular the Grasshopper Sparrow at the Consolidation Facility) will be considered during the design and implementation of this alternative.

Notes:

AWQC = Ambient Water Quality Criteria
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
DOI = Department of the Interior
FWS = Fish and Wildlife Services
MEPA = Massachusetts Environmental Policy Act
MGL = Massachusetts General Laws
NMFS = National Marine Fisheries Service
USC = United States Code

Note: A Record Notice of Landfill Operation for AOC 11 is not necessary with Alternative 4c.

TABLE B.2
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Surface water	Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]	Relevant and Appropriate AOC 11 AOC 40	Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria development for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentratons for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release.	Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activities at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond.
	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs and MCLGs (40 CFR Parts 141.60 - 141.63 and 141.50 - 141.52]	Relevant and Appropriate AOC 40	The National Primary Drinking Water Regulations establish Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations if contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCGLs are non-enforceable health based goals set equal to or lower than MCLs.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.

TABLE B.2
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State	Surface water	Massachusetts Surface Water Quality Standards [314 CMR 4.00]	Relevant and Appropriate AOC 11 AOC 40	Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC.	At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River. At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations.
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Relevant and Appropriate AOC 40	These standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I, fresh groundwaters designated as a source of potable water supply.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.
	Groundwater	Massachusetts Drinking Water Regulations [310 CMR 22.00]	Relevant and Appropriate AOC 40	These regulations list Massachusetts MCLs which apply to drinking water distributed through a public water system.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.

Notes:

AWQC = Ambient Water Quality Criteria
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
MCL = Maximum Contaminant Rules
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level
NPDWR = National Primary Drinking Water Regulations
SDWA = Safe Drinking Water Act
SMCL = Secondary Maximum Contaminant Level

Note: A Record Notice of Landfill Operation for AOC 11 is not necessary with Alternative 4c.

TABLE B.3
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Construction over/in navigable waters	Rivers and Harbors Act of 1899 [33 USC 401 et seq.]	Relevant and Appropriate AOC 40 AOC 11	Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.	Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.
	Control of surface water runoff, Direct discharge to surface water	Clean Water Act NPDES Permit Program [40 CFR 122, 125]	Relevant and Appropriate AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.	Construction activities will be controlled to meet USEPA discharge requirements. On-site discharge will meet the substantive requirements of these regulations.
	Land Disposal of Hazardous Wastes	Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268)	Applicable AOC 9 AOC 11 AOC 40 SA 13	Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determined if they constitute "placement" and if LDRs are applicable. The LDRs requie that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	If it is determined that materials excavated from AOCs 9, 11, 40, or SA 13 are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.
	Disposal of PCB-contaminated wastes	Toxic Substance Control act Regulations [40 CFR Part 761]	Applicable AOC 9 AOC 11 AOC 40 SA 13	Establish prohibitions of and requirements for the manufacturing, processing, distribution in commerce, use, disposal, storage and marking of PCB items. Sets forth the "PCB Spill Cleanup Policy."	If it is determined that materials excavated from AOCs 9, 11, 40 or SA 13 are contaminated with PCBs at concentrations of 50 ppm or greater, the materials will be handled and disposed of in compliance with these regulations.
State	Solid Waste Landfill Siting	Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]	Applicable Consolidation Facility	These regulations outline the requirements for selecting the site of a new solid waste landfill for the Commonwealth of Massachusetts.	The consolidation facility will be sited in accordance with these regulations.

TABLE B.3
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State	Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care	Massachusetts Solid Waste Management Regulations [310 CMR 19.000]	Relevant and Appropriate AOC 9, AOC 11, SA 12, SA 13 Consolidation Facility	These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.	Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for AOCs 9, 11, and 40, and SAs 12 and 13. The consolidation landfill will be constructed, operated, and closed in conformance with the regulations at 310 CMR 19.000. A Record Notice of Landfill Operation will be filed for AOC 11 in accordance with 310 CMR 19.141.
	Activities that potentially affect surface water quality	Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]	Relevant and Appropriate AOC 40	For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.	Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.
	Activities that affect ambient air quality	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	These regulations pertain to the prevention of emissions in excess of Massachusetts ambient air quality standards.	Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).

Notes:

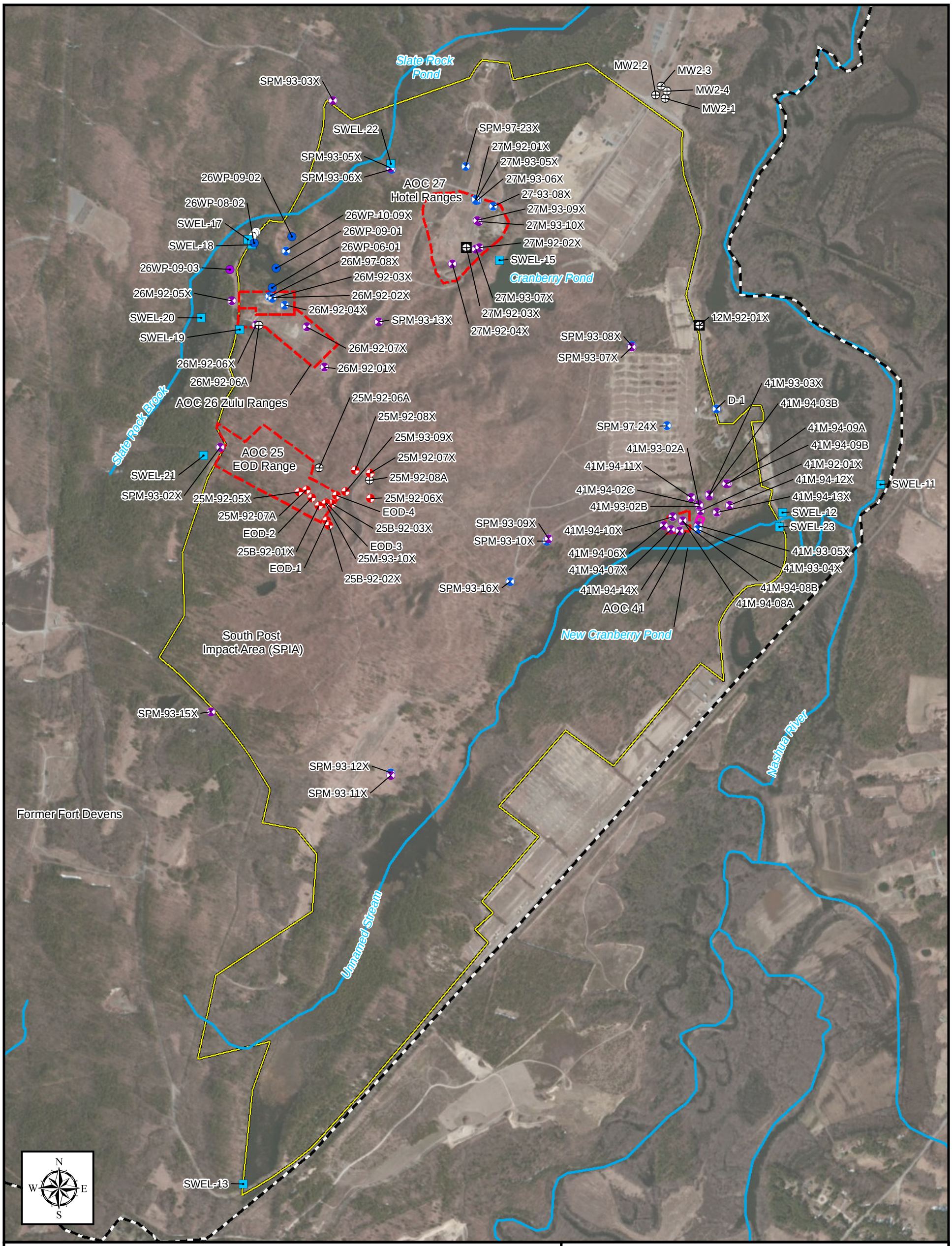
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
MADEP = Massachusetts Department of Environmental Protection
MGL = Massachusetts General Laws
NPEDES = National Pollutant Discharge Elimination System
RCLA = Comprehensive Environmental Response, Compensation, and Liability Act
USACE = U.S. Army Corps of Engineers
USC = United States Code

Note: A Record Notice of Landfill Operation for AOC 11 is not necessary with Alternative 4c.

APPENDIX E –South Post Impact Area

E.1 South Post Impact Area

Figures



Legend

- LTM Sample Well
- LTM Well - Periodic Gauge Only
- LTM Sample Well Point
- Monitoring Well - Abandoned
- Well Point Installation Location (Shallow Refusal)-Abandoned
- Monitoring Well - Possibly Destroyed
- Well Point - Periodic Gauge Only
- Monitoring Well
- Surface Water Elevation Location
- SWEL-12 Well/Elevation Location Identification
- Surface Water Course
- Former Fort Devens Boundary
- Landfill Debris
- Area of Contamination (AOC)
- South Post Impact Area

Notes: LTM = Long-term monitoring
References: HGL. LTMMP 2012.
Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 4.1
Site Layout
South Post Impact Area

2015 Five-Year Review
South Post Impact Area

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

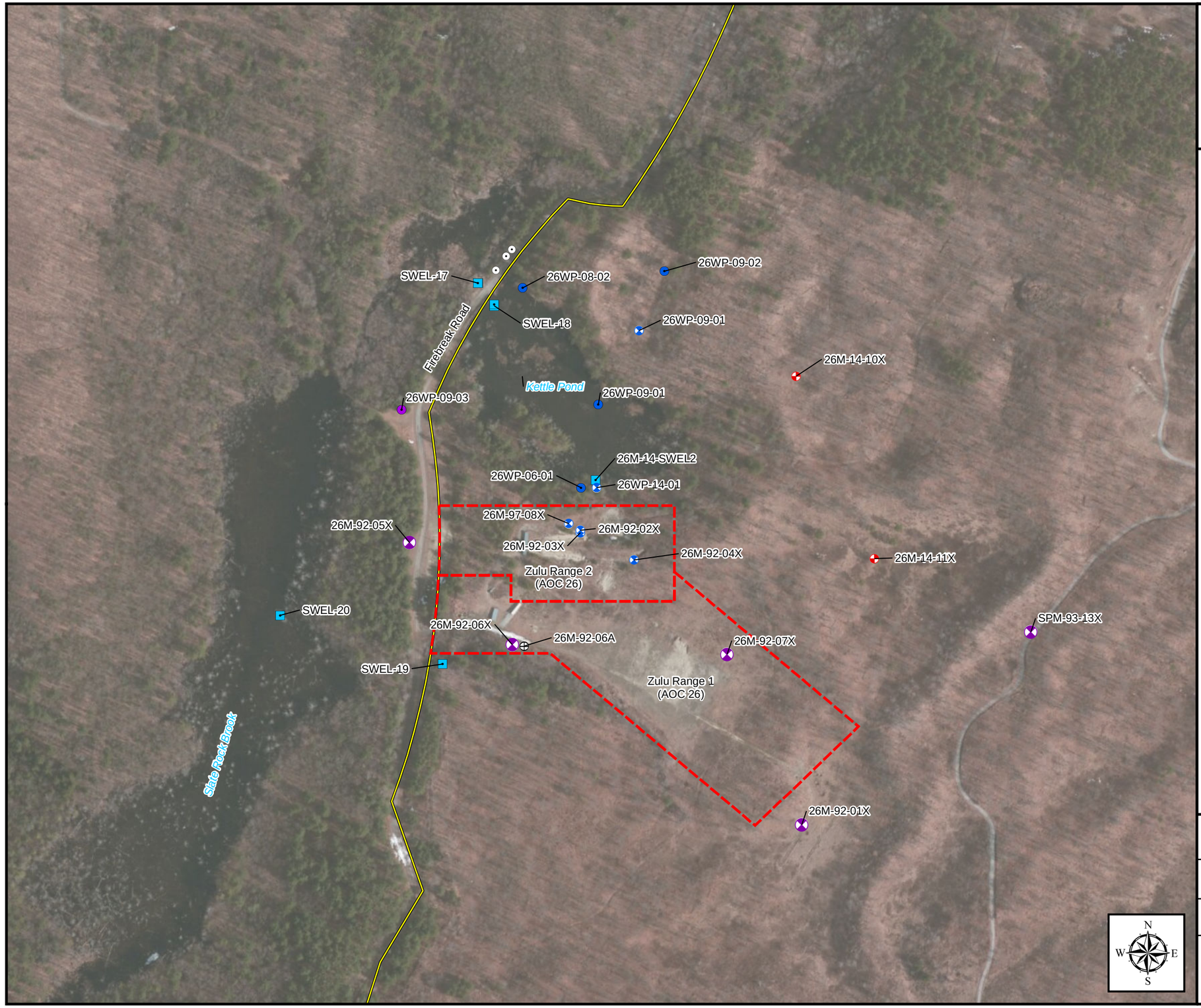
0 600 1,200
Feet

Date: 04/15/2015

Figure 4.1

File: SPIA_2015_Figure6_1.mxd

Figure 4.2
Site Layout
South Post Impact Area
Area of Contamination 26
Zulu Ranges 1 and 2



Legend

- Well Point (Shallow Refusal) - Abandoned
- LTM Sample Well Point
- Well Point - Periodic Gauge Only
- Surface Water Elevation Location
- LTM Well - Periodic Gauge Only
- LTM Sample Well
- Monitoring Well
- Monitoring Well - Abandoned
- 26M-92-03X Well/Elevation Point Identification
- Area of Contamination (AOC)
- South Post Impact Area

Notes:
ft = Feet
NGVD = National Geodetic Vertical Datum
LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
South Post Impact Area

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 150 300
Feet

Date: 04/15/2015

Figure 4.2

File: SPIA_2015_Figure6_2_AOC26.mxd

Figure 4.3
Site Layout
South Post Impact Area
Area of Contamination 27
Hotel Range



Legend

- Monitoring Well - Possibly Destroyed
- Surface Water Elevation Location
- LTM Well - Periodic Gauge Only
- LTM Sample Well
- 27M-93-08X — Well/Elevation Point Identification
- Area of Contamination (AOC)

Notes:
LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
South Post Impact Area

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Devens, Massachusetts

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0 75 150
Feet

Date:
04/15/2015

Figure
4.3

H&S

File: SPIA_2015_Figure6_3_HotelRange.mxd



Figure 4.4
Site Layout
South Post Impact Area
Area of Contamination 41

Legend

- LTM Well - Periodic Gauge Only
- LTM Sample Well
- 41M-94-12X Well/Elevation Point Identification
- Landfill Debris

Notes:
ft = Feet
NGVD = National Geodetic Vertical Datum
LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
South Post Impact Area

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

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0 50 100
Feet

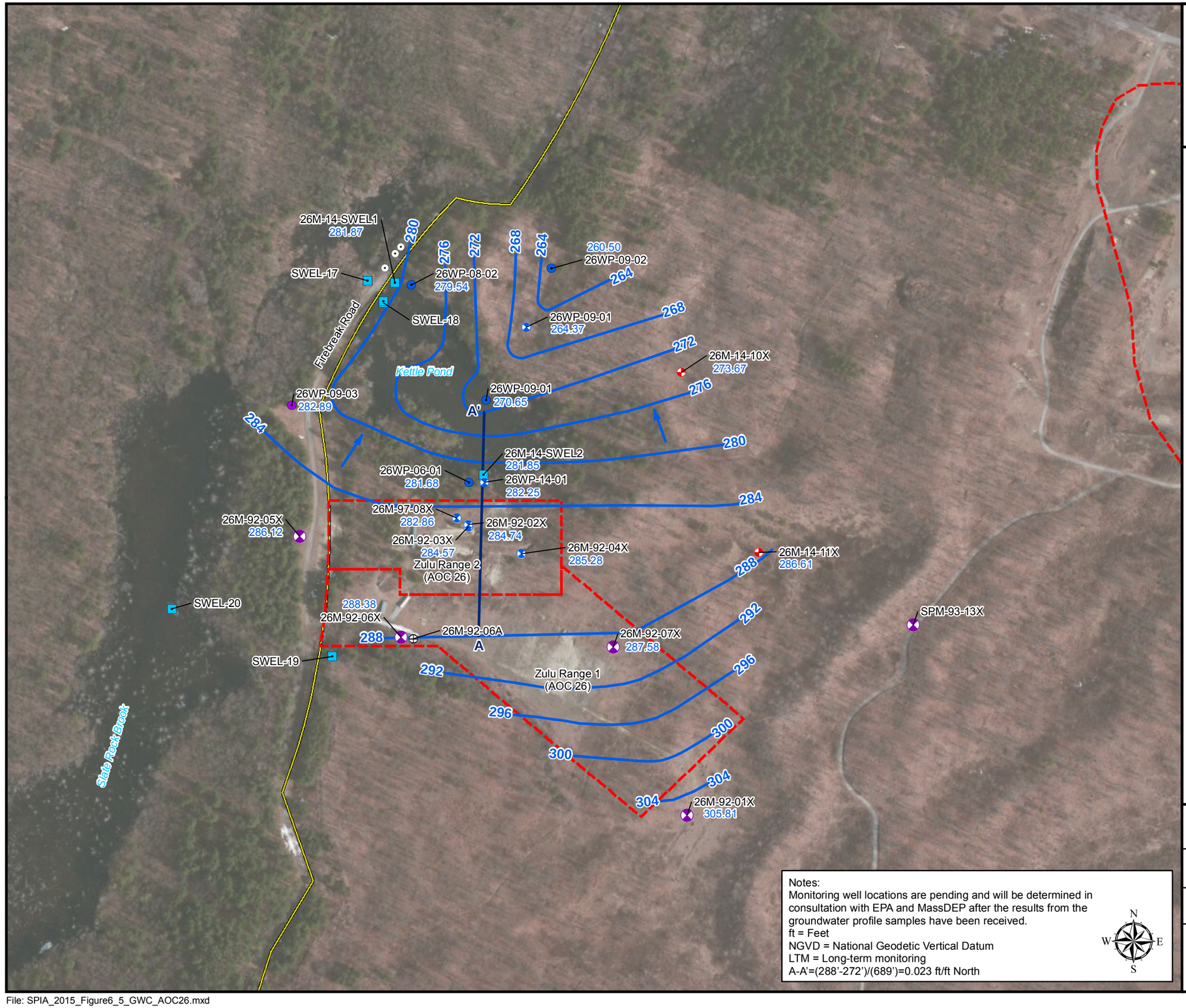
Date: 04/15/2015

Figure 4.4

H&S

File: SPIA_2015_Figure6_4_AOC41.mxd

Figure 4.5
Interpretive Water Table Elevation
South Post Impact Area
Zulu Ranges 1 and 2
November 2014



Notes:
Monitoring well locations are pending and will be determined in consultation with EPA and MassDEP after the results from the groundwater profile samples have been received.
ft = Feet
NGVD = National Geodetic Vertical Datum
LTM = Long-term monitoring
A-A'=(288'-272')/(689')=0.023 ft/ft North

N
W
E
S

Legend

- Well Point (Shallow Refusal) - Abandoned
- LTM Sample Well Point
- Well Point - Periodic Gauge Only
- Surface Water Elevation Location
- LTM Well - Periodic Gauge Only
- LTM Sample Well
- Monitoring Well
- Monitoring Well - Abandoned
- 26M-92-03X — Well/Elevation Point Identification
- 273.67 — Groundwater Elevation (ft amsl)
- Groundwater Flow Direction
- 272 — Groundwater Elevation Contour (ft amsl) (contour interval = 4 ft)
- A — A' — Groundwater Gradient Calculation Location
- Area of Contamination (AOC)
- South Post Impact Area

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Devens, Massachusetts

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0 150 300
Feet

Date: 04/15/2015

Figure 4.5

File: SPIA_2015_Figure6_5_GWC_AOC26.mxd

Figure 4.6
Explosives, Metals and Perchlorate Concentrations
South Post Impact Area
Area of Contamination 26 - Zulu Ranges 1 and 2
Nov. 2013, Oct. and Nov. 2014, Jan. 2015

Well Point 26WP-08-02	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.4540 J	< 2	NC
Arsenic	**53**	**53.5**	NC
Barium	3.0 J	< 252	NC
Cadmium	1.0 J	< 2	NC
Calcium	3,500	3,440 J	NC
Chromium	6 J	< 5	NC
Copper	4.0 J	< 13	NC
Iron	**26,000**	**20,700**	NC
Lead	14	< 2.5	NC
Magnesium	620	< 2,500	NC
Manganese	149	149	NC
Potassium	400 J	< 2,500	NC
Sodium	2,100	<2,500	NC
Zinc	**6,720**	**3,260**	NC
Metals, Total:	Concentration (µg/L)		
Antimony	0.4540 J	< 2	NC
Arsenic	**53**	**53.7**	NC
Barium	3.0 J	< 25	NC
Cadmium	1.0 J	< 2	NC
Calcium	3,500	2,740 J	NC
Chromium	6 J	< 5	NC
Copper	4.0 J	< 13	NC
Iron	**26,000**	**21,000**	NC
Lead	14	< 2.5	NC
Magnesium	620	< 2,500	NC
Manganese	149	151	NC
Potassium	400 J	< 2,500	NC
Sodium	2,100	<2,500	NC
Zinc	**6,720**	**3,390**	NC
Other:	Concentration (µg/L)		
Perchlorate	< 0.05	< 0.10	NC

Well Point 26M-10-09X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	NC	NC	ND
Metals, Total:	Total (µg/L)	Dissolved (µg/L)	
Calcium	NC	4,720 J	NC
Sodium	NC	3,970 J	NC
Other:	Concentration (µg/L)		
Perchlorate	0.026 J	< 10	NC

Well Point 26WP-09-02	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	NC	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Manganese	NC	18.1	NC
Zinc	NC	**3140**	NC
Metals, Total:	Total (µg/L)	Dissolved (µg/L)	
Iron	NC	162	NC
Manganese	NC	19.3	NC
Zinc	NC	**3,150**	NC
Other:	Concentration (µg/L)		
Perchlorate	0.046 J	< 0.10	NC

Well Point 26WP-09-01	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	NC	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Arsenic	NC	**153**	NC
Calcium	NC	2,900 J	NC
Iron	NC	6,180	NC
Manganese	NC	134	NC
Sodium	NC	2,860 J	NC
Zinc	NC	**1,870**	NC
Metals, Total:	Concentration (µg/L)		
Arsenic	NC	**15.5**	NC
Iron	NC	6,390	NC
Magnesium	NC	2,610 J	NC
Manganese	NC	138	NC
Sodium	NC	2,610 J	NC
Zinc	NC	**1,890**	NC
Other:	Concentration (µg/L)		
Perchlorate	< 0.05	< 0.10	NC

Well Point 26M-14-10X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals, Total:	Total (µg/L)	Dissolved (µg/L)	
Calcium	NC	10,200	NC
Manganese	NC	12.4	NC
Sodium	NC	5,010	NC
Other:	Concentration (µg/L)		
Perchlorate	< 0.10	< 0.10	NC

Well Point 26WP-06-01	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
HMX	18.8	NC	< 0.21
RDX	**76**	NC	< 0.21
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	1.062	< 2	NC
Barium	10	< 25	NC
Cadmium	1.0 J	< 2	NC
Calcium	6,100	6,650	NC
Chromium	6.0 J	< 5	NC
Copper	6 J	< 13	NC
Iron	**40,000**	3,070	NC
Magnesium	500	< 2,500	NC
Manganese	73	35.5	NC
Potassium	620 J	< 2,500	NC
Sodium	2,400	2,570 J	NC
Thallium	0.0730 J	< 1	NC
Zinc	**117**	10.4 J	NC
Metals, Total:	Total (µg/L)	Dissolved (µg/L)	
Antimony	1.062	< 2	NC
Barium	10	< 25	NC
Cadmium	1.0 J	< 2	NC
Calcium	6,100	6,790	NC
Chromium	6.0 J	< 5	NC
Copper	6 J	< 13	NC
Iron	**40,000**	**9,700 J**	NC
Magnesium	500	< 2,500	NC
Manganese	73	30.4	NC
Potassium	620 J	< 2,500	NC
Sodium	2,400	2,650 J	NC
Thallium	0.0730 J	< 1	NC
Zinc	**117**	**28.8**	NC
Other:	Concentration (µg/L)		
Perchlorate	**305**	**4.4**	NC

Well 26M-92-02X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Arsenic	5	3.4 J	NC
Antimony	0.566	< 2	NC
Calcium	2,400	4,300 J	NC
Chromium	3.0 J	< 5	NC
Copper	2.0 J	< 13	NC
Iron	60 J	< 50	NC
Magnesium	870	< 2,500	NC
Sodium	3,200	3,960 J	NC
Zinc	13.0 J	10.3 J	NC
Other:	Concentration (µg/L)		
Perchlorate	0.100	< 0.100	NC

Well 26M-97-08X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
HMX	7.88	NC	10
RDX	**20.9**	NC	**26.5**
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.306	< 2	NC
Barium	8.0 J	< 25	NC
Calcium	2,800	3,550 J	NC
Chromium	10	< 5	NC
Copper	2.0 J	< 13	NC
Iron	110	< 50	NC
Magnesium	130	< 2,500	NC
Manganese	6.0 J	< 7.5	NC
Potassium	410 J	< 2,500	NC
Sodium	1,200 J	< 2,500	NC
Zinc	13.0 J	< 10	NC
Other:	Concentration (µg/L)		
Perchlorate	**3.84**	0.39	NC

Well 26M-92-03X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
HMX	0.806	NC	8.4
RDX	**3.62**	NC	**19.3**
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.923	< 2	NC
Barium	5 J	< 25	NC
Calcium	2,900	3,530 J	NC
Copper	3.0 J	< 13	NC
Magnesium	260	< 2,500	NC
Manganese	4.0 J	< 7.5	NC
Potassium	560 J	< 2,500	NC
Sodium	1,400 J	< 2,500	NC
Zinc	13.0 J	< 10	NC
Other:	Concentration (µg/L)		
Perchlorate	NC	0.36	NC

Well 26M-14-11X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
RDX	0.11 J	NC	< 0.20
Metals, Total:	Total (µg/L)	Dissolved (µg/L)	
Calcium	NC	4,840 J	NC
Manganese	NC	31.6	NC
Sodium	NC	2,820 J	NC
Other:	Concentration (µg/L)		
Perchlorate	0.15 J	0.16	NC

Well 26M-92-04X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
HMX	52.9	NC	27.1
RDX	**1,890**	NC	**1,890**
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.566	< 2	NC
Calcium	2,400	9,170	NC
Copper	2.0 J	< 13	NC
Magnesium	NC	< 2,500	NC
Manganese	NC	9.1 J	NC
Potassium	NC	< 2,500	NC
Sodium	NC	2,730 J	NC
Zinc	NC	< 10	NC
Other:	Concentration (µg/L)		
Perchlorate	**142**	**34.6**	NC

26WP-08-02, 26WP-09-02, 26WP-09-03, 26WP-09-01, 26WP-06-01, 26WP-14-01, 26M-14-SWEL1, 26M-14-SWEL2, SWEL-17, SWEL-18, SWEL-19, SWEL-20, 26M-10-09X, 26M-14-10X, 26M-14-11X, 26M-92-01X, 26M-92-02X, 26M-92-03X, 26M-92-04X, 26M-92-05X, 26M-92-06X, 26M-92-06A, 26M-92-07X, 26M-97-08X, SPM-93-13X

Kettle Pond

Firebreak Road

Slate Rock Brook

Zulu Range 2 (AOC 26)

Zulu Range 1 (AOC 26)

Legend

- Well Point (Shallow Refusal) - Abandoned
- LTM Sample Well Point
- Well Point - Periodic Gauge Only
- Surface Water Elevation Location
- LTM Well - Periodic Gauge Only
- LTM Sample Well
- Monitoring Well
- Monitoring Well - Abandoned
- 26M-92-03X Well/Elevation Point Identification
- Area of Contamination (AOC)
- South Post Impact Area

Notes:
- 305 =result exceeds GW-1 standard
- 117 =result exceeds the background level
- COC=contaminant of concern
- Conc.=concentration
- ft=feet
- NGVD=National Geodetic Vertical Datum
- HMX=cyclotetramethylenetetranitramine
- J=estimated value
- LTM=long-term monitoring
- NC=not collected
- ND=non-detection
- RDX=cyclotrimethylenetrinitramine
- µg/L=micrograms per liter

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
South Post Impact Area

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 150 300 Feet

Date: 04/16/2015

Figure 4.6

File: SPIA_2015_Figure6_7_AOC26_Sampling.mxd

Figure 4.7 Interpretive Water Table Elevation
South Post Impact Area
Area of Contamination 27
November 2014



Legend

- Monitoring Well - Possibly Destroyed
- Surface Water Elevation Location
- LTM Well - Periodic Gauge Only
- LTM Sample Well
- 27M-93-08X — Well/Elevation Point Identification
- 232.32 — Groundwater Elevation (ft amsl)
- Groundwater Flow Direction
- 232 — Groundwater Elevation Contour (ft amsl) (contour interval = 1 ft)
- A—A' — Groundwater Gradient Calculation Location
- Area of Contamination (AOC)

Notes:
27M-92-01X not used in contouring
ft = Feet
NGVD = National Geodetic Vertical Datum
LTM = Long-term monitoring
A-A'=(233'-231')/(662')=0.003 ft/ft Northeast

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
South Post Impact Area

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Devens, Massachusetts

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0 75 150
Feet

Date: 04/15/2015

Figure 4.7

File: SPIA_2015_Figure6_6_GWC_AOC27.mxd

Figure 4.8
Explosives and Metals Concentrations
South Post Impact Area - AOC 27
Nov. 2012, Nov. 2014, and Jan. 2015

Well 27M-92-01X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Calcium	7,300	10,400	NC
Copper	6 J	< 13	NC
Iron	180	87.6 J	NC
Lead	4 J	< 2.5	NC
Zinc	**42 J**	13.8 J	NC

Well 27M-93-06X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Arsenic	**15**	< 3	NC
Calcium	**16,000**	3,890 J	NC
Zinc	20.0 J	19.5 J	NC

Well 27M-93-05X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Arsenic	4 J	5.1	NC
Copper	5 J	< 13	NC
Iron	210	< 50	NC
Lead	5 J	< 2.5	NC
Zinc	21 J	13.8 J	NC

Well 27M-93-08X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Calcium	6300	6310	NC
Chromium	7 J	< 5	NC
Iron	60	< 5	NC
Zinc	16 J	< 10	NC



Legend

- Monitoring Well - Possibly Destroyed
- Surface Water Elevation Location
- LTM Well - Periodic Gauge Only
- LTM Sample Well
- 27M-93-08X Well/Elevation Point Identification
- Area of Contamination (AOC)

Note:
LTM=long-term monitoring
15 =result exceeded GW-1 standard
16,000 =result exceeded background level
COC=contaminant of concern
Conc.=concentration
ft amsl=feet above mean sea level
HMX=cyclotetramethylenetetranitramine
J=estimated value
LTM=long-term monitoring
NC=not collected
RDX=cyclotrimethylenetrinitramine
µg/L=micrograms per liter

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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0 75 150
Feet

Date: 04/16/2015

Figure 4.8

File: SPIA_2015_Figure6_8_HotelRange_Sampling.mxd

Well SPM-93-03X	Oct 2014
Explosives:	Conc (µg/L)
All Explosives	ND
Other:	Conc (µg/L)
Perchlorate	< 0.10

Well SPM-93-06X	Nov 2013	Oct 2014	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)			
All Explosives	ND	NC	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)		
Aluminum	140	NC	< 100	NC
Antimony	1,848	NC	< 2	NC
Arsenic	**12**	NC	**12.5**	NC
Barium	36	NC	36.8 J	NC
Calcium	14,000	NC	13,700	NC
Magnesium	220	NC	< 2,500	NC
Potassium	3,100	NC	2,940 J	NC
Sodium	6,200	NC	6,666	NC
Thallium	0.12 J	NC	< 1	NC
Zinc	8.0 J	NC	< 10	NC
Other:	Concentration (µg/L)			
Perchlorate	NC	< 0.10	< 0.10	NC

Well SPM-97-23X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.93	< 2	NC
Calcium	3,800	6,420	NC
Iron	350	< 50	NC
Magnesium	760	< 2,500	NC
Manganese	31	7.5 J	NC
Potassium	450 J	< 2,500	NC
Sodium	2,700	3,140 J	NC
Zinc	12.0 J	**53.3**	NC

Well SPM-93-08X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.288	< 2	NC
Calcium	2,200	< 2,500	NC
Copper	3.0 J	< 13	NC
Magnesium	260	< 2,500	NC
Sodium	2,000	< 2,500	NC
Thallium	0.0690 J	< 1	NC
Zinc	9.0 J	< 10	NC

Hydrant D-1	11/1/2013	11/1/2014	1/1/2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Calcium	NC	6,690	NC
Iron	NC	169	NC
Manganese	NC	20.9	NC
Sodium	NC	3,050 J	NC
Zinc	NC	**137**	NC

Well SPM-97-24X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.9430 J	< 2	NC
Arsenic	6	3.2 J	NC
Calcium	6,800	8,290	NC
Copper	2.0 J	< 13	NC
Magnesium	2,600	3,460 J	NC
Potassium	880 J	< 2,500	NC
Sodium	3,000	3,310 J	NC
Zinc	8.0 J	< 10	NC

Well SPM-93-10X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Aluminum	50 J	< 100	NC
Antimony	0.7	< 2	NC
Arsenic	7.0	6.1	NC
Calcium	3,000	3,220 J	NC
Chromium	4.0 J	< 5	NC
Magnesium	810	< 2,500	NC
Manganese	3.0 J	< 7.5	NC
Potassium	530 J	< 2,500	NC
Sodium	2,900	2,870 J	NC
Vanadium	1.0 J	< 5	NC
Zinc	11 J	< 10	NC

Well SPM-93-12X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.942	< 2	NC
Calcium	5,800	6,650	NC
Magnesium	1,800	< 2,500	NC
Manganese	3.0 J	< 7.5	NC
Potassium	640 J	< 2,500	NC
Sodium	5,000	5,330	NC
Zinc	12 J	13.7 J	NC

Well SPM-93-16X	Nov 2013	Nov 2014	Jan 2015
Explosives:	Concentration (µg/L)		
All Explosives	ND	NC	ND
Metals:	Total (µg/L)	Dissolved (µg/L)	
Antimony	0.3120 J	< 2	NC
Calcium	2,200	2,600 J	NC
Magnesium	540	< 2,500	NC
Sodium	2,300	< 2,500	NC
Zinc	13 J	< 10	NC

Notes:
All analytical results were below GW-3 standards.
12 =result exceeded GW-1 standard
53.3 =result exceeded the background level
COC=contaminant of concern
Conc.=concentration
EOD=Explosive Ordnance Range
HMX=cyclotetramethylenetetranitramine
J=estimated value
LTM=long-term monitoring
NC=not collected
NS=not sampled
RDX=cyclotrimethylenetrinitramine

Legend

- LTM Sample Well
- LTM Well - Periodic Gauge Only
- LTM Sample Well Point
- Monitoring Well - Abandoned
- Well Point Installation Location (Shallow Refusal)-Abandoned
- Monitoring Well - Possibly Destroyed
- Well Point - Periodic Gauge Only
- Monitoring Well
- Surface Water Elevation Location
- SWEL-12 Well/Elevation Location Identification
- Surface Water Course
- Former Fort Devens Boundary
- Landfill Debris
- Area of Contamination (AOC)
- South Post Impact Area

References: HGL. LTMMP 2012.
Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 4.9
Groundwater Sampling Analytical Results
South Post Impact Area
Nov. 2013, Oct. and Nov 2014, Jan 2015

2015 Five-Year Review
South Post Impact Area

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 1,000 2,000 Feet

Date: 04/16/2015

Figure 4.9

File: SPIA_2015_Figure6_9_Sampling.mxd

E.2 South Post Impact Area

Tables

Table 4.12
Groundwater Analytical Results
SPIA South Post Monitoring Wells
October 2010

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Qual	SPM-93-06X	Qual	SPM-93-08X	Qual	SPM-93-10X	Qual	SPM-93-12X	Qual	SPM-93-16X	Qual	SPM-97-23X	Qual
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	2-Nitrotoluene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	3-Nitrotoluene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	4-Nitrotoluene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	RDX	µg/L	1	50,000	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	Tetryl	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	Nitrobenzene	µg/L	NS	NS	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
	HMX	µg/L	200	50,000	NS	0.200	UJ	0.200	UJ	0.204	UJ	0.210	U	0.208	UJ	0.206	U	0.208	UJ
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	NA		480		100	U	83	J	100	U	100	U	3.8	J
	Antimony, Total[3,4]	µg/L	6	8,000	3.03	NA		50	U	50	U	50	U	50	U	50	U	50	U
	Arsenic, Total	µg/L	10	900	10.5	NA		**13**		5	U	6		5	U	5	U	5	U
	Barium, Total	µg/L	2,000	50,000	39.6	NA		**60**		10	U	10	U	10	U	10	U	10	U
	Beryllium, Total[3]	µg/L	4	200	5	NA		5	U	5	U	5	U	5	U	5	U	5	U
	Cadmium, Total[4,5]	µg/L	5	4	4.1	NA		4	U	4	U	4	U	4	U	4	U	4	U
	Calcium, Total	µg/L	NS	NS	14,700	NA		**32,000**		2,600		3,100		6,500		2,300		4,000	
	Chromium, Total	µg/L	100	300	14.7	NA		10	U	10	U	2	J	3	J	10	U	10	U
	Cobalt, Total	µg/L	NS	NS	25	NA		20	U	20	U	20	U	20	U	20	U	20	U
	Copper, Total[4]	µg/L	NS	NS	8.09	NA		10	U	10	U	10	U	10	U	10	U	10	U
	Iron, Total	µg/L	NS	NS	9,100	NA		50	U	50	U	120		43	J	50	U	120	
	Lead, Total[4]	µg/L	15	10	4.25	NA		10	U	10	U	10	U	10	U	10	U	10	U
	Magnesium, Total	µg/L	NS	NS	3,480	NA		78	J	310		860		1,900		600		820	
	Manganese, Total	µg/L	NS	NS	291	NA		10	U	10	U	3.1	J	2.4	J	10	U	18	
	Nickel, Total	µg/L	100	200	34.3	NA		25	U	25	U	25	U	7.8	J	25	U	25	U
	Potassium, Total[4]	µg/L	NS	NS	2,370	NA		**4,000**		2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
	Selenium, Total[4]	µg/L	50	100	3.02	NA		10	U	10	U	10	U	10	U	10	U	10	U
	Silver, Total[4]	µg/L	100	7	4.6	NA		7	U	7	U	7	U	7	U	7	U	7	U
	Sodium, Total	µg/L	NS	NS	10,800	NA		6,800		2,200		2,700		5,400		2,200		2,600	
	Thallium, Total[3,4]	µg/L	2	3,000	7	NA		20	U	20	U	20	U	20	U	20	U	20	U
	Vanadium, Total	µg/L	30	4,000	11	NA		10	U	10	U	1.2	J	10	U	10	U	10	U
	Zinc, Total[4]	µg/L	5,000	900	21.1	NA		11.5	J	11.7	J	11.6	J	12.3	J	10.4	J	13.6	J
Mercury - SW7470A	Mercury, Total	µg/L	2	20	0.243	NA		0.05	J	0.04	J	0.2	U	0.06	J	0.2	U	0.03	J
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
	cis -1,2-Dichloroethene	µg/L	70	100	NS	NA		NA		NA		NA		NA		NA		NA	
	trans -1,2-Dichloroethene	µg/L	100	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Carbon Disulfide	µg/L	NS	NS	NS	NA		NA		NA		NA		NA		NA		NA	
	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Tetrachloroethene	µg/L	5	30,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Toluene	µg/L	1,000	40,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Trichloroethene	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Vinyl Chloride	µg/L	2	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
Field Parameter	Temperature, Initial	° Celsius	NS	NS	NS	14.0		9.12		10.14		10.62		10.93		10.86		10.81	
	Temperature, Final	° Celsius	NS	NS	NS	14.0		9.65		9.87		11.95		10.16		10.73		10.74	
	Dissolved Oxygen	mg/L	NS	NS	NS	7.15		1.72		10.64		9.31		4.83		10.59		10.28	
	ORP[3]	mV	NS	NS	NS	8.9		14		187.1		163.4		108.8		179.7		34.8	
	pH	Standard units	NS	NS	NS	6.82		11.23		6.37		6.72		6.61		6.5		6.15	
	Specific Conductance	µS/cm	NS	NS	NS	62		336		19		36		66		28		38	
	Turbidity	NTU	NS	NS	NS	NA		1.59		0.0		0.04		0.90		1.89		1.19	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.12
Groundwater Analytical Results
SPIA South Post Monitoring Wells
October 2010

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-97-24X	Qual	41M-93-04X	Qual	41M-93-04X Duplicate	Qual
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.205	UJ	0.354	J	NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.205	UJ	0.204	U	NA	
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	2-Nitrotoluene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	3-Nitrotoluene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	4-Nitrotoluene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	RDX	µg/L	1	50,000	NS	0.128	J	0.204	U	NA	
	Tetryl	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	Nitrobenzene	µg/L	NS	NS	NS	0.205	UJ	0.204	U	NA	
	HMX	µg/L	200	50,000	NS	0.205	UJ	0.204	U	NA	
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	100	U	NA		NA	
	Antimony, Total[3,4]	µg/L	6	8,000	3.03	50	U	NA		NA	
	Arsenic, Total	µg/L	10	900	10.5	6		NA		NA	
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	NA		NA	
	Beryllium, Total[3]	µg/L	4	200	5	5	U	NA		NA	
	Cadmium, Total[4,5]	µg/L	5	4	4.1	4	U	NA		NA	
	Calcium, Total	µg/L	NS	NS	14,700	7,200		NA		NA	
	Chromium, Total	µg/L	100	300	14.7	10	U	NA		NA	
	Cobalt, Total	µg/L	NS	NS	25	20	U	NA		NA	
	Copper, Total[4]	µg/L	NS	NS	8.09	10	U	NA		NA	
	Iron, Total	µg/L	NS	NS	9,100	50	U	NA		NA	
	Lead, Total[4]	µg/L	15	10	4.25	10	U	NA		NA	
	Magnesium, Total	µg/L	NS	NS	3,480	2,700		NA		NA	
	Manganese, Total	µg/L	NS	NS	291	10	U	NA		NA	
	Nickel, Total	µg/L	100	200	34.3	25	U	NA		NA	
	Potassium, Total[4]	µg/L	NS	NS	2,370	1,000	J	NA		NA	
	Selenium, Total[4]	µg/L	50	100	3.02	10	U	NA		NA	
	Silver, Total[4]	µg/L	100	7	4.6	7	U	NA		NA	
	Sodium, Total	µg/L	NS	NS	10,800	3,100		NA		NA	
	Thallium, Total[3,4]	µg/L	2	3,000	7	20	U	NA		NA	
	Vanadium, Total	µg/L	30	4,000	11	10	U	NA		NA	
	Zinc, Total[4]	µg/L	5,000	900	21.1	18.7	J	NA		NA	
Mercury - SW7470A	Mercury, Total	µg/L	2	20	0.243	0.04	J	NA		NA	
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		0.75	U	0.75	U
	cis -1,2-Dichloroethene	µg/L	70	100	NS	NA		0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	NS	NA		0.75	U	0.75	U
	Carbon Disulfide	µg/L	NS	NS	NS	NA		5.0	U	5.0	U
	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	NS	NA		0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	NS	NA		0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	NS	NA		0.5	U	0.5	U
	Vinyl Chloride	µg/L	2	50,000	NS	NA		1.0	U	1.0	U
Field Parameter	Temperature, Initial	˚ Celsius	NS	NS	NS	10.62		13.63		NA	
	Temperature, Final	˚ Celsius	NS	NS	NS	10.28		13.80		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	6.99		2.9		NA	
	ORP[3]	mV	NS	NS	NS	79.2		136.7		NA	
	pH	Standard units	NS	NS	NS	7.78		5.4		NA	
	Specific Conductance	µS/cm	NS	NS	NS	68		43		NA	
	Turbidity	NTU	NS	NS	NS	3.25		0.0		NA	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.13
Groundwater Analytical Results
Areas of Contamination 27
October 2010

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	27M-92-01X	Qual	27M-93-05X	Qual	27M-93-06X	Qual	27M-93-08X	Qual
Explosives 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	2-Nitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	3-Nitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	4-Nitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	RDX	µg/L	1	50,000	NS	0.204	UJ	0.255	J	**2.12**	J	0.206	UJ
	Tetryl	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	Nitrobenzene	µg/L	NS	NS	NS	0.204	UJ	0.206	UJ	0.205	UJ	0.206	UJ
	HMX	µg/L	200	50,000	NS	0.204	UJ	0.206	UJ	0.726	J	0.206	UJ
Metals SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	340		990		51	J	100	U
	Antimony, Total	µg/L	6	8,000	3.03	50	U	50	U	50	U	50	U
	Arsenic, Total	µg/L	10	900	10.5	5	U	7		5	U	5	U
	Barium, Total	µg/L	2,000	50,000	39.6	5.8	J	6.3	J	10	U	2.9	J
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U	5	U
	Cadmium, Total	µg/L	5	4	4.01	4	U	4	U	4	U	4	U
	Calcium, Total	µg/L	NS	NS	14,700	11,000		10,000		4,400		5,900	
	Chromium, Total	µg/L	100	300	14.7	10		2	J	10	U	6	J
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U
	Copper, Total	µg/L	NS	NS	8.09	6	J	4.6	J	10	U	10	U
	Iron, Total	µg/L	NS	NS	9,100	360		1,100		80		29	J
	Lead, Total	µg/L	15	10	4.25	3.5	J	2.9	J	**6.9**	J	10	U
	Magnesium, Total	µg/L	NS	NS	3,480	590		1,200		1,100		1,300	
	Manganese, Total	µg/L	NS	NS	291	18		27		10	U	10	U
	Nickel, Total	µg/L	100	200	34.3	6.4	J	3.7	J	25	U	3.5	J
	Potassium, Total	µg/L	NS	NS	2,370	2,100	J	**2,500**		2,500	U	1,300	J
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U	10	U
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U	7	U
	Sodium, Total	µg/L	NS	NS	10,800	6,200		5,300		2,000		4,600	
	Thallium, Total	µg/L	2	3,000	6.99	20	U	20	U	20	U	20	U
	Vanadium, Total	µg/L	30	4,000	11	10	U	8.5	J	10	U	10	U
	Zinc, Total	µg/L	5,000	900	21.1	**47.3**	J	**30.4**	J	15.4	J	15.2	J
Mercury SW7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.05	J	0.2	U
Field Parameter	Temperature, Initial	°C	NS	NS	NS	13.15		11.34		10.75		11.55	
	Temperature, Final	°C	NS	NS	NS	13.43		11.25		10.17		11.07	
	pH	mg/L	NS	NS	NS	55.9		9.32		6.14		5.7	
	Specific Conductance	mV	NS	NS	NS	69		82		39		59	
	ORP[3]	Standard units	NS	NS	NS	224.3		162.4		132.5		164.7	
	Dissolved Oxygen	µS/cm	NS	NS	NS	5.12		2.09		7.22		7.92	
	Turbidity	NTU	NS	NS	NS	2.25		13.4		3.8		1.94	

Notes: All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Background levels for metals are from HLA, 2000.

[2] GW-1 or GW-3 standard effective June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
October 2011

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Qual	26M-92-03X	Qual	26M-92-03X Duplicate 1	Qual	26M-92-04X	Qual	26M-92-04X Duplicate 2	Qual	26M-97-08X	Qual	26M-97-08X Duplicate 3	Qual	26WP-06-01	Qual
Perchlorate 332.0	Perchlorate	µg/L	2	1,000	NS	NA		NA		NA		**332**		**353**		NA		NA		**68.3**	
Explosives 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.429		NA		0.200	U	0.200	U	0.200	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.766		NA		0.200	U	0.200	U	0.200	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	RDX	µg/L	1	50,000	NS	0.200	U	**10.7**		**11.4**		**157**		NA		**25.8**		**25.5**		**116**	
	Tetryl	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	Nitrobenzene	µg/L	NS	NS	NS	0.200	U	0.204	U	0.200	U	0.202	U	NA		0.200	U	0.200	U	0.200	U
	HMX	µg/L	200	50,000	NS	0.200	U	2.58		2.14		27.7		NA		4.76		4.28		33.3	
Metals SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U	NA		100	U	100	U	100	U
	Antimony, Total	µg/L	6	8,000	3.03	4	U	4	U	4	U	4	U	NA		4	U	4	U	4	U
	Arsenic, Total	µg/L	10	900	10.5	6		5	U	5	U	5	U	NA		5	U	5	U	5	U
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	6	J	6	J	7	J	NA		8	J	8	J	10	
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U	5	U	NA		5	U	5	U	5	U
	Cadmium, Total	µg/L	5	4	4.01	5	U	5	U	5	U	5	U	NA		5	U	5	U	5	U
	Calcium, Total	µg/L	NS	NS	14,700	2,400		2,700		2,800		7,200		NA		2,700		2,700		9,300	
	Chromium, Total	µg/L	100	300	14.7	10		10	U	10	U	10	U	NA		4	J	4	J	10	U
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U	NA		20	U	20	U	20	U
	Copper, Total	µg/L	NS	NS	8.09	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	
	Iron, Total	µg/L	NS	NS	9,100	200		50	U	30	J	50	U	NA		50		50		5,800	
	Lead, Total	µg/L	15	10	4.25	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U
	Magnesium, Total	µg/L	NS	NS	3,480	960		290		280		760		NA		150		150		710	
	Manganese, Total	µg/L	NS	NS	291	10	U	10	U	10	U	11		NA		10	U	3	J	30	
	Nickel, Total	µg/L	100	200	34.3	5	J	25	U	25	U	25	U	NA		25	U	25	U	25	U
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U	NA		2,500	U	2,500	U	2,500	U
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U	7	U	NA		7	U	7	U	7	U
	Sodium, Total	µg/L	NS	NS	10,800	3,100		1,300	J	1,300	J	2,400		NA		1,000	J	1,100	J	2,200	
	Thallium, Total	µg/L	2	3,000	6.99	2	U	2	U	2	U	2	U	NA		2	U	2	U	2	U
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U
	Zinc, Total	µg/L	5,000	900	21.1	50	U	50	U	50	U	50	U	NA		50	U	50	U	45	J
Mercury SW7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	0.2	U	NA		0.2	U	0.2	U	0.2	U
Field Parameter	Temperature, Initial	°C	NS	NS	NS	10.94		10.36		NA		10.1		NA		12.13		NA		10.89	
	Temperature, Final	°C	NS	NS	NS	11.01		10.35		NA		10.16		NA		11.387		NA		10.9	
	pH	mg/L	NS	NS	NS	6.05		5.6		NA		5.4		NA		5.69		NA		5.98	
	Specific Conductance	mV	NS	NS	NS	29		22		NA		73		NA		21		NA		69	
	ORP[3]	Standard units	NS	NS	NS	-143.6		-101.6		NA		79.1		NA		-128.1		NA		7.8	
	Dissolved Oxygen	µS/cm	NS	NS	NS	7.01		10.05		NA		7.56		NA		10.56		NA		3	
	Turbidity	NTU	NS	NS	NS	1.9		0.14		NA		0.41		NA		1.65		NA		6.38	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Background levels for metals are from HLA, 2000.

[2] GW-1 or GW-3 standard effective June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
October 2011

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26WP-08-02	Qual	26WP-09-01	Qual	26WP-09-02	Qual	26M-10-09X	Qual
Perchlorate 332.0	Perchlorate	µg/L	2	1,000	NS	0.050	U	0.050	U	0.047	J	0.035	J
Explosives 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.202	U	NA		NA		NA	
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	2-Nitrotoluene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	3-Nitrotoluene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	4-Nitrotoluene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	RDX	µg/L	1	50,000	NS	0.202	U	NA		NA		NA	
	Tetryl	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	Nitrobenzene	µg/L	NS	NS	NS	0.202	U	NA		NA		NA	
	HMX	µg/L	200	50,000	NS	0.202	U	NA		NA		NA	
Metals SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	100	U	NA		NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03	4	U	NA		NA		NA	
	Arsenic, Total	µg/L	10	900	10.5	**62**		NA		NA		NA	
	Barium, Total	µg/L	2,000	50,000	39.6	3	J	NA		NA		NA	
	Beryllium, Total	µg/L	4	200	5	5	U	NA		NA		NA	
	Cadmium, Total	µg/L	5	4	4.01	5	U	NA		NA		NA	
	Calcium, Total	µg/L	NS	NS	14,700	3,100		NA		NA		NA	
	Chromium, Total	µg/L	100	300	14.7	10	U	NA		NA		NA	
	Cobalt, Total	µg/L	NS	NS	25	20	U	NA		NA		NA	
	Copper, Total	µg/L	NS	NS	8.09	10	U	NA		NA		NA	
	Iron, Total	µg/L	NS	NS	9,100	**20,000**		NA		NA		NA	
	Lead, Total	µg/L	15	10	4.25	10	U	NA		NA		NA	
	Magnesium, Total	µg/L	NS	NS	3,480	610		NA		NA		NA	
	Manganese, Total	µg/L	NS	NS	291	131		NA		NA		NA	
	Nickel, Total	µg/L	100	200	34.3	25	U	NA		NA		NA	
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	NA		NA		NA	
	Selenium, Total	µg/L	50	100	3.02	10	U	NA		NA		NA	
	Silver, Total	µg/L	100	7	4.6	7	U	NA		NA		NA	
	Sodium, Total	µg/L	NS	NS	10,800	1,400	J	NA		NA		NA	
	Thallium, Total	µg/L	2	3,000	6.99	2	U	NA		NA		NA	
	Vanadium, Total	µg/L	30	4,000	11	10	U	NA		NA		NA	
	Zinc, Total	µg/L	5,000	900	21.1	**6,750**		NA		NA		NA	
Mercury SW7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	NA		NA		NA	
Field Parameter	Temperature, Initial	°C	NS	NS	NS	15.88		16.61		12.31		11.35	
	Temperature, Final	°C	NS	NS	NS	16.73		16.57		12.28		11.41	
	pH	mg/L	NS	NS	NS	6.59		6.06		6.12		5.89	
	Specific Conductance	mV	NS	NS	NS	123		66		24		35	
	ORP[3]	Standard units	NS	NS	NS	-77.8		-5.4		53.3		105.1	
	Dissolved Oxygen	µS/cm	NS	NS	NS	0.15		0.11		7.13		5.09	
	Turbidity	NTU	NS	NS	NS	2.29		31.6		2.14		0.97	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Background levels for metals are from HLA, 2000.

[2] GW-1 or GW-3 standard effective June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.3
Groundwater Analytical Results
SPIA South Post Monitoring Wells
October 2011

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Qual	SPM-93-06X	Qual	SPM-93-08X	Qual	SPM-93-10X	Qual	SPM-93-12X	Qual	SPM-93-16X	Qual	SPM-97-23X[4]	Qual
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	2-Nitrotoluene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	3-Nitrotoluene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	4-Nitrotoluene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	RDX	µg/L	1	50,000	NS	0.202	U	0.248		0.202	U	0.200	U	0.200	U	0.204	U	NS	
	Tetryl	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	Nitrobenzene	µg/L	NS	NS	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
	HMX	µg/L	200	50,000	NS	0.202	U	0.210	U	0.202	U	0.200	U	0.200	U	0.204	U	NS	
Metals (SW6010B)	Aluminum, Total	µg/L	NS	NS	6,870	NA		390		40	J	40	J	10	U	10	U	NS	
	Antimony, Total	µg/L	6	8,000	3.03	NA		4.00	U	0.300	J	0.190	J	1.00	U	1.00	U	NS	
	Arsenic, Total	µg/L	10	900	10.5	NA		**13**		2	J	**10**		5	U	3	J	NS	
	Barium, Total	µg/L	2,000	50,000	39.6	NA		**59**		10	U	10	U	2	J	10	U	NS	
	Beryllium, Total	µg/L	4	200	5	NA		5	U	5	U	5	U	5	U	5	U	NS	
	Cadmium, Total	µg/L	5	4	4.1	NA		5	U	5	U	5	U	5	U	5	U	NS	
	Calcium, Total	µg/L	NS	NS	14,700	NA		**30,000**		2,400		2,900		6,500		2,400		NS	
	Chromium, Total	µg/L	100	300	14.7	NA		10	U	5	J	2	J	3	J	10	U	NS	
	Cobalt, Total	µg/L	NS	NS	25	NA		20	U	20	U	20	U	20	U	20	U	NS	
	Copper, Total	µg/L	NS	NS	8.09	NA		10	U	10	U	10	U	10	U	10	U	NS	
	Iron, Total	µg/L	NS	NS	9,100	NA		50	U	110		50		20	J	70		NS	
	Lead, Total	µg/L	15	10	4.25	NA		10	U	10	U	2	J	2	J	10	U	NS	
	Magnesium, Total	µg/L	NS	NS	3,480	NA		140		340		890		2,200		680		NS	
	Manganese, Total	µg/L	NS	NS	291	NA		10	U	3	J	10	U	10	U	10	U	NS	
	Nickel, Total	µg/L	100	200	34.3	NA		25	U	25	U	25	U	5	J	25	U	NS	
	Potassium, Total	µg/L	NS	NS	2,370	NA		**3,700**		2,500	U	2,500	U	2,500	U	2,500	U	NS	
	Selenium, Total	µg/L	50	100	3.02	NA		10	U	10	U	10	U	10	U	10	U	NS	
	Silver, Total	µg/L	100	7	4.6	NA		7	U	7	U	7	U	7	U	7	U	NS	
	Sodium, Total	µg/L	NS	NS	10,800	NA		6,400		1,900	J	2,600		5,000		2,200		NS	
	Thallium, Total	µg/L	2	3,000	7	NA		2.00	U	0.500	U	0.500	U	0.500	U	0.260	J	NS	
	Vanadium, Total	µg/L	30	4,000	11	NA		10	U	10	U	10	U	10	U	10	U	NS	
	Zinc, Total	µg/L	5,000	900	21.1	NA		50	U	12	J	12	J	14	J	11	J	NS	
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	NA		0.2	U	0.2	U	0.2	U	0.2	U	0.2	J	NS	
VOCS (SW8260B)	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
	cis -1,2-Dichloroethene	µg/L	70	100	NS	NA		NA		NA		NA		NA		NA		NA	
	trans -1,2-Dichloroethene	µg/L	100	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Carbon Disulfide	µg/L	NS	NS	NS	NA		NA		NA		NA		NA		NA		NA	
	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Tetrachloroethene	µg/L	5	30,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Toluene	µg/L	1,000	40,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Trichloroethene	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Vinyl Chloride	µg/L	2	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
Field Parameters	Temperature, Initial	° Celsius	NS	NS	NS	14.59		11.31		9.86		10.79		10.46		10.72		NS	
	Temperature, Final	° Celsius	NS	NS	NS	14.59		11.12		9.79		10.55		10.45		10.55		NS	
	Dissolved Oxygen	mg/L	NS	NS	NS	7.38		1.04		10.91		8.89		5.06		10.29		NS	
	ORP[3]	mV	NS	NS	NS	-91.6		-129.9		-137.4		43.6		96.1		-117.7		NS	
	pH	Standard units	NS	NS	NS	7.41		11.47		6.36		7.39		6.72		6.52		NS	
	Specific Conductance	µS/cm	NS	NS	NS	81		257		30		29		59		35		NS	
	Turbidity	NTU	NS	NS	NS	0.77		2.96		0.62		1.77		1.72		0.36		NS	

Notes:

[1] The GW-1 or GW-3 standard was effective on June 26, 2009.

[2] The background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

[4] Well SPM-97-23X was not sampled due to flooding that obscured the location.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.3
Groundwater Analytical Results
SPIA South Post Monitoring Wells
October 2011

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-97-24X	Qual	41M-93-04X	Qual	41M-93-04X Duplicate	Qual
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.204	U	0.200	U	NA	
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	2-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	3-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	4-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	RDX	µg/L	1	50,000	NS	0.204	U	0.200	U	NA	
	Tetryl	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	Nitrobenzene	µg/L	NS	NS	NS	0.204	U	0.200	U	NA	
	HMX	µg/L	200	50,000	NS	0.204	U	0.200	U	NA	
Metals (SW6010B)	Aluminum, Total	µg/L	NS	NS	6,870	30	J	NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03	0.290	J	NA		NA	
	Arsenic, Total	µg/L	10	900	10.5	6		NA		NA	
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	NA		NA	
	Beryllium, Total	µg/L	4	200	5	5	U	NA		NA	
	Cadmium, Total	µg/L	5	4	4.1	5	U	NA		NA	
	Calcium, Total	µg/L	NS	NS	14,700	6,900		NA		NA	
	Chromium, Total	µg/L	100	300	14.7	10	U	NA		NA	
	Cobalt, Total	µg/L	NS	NS	25	20	U	NA		NA	
	Copper, Total	µg/L	NS	NS	8.09	10	U	NA		NA	
	Iron, Total	µg/L	NS	NS	9,100	40	J	NA		NA	
	Lead, Total	µg/L	15	10	4.25	2	J	NA		NA	
	Magnesium, Total	µg/L	NS	NS	3,480	3,000		NA		NA	
	Manganese, Total	µg/L	NS	NS	291	4	J	NA		NA	
	Nickel, Total	µg/L	100	200	34.3	25	U	NA		NA	
	Potassium, Total	µg/L	NS	NS	2,370	1,000	J	NA		NA	
	Selenium, Total	µg/L	50	100	3.02	10	U	NA		NA	
	Silver, Total	µg/L	100	7	4.6	7	U	NA		NA	
	Sodium, Total	µg/L	NS	NS	10,800	2,700		NA		NA	
	Thallium, Total	µg/L	2	3,000	7	0.060	J	NA		NA	
	Vanadium, Total	µg/L	30	4,000	11	10	U	NA		NA	
	Zinc, Total	µg/L	5,000	900	21.1	11	J	NA		NA	
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	NA		NA	
VOCS (SW8260B)	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		0.75	U	0.75	U
	cis -1,2-Dichloroethene	µg/L	70	100	NS	NA		0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	NS	NA		0.75	U	0.75	U
	Carbon Disulfide	µg/L	NS	NS	NS	NA		5.0	U	5.0	U
	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	NS	NA		0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	NS	NA		0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	NS	NA		0.21	J	0.22	J
	Vinyl Chloride	µg/L	2	50,000	NS	NA		1.0	U	1.0	U
Field Parameters	Temperature, Initial	° Celsius	NS	NS	NS	12.39		14.11		NA	
	Temperature, Final	° Celsius	NS	NS	NS	11.72		14.32		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	6.28		3.02		NA	
	ORP[3]	mV	NS	NS	NS	57.2		123.7		NA	
	pH	Standard units	NS	NS	NS	7.58		5.19		NA	
	Specific Conductance	µS/cm	NS	NS	NS	60		36		NA	
	Turbidity	NTU	NS	NS	NS	1.48		2.63		NA	

Notes:
[1] The GW-1 or GW-3 standard was effective on June 26, 2009.
[2] The background levels for metals are from HLA, 2000
[3] The ORP value was not corrected to SHE.
[4] Well SPM-97-23X was not sampled due to flooding that obscured the location.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Qual	26M-92-03X	Qual	26M-92-03X Duplicate 1	Qual	26M-92-04X	Qual	26M-92-04X Duplicate 2	Qual	26M-97-08X	Qual
Perchlorate (E332.0)	Perchlorate	µg/L	2	1,000	NS	0.097	J	0.322	J	NA		**49.2**		**47.9**		**3.84**	
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U	NA		0.206	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.563				0.206	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.750				0.206	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	RDX	µg/L	1	50,000	NS	0.203	U	**9.75**		**9.57**		**181**				**43.2**	
	Tetryl	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	Nitrobenzene	µg/L	NS	NS	NS	0.203	U	0.205	U	0.205	U	0.204	U			0.206	U
	HMX	µg/L	200	50,000	NS	0.203	U	1.82		2.06		24.7				11.7	
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U	NA		100	U
	Antimony, Total	µg/L	6	8,000	3.03	0.1300	J	0.5000	U	0.5000	U	0.5000	U			0.5000	U
	Arsenic, Total	µg/L	10	900	10.5	5		5	U	5	U	5	U			5	U
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	7	J	6	J	9	J			10	
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U	5	U			5	U
	Cadmium, Total	µg/L	5	4	4.01	5	U	5	U	5	U	5	U			5	U
	Calcium, Total	µg/L	NS	NS	14,700	2,600		3,200		3,000		9,400				3,500	
	Chromium, Total	µg/L	100	300	14.7	5	J	10	U	10	U	10	U			2	J
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U			20	U
	Copper, Total	µg/L	NS	NS	8.09	10	U	10	U	10	U	10	U			10	U
	Iron, Total	µg/L	NS	NS	9,100	60		50	U	50	U	50	U			50	U
	Lead, Total	µg/L	15	10	4.25	10	U	10	U	10	U	10	U			10	U
	Magnesium, Total	µg/L	NS	NS	3,480	1,000		360		340		830				170	
	Manganese, Total	µg/L	NS	NS	291	10	U	10	U	10	U	11				3	J
	Nickel, Total	µg/L	100	200	34.3	25	U	25	U	25	U	25	U			25	U
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U			2,500	U
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U	10	U			10	U
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U	7	U			7	U
	Sodium, Total	µg/L	NS	NS	10,800	3,500		1,400	J	1,300	J	2,300				1,500	J
	Thallium, Total	µg/L	2	3,000	6.99	0.0800	J	0.0400	J	0.5000	U	0.0300	J			0.5000	U
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U	10	U			10	U
	Zinc, Total	µg/L	5,000	900	21.1	21	J	18	J	17	J	18	J			**22**	J

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Qual	26M-92-03X	Qual	26M-92-03X Duplicate 1	Qual	26M-92-04X	Qual	26M-92-04X Duplicate 2	Qual	26M-97-08X	Qual
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.01	J	0.2	U	NA		0.2	U
Field Parameters	Temperature, Initial	°C	NS	NS	NS	10.06		10.28				10.08				9.26	
	Temperature, Final	°C	NS	NS	NS	10.22		10.32				10.00				9.96	
	pH	mg/L	NS	NS	NS	6.07		6.00				5.71				5.68	
	Specific Conductance	mV	NS	NS	NS	28		22		NA		78		NA		31	
	ORP[3]	Standard units	NS	NS	NS	175.9		114.8				231.2				140.1	
	Dissolved Oxygen	µS/cm	NS	NS	NS	6.69		18.89				7.58				10.04	
	Turbidity	NTU	NS	NS	NS	2.08		1.59				0.71				0.42	

Notes:

9.8 = GW-1 groundwater standard exceedance

9.8 = Background level exceedance

NA = Not applicable or not analyzed.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] The background levels for metals are from HLA, 2000.

[2] The GW-1 or GW-3 standard was effective on June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-97-08X Duplicate 3	Qual	26WP-06-01	Qual	26WP-08-02	Qual	26WP-09-01	Qual	26WP-09-02	Qual	26M-10-09X	Qual
Perchlorate (E332.0)	Perchlorate	µg/L	2	1,000	NS	NA		**19.1**		0.050	U	0.050	U	0.046	J	0.026	J
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U	NA		NA		NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.205	U	0.204	U	0.204	U						
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	2-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	3-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	4-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	RDX	µg/L	1	50,000	NS	**43.5**		**65.2**		0.204	U						
	Tetryl	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	Nitrobenzene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.204	U						
	HMX	µg/L	200	50,000	NS	11.5		20.8		0.204	U						
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	20	J	NA		NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03	0.5000	U	0.4200	J	0.2800	J						
	Arsenic, Total	µg/L	10	900	10.5	5	U	5	U	**68**							
	Barium, Total	µg/L	2,000	50,000	39.6	10		9	J	5	J						
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U						
	Cadmium, Total	µg/L	5	4	4.01	5	U	5	U	1	J						
	Calcium, Total	µg/L	NS	NS	14,700	3,400		7,700		3,600							
	Chromium, Total	µg/L	100	300	14.7	2	J	10	U	10	U						
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	6	J						
	Copper, Total	µg/L	NS	NS	8.09	10	U	10	U	10	U						
	Iron, Total	µg/L	NS	NS	9,100	20	J	7,000		**37,000**							
	Lead, Total	µg/L	15	10	4.25	10	U	10	U	**6**	J						
	Magnesium, Total	µg/L	NS	NS	3,480	180		640		720							
	Manganese, Total	µg/L	NS	NS	291	3	J	38		167							
	Nickel, Total	µg/L	100	200	34.3	25	U	25	U	25	U						
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U						
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U						
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U						
	Sodium, Total	µg/L	NS	NS	10,800	1,500	J	2,300		1,900	J						
	Thallium, Total	µg/L	2	3,000	6.99	0.5000	U	0.0300	J	0.3000	J						
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U						
	Zinc, Total	µg/L	5,000	900	21.1	20	J	**44**	J	**9,790**							

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-97-08X Duplicate 3	Qual	26WP-06-01	Qual	26WP-08-02	Qual	26WP-09-01	Qual	26WP-09-02	Qual	26M-10-09X	Qual
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	NA		NA		NA	
Field Parameters	Temperature, Initial	°C	NS	NS	NS	NA		10.57		12.81		10.96		11.68		10.68	
	Temperature, Final	°C	NS	NS	NS			10.78		13.7		10.67		11.42		10.93	
	pH	mg/L	NS	NS	NS			6.03		6.61		5.49		6.19		5.98	
	Specific Conductance	mV	NS	NS	NS			56		107		43		37		51	
	ORP[3]	Standard units	NS	NS	NS			-1.7		-112.1		-250.7		15.7		163.1	
	Dissolved Oxygen	µS/cm	NS	NS	NS			3.0		0.47		0.3		7.71		3.15	
	Turbidity	NTU	NS	NS	NS			16.90		1.85		2.55		4.23		0.19	

Notes:

9.8 = GW-1 groundwater standard exceedance

9.8 = Background level exceedance

NA = Not applicable or not analyzed.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] The background levels for metals are from HLA, 2000.

[2] The GW-1 or GW-3 standard was effective on June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.3
Groundwater Analytical Results
SPIA Area of Contamination 27
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	27M-92-01X	Qual	27M-93-05X	Qual	27M-93-06X	Qual	27M-93-08X	Qual
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.203	U	0.206	U	0.205	U	0.203	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	RDX	µg/L	1	50,000	NS	0.203	U	0.206	U	0.205	U	0.203	U
	Tetryl	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	Nitrobenzene	µg/L	NS	NS	NS	0.203	U	0.206	U	0.205	U	0.203	U
	HMX	µg/L	200	50,000	NS	0.203	U	0.206	U	0.205	U	0.203	U
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	180		340		170		100	U
	Antimony, Total	µg/L	6	8,000	3.03	0.8100		0.5500		0.3800	J	0.5000	U
	Arsenic, Total	µg/L	10	900	10.5	5	U	4	J	**15**		5	U
	Barium, Total	µg/L	2,000	50,000	39.6	5	J	6	J	**47**		10	U
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U	5	U
	Cadmium, Total	µg/L	5	4	4.01	5	U	5	U	5	U	5	U
	Calcium, Total	µg/L	NS	NS	14,700	7,300		12,000		**16,000**		6,300	
	Chromium, Total	µg/L	100	300	14.7	10	U	10	U	10	U	7	J
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U
	Copper, Total	µg/L	NS	NS	8.09	6	J	5	J	10	U	10	U
	Iron, Total	µg/L	NS	NS	9,100	180		210		50	U	60	
	Lead, Total	µg/L	15	10	4.25	4	J	**5**	J	10	U	10	U
	Magnesium, Total	µg/L	NS	NS	3,480	480		620		160		1,600	
	Manganese, Total	µg/L	NS	NS	291	15		39		10	U	2	J
	Nickel, Total	µg/L	100	200	34.3	25	U	6.0	J	25	U	25	U
	Potassium, Total	µg/L	NS	NS	2,370	1,500	J	**3,000**		**4,700**		1,500	J
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U	10	U
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U	7	U
	Sodium, Total	µg/L	NS	NS	10,800	6,700		4,300		9,600		4,700	
	Thallium, Total	µg/L	2	3,000	6.99	0.0300	J	0.5000	U	0.5000	U	0.5000	U
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U	10	U
	Zinc, Total	µg/L	5,000	900	21.1	**42**	J	21	J	20	J	16	J
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.01	J	0.2	U	0.2	U

Table 4.3
Groundwater Analytical Results
SPIA Area of Contamination 27
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	27M-92-01X	Qual	27M-93-05X	Qual	27M-93-06X	Qual	27M-93-08X	Qual
Field Parameter	Temperature, Initial	°C	NS	NS	NS	11.46		11.25		10.78		8.37	
	Temperature, Final	°C	NS	NS	NS	11.87		11.05		10.70		9.44	
	pH	mg/L	NS	NS	NS	5.79		7.84		6.34		5.89	
	Specific Conductance	mV	NS	NS	NS	50		74		31		61	
	ORP[3]	Standard units	NS	NS	NS	122.2		-31.2		233.0		175.9	
	Dissolved Oxygen	µS/cm	NS	NS	NS	5.76		0.53		10.65		7.89	
	Turbidity	NTU	NS	NS	NS	10.42		6.09		2.62		0.60	

Notes:

9.8 = GW-1 groundwater standard exceedance

9.8 = Background level exceedance

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Background levels for metals are from HLA, 2000.

[2] GW-1 or GW-3 standard effective June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Qual	SPM-93-06X	Qual	SPM-93-08X	Qual	SPM-93-10X	Qual	SPM-93-12X	Qual
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	RDX	µg/L	1	50,000	NS	0.205	U	**1.23**		0.182	J	0.205	U	0.204	U
	Tetryl	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	Nitrobenzene	µg/L	NS	NS	NS	0.205	U	0.204	U	0.203	U	0.205	U	0.204	U
	HMX	µg/L	200	50,000	NS	0.205	U	0.625		0.203	U	0.205	U	0.204	U
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870			140		100	U	80	J	100	U
	Antimony, Total	µg/L	6	8,000	3.03			0.1600	J	0.5000	U	0.1700	J	0.5000	U
	Arsenic, Total	µg/L	10	900	10.5			5	U	5	U	4.7	J	5	U
	Barium, Total	µg/L	2,000	50,000	39.6			10	U	10	U	10	U	10	U
	Beryllium, Total	µg/L	4	200	5			5	U	5	U	5	U	5	U
	Cadmium, Total	µg/L	5	4	4.1			5	U	5	U	5	U	5	U
	Calcium, Total	µg/L	NS	NS	14,700			4,400		2,400		3,200		6,500	
	Chromium, Total	µg/L	100	300	14.7			10	U	10	U	2	J	3	J
	Cobalt, Total	µg/L	NS	NS	25			20	U	20	U	20	U	20	U
	Copper, Total	µg/L	NS	NS	8.09			10	U	10	U	10	U	10	U
	Iron, Total	µg/L	NS	NS	9,100	NA		130		50	U	160		50	U
	Lead, Total	µg/L	15	10	4.25			**17**		10	U	10	U	10	U
	Magnesium, Total	µg/L	NS	NS	3,480			1,200		310		990		2,200	
	Manganese, Total	µg/L	NS	NS	291			7	J	10	U	4	J	2	J
	Nickel, Total	µg/L	100	200	34.3			25	U	25	U	25	U	4	J
	Potassium, Total	µg/L	NS	NS	2,370			2,500	U	2,500	U	810	J	12,000	U
	Selenium, Total	µg/L	50	100	3.02			10	U	10	U	10	U	10	U
	Silver, Total	µg/L	100	7	4.6			7	U	7	U	7	U	7	U
	Sodium, Total	µg/L	NS	NS	10,800			2,000		2,000		2,900		5,400	
	Thallium, Total	µg/L	2	3,000	7			0.5000	U	0.5000	U	0.0300	J	0.5000	U
	Vanadium, Total	µg/L	30	4,000	11			10	U	10	U	10	U	10	U
	Zinc, Total	µg/L	5,000	900	21.1			**22**	J	16	J	17	J	**33**	J
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	NA		0.2	U	0.2	U	0.2	U	0.2	U

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Qual	SPM-93-06X	Qual	SPM-93-08X	Qual	SPM-93-10X	Qual	SPM-93-12X	Qual
VOCS (SW8260C)	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		NA		NA	
	cis -1,2-Dichloroethene	µg/L	70	50,000											
	trans -1,2-Dichloroethene	µg/L	100	50,000											
	Carbon Disulfide	µg/L	NS	NS											
	Carbon Tetrachloride	µg/L	5	5,000											
	Tetrachloroethene	µg/L	5	30,000											
	Toluene	µg/L	1,000	40,000											
	Trichloroethene	µg/L	5	5,000											
	Vinyl Chloride	µg/L	2	50,000											
Field Parameters	Temperature, Initial	˚ Celsius	NS	NS	NS	10.63		10.59		9.48		9.93		9.88	
	Temperature, Final	˚ Celsius	NS	NS		10.63		10.08		9.26		9.68		9.68	
	Dissolved Oxygen	mg/L	NS	NS		7.87		2.50		11.01		10.01		5.32	
	ORP[3]	mV	NS	NS		272.5		7.5		176.6		39.7		107.0	
	pH	Standard units	NS	NS		8.99		11.06		6.58		7.5		6.71	
	Specific Conductance	µS/cm	NS	NS		73		203		28		24		67	
	Turbidity	NTU	NS	NS		7.87		0.0		0.55		2.65		0.98	

Notes:

9.8 = GW-1 groundwater standard exceedance

9.8 = Background level exceedance

NA = Not applicable or not analyzed.

NS = Not sampled.

[1] The GW-1 or GW-3 standard was effective on June 26, 2009.

[2] The background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

[4] Well SPM-97-23X could not be located and, therefore, was not sampled.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-93-16X	Qual	SPM-97-23X[4]	Qual	SPM-97-24X	Qual	41M-93-04X	Qual	41M-93-04X Duplicate 1	Qual
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.205	U	NS		0.204	U	0.203	U	NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.205	U			0.204	U	0.203	U		
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	2-Nitrotoluene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	3-Nitrotoluene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	4-Nitrotoluene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	RDX	µg/L	1	50,000	NS	0.205	U			0.204	U	0.203	U		
	Tetryl	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	Nitrobenzene	µg/L	NS	NS	NS	0.205	U			0.204	U	0.203	U		
	HMX	µg/L	200	50,000	NS	0.205	U			0.204	U	0.203	U		
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	100	U	NS		100	U	NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03	0.5000	U			0.2300	J				
	Arsenic, Total	µg/L	10	900	10.5	5	U			6					
	Barium, Total	µg/L	2,000	50,000	39.6	10	U			10	U				
	Beryllium, Total	µg/L	4	200	5	5	U			5	U				
	Cadmium, Total	µg/L	5	4	4.1	5	U			5	U				
	Calcium, Total	µg/L	NS	NS	14,700	2,500				7,600					
	Chromium, Total	µg/L	100	300	14.7	10	U			10	U				
	Cobalt, Total	µg/L	NS	NS	25	20	U			20	U				
	Copper, Total	µg/L	NS	NS	8.09	10	U			10	U				
	Iron, Total	µg/L	NS	NS	9,100	50	U			47	J				
	Lead, Total	µg/L	15	10	4.25	10	U			10	U				
	Magnesium, Total	µg/L	NS	NS	3,480	690				3,300					
	Manganese, Total	µg/L	NS	NS	291	2	J			2	J				
	Nickel, Total	µg/L	100	200	34.3	25	U			25	U				
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U			1,100	J				
	Selenium, Total	µg/L	50	100	3.02	10	U			10	U				
	Silver, Total	µg/L	100	7	4.6	7	U			7	U				
	Sodium, Total	µg/L	NS	NS	10,800	2,400				3,200					
	Thallium, Total	µg/L	2	3,000	7	0.0700	J			0.0400	J				
	Vanadium, Total	µg/L	30	4,000	11	10	U			10	U				
	Zinc, Total	µg/L	5,000	900	21.1	16	J			18	J				
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	NS		0.2	U	NA		NA	

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2012

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-93-16X	Qual	SPM-97-23X[4]	Qual	SPM-97-24X	Qual	41M-93-04X	Qual	41M-93-04X Duplicate 1	Qual
VOCS (SW8260C)	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NS		NA		0.750	U	0.750	U
	cis -1,2-Dichloroethene	µg/L	70	50,000								0.500	U	0.500	U
	trans -1,2-Dichloroethene	µg/L	100	50,000								0.750	U	0.750	U
	Carbon Disulfide	µg/L	NS	NS								5.00	U	5.00	U
	Carbon Tetrachloride	µg/L	5	5,000								0.500	U	0.500	U
	Tetrachloroethene	µg/L	5	30,000								0.500	U	0.500	U
	Toluene	µg/L	1,000	40,000								0.750	U	0.750	U
	Trichloroethene	µg/L	5	5,000								0.500	U	0.500	U
	Vinyl Chloride	µg/L	2	50,000								1.00	U	1.00	U
Field Parameters	Temperature, Initial	˚ Celsius	NS	NS	NS	10.05		NA		11.09		12.24		NA	
	Temperature, Final	˚ Celsius	NS	NS		9.82				10.70		12.30			
	Dissolved Oxygen	mg/L	NS	NS		11.22				6.13		0.26			
	ORP[3]	mV	NS	NS		212.5				57.8		-68.0			
	pH	Standard units	NS	NS		6.48				7.55		5.66			
	Specific Conductance	µS/cm	NS	NS		27				71		58			
	Turbidity	NTU	NS	NS		0.12				1.31		3.38			

Notes:

9.8 = GW-1 groundwater standard exceedance

9.8 = Background level exceedance

NA = Not applicable or not analyzed.

NS = Not sampled.

[1] The GW-1 or GW-3 standard was effective on June 26, 2009.

[2] The background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

[4] Well SPM-97-23X could not be located and, therefore, was not sampled.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Q	26M-92-03X	Q	26M-92-03X Duplicate 1	Q	26M-92-04X	Q	26M-92-04X Duplicate 2	Q	26M-97-08X	Q
Perchlorate (E332.0)	Perchlorate	µg/L	2	1,000	NS	0.100		NA		NA		**142**		**142**		NA	
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.204	UJ	0.202	U	0.204	U	0.206	U	NA		0.204	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.204	U	0.202	U	0.204	U	0.206	U			0.204	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.202	U	0.204	U	0.206	U			0.204	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.204	U	0.202	U	0.204	U	0.206	U			0.204	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.202	U	0.204	U	0.468				0.204	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.202	U	0.204	U	0.206	U			0.204	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.204	UJ	0.202	U	0.204	U	0.206	U			0.204	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.202	U	0.204	U	0.206	U			0.204	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.202	U	0.204	U	0.727				0.204	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.202	U	0.204	U	0.206	U			0.204	U
	RDX	µg/L	1	50,000	NS	0.204	U	**3.62**		**4.04**		**1,010**				**20.9**	
	Tetryl	µg/L	NS	NS	NS	0.204	UJ	0.202	U	0.204	U	0.206	U			0.204	U
	Nitrobenzene	µg/L	NS	NS	NS	0.204	UJ	0.202	U	0.204	U	0.206	U			0.204	U
	HMX	µg/L	200	50,000	NS	0.204	U	0.806		0.765		52.9				7.88	
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U	NA		100	U
	Antimony, Total	µg/L	6	8,000	3.03	0.5660		0.9230		0.9610		0.5140				0.3060	J
	Arsenic, Total	µg/L	10	900	10.5	5		5	U	5	U	5	U			5	U
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	5	J	5	J	10				9	J
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U	5	U			5	U
	Cadmium, Total	µg/L	5	4	4.01	5	U	5	U	5	U	5	U			5	U
	Calcium, Total	µg/L	NS	NS	14,700	2,400		2,900		2,800		10,000				2,800	
	Chromium, Total	µg/L	100	300	14.7	3	J	10	U	10	U	10	U			10	
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U			20	U
	Copper, Total	µg/L	NS	NS	8.09	2	J	3	J	3	J	2	J			2	J
	Iron, Total	µg/L	NS	NS	9,100	60		50	U	50	U	50	U			100	
	Lead, Total	µg/L	15	10	4.25	10	U	10	U	10	U	10	U			10	U
	Magnesium, Total	µg/L	NS	NS	3,480	870		260		260		850				130	
	Manganese, Total	µg/L	NS	NS	291	10	U	4	J	4	J	14				6	J
	Nickel, Total	µg/L	100	200	34.3	25	U	25	U	25	U	25	U			25	U
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	560	J	550	J	630	J			410	J
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U	10	U			10	U
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U	7	U			7	U
	Sodium, Total	µg/L	NS	NS	10,800	3,200		1,400	J	1,300	J	2,700				1,200	J
	Thallium, Total	µg/L	2	3,000	6.99	0.5000	U	0.5000	U	0.5000	U	0.5000	U			0.5000	U
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U	10	U			10	U
	Zinc, Total	µg/L	5,000	900	21.1	13	J	13	J	11	J	10	J			13	J

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Q	26M-92-03X	Q	26M-92-03X Duplicate 1	Q	26M-92-04X	Q	26M-92-04X Duplicate 2	Q	26M-97-08X	Q
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	0.2	U	NA		0.2	U
Field Parameters	Temperature, Initial	°C	NS	NS	NS	9.93		9.28		NA		9.89		NA		9.98	
	Temperature, Final	°C	NS	NS	NS	9.87		9.38				9.74				10.09	
	pH	mg/L	NS	NS	NS	4.75		4.20				5.52				4.84	
	Specific Conductance	mV	NS	NS	NS	25		20				83				17	
	ORP[3]	Standard units	NS	NS	NS	190.1		317.6				143.7				270.5	
	Dissolved Oxygen	µS/cm	NS	NS	NS	8.5		10.36				9.99				11.03	
	Turbidity	NTU	NS	NS	NS	1.78		0.39				0.31				1.78	

Notes:

53 = GW-1 groundwater standard exceedance

14 = GW-3 groundwater standard exceedance

9.8 = Background level exceedance

NA = Not applicable or not analyzed.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] The background levels for metals are from HLA, 2000.

[2] The GW-1 or GW-3 standard was effective on June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-97-08X Duplicate 3	Q	26WP-06-01	Q	26WP-08-02	Q	26WP-09-01	Q	26WP-09-02	Q	26M-10-09X	Q
Perchlorate (E332.0)	Perchlorate	µg/L	2	1,000	NS	NA		**19.4**		0.050	U	0.050	U	0.072		0.019	J
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U	NA		NA		NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.206	U	0.208	U	0.204	U						
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	2-Nitrotoluene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	3-Nitrotoluene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	4-Nitrotoluene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	RDX	µg/L	1	50,000	NS	**19.2**		**76**		0.204	U						
	Tetryl	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	Nitrobenzene	µg/L	NS	NS	NS	0.206	U	0.208	U	0.204	U						
	HMX	µg/L	200	50,000	NS	7.50		18.8		0.204	U						
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	100	U	NA		NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03	0.7800	J	1.062		0.4540	J						
	Arsenic, Total	µg/L	10	900	10.5	5	U	5	U	**53**							
	Barium, Total	µg/L	2,000	50,000	39.6	8	J	10		3	J						
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U						
	Cadmium, Total	µg/L	5	4	4.01	5	U	1	J	1	J						
	Calcium, Total	µg/L	NS	NS	14,700	2,800		6,100		3,500							
	Chromium, Total	µg/L	100	300	14.7	10		6	J	10	U						
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U						
	Copper, Total	µg/L	NS	NS	8.09	2	J	6	J	4	J						
	Iron, Total	µg/L	NS	NS	9,100	110		40,000		26,000							
	Lead, Total	µg/L	15	10	4.25	10	U	10	U	***14***							
	Magnesium, Total	µg/L	NS	NS	3,480	130		500		620							
	Manganese, Total	µg/L	NS	NS	291	7	J	73		149							
	Nickel, Total	µg/L	100	200	34.3	25	U	25	U	25	U						
	Potassium, Total	µg/L	NS	NS	2,370	420	J	620	J	400	J						
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U						
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U						
	Sodium, Total	µg/L	NS	NS	10,800	1,200	J	2,400		2,100							
	Thallium, Total	µg/L	2	3,000	6.99	0.5000	U	0.0730	J	0.5000	U						
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U						
	Zinc, Total	µg/L	5,000	900	21.1	16	J	117		**6,720**							

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-97-08X Duplicate 3	Q	26WP-06-01	Q	26WP-08-02	Q	26WP-09-01	Q	26WP-09-02	Q	26M-10-09X	Q
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	NA		NA		NA	
Field Parameters	Temperature, Initial	°C	NS	NS	NS	NA		9.62		10.04		10.00		10.57		9.84	
	Temperature, Final	°C	NS	NS	NS			10.23		10.96		10.68		10.44		9.65	
	pH	mg/L	NS	NS	NS			6.37		6.81		6.25		6.42		6.11	
	Specific Conductance	mV	NS	NS	NS			53		90		36		31		43	
	ORP[3]	Standard units	NS	NS	NS			-13.4		-117.5		2.1		94.1		134	
	Dissolved Oxygen	µS/cm	NS	NS	NS			2.6		0.28		0.21		8.33		3.92	
	Turbidity	NTU	NS	NS	NS			62.50		4.18		4.82		2.11		0.48	

Notes:

53 = GW-1 groundwater standard exceedance

14 = GW-3 groundwater standard exceedance

9.8 = Background level exceedance

NA = Not applicable or not analyzed.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] The background levels for metals are from HLA, 2000.

[2] The GW-1 or GW-3 standard was effective on June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.3
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Q	SPM-93-06X	Q	SPM-93-08X	Q	SPM-93-10X	Q	SPM-93-12X	Q
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	RDX	µg/L	1	50,000	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	Tetryl	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	Nitrobenzene	µg/L	NS	NS	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
	HMX	µg/L	200	50,000	NS	0.205	U	0.206	U	0.206	U	0.203	U	0.204	U
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870			140		100	U	50	J	100	U
	Antimony, Total	µg/L	6	8,000	3.03			1.8480		0.2880	J	0.6700		0.9420	
	Arsenic, Total	µg/L	10	900	10.5			**12**		5	U	7		5	U
	Barium, Total	µg/L	2,000	50,000	39.6			36		10	U	10	U	10	U
	Beryllium, Total	µg/L	4	200	5			5	U	5	U	5	U	5	U
	Cadmium, Total	µg/L	5	4	4.1			5	U	5	U	5	U	5	U
	Calcium, Total	µg/L	NS	NS	14,700			14,000		2,200		3,000		5,800	
	Chromium, Total	µg/L	100	300	14.7			10	U	10	U	4	J	4	J
	Cobalt, Total	µg/L	NS	NS	25			20	U	20	U	20	U	20	U
	Copper, Total	µg/L	NS	NS	8.09			10	U	3	J	10	U	10	U
	Iron, Total	µg/L	NS	NS	9,100			50	U	50	U	100		50	U
	Lead, Total	µg/L	15	10	4.25	NA		10	U	10	U	10	U	10	U
	Magnesium, Total	µg/L	NS	NS	3,480			220		260		810		1,800	
	Manganese, Total	µg/L	NS	NS	291			10	U	10	U	3	J	3	J
	Nickel, Total	µg/L	100	200	34.3			25	U	25	U	25	U	25	U
	Potassium, Total	µg/L	NS	NS	2,370			**3,100**		2,500	U	530	J	640	J
	Selenium, Total	µg/L	50	100	3.02			10	U	10	U	10	U	10	U
	Silver, Total	µg/L	100	7	4.6			7	U	7	U	7	U	7	U
	Sodium, Total	µg/L	NS	NS	10,800			6,200		2,000		2,900		5,000	
	Thallium, Total	µg/L	2	3,000	7			0.1200	J	0.0690	J	0.5000	U	0.5000	U
	Vanadium, Total	µg/L	30	4,000	11			10	U	10	U	1	J	10	U
	Zinc, Total	µg/L	5,000	900	21.1			8	J	9	J	11	J	12	J
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	NA		0.2	U	0.2	U	0.2	U	0.2	U

Table 4.3
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Q	SPM-93-06X	Q	SPM-93-08X	Q	SPM-93-10X	Q	SPM-93-12X	Q
VOCS (SW8260C)	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		NA		NA	
	cis -1,2-Dichloroethene	µg/L	70	50,000											
	trans -1,2-Dichloroethene	µg/L	100	50,000											
	Carbon Disulfide	µg/L	NS	NS											
	Carbon Tetrachloride	µg/L	5	5,000											
	Tetrachloroethene	µg/L	5	30,000											
	Toluene	µg/L	1,000	40,000											
	Trichloroethene	µg/L	5	5,000											
	Vinyl Chloride	µg/L	2	50,000											
Field Parameters	Temperature, Initial	˚ Celsius	NS	NS	NS	12.53		8.96		8.96		9.23		9.35	
	Temperature, Final	˚ Celsius	NS	NS		12.53		8.64		8.9		9.23		9.72	
	Dissolved Oxygen	mg/L	NS	NS		9.01		1.76		11.89		11.66		6.07	
	ORP[3]	mV	NS	NS		236.4		9.7		168.9		65.8		140.9	
	pH	Standard units	NS	NS		6.68		11.95		6.36		7.81		5.86	
	Specific Conductance	µS/cm	NS	NS		62		101		20		24		49	
	Turbidity	NTU	NS	NS		NA		0.45		0.51		2.45		0.39	

Notes:

12 = GW-1 groundwater standard exceedance

3,100 = Background level exceedance

NA = Not applicable or not analyzed.

NS = Not sampled.

[1] The GW-1 or GW-3 standard was effective on June 26, 2009.

[2] The background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.3
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-93-16X	Q	SPM-97-23X	Q	SPM-97-24X	Q	41M-93-04X	Q	41M-93-04X Duplicate 1	Q
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U	NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	2-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	3-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	4-Nitrotoluene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	RDX	µg/L	1	50,000	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	Tetryl	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	Nitrobenzene	µg/L	NS	NS	NS	0.204	U	0.205	U	0.204	U	0.205	U		
	HMX	µg/L	200	50,000	NS	0.204	U	0.205	U	0.204	U	0.205	U		
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	100	U	NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03	0.3120	J	0.9300		0.9430	J				
	Arsenic, Total	µg/L	10	900	10.5	5	U	5	U	6					
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	10	U	10	U				
	Beryllium, Total	µg/L	4	200	5	5	U	5	U	5	U				
	Cadmium, Total	µg/L	5	4	4.1	5	U	5	U	5	U				
	Calcium, Total	µg/L	NS	NS	14,700	2,200		3,800		6,800					
	Chromium, Total	µg/L	100	300	14.7	10	U	10	U	10	U				
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U				
	Copper, Total	µg/L	NS	NS	8.09	10	U	10	U	2	J				
	Iron, Total	µg/L	NS	NS	9,100	50	U	350		50	U				
	Lead, Total	µg/L	15	10	4.25	10	U	10	U	10	U				
	Magnesium, Total	µg/L	NS	NS	3,480	540		760		2,600					
	Manganese, Total	µg/L	NS	NS	291	10	U	31		10	U				
	Nickel, Total	µg/L	100	200	34.3	25	U	25	U	25	U				
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	450	J	880	J				
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U				
	Silver, Total	µg/L	100	7	4.6	7	U	7	U	7	U				
	Sodium, Total	µg/L	NS	NS	10,800	2,300		2,700		3,000					
	Thallium, Total	µg/L	2	3,000	7	0.5000	U	0.5000	U	0.5000	U				
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U				
	Zinc, Total	µg/L	5,000	900	21.1	13	J	12	J	8	J				
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	NA		NA	

Table 4.3
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2013

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-93-16X	Q	SPM-97-23X	Q	SPM-97-24X	Q	41M-93-04X	Q	41M-93-04X Duplicate 1	Q
VOCS (SW8260C)	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		0.750	U	0.750	U
	cis -1,2-Dichloroethene	µg/L	70	50,000								0.500	U	0.500	U
	trans -1,2-Dichloroethene	µg/L	100	50,000								0.750	U	0.750	U
	Carbon Disulfide	µg/L	NS	NS								5.00	U	5.00	U
	Carbon Tetrachloride	µg/L	5	5,000								0.500	U	0.500	U
	Tetrachloroethene	µg/L	5	30,000								0.500	U	0.500	U
	Toluene	µg/L	1,000	40,000								0.750	U	0.750	U
	Trichloroethene	µg/L	5	5,000								0.500	U	0.500	U
	Vinyl Chloride	µg/L	2	50,000								1.00	U	1.00	U
Field Parameters	Temperature, Initial	˚ Celsius	NS	NS	NS	8.92		9.69		10.77		11.16		NA	
	Temperature, Final	˚ Celsius	NS	NS		9.22		10.40		10.30		10.99			
	Dissolved Oxygen	mg/L	NS	NS		13.67		10.34		6.17		3.87			
	ORP[3]	mV	NS	NS		283.4		180.6		97.0		79.0			
	pH	Standard units	NS	NS		5.15		6.37		7.86		6.02			
	Specific Conductance	µS/cm	NS	NS		19		25		58		30			
	Turbidity	NTU	NS	NS		0.80		3.31		1.43		4.27			

Notes:

12 = GW-1 groundwater standard exceedance

3,100 = Background level exceedance

NA = Not applicable or not analyzed.

NS = Not sampled.

[1] The GW-1 or GW-3 standard was effective on June 26, 2009.

[2] The background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2014 (Perchlorate and Metals) and January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Q	26M-92-03X	Q	26M-92-03X Duplicate 1	Q	26M-92-04X	Q	26M-92-04X Duplicate 2	Q	26M-97-08X	Q	26M-97-08X Duplicate 3	Q
Perchlorate (6850.0)	Perchlorate	µg/L	2	1,000	NS	0.100	U	0.36		NA		**34.6**		**39.4**		0.39		0.46	
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	4-Nitrotoluene	µg/L	NS	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	RDX	µg/L	1	50,000	NS	0.2	U	**19.30**		**20**		**318**		**312**		**26.5**		**29.1**	
	Tetryl	µg/L	NS	NS	NS	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
	Nitrobenzene	µg/L	NS	NS	NS	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	HMX	µg/L	200	50,000	NS	0.2	U	8.4		8.9		27.1		26.1		10		10.4	
Metals (SW6010C/ SW6020A)	Aluminum, Dissolved	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U	100	U	100	U	100	U
	Antimony, Dissolved	µg/L	6	8,000	3.03	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Arsenic, Dissolved	µg/L	10	900	10.5	3.4	J	3	U	3	U	3	U	3	U	3	U	3	U
	Barium, Disolved	µg/L	2,000	50,000	39.6	25	U	25	U	25	U	25	U	25	U	25	U	25	U
	Beryllium, Dissolved	µg/L	4	200	5	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Cadmium, Dissolved	µg/L	5	4	4.01	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Calcium, Dissolved	µg/L	NS	NS	14,700	4,330	J	3,530	J	3,590	J	9,170		9,090		3,550	J	3,600	J
	Chromium, Dissolved	µg/L	100	300	14.7	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	Cobalt, Dissolved	µg/L	NS	NS	25	25	U	25	U	25	U	25	U	25	U	25	U	25	U
	Copper, Dissolved	µg/L	NS	NS	8.09	13	U	13	U	13	U	13	U	13	U	13	U	13	U
	Iron, Dissolved	µg/L	NS	NS	9,100	50	U	50	U	50	U	50	U	50	U	50	U	50	U
	Lead, Dissolved	µg/L	15	10	4.25	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Magnesium, Dissolved	µg/L	NS	NS	3,480	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
	Manganese, Dissolved	µg/L	NS	NS	291	7.5	U	7.5	U	7.5	U	9.1	J	9.3	J	7.5	U	7.5	U
	Nickel, Dissolved	µg/L	100	200	34.3	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Potassium, Dissolved	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
	Selenium, Dissolved	µg/L	50	100	3.02	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	Silver, Dissolved	µg/L	100	7	4.6	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Sodium, Dissolved	µg/L	NS	NS	10,800	3,960	J	2,500	U	2,500	U	2,730	J	2,520	J	2,500	U	2,500	U
	Thallium, Dissolved	µg/L	2	3,000	6.99	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	Vanadium, Dissolved	µg/L	30	4,000	11	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	Zinc, Dissolved	µg/L	5,000	900	21.1	10.3	J	10	U	10	U	10	U	14.8	J	10	U	10	U
Mercury (SW7470A)	Mercury, Dissolved	µg/L	2	20	0.243	0.15	U	0.15	U	0.15	U	0.15	U	0.15		0.15	U	0.15	U

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2014 (Perchlorate and Metals) and January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Q	26M-92-03X	Q	26M-92-03X Duplicate 1	Q	26M-92-04X	Q	26M-92-04X Duplicate 2	Q	26M-97-08X	Q	26M-97-08X Duplicate 3	Q
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	NA		NA		NA		NA		NA		NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03														
	Arsenic, Total	µg/L	10	900	10.5														
	Barium, Total	µg/L	2,000	50,000	39.6														
	Beryllium, Total	µg/L	4	200	5														
	Cadmium, Total	µg/L	5	4	4.01														
	Calcium, Total	µg/L	NS	NS	14,700														
	Chromium, Total	µg/L	100	300	14.7														
	Cobalt, Total	µg/L	NS	NS	25														
	Copper, Total	µg/L	NS	NS	8.09														
	Iron, Total	µg/L	NS	NS	9,100														
	Lead, Total	µg/L	15	10	4.25														
	Magnesium, Total	µg/L	NS	NS	3,480														
	Manganese, Total	µg/L	NS	NS	291														
	Nickel, Total	µg/L	100	200	34.3														
	Potassium, Total	µg/L	NS	NS	2,370														
	Selenium, Total	µg/L	50	100	3.02														
	Silver, Total	µg/L	100	7	4.6														
	Sodium, Total	µg/L	NS	NS	10,800														
	Thallium, Total	µg/L	2	3,000	6.99														
	Vanadium, Total	µg/L	30	4,000	11														
	Zinc, Total	µg/L	5,000	900	21.1														
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	NA		NA		NA		NA		NA		NA		NA	
Field Parameters November 2014	Temperature, Initial	°C	NS	NS	NS	11.5		11.76				10.7				11.36			
	Temperature, Final	°C	NS	NS	NS	10.91		12.25				10.80				10.82			
	pH	mg/L	NS	NS	NS	5.36		5.41				5.56				4.88			
	Specific Conductance	mV	NS	NS	NS	56		53		NA		73.7		NA		51		NA	
	ORP[3]	Standard units	NS	NS	NS	220.3		273.1				155.4				310.9			
	Dissolved Oxygen	µS/cm	NS	NS	NS	6.01		10.22				7.47				6.8			
	Turbidity	NTU	NS	NS	NS	2.56		0.47				0.12				1.41			
Field Parameters January 2015	Temperature, Initial	°C	NS	NS	NS	8.79		8.63				9.05				8.73			
	Temperature, Final	°C	NS	NS	NS	8.72		8.89				9.40				8.5			
	pH	mg/L	NS	NS	NS	5.96		5.61				5.63				5.71			
	Specific Conductance	mV	NS	NS	NS	26		39		NA		70		NA		26		NA	
	ORP[3]	Standard units	NS	NS	NS	171.6		236.6				251.7				207.1			
	Dissolved Oxygen	µS/cm	NS	NS	NS	5.76		9.95				7.94				10.19			
	Turbidity	NTU	NS	NS	NS	0.48		10.49				0.33				0.09			

[1] The background levels for metals are from HLA, 2000.

[2] The GW-1 or GW-3 standard was effective on June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2014 (Perchlorate and Metals) and January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26WP-06-01	Q	26WP-08-02	Q	26WP-08-02 Duplicate 4	Q	26WP-09-01	Q	26WP-09-02	Q	26M-10-09X	Q	26M-14-10X	Q	26M-14-11X	Q
Perchlorate (6850.0)	Perchlorate	µg/L	2	1,000	NS	**4.4**		0.10	U	NA		0.10	U	0.10	U	0.10	U	0.10	U	0.16	
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.21	U	0.3	U	NA		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.28	U	0.3	U			0.23	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.21	U	0.2	U			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.21	U	0.2	U			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.21	U	0.2	U			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.21	U	0.2	U			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.21	U	0.2	U			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.52	U	0.75	U			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	1.0	U	1.5	U			1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	4-Nitrotoluene	µg/L	NS	NS	NS	1.0	U	1.5	U			1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	RDX	µg/L	1	50,000	NS	0.21	U	0.3	U			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Tetryl	µg/L	NS	NS	NS	5.2	U	7.5	U			5	U	5.0	U	5.0	U	5.0	U	5.0	U
	Nitrobenzene	µg/L	NS	NS	NS	0.52	U	0.75	U			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	HMX	µg/L	200	50,000	NS	0.21	U	0.3	U			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Metals (SW6010C/ SW6020A)	Aluminum, Dissolved	µg/L	NS	NS	6,870	100	U	100	U	NA		100	U	100	U	100	U	100	U	100	U
	Antimony, Dissolved	µg/L	6	8,000	3.03	2	U	2	U			2	U	2	U	2	U	2	U	2	U
	Arsenic, Dissolved	µg/L	10	900	10.5	3	U	**53.5**				15.3	U	3	U	3	U	3	U	3	U
	Barium, Disolved	µg/L	2,000	50,000	39.6	25	U	25	U			25	U	25	U	25	U	25	U	25	U
	Beryllium, Dissolved	µg/L	4	200	5	2	U	2	U			2	U	2	U	2	U	2	U	2	U
	Cadmium, Dissolved	µg/L	5	4	4.01	2	U	2	U			2	U	2	U	2	U	2	U	2	U
	Calcium, Dissolved	µg/L	NS	NS	14,700	6,650		3,440	J			2,900	J	2,500	U	4,720	J	10,200		4,840	J
	Chromium, Dissolved	µg/L	100	300	14.7	5	U	5	U			5	U	5	U	5	U	5	U	5	U
	Cobalt, Dissolved	µg/L	NS	NS	25	25	U	25	U			25	U	25	U	25	U	25	U	25	U
	Copper, Dissolved	µg/L	NS	NS	8.09	13	U	13	U			13	U	13	U	13	U	13	U	13	U
	Iron, Dissolved	µg/L	NS	NS	9,100	3,070		20,700				6,180		50	U	50	U	50	U	50	U
	Lead, Dissolved	µg/L	15	10	4.25	2.5	U	2.5	U			2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Magnesium, Dissolved	µg/L	NS	NS	3,480	2,500	U	2,500	U			2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
	Manganese, Dissolved	µg/L	NS	NS	291	35.5		149				134		18.1		7.5	U	12.4	J	31.6	
	Nickel, Dissolved	µg/L	100	200	34.3	20	U	20	U			20	U	20	U	20	U	20	U	20	U
	Potassium, Dissolved	µg/L	NS	NS	2,370	2,500	U	2,500	U			2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
	Selenium, Dissolved	µg/L	50	100	3.02	5	U	5	U			5	U	5	U	5	U	5	U	5	U
	Silver, Dissolved	µg/L	100	7	4.6	2.5	U	2.5	U			2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Sodium, Dissolved	µg/L	NS	NS	10,800	2,570	J	2,500	U			2,860	J	2,500	U	3,970	J	5,010		2,820	J
	Thallium, Dissolved	µg/L	2	3,000	6.99	1.0	U	1.0	U			1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	Vanadium, Dissolved	µg/L	30	4,000	11	5	U	5	U			5	U	5	U	5	U	5	U	5	U
	Zinc, Dissolved	µg/L	5,000	900	21.1	10.4	J	**3,260**				**1,870**		**3,140**		10	U	10	U	10	U
Mercury (SW7470A)	Mercury, Dissolved	µg/L	2	20	0.243	0.15	U	0.15	U	NA		0.15	U	0.15	U	0.15	U	0.15	U	0.15	U

Table 4.2
Groundwater Analytical Results
SPIA Area of Contamination 26
November 2014 (Perchlorate and Metals) and January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26WP-06-01	Q	26WP-08-02	Q	26WP-08-02 Duplicate 4	Q	26WP-09-01	Q	26WP-09-02	Q	26M-10-09X	Q	26M-14-10X	Q	26M-14-11X	Q
Metals (SW6010C/ SW6020A)	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U	100	U						
	Antimony, Total	µg/L	6	8,000	3.03	2	U	2	U	2	U	2	U	2	U						
	Arsenic, Total	µg/L	10	900	10.5	3	U	**53.7**		**52.7**		**15.5**		3	U						
	Barium, Total	µg/L	2,000	50,000	39.6	25	U	25	U	25	U	25	U	25	U						
	Beryllium, Total	µg/L	4	200	5	2	U	2	U	2	U	2	U	2	U						
	Cadmium, Total	µg/L	5	4	4.01	2	U	2	U	2	U	2	U	2	U						
	Calcium, Total	µg/L	NS	NS	14,700	6,790		2,740	J	2,770	J	2,500	U	2,500	U						
	Chromium, Total	µg/L	100	300	14.7	5	U	5	U	5	U	5	U	5	U						
	Cobalt, Total	µg/L	NS	NS	25	25	U	25	U	25	U	25	U	25	U						
	Copper, Total	µg/L	NS	NS	8.09	13	U	13	U	13	U	13	U	13	U						
	Iron, Total	µg/L	NS	NS	9,100	9,700	J	21,000		21,300		6,390		162		NA		NA		NA	
	Lead, Total	µg/L	15	10	4.25	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U						
	Magnesium, Total	µg/L	NS	NS	3,480	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U						
	Manganese, Total	µg/L	NS	NS	291	30.4		151		151		138		19.3							
	Nickel, Total	µg/L	100	200	34.3	20	U	20	U	20	U	20	U	20	U						
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U						
	Selenium, Total	µg/L	50	100	3.02	5	U	5	U	5	U	5	U	5	U						
	Silver, Total	µg/L	100	7	4.6	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U						
	Sodium, Total	µg/L	NS	NS	10,800	2,650	J	2,500	U	2,500	U	2,610	J	2,500	U						
	Thallium, Total	µg/L	2	3,000	6.99	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U						
	Vanadium, Total	µg/L	30	4,000	11	5	U	5	U	5	U	5	U	5	U						
	Zinc, Total	µg/L	5,000	900	21.1	28.8		**3,390**		**3,350**		**1,890**		**3,150**							
Mercury (SW7470A)	Mercury, Total	µg/L	2	20	0.243	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	NA		NA		NA	
Field Parameters November 2014	Temperature, Initial	°C	NS	NS	NS	11.3		9.19				9.86		11		12.08		10.17		9.37	
	Temperature, Final	°C	NS	NS	NS	11.3		9.38				9.72		11.1		11.83		9.66		9.29	
	pH	mg/L	NS	NS	NS	6.17		6.38				5.77		6.64		5.74		6.22		5.44	
	Specific Conductance	mV	NS	NS	NS	67.2		67		NA		41		34.1		51		86		38	
	ORP[3]	Standard units	NS	NS	NS	-107.4		-39.5				-145.6		58.4		170.5		172.19		204.1	
	Dissolved Oxygen	µS/cm	NS	NS	NS	4.0		9.95				0.12		6.56		3.14		9.17		10.46	
	Turbidity	NTU	NS	NS	NS	12.80		2.41				15.00		2.31		0.15		17.30		1.33	
Field Parameters January 2015	Temperature, Initial	°C	NS	NS	NS	4.68		5				3.82		8.12		8.52		7.24		7.99	
	Temperature, Final	°C	NS	NS	NS	5.72		5.25				3.91		8.07		8.89		6.58		8.06	
	pH	mg/L	NS	NS	NS	5.92		7.01				6.09		6.37		6.02		6.99		6.58	
	Specific Conductance	mV	NS	NS	NS	37		44		NA		53		26		30		54		23	
	ORP[3]	Standard units	NS	NS	NS	-40.3		-181.7				-39.8		112.7		196.1		124.9		174.4	
	Dissolved Oxygen	µS/cm	NS	NS	NS	1.57		0.5				0.11		10.78		6.17		9.09		10.05	
	Turbidity	NTU	NS	NS	NS	1.23		21.60				3.97		15.60		0.33		3.82		3.09	

[1] The background levels for metals are from HLA, 2000.

[2] The GW-1 or GW-3 standard was effective on June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.3
Groundwater Analytical Results
SPIA Area of Contamination 27
November 2014 (Metals) January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	27M-92-01X	Qual	27M-93-05X	Qual	27M-93-06X	Qual	27M-93-08X	Qual
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	NC		0.20	U	0.21	0.22	0.22	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	NC		0.20	U	0.21	U	0.22	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	NC		0.20	U	0.21	U	0.22	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	NC		0.20	U	0.21	U	0.22	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	NC		0.20	U	0.21	U	0.22	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	NC		0.20	U	0.21	U	0.22	U
	2-Nitrotoluene	µg/L	NS	NS	NS	NC		0.20	U	0.21	U	0.22	U
	3-Nitrotoluene	µg/L	NS	NS	NS	NC		0.50	U	0.53	U	0.54	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	NC		1.0	U	1.1	U	1.1	U
	4-Nitrotoluene	µg/L	NS	NS	NS	NC		1.0	U	1.1	U	1.1	U
	RDX	µg/L	1	50,000	NS	NC		0.20	U	0.21	U	0.22	U
	Tetryl	µg/L	NS	NS	NS	NC		5.0	U	5.3	U	5.4	U
	Nitrobenzene	µg/L	NS	NS	NS	NC		0.50	U	0.53	U	0.54	U
	HMX	µg/L	200	50,000	NS	NC		0.20	U	0.21	U	0.22	U
Metals (SW6010C/ SW6020A)	Aluminum, Dissolved	µg/L	NS	NS	6,870	100	U	151	J	100	U	100	U
	Antimony, Dissolved	µg/L	6	8,000	3.03	2	U	2	U	2	U	2	U
	Arsenic, Dissolved	µg/L	10	900	10.5	3	U	5.1		3	U	3	U
	Barium, Dissolved	µg/L	2,000	50,000	39.6	25	U	25	U	25	U	25	U
	Beryllium, Dissolved	µg/L	4	200	5	2	U	2	U	2	U	2	U
	Cadmium, Dissolved	µg/L	5	4	4.01	2	U	2	U	2	U	2	U
	Calcium, Dissolved	µg/L	NS	NS	14,700	10,400		13,600		3,890	J	6,310	
	Chromium, Dissolved	µg/L	100	300	14.7	5	U	5	U	5	U	5	U
	Cobalt, Dissolved	µg/L	NS	NS	25	25	U	25	U	25	U	25	U
	Copper, Dissolved	µg/L	NS	NS	8.09	13	U	13	U	13	U	13	U
	Iron, Dissolved	µg/L	NS	NS	9,100	87.6	J	50	U	50	U	50	U
	Lead, Dissolved	µg/L	15	10	4.25	2.5	U	2.5	U	2.5	U	2.5	U
	Magnesium, Dissolved	µg/L	NS	NS	3,480	2,500	U	2,500	U	2,500	U	2,500	U
	Manganese, Dissolved	µg/L	NS	NS	291	7.5	U	23.9		7.5	U	7.5	U
	Nickel, Dissolved	µg/L	100	200	34.3	20	U	20	U	20	U	20	U
	Potassium, Dissolved	µg/L	NS	NS	2,370	2,500	U	**3,010**	J	2,500	U	2,500	U
	Selenium, Dissolved	µg/L	50	100	3.02	5	U	5	U	5	U	5	U
	Silver, Dissolved	µg/L	100	7	4.6	2.5	U	2.5	U	2.5	U	2.5	U
	Sodium, Dissolved	µg/L	NS	NS	10,800	5,620		4,860	J	2,500	U	4,520	J
	Thallium, Dissolved	µg/L	2	3,000	6.99	1	U	1	U	1	U	1	U
	Vanadium, Dissolved	µg/L	30	4,000	11	5	U	6.1	J	5	U	5	U
	Zinc, Dissolved	µg/L	5,000	900	21.1	**41.1**		13.8	J	19.5	J	10	U
Mercury (SW7470A)	Mercury, Dissolved	µg/L	2	20	0.243	0.15	U	0.15	U	0.15	U	0.15	U

Table 4.3
Groundwater Analytical Results
SPIA Area of Contamination 27
November 2014 (Metals) January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	27M-92-01X	Qual	27M-93-05X	Qual	27M-93-06X	Qual	27M-93-08X	Qual
Field Parameters, November 2014	Temperature, Initial	°C	NS	NS	NS	12.76		11.2		10.71		10.34	
	Temperature, Final	°C	NS	NS	NS	12.89		11		10.62		10.23	
	pH	mg/L	NS	NS	NS	6.1		7.53		5.71		5.57	
	Specific Conductance	mV	NS	NS	NS	86		81.8		44		73	
	ORP[3]	Standard units	NS	NS	NS	178.2		72.6		206.4		193.3	
	Dissolved Oxygen	µS/cm	NS	NS	NS	6.95		0.12		9.52		7.54	
	Turbidity	NTU	NS	NS	NS	6.09		1.46		3.67		0.91	
Field Parameters, January 2015	Temperature, Initial	°C	NS	NS	NS	NC		9.28		9.71		8.29	
	Temperature, Final	°C	NS	NS	NS	NC		9.49		9.42		8.62	
	pH	mg/L	NS	NS	NS	NC		7.58		6.93		6.64	
	Specific Conductance	mV	NS	NS	NS	NC		65		32		66	
	ORP[3]	Standard units	NS	NS	NS	NC		98.5		190.9		194.7	
	Dissolved Oxygen	µS/cm	NS	NS	NS	NC		1.93		9.6		8.3	
	Turbidity	NTU	NS	NS	NS	NC		25.10		1.21		2.61	

Notes:

9.8 = GW-1 groundwater standard exceedance

9.8 = Background level exceedance

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Background levels for metals are from HLA, 2000.

[2] GW-1 or GW-3 standard effective June 26, 2009.

[3] The ORP value was not corrected to SHE.

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2014 (Metals) January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Q	SPM-93-06X	Q	SPM-93-08X	Q	SPM-93-10X	Q
Perchlorate (6850.0)	Perchlorate	µg/L	2	1,000	NS	NC		0.10	U	NC		NC	
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.20	U	0.20	U	0.20	U	0.20	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.21	U	0.20	U	0.20	U	0.20	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.20	U	0.20	U	0.20	U	0.20	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.20	U	0.20	U	0.20	U	0.20	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.20	U	0.20	U	0.20	U	0.20	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.20	U	0.20	U	0.20	U	0.20	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.20	U	0.20	U	0.20	U	0.20	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.50	U	0.50	U	0.50	U	0.50	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U
	4-Nitrotoluene	µg/L	NS	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U
	RDX	µg/L	1	50,000	NS	0.20	U	0.20	U	0.20	U	0.20	U
	Tetryl	µg/L	NS	NS	NS	5.0	U	5.0	U	5.0	U	5.0	U
	Nitrobenzene	µg/L	NS	NS	NS	0.50	U	0.50	U	0.50	U	0.50	U
	HMX	µg/L	200	50,000	NS	0.20	U	0.20	U	0.20	U	0.20	U
Metals (SW6010C/ SW6020A)	Aluminum, Dissolved	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U
	Antimony, Dissolved	µg/L	6	8,000	3.03	2	U	2	U	2	U	2	U
	Arsenic, Dissolved	µg/L	10	900	10.5	3	U	**12.5**		3	U	6.1	
	Barium, Dissolved	µg/L	2,000	50,000	39.6	25	U	36.8	J	25	U	25	U
	Beryllium, Dissolved	µg/L	4	200	5	2	U	2	U	2	U	2	U
	Cadmium, Dissolved	µg/L	5	4	4.1	2	U	2	U	2	U	2	U
	Calcium, Dissolved	µg/L	NS	NS	14,700	6,690		13,700		2,500	U	3,220	J
	Chromium, Dissolved	µg/L	100	300	14.7	5	U	5	U	5	U	5	U
	Cobalt, Dissolved	µg/L	NS	NS	25	25	U	25	U	25	U	25	U
	Copper, Dissolved	µg/L	NS	NS	8.09	13	U	13	U	13	U	13	U
	Iron, Dissolved	µg/L	NS	NS	9,100	169		50	U	50	U	50	U
	Lead, Dissolved	µg/L	15	10	4.25	2.5	U	2.5	U	2.5	U	2.5	U
	Magnesium, Dissolved	µg/L	NS	NS	3,480	2,500	U	2,500	U	2,500	U	2,500	U
	Manganese, Dissolved	µg/L	NS	NS	291	20.9		7.5	U	7.5	U	7.5	U
	Nickel, Dissolved	µg/L	100	200	34.3	20	U	20	U	20	U	20	U
	Potassium, Dissolved	µg/L	NS	NS	2,370	2,500	U	**2,940**	J	2,500	U	2,500	U
	Selenium, Dissolved	µg/L	50	100	3.02	5	U	5	U	5	U	5	U
	Silver, Dissolved	µg/L	100	7	4.6	2.5	U	2.5	U	2.5	U	2.5	U
	Sodium, Dissolved	µg/L	NS	NS	10,800	3,050	J	6,666		2,500	U	2,870	J
	Thallium, Dissolved	µg/L	2	3,000	7	1	U	1	U	1	U	1	U
	Vanadium, Dissolved	µg/L	30	4,000	11	5	U	5	U	5	U	5	U
	Zinc, Dissolved	µg/L	5,000	900	21.1	**137**		10	U	10	U	10	U
Mercury (SW7470A)	Mercury, Dissolved	µg/L	2	20	0.243	0.15	U	0.15	U	0.15	U	0.15	U

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2014 (Metals) January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	DW Well/ Hydrant D-1	Q	SPM-93-06X	Q	SPM-93-08X	Q	SPM-93-10X	Q
Field Parameters, November 2014	Temperature, Initial	˚ Celsius	NS	NS	NS	10.56		10.6		9.8		9.3	
	Temperature, Final	˚ Celsius	NS	NS		10.56		10.5		9.57		9.36	
	Dissolved Oxygen	mg/L	NS	NS		5.66		0.44		11.08		10.09	
	ORP[3]	mV	NS	NS		184.4		130		201.7		-35.8	
	pH	Standard units	NS	NS		5.84		10.66		5.7		6.9	
	Specific Conductance	µS/cm	NS	NS		169		114.3		28		35	
	Turbidity	NTU	NS	NS		34.2		0.28		0.44		2.33	
Field Parameters, January 2015	Temperature, Initial	˚ Celsius	NS	NS	NS	NC		8.34		6.82		7.9	
	Temperature, Final	˚ Celsius	NS	NS		NC		8.49		8.34		7.43	
	Dissolved Oxygen	mg/L	NS	NS		NC		5.19		11.34		10.33	
	ORP[3]	mV	NS	NS		NC		101.1		232.3		214.2	
	pH	Standard units	NS	NS		NC		10.85		6.34		6.87	
	Specific Conductance	µS/cm	NS	NS		NC		121		27		25	
	Turbidity	NTU	NS	NS		NC		3.16		0.54		0.28	

Notes:

12 = GW-1 groundwater standard exceedance

3,100 = Background level exceedance

NA = Not applicable or not analyzed.

NS = Not sampled.

[1] The GW-1 or GW-3 standard was effective on June 26, 2009.

[2] The background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2014 (Metals) January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-93-12X	Q	SPM-93-16X	Q	SPM-97-23X	Q	SPM-97-24X	Q
Perchlorate (6850.0)	Perchlorate	µg/L	2	1,000	NS	NC		NC		NC		NC	
Explosives (SW8330A)	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.22	U	0.20	U	NC		0.20	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.22	U	0.20	U	NC		0.20	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.22	U	0.20	U	NC		0.20	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.22	U	0.20	U	NC		0.20	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.22	U	0.20	U	NC		0.20	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.22	U	0.20	U	NC		0.20	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.22	U	0.20	U	NC		0.20	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.56	U	0.50	U	NC		0.50	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	1.1	U	1.0	U	NC		1.0	U
	4-Nitrotoluene	µg/L	NS	NS	NS	1.1	U	1.0	U	NC		1.0	U
	RDX	µg/L	1	50,000	NS	0.22	U	0.20	U	NC		0.20	U
	Tetryl	µg/L	NS	NS	NS	5.6	U	5.0	U	NC		5.0	U
	Nitrobenzene	µg/L	NS	NS	NS	0.56	U	0.50	U	NC		0.50	U
	HMX	µg/L	200	50,000	NS	0.22	U	0.20	U	NC		0.20	U
Metals (SW6010C/ SW6020A)	Aluminum, Dissolved	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U
	Antimony, Dissolved	µg/L	6	8,000	3.03	2	U	2	U	2	U	2	U
	Arsenic, Dissolved	µg/L	10	900	10.5	3	U	3	U	3	U	3.2	J
	Barium, Dissolved	µg/L	2,000	50,000	39.6	25	U	25	U	25	U	25	U
	Beryllium, Dissolved	µg/L	4	200	5	2	U	2	U	2	U	2	U
	Cadmium, Dissolved	µg/L	5	4	4.1	2	U	2	U	2	U	2	U
	Calcium, Dissolved	µg/L	NS	NS	14,700	6,650		2,600	J	6,420		8,290	
	Chromium, Dissolved	µg/L	100	300	14.7	5	U	5	U	5	U	5	U
	Cobalt, Dissolved	µg/L	NS	NS	25	25	U	25	U	25	U	25	U
	Copper, Dissolved	µg/L	NS	NS	8.09	13	U	13	U	13	U	13	U
	Iron, Dissolved	µg/L	NS	NS	9,100	50	U	50	U	50	U	50	U
	Lead, Dissolved	µg/L	15	10	4.25	2.5	U	2.5	U	2.5	U	2.5	U
	Magnesium, Dissolved	µg/L	NS	NS	3,480	2,500	U	2,500	U	2,500	U	3,460	J
	Manganese, Dissolved	µg/L	NS	NS	291	7.5	U	7.5	U	7.5	J	7.5	U
	Nickel, Dissolved	µg/L	100	200	34.3	20	U	20	U	20	U	20	U
	Potassium, Dissolved	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U
	Selenium, Dissolved	µg/L	50	100	3.02	5	U	5	U	5	U	5	U
	Silver, Dissolved	µg/L	100	7	4.6	2.5	U	2.5	U	2.5	U	2.5	U
	Sodium, Dissolved	µg/L	NS	NS	10,800	5,330		2,500	U	3,140	J	3,310	J
	Thallium, Dissolved	µg/L	2	3,000	7	1	U	1	U	1	U	1	U
	Vanadium, Dissolved	µg/L	30	4,000	11	5	U	5	U	5	U	5	U
	Zinc, Dissolved	µg/L	5,000	900	21.1	13.7	J	10	U	**53.3**		10	U
Mercury (SW7470A)	Mercury, Dissolved	µg/L	2	20	0.243	0.15	U	0.15	U	0.15	U	0.15	U

Table 4.4
Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2014 (Metals) January 2015 (Explosives)

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-93-12X	Q	SPM-93-16X	Q	SPM-97-23X	Q	SPM-97-24X	Q
Field Parameters, November 2014	Temperature, Initial	˚ Celsius	NS	NS	NS	9.62		9.61		10.6		10.72	
	Temperature, Final	˚ Celsius	NS	NS		9.39		9.75		10.5		10.53	
	Dissolved Oxygen	mg/L	NS	NS		5.19		11.16		7.56		4.89	
	ORP[3]	mV	NS	NS		147		154.6		558.1		24.2	
	pH	Standard units	NS	NS		6.5		5.86		6.1		24.2	
	Specific Conductance	µS/cm	NS	NS		78		30		59.8		80	
	Turbidity	NTU	NS	NS		0.07		0.49		0.59		0.64	
Field Parameters, January 2015	Temperature, Initial	˚ Celsius	NS	NS	NS	9.01		7.56		NC		9.55	
	Temperature, Final	˚ Celsius	NS	NS		7.81		7.82		NC		9.68	
	Dissolved Oxygen	mg/L	NS	NS		10.65		10.85		NC		5.14	
	ORP[3]	mV	NS	NS		195.2		174.2		NC		164.5	
	pH	Standard units	NS	NS		6.6		6.84		NC		7.1	
	Specific Conductance	µS/cm	NS	NS		60		18		NC		63	
	Turbidity	NTU	NS	NS		1.72		1.61		NC		2.43	

Notes:

12 = GW-1 groundwater standard exceedance

3,100 = Background level exceedance

NA = Not applicable or not analyzed.

NS = Not sampled.

[1] The GW-1 or GW-3 standard was effective on June 26, 2009.

[2] The background levels for metals are from HLA, 2000

[3] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.5
Exceendances Over Time - South Post Impact Area
1992 to 2015

Well Number	1992	1993	1993	1993	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	May 2009	Nov 2009	Feb 2010	July 2010	Oct 2010	Oct 2011	Nov 2012	Nov 2013	Nov 2014	Jan 2015
Area of Contamination 26																														
RDX - 1 µg/L GW-1 Standard																														
26M-92-03X	75	83.4	58	NC	NC	NC	NC	NC	23	8.9	97	12	62	260	6.7	18	17	7.79	12.9	12.5	NC	17.3	NC	NC	16.3	10.7	9.75	3.62	NC	19.3
26M-92-04X	270	390	198	NC	NC	NC	NC	NC	NC	227.4	240	260	200	180	210	260	210	196	184	165	NC	170	NC	NC	170	157	181	1,010	NC	318
26M-97-08X	NC	NC	NC	NC	NC	NC	NC	NC	29	28.5	46	30	57	63	37	45	41	45.1	44	32.8	NC	26.7	NC	NC	27.6	25.8	43.2	20.9	NC	26.5
26WP-06-01	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	190	NC	137	162 J	98.1	126	116	65.2	76	NC	ND
Perchlorate - 2 µg/L GW-1 Standard																														
26WP-06-01	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.1	5.6	133	305	114	93.7	64.1	89.2	68.3	19.1	19.4	4.4	NC
26M-92-04X	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.1	NC	2.3	(1.8)	(1.7)	(1.5)	2.98	NC	NC	47.5	332	49.2	142	34.6	NC
26M-97-08X	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.84	NC	(0.39)	NC
Arsenic, total - 10 µg/L GW-1 Standard; 10.5 µg/L Background Level																														
26M-92-04X	100	[7.46]	[6.61]	NC	NC	NC	NC	NC	NC	ND	(1.5)	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC	ND	ND	ND	ND	ND	NC
26WP-08-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	128	NC	46	NC	NC	64	62	68	53	53.5*	NC
Lead - 15 µg/L GW-1 Standard; 4.25 µg/L Background Level																														
26M-92-04X	27	(6.4)	ND	NC	NC	NC	NC	NC	NC	ND	ND	ND	ND	ND	ND	[1.7]	ND	ND	ND	ND	NC	ND	NC	NC	ND	ND	ND	ND	ND*	NC
26WP-08-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	20	NC	ND	NC	NC	(6.0 J)	ND	(6.0 J)	(14)	ND*	NC
Area of Contamination 27																														
RDX -1 µg/L GW-1 Standard																														
27M-92-01X	12.1	12.3	NC	NC	NC	NC	NC	NC	4.6	2.8	3.0	2.6	3.0	1.8	ND	1.3	ND	ND	NC	ND	NC	NC	NC	NC	ND	NC	ND	NC	NC	NC
27M-93-06X	NC	1.56	1.77	NC	NC	NC	NC	NC	2.2	2.2	1.3	(0.96)	(0.91)	(0.95)	(0.75)	(0.91)	1.50	3.4	NC	1.8	NC	NC	NC	NC	2.12 J	NC	ND	NC	NC	ND
Arsenic, total - 10 µg/L GW-1 Standard; 10.5 µg/L Background Level																														
27M-92-01X	25.3	25.9	NC	NC	NC	NC	NC	NC	NC	ND	ND	ND	(6.5)	(4.5)	ND	ND	ND	(3.0)	NC	ND	NC	NC	NC	NC	ND	NC	ND	NC	ND*	NC
27M-93-05X	NC	[4.96]	[5.22]	10.8	(6.64)	NC	NC	NC	ND	ND	[3.3]	[6.6]	[4.1]	ND	ND	ND	ND	(7.0)	NC	ND	NC	NC	NC	NC	(7.0)	NC	(4 J)	NC	(5.1)	NC
27M-93-06X	NC	ND	ND	ND	(1.03)	NC	NC	NC	ND	ND	ND	ND	(2.2)	ND	ND	ND	ND	(2.8)	ND	ND	NC	NC	NC	NC	ND	NC	15.0	NC	ND*	NC
Lead - 15 µg/L GW-1 Standard; 4.25 µg/L Backgroud Level																														
27M-92-01X	17.4	15.3	NC	NC	NC	NC	NC	NC	ND	ND	[1.6]	[2.2]	[2.2]	[2.2]	ND	[2.3]	ND	ND	NC	[2.3]	NC	NC	NC	NC	(3.5 J)	NC	(4 J)	NC	ND*	NC
1,3-Dintrobenzene - No Groundwater Standard																														
27M-93-05X	NC	NC	NC	0.288	1.3	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC	NC	NC	ND	NC	ND	NC	NC	ND
27M-93-06X	NC	NC	NC	NC	1.09	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC	NC	NC	ND	NC	ND	NC	NC	ND
27M-93-08X	NC	NC	NC	(1.82)	1.03	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC	NC	NC	ND	NC	ND	NC	NC	ND
Area of Contamination 41																														
Vinyl Chloride - 2 µg/L GW-1 Standard																														
41M-93-04X	NC	NC	NC	NC	NC	NC	NC	NC	ND	ND	3.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	NC	NC	NC	ND	ND	ND	ND	NC	NC
TCE - 5 µg/L GW-1 Standard																														
41M-93-04X	NC	NC	NC	NC	NC	1.3	<0.5	NC	<0.5	1 J	<1.0	<1.0	0.24 J	<1.0	<5.0	<1.0	<1.0	9.1	ND	ND	NC	NC	NC	NC	ND	(0.21 J)	ND	ND	NC	NC
South Post Monitoring Wells																														
Arsenic, total - 10 µg/L GW-1 Standard; 10.5 µg/L Background Level																														
SPM-93-06X	NC	33.6	21.7	33.3	19.8	NC	NC	NC	ND	ND	[8.1]	15.4	[7.4]	[9.8]	11.7	10.9	35.2	24	31	27	NC	11	NC	NC	13	13	ND	12	12.5*	NC
SPM-93-10X	NC	ND	ND	ND	ND	NC	NC	NC	ND	ND	[6.4]	[5.6]	[5.8]	[3.7]	[7.8]	[5.2]	13.2	[7.0]	(5.0)	(7.0)	NC	ND	NC	NC	(6.0)	10	(4.7 J)	(7)	(6.1)*	NC
1,3-Dintrobenzene - No Groundwater Standard																														
SPM-93-08X	NC	NC	NC	ND	3.84	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC	ND	ND	ND	ND	NC	ND
SPM-93-10X	NC	NC	NC	3.25	ND	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC	ND	ND	ND	ND	NC	ND
SPM-93-16X	NC	NC	NC	4.37	2.06	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC	ND	ND	ND	ND	NC	ND
Antimony, total - 6 µg/L GW-1 Standard; 3.03 µg/L Background Level																														
SPM-93-06X	NC	ND	ND	ND	ND	NC	NC	NC	ND	ND	ND	ND	(2.2)	ND	ND	ND	ND	ND	7.8	ND	NC	ND	NC	NC	ND	ND	(0.16 J)	1.848	ND*	NC
SPM-93-16X	ND	ND	ND	ND	ND	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	13.8	ND	ND	ND	NC	8.5 J	NC	NC	ND	ND	ND	0.312	ND*	NC
RDX - 1 µg/L GW-1 Standard																														
SPM-93-06X	N/A	NC	NC	ND	ND	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	(0.248)	1.23	ND	NC	ND

Notes:

Number in parentheses denotes that concentration is below GW-1 standard.

Number in brackets denotes that concentration is below background level.

* = Dissolved metals, not total metals.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

E.3 South Post Impact Area Site Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens SPIA	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Leachate Collection System		
Inspectors:	Elizabeth Anderson, Joseph Kendall	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Sites are in good condition. Well locks need replacement. No signs of cap failure or erosion.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	Sites are active munitions ranges. All site inspections must be scheudled through range control
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview

Name of Interviewer: Elizabeth Anderson

Name of Interviewee: N/A - previously conducted

Date:

Position:

Owner ☐

Manager ☐

Other: Please Specify ☒

Location:

Site ☐

Office ☐

Phone: ☒

Telephone #

Item	Check One	Comments
Are there any extraction wells at the property?	Yes ☐ No ☒	No extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No ☒	No specific construction plans are known. Sites are active ranges used for military training purposes.
Are there any issues with site access for monitoring?	Yes ☐ No ☒	All site visits must be scheduled with range control.

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____





Images from SPIA, AOC 27, Hotel Range





Monitoring well at SPIA AOC 27, signage for potential UXO on ground (AOC 27)



Drum at SPIA, AOC 41



Cut lock at SPIA, AOC 41



Cut lock at SPIA AOC 41



Monitoring well near pond at AOC 41

APPENDIX F –Barnum Road Maintenance Yards

F.1 Barnum Road Maintenance

Yards Figures

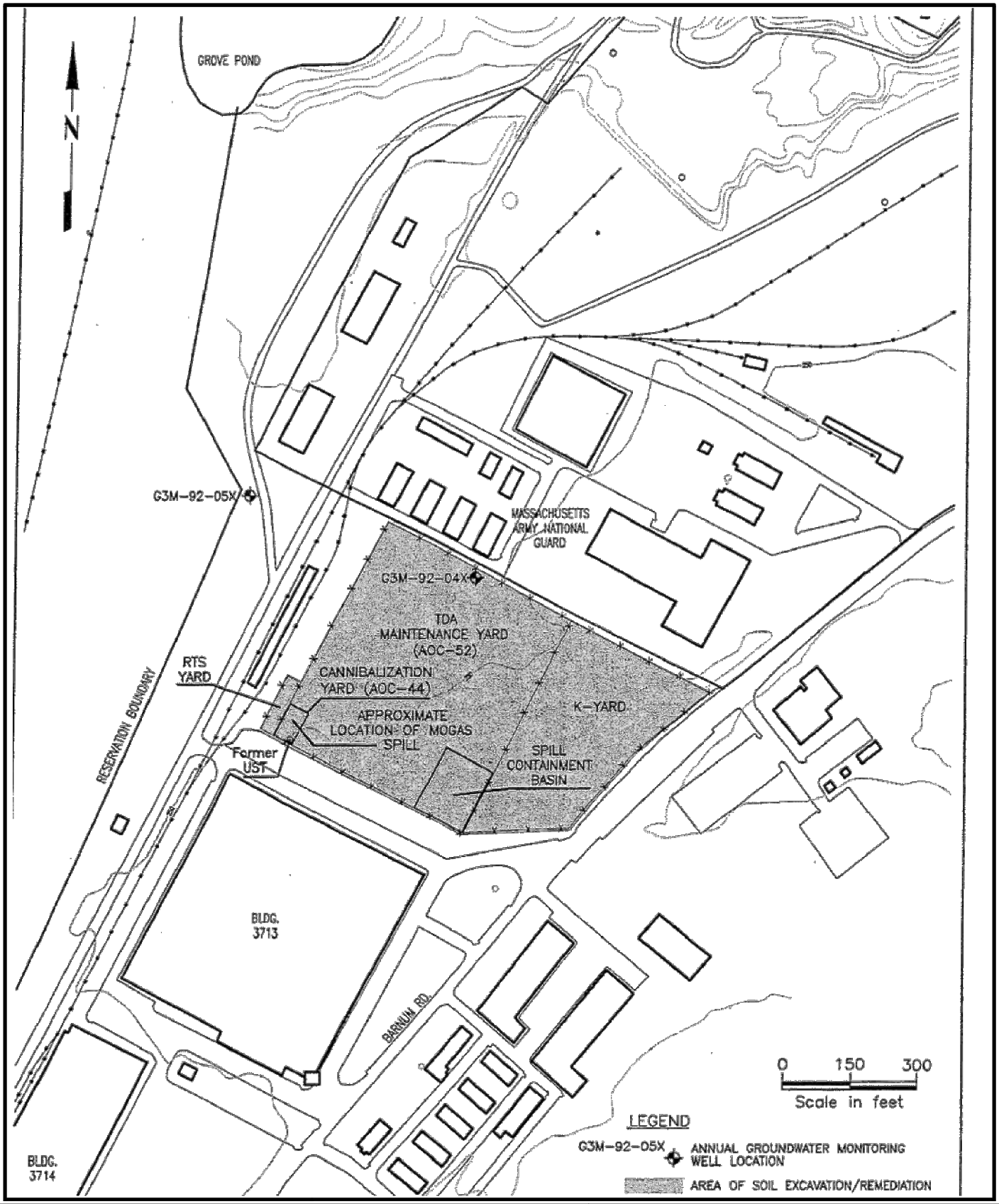


Figure 5.1
Areas of Contamination 44 and 52
Barnum Road Maintenance Yards

Source: HGL LTMMP 2010, MACTEC 2005

2015 Five-Year Review
AOC 44 and 52

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental, Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

Date:	Figure
04/16/2015	5.1

File: AOC44_52.dwg



File: AOC44_52_2015_Figure2_2_BRMA.mxd

Figure 5.2
Site Layout
Barnum Road Maintenance Yards
AOC 44 & 52

Legend

- LTM Sample Well
- G3M-92-07X Well Location Identification
- Maintenance Yard Boundary
- Former Yard or Basin
- Existing Building

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
AOC 44 and 52

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 75 150
Feet

Date: 04/16/2015

Figure 5.2

H&S

F.2 Barnum Road Site

Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens AOC 44/52	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Source Removal via excavation and off site disposal/ treatment Institutional Controls		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Sites are in good condition.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview		
Name of Interviewer:	Elizabeth Anderson	
Name of Interviewee:	N/A - previously conducted	
Date:		
Position: Owner ☐ Manager ☐ Other: Please Specify [x]		
Location: Site ☐ Office ☐ Phone: [X] Telephone #		
Item	**Check One**	**Comments**
Are there any extraction wells at the property?	Yes ☐ No [X]	No extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No [X]	No specific construction plans are known.
Are there any issues with site access for monitoring?	Yes ☐ No [X]	All site visits must be scheduled with BRAC

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____

APPENDIX G – Defense Reutilization and Marketing Office

G.1 Defense Reutilization and Marketing Office Figures

Figure 6.1
Site Layout
Area of Contamination 32 and 43A



Legend

	LTM Sample Well
	LTM Well - Periodic Gauge Only
⊠	Monitoring Well - Paved Over
32M-92-01X	Well Identification
	Former Storage Tank(s)
	Former Building
T-247	Former Building Number
	Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on April 2002 to October 2011 analytical data)
	TPHC Soil Contamination
	Remaining Bedrock Outcrop

Notes:
AST = Above ground storage tank
UST = Underground storage Tank
DRMO = Defense Reutilization and Marketing Office
LTM = Long-term monitoring
TPHC = Total petroleum hydrocarbons

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
AOC 32 and 43A

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 80 160
Feet

Date: 04/15/2015

Figure 6.1

File: AOC32-43A_2015_Figure7_1_Site.mxd

G.2 Defense Reutilization and Marekting Office Tables

Table 6.14
Groundwater Analytical Results
Areas of Contamination 32 and 43A
May 2010

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32Z-99-02X	Qual	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-14XBR	Qual	32M-01-15XBR	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5	U	5	U	**43**		5	U	9	
	Manganese, Total	µg/L	3,500	NS	5.2	J	33		2,460		24		46	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	2.5	U	2.5	U	2.6	
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	1.5	J	2.5	U	0.22	J	1.3	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	2.5	U	0.3	J	0.55	J
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.11	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	114	U	111	U	100	U	105	UJ	111	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	114	U	111	U	100	U	105	UJ	111	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	114	U	111	U	100	U	105	UJ	111	U
Field Parameter	Temperature, initial	°C	NS	NS	11.21		11.98		10.89		11.23		12.79	
	Temperature, final	°C	NS	NS	10.76		12.32		10.96		11.37		12.80	
	ORP[4]	mV	NS	NS	-118.4		131.1		-229.6		-90.9		308.2	
	pH	standard units	NS	NS	5.86		5.56		6.45		6.80		7.22	
	Specific Conductance	µS/cm	NS	NS	166		213		491		673		5,400	
	Dissolved Oxygen	mg/L	NS	NS	6.17		5.44		0.37		0.99		17.0	
	Turbidity	NTU	NS	NS	4.09		1.69		52.6		0.42		2.2	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] Revised GW-1 or GW-3 standard effective June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.14
Groundwater Analytical Results
Areas of Contamination 32 and 43A
May 2010

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR Duplicate	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5	U	5	U	**18**		**17**	
	Manganese, Total	µg/L	3,500	NS	11		10	U	2,360		2,320	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	5.0	U	5.0	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	7.5	U	7.5	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	25	J	300		290	
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	19	J	**59**		**58**	
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	**7.1**	J	**26**		**26**	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.24	J	5.0	U	5.0	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	7.5	U	7.5	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	5.0	U	5.0	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	9.2	J	88		90	
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	5.0	U	5.0	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	7.5	U	7.5	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	5.0	U	5.0	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.32	J	5.0	U	5.0	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	10	U	10	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	**300**		**322**	
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	UJ	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	UJ	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	UJ	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	118	U	110	U	109	U	104	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	118	U	110	U	109	U	104	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	118	U	110	U	109	U	104	U
Field Parameter	Temperature, initial	°C	NS	NS	13.09		11.71		12.48		NA	
	Temperature, final	°C	NS	NS	12.84		12.03		12.47		NA	
	ORP[4]	mV	NS	NS	225.4		222.9		-177.8		NA	
	pH	standard units	NS	NS	6.03		6.79		5.92		NA	
	Specific Conductance	µS/cm	NS	NS	583		1533		1551		NA	
	Dissolved Oxygen	mg/L	NS	NS	5.09		0.75		1.74		NA	
	Turbidity	NTU	NS	NS	4.71		0.09		224.0		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] Revised GW-1 or GW-3 standard effective June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.15
Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2010

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-13XBR	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5	U	2.9	J	5	U	5	U
	Manganese, Total	µg/L	3,500	NS	9.4	J	30		3.8	J	10	U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	0.41	J	2.5	U	1.6	J
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	0.68	J	2.5	U	4.0	
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	2.5	U	0.33	J
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.23	J
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.72	
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.21	J
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	UJ
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	UJ
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	UJ
Field Parameter	Temperature, initial	°C	NS	NS	15.28		15.0		15.4		12.38	
	Temperature, final	°C	NS	NS	16.35		14.84		14.68		12.59	
	pH	mV	NS	NS	5.92		7.02		6.06		6.88	
	Specific Conductance	standard units	NS	NS	218		1948		547		1269	
	ORP[4]	µS/cm	NS	NS	89.8		175.3		83.2		38.8	
	Dissolved Oxygen	mg/L	NS	NS	3.0		9.31		2.91		0.25	
	Turbidity	NTU	NS	NS	0.90		0.22		1.98		1.0	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

[4] The ORP value was not corrected to SHE.

Table 6.15
Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2010

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-18XBR	Qual	32M-01-18XBR Duplicate	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	3.5	J	4.1	J
	Manganese, Total	µg/L	3,500	NS	**4,510**		**4,610**	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	5.0	U	5.0	U
	1,1,2-Trichloroethane	µg/L	5	50,000	7.5	U	7.5	U
	1,2-Dichlorobenzene	µg/L	600	2,000	570		570	
	1,3-Dichlorobenzene	µg/L	40	50,000	**100**		**110**	
	1,4-Dichlorobenzene	µg/L	5	8,000	**62**		**62**	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	5.0	U	5.0	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	7.5	U	7.5	U
	Benzene	µg/L	5	10,000	5.0	U	5.0	U
	Chlorobenzene	µg/L	100	1,000	**210**		**210**	
	Ethylbenzene	µg/L	700	5,000	5.0	U	5.0	U
	Toluene	µg/L	1,000	40,000	7.5	U	7.5	U
	Trichloroethene	µg/L	5	5,000	5.0	U	5.0	U
	Vinyl Chloride	µg/L	2	50,000	10	U	10	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	100	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	100	U	67.6	
	C_9-C_{10} Aromatics	µg/L	200	50,000	**541**		**545**	
	Benzene	µg/L	5	10,000	4.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	4.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	4.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	4.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	4.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	4.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	UJ	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	UJ	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	UJ	100	U
Field Parameter	Temperature, initial	°C	NS	NS	15.74		NA	
	Temperature, final	°C	NS	NS	15.96		NA	
	pH	mV	NS	NS	5.93		NA	
	Specific Conductance	standard units	NS	NS	1021		NA	
	ORP[4]	µS/cm	NS	NS	137.2		NA	
	Dissolved Oxygen	mg/L	NS	NS	1.68		NA	
	Turbidity	NTU	NS	NS	3.07		NA	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

[4] The ORP value was not corrected to SHE.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
June 2011

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32Z-99-02X	Qual	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-14XBR	Qual	32M-01-15XBR	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5	U	5	U	**62**		5	U	5	U
	Manganese, Total	µg/L	3,500	NS	11		11		1,740		35		86	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.50	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	2.5	U	2.5	U	0.20	J	0.34	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	2.5	U	0.22	J	2.50	U
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.24	J
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	14.49		15.17		13.61		15.02		15.70	
	Temperature, final	°C	NS	NS	13.46		14.90		14.09		14.89		14.61	
	ORP[4]	mV	NS	NS	342.8		252.4		12.6		250.1		435.9	
	pH	standard units	NS	NS	3.55		5.42		5.27		5.73		5.19	
	Specific Conductance	µS/cm	NS	NS	159		146		358		529		2,599	
	Dissolved Oxygen	mg/L	NS	NS	5.29		6.81		0.30		2.46		32.2	
	Turbidity	NTU	NS	NS	0.00		1.55		3.08		0.84		7.4	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] Revised GW-1 or GW-3 standard effective June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
June 2011

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR Duplicate	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5	U	5	U	3	J	3	J
	Manganese, Total	µg/L	3,500	NS	3	J	10	U	2,300		2,210	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	5.0	U	5.0	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	7.5	U	7.5	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	340		320	
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	0.40	J	**86**		**82**	
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	**50**		**48**	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	5.0	U	5.0	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	7.5	U	7.5	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	5.0	U	5.0	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	78		75	
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	5.0	U	5.0	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	7.5	U	7.5	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	5.0	U	5.0	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.24	J	5.0	U	5.0	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	10	U	10	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	UJ	**444**		**430**	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	104		115	
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	UJ	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	UJ	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	UJ	100	U	100	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	14.49		13.87		15.11		NA	
	Temperature, final	°C	NS	NS	14.46		13.86		14.7		NA	
	ORP[4]	mV	NS	NS	417.9		342.5		408.1		NA	
	pH	standard units	NS	NS	3.90		6.17		3.95		NA	
	Specific Conductance	µS/cm	NS	NS	336		812		383		NA	
	Dissolved Oxygen	mg/L	NS	NS	44.12		1.22		42.07		NA	
	Turbidity	NTU	NS	NS	0.42		0.38		2.68		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] Revised GW-1 or GW-3 standard effective June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.10
Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2011

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-13XBR	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5	U	3	J	5	U	5	U
	Manganese, Total	µg/L	3,500	NS	4	J	22		5	J	10	U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	0.37	J	0.19	J	2.5	U	2.5	U
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	0.38	J	2.5	U	0.63	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	2.5	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.25	J
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	17.77		17.0		15.45		14.56	
	Temperature, final	°C	NS	NS	17.83		16.45		15.37		14.36	
	pH	mV	NS	NS	5.74		7.07		5.93		7.02	
	Specific Conductance	standard units	NS	NS	189		816		450		761	
	ORP[4]	µS/cm	NS	NS	184.2		179		185.3		76.1	
	Dissolved Oxygen	mg/L	NS	NS	3.4		7.7		3.66		0.52	
	Turbidity	NTU	NS	NS	1.22		3.56		1.21		0.7	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

[4] The ORP value was not corrected to SHE.

Table 6.10
Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2011

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-18XBR	Qual	32M-01-18XBR Duplicate	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5		8	
	Manganese, Total	µg/L	3,500	NS	1,150		1,170	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	5.0	U	0.5	U
	1,1,2-Trichloroethane	µg/L	5	50,000	7.5	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	260		230	
	1,3-Dichlorobenzene	µg/L	40	50,000	**64**		**61**	
	1,4-Dichlorobenzene	µg/L	5	8,000	**37**		**35**	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	5.0	U	0.5	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	7.5	U	0.75	U
	Benzene	µg/L	5	10,000	5.0	U	0.5	U
	Chlorobenzene	µg/L	100	1,000	49		46	
	Ethylbenzene	µg/L	700	5,000	5.0	U	0.5	U
	Toluene	µg/L	1,000	40,000	7.5	U	0.75	U
	Trichloroethene	µg/L	5	5,000	5.0	U	0.5	U
	Vinyl Chloride	µg/L	2	50,000	10	U	1.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	108		99.6	
	C_9-C_{10} Aromatics	µg/L	200	50,000	**272**		**246**	
	Benzene	µg/L	5	10,000	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	17.85		NA	
	Temperature, final	°C	NS	NS	18.15		NA	
	pH	mV	NS	NS	5.99		NA	
	Specific Conductance	standard units	NS	NS	446		NA	
	ORP[4]	µS/cm	NS	NS	158.8		NA	
	Dissolved Oxygen	mg/L	NS	NS	1.31		NA	
	Turbidity	NTU	NS	NS	3.53		NA	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

[4] The ORP value was not corrected to SHE.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
May 2012

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32Z-99-02X	Qual	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-14XBR	Qual	32M-01-15XBR	Qual
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5	U	5	U	**80**		5	U	2	J
	Manganese, Total	µg/L	3,500	NS	3	J	10		1,950		94		46	
VOCs (SW8260B)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	2.5	U	2.5	U	2.5	U	0.41	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	2.5	U	0.29	J	2.5	U
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	102	U	102	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	102	U	102	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	102	U	102	U	100	U	100	U
Field Parameters	Temperature, initial	°C	NS	NS	12.86		13.44		12.70		14.11		13.88	
	Temperature, final	°C	NS	NS	12.65		15.02		15.71		14.53		14.07	
	ORP[4]	mV	NS	NS	97.4		194.2		-26.0		52.7		289.8	
	pH	standard units	NS	NS	6.07		5.71		6.34		6.85		6.84	
	Specific Conductance	µS/cm	NS	NS	111		146		347		501		1,012	
	Dissolved Oxygen	mg/L	NS	NS	7.58		6.04		0.36		0.84		10.96	
	Turbidity	NTU	NS	NS	2.66		1.66		4.73		1.58		3.31	

Notes:

[1] The cleanup goal is based on whichever is lower, the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] The revised GW-1 or GW-3 standard was effective on June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
May 2012

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR Duplicate	Qual
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5	U	5	U	5		4	J
	Manganese, Total	µg/L	3,500	NS	3	J	10	U	**4,100**		**4,180**	
VOCs (SW8260B)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	**640**	J	**460**	J
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	1.2	J	**120**	J	**90**	
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	**69**		**59**	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	1.0		0.92	
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.23	J	0.20	J
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	**280**		**200**	J
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.48	J	0.41	J
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.20	J	0.19	J
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.23	J	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.26	J	0.60		0.54	
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	125	U	125	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	**728**		**680**	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	486		497	
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	5.0	U	5.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	5.0	U	5.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	5.0	U	5.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	5.0	U	5.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	5.0	U	5.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	5.0	U	5.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	175		165	
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U
Field Parameters	Temperature, initial	°C	NS	NS	13.85		12.74		13.87		NA	
	Temperature, final	°C	NS	NS	13.84		12.80		13.79			
	ORP[4]	mV	NS	NS	91.1		28.8		163.4			
	pH	standard units	NS	NS	6.25		7.21		6.23			
	Specific Conductance	µS/cm	NS	NS	402		755		675			
	Dissolved Oxygen	mg/L	NS	NS	5.35		0.62		2.22			
	Turbidity	NTU	NS	NS	0.67		0.88		2.22			

Notes:

[1] The cleanup goal is based on whichever is lower, the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] The revised GW-1 or GW-3 standard was effective on June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of th

Table 6.10
Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2012

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-13XBR	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5	U	5	U	5	U	5	U
	Manganese, Total	µg/L	3,500	NS	6	J	8	J	4	J	10	U
VOCs (SW8260B)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.1	J	2.5	U	2.5	U
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	1.4	J	2.5	U	1.4	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	0.33	J	2.5	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.25	J	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.17	J	0.50	U	0.31	J
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.00	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	2.0	U	2.0	U	2.00	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.00	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.00	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.00	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.00	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U
Field Parameters	Temperature, initial	°C	NS	NS	17.28		15.35		14.97		13.02	
	Temperature, final	°C	NS	NS	17.61		16.00		14.93		13.15	
	pH	mV	NS	NS	6.00		6.99		6.04		7.03	
	Specific Conductance	standard units	NS	NS	218		705		405		701	
	ORP[4]	µS/cm	NS	NS	177.3		192.5		274.9		149.8	
	Dissolved Oxygen	mg/L	NS	NS	3.31		10.89		4.12		0.47	
	Turbidity	NTU	NS	NS	0.32		0.66		0.0		0.0	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

[4] The ORP value was not corrected to SHE.

Table 6.10
Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2012

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-18XBR	Qual	32M-01-18XBR Duplicate	Qual
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	4	J	5	U
	Manganese, Total	µg/L	3,500	NS	1,540		1,510	
VOCs (SW8260B)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	5.0	U	5.0	U
	1,1,2-Trichloroethane	µg/L	5	50,000	7.5	U	7.5	U
	1,2-Dichlorobenzene	µg/L	600	2,000	340		330	
	1,3-Dichlorobenzene	µg/L	40	50,000	**70**		**70**	
	1,4-Dichlorobenzene	µg/L	5	8,000	**42**		**42**	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	5.0	U	5.0	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	7.5	U	7.5	U
	Benzene	µg/L	5	10,000	5.0	U	5.0	U
	Chlorobenzene	µg/L	100	1,000	82		79	
	Ethylbenzene	µg/L	700	5,000	5.0	U	5.0	U
	Tetrachloroethene	µg/L	5	30,000	5.0	U	5.0	U
	Toluene	µg/L	1,000	40,000	7.5	U	7.5	U
	Trichloroethene	µg/L	5	5,000	5.0	U	5.0	U
	Vinyl Chloride	µg/L	2	50,000	10	U	10	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	**322**		**300**	
	Benzene	µg/L	5	10,000	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	101	
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U
Field Parameters	Temperature, initial	°C	NS	NS	16.09		NA	
	Temperature, final	°C	NS	NS	16.16			
	pH	mV	NS	NS	6.26			
	Specific Conductance	standard units	NS	NS	564			
	ORP[4]	µS/cm	NS	NS	223.8			
	Dissolved Oxygen	mg/L	NS	NS	2.3			
	Turbidity	NTU	NS	NS	1.26			

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

[4] The ORP value was not corrected to SHE.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
June 2013

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32Z-99-02X	Q	32M-01-13XBR	Q	32M-01-14XOB	Q	32M-01-14XBR	Q	32M-01-15XBR	Q
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5	U	5	U	58		5	U	5	U
	Manganese, Total	µg/L	3,500	NS	43		4	J	1,650		29		9	J
VOCs (SW8260B)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	2.5	U	2.5	U	2.5	U	0.330	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	2.5	U	2.50	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.182	J
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U	100	U
Field Parameters	Temperature, initial	°C	NS	NS	12.74		12.83		13.04		12.33		14.02	
	Temperature, final	°C	NS	NS	11.99		12.87		12.38		12.53		14.51	
	ORP[4]	mV	NS	NS	264.9		343.6		-32.1		241.1		314.4	
	pH	standard units	NS	NS	5.49		5.42		6.15		6.78		6.78	
	Specific Conductance	µS/cm	NS	NS	104		97		400		578		1,504	
	Dissolved Oxygen	mg/L	NS	NS	3.82		7.60		0.16		3.47		18.37	
	Turbidity	NTU	NS	NS	3.12		0.66		2.20		0.00		0.70	

Notes:

[1] The cleanup goal is based on whichever is lower, the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] The revised GW-1 or GW-3 standard was effective on June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
June 2013

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-16XBR	Q	32M-01-17XBR	Q	32M-01-18XBR	Q	32M-01-18XBR Duplicate	Q
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5	U	5	U	2	J	2	J
	Manganese, Total	µg/L	3,500	NS	3	J	10	U	270		280	
VOCs (SW8260B)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	7.46	J	19.1	J
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	0.299	J	7.10	J	10.0	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	1.19	J	3.06	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.5	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.879	J	2.12	J
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.283	J	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	UJ	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U
Field Parameters	Temperature, initial	°C	NS	NS	13.79		12.85		14.13		NA	
	Temperature, final	°C	NS	NS	13.52		12.93		13.87			
	ORP[4]	mV	NS	NS	277.1		214.0		298.8			
	pH	standard units	NS	NS	5.72		6.55		5.71			
	Specific Conductance	µS/cm	NS	NS	263		516		178			
	Dissolved Oxygen	mg/L	NS	NS	5.38		1.81		6.96			
	Turbidity	NTU	NS	NS	0.62		1.1		1.36			

Notes:

[1] The cleanup goal is based on whichever is lower, the site-specific cleanup goal or the MCP GW-1 Standard (310 C

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] The revised GW-1 or GW-3 standard was effective on June 26, 2009.

[4]The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginni

Table 6.10
Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2013

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-13XBR	Q	32M-01-15XBR	Q	32M-01-16XBR	Q	32M-01-17XBR	Q	32M-01-18XBR	Q	32M-01-18XBR Duplicate	Q
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5	U	2	J	5	U	5	U	6		6	
	Manganese, Total	µg/L	3,500	NS	10	U	6	J	10	U	10	U	137		113	
VOCs (SW8260B)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U	5.0	U	5.0	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	7.5	U	7.5	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	0.755	J	2.5	U	2.5	U	7.30		18	
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	0.603	J	2.5	U	0.289	J	2.12	J	4.94	
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.50	U	2.5	U	2.5	U	1.14	J	2.61	
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.968		2.55	
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.269	J	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.00	U	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	2.0	U	2.0	U	2.00	U	2.0	U	2.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.00	U	2.0	U	2.0	U
	m,p- Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.00	U	2.0	U	2.0	U
	o- Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.00	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.00	U	2.0	U	2.0	U
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U	100	U	100	U
Field Parameters	Temperature, initial	°C	NS	NS	16.06		14.88		14.82		12.63		15.62		NA	
	Temperature, final	°C	NS	NS	15.99		14.74		14.89		12.83		15.59			
	pH	mV	NS	NS	6.33		6.91		6.26		7.26		6.54			
	Specific Conductance	standard units	NS	NS	218		970		334		648		348			
	ORP[4]	µS/cm	NS	NS	269.1		354.9		212.1		102.8		192			
	Dissolved Oxygen	mg/L	NS	NS	4.35		11.48		4.47		1.72		3			
	Turbidity	NTU	NS	NS	2.97		1.34		0.94		1.0		3.5			

Notes:
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.
[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).
[2] The site-specific cleanup goal is lower than the groundwater standard.
[3] GW-1 or GW-3 standard effective June 26, 2009
[4] The ORP value was not corrected to SHE.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
June 2014

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32Z-99-02X	Q	32M-01-13XBR	Q	32M-01-14XOB	Q	32M-01-14XBR	Q	32M-01-15XBR	Q
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5.0	U	5.0	U	62	J	5.0	U	5.0	U
	Manganese, Total	µg/L	3,500	NS	130		10		2,550		41		12	
VOCs (SW8260C)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.50	U	2.50	U	2.50	U	2.50	U	0.342	J
	1,3-Dichlorobenzene	µg/L	100	50,000	2.50	U	2.50	U	2.50	U	2.50	U	0.428	J
	1,4-Dichlorobenzene	µg/L	5.0	8,000	2.50	U	2.50	U	2.50	U	0.352	J	2.50	U
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.50	U	0.5	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.5	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Trichlorethene	µg/L	5	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	m,p -Xylene	µg/L	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	o -Xylene	µg/L	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U	100	U
Field Parameters	Temperature, Initial	°Celcius	NS	NS	15.24		14.94		14.52		14.87		16.10	
	Temperature, Final	°Celcius	NS	NS	14.07		14.50		13.72		16.92		15.61	
	ORP	Std units	NS	NS	174.2		184.5		-14.5		114.1		195.3	
	pH	µS/cm	NS	NS	6.19		6.37		6.25		6.81		6.72	
	Specific Conductance	mV	NS	NS	121		291		315		459		1,597	
	Dissolved Oxygen	mg/L	NS	NS	1.29		5.20		0.37		2.44		18.7	
	Turbidity	NTU	NS	NS	3.63		2.28		10.33		11.04		1.10	

Notes:
0.333 = Cleanup goal exceedance
NS - No standard
NA - Not analyzed

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 2014

[4] The ORP value was not corrected to SHE.

Table 6.9
Groundwater Analytical Results
Areas of Contamination 32 and 43A
June 2014

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-16XBR	Q	32M-01-17XBR	Q	32M-01-18XBR	Q	32M-01-18XBR Duplicate	Q
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	5	U	5	U	3	J	3	J
	Manganese, Total	µg/L	3,500	NS	14		10	U	1,990	J	1210	J
VOCs (SW8260C)	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.50	U	0.50	U	0.50	U	0.50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.50	U	2.50	U	598		568	J
	1,3-Dichlorobenzene	µg/L	100	50,000	2.50	U	0.21	J	106		93.3	J
	1,4-Dichlorobenzene	µg/L	5.0	8,000	2.50	U	2.50	U	71.2		67.4	J
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.50	U	0.50	U	0.5	U	0.50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.8	U	0.75	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.5	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	0.50	U	0.50	U	131		114	J
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5	30,000	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U
	Trichlorethene	µg/L	5	5,000	0.50	U	0.176	J	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	UJ	730		644	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U
	Benzene	µg/L	5	10,000	0.50	U	0.50	U	0.50	U	0.50	U
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U
	m,p -Xylene	µg/L	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U
	o -Xylene	µg/L	NS	NS	1.0	U	1.0	U	1.0	U	1.0	U
	Total Xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	100	U	100	U	100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	100	U	100	U	100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	100	U	100	U	100	U	100	U
Field Parameters	Temperature, Initial	°Celcius	NS	NS	16.33		13.99		13.77		NA	
	Temperature, Final	°Celcius	NS	NS	15.85		13.57		13.38		NA	
	ORP	Std units	NS	NS	187.3		81.3		111.1		NA	
	pH	µS/cm	NS	NS	6.65		6.52		6.50		NA	
	Specific Conductance	mV	NS	NS	414		593		466		NA	
	Dissolved Oxygen	mg/L	NS	NS	6.24		1.07		3.53		NA	
	Turbidity	NTU	NS	NS	1.27		0.94		1.21		NA	

Notes:
0.333 = Cleanup goal exceedance
NS - No standard
NA - Not analyzed

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 2014

[4] The ORP value was not corrected to SHE.

Table 6.10
Exceedances Over Time
Areas of Contamination 32 and 43A
2002 to 2014

Well	April 2002	October 2002	June 2003	December 2003	May 2004	October 2004	June 2005	October 2005	June 2006	October 2006	May 2007	October 2007	June 2008	October 2008
	AOC 32 WELLS - EXCEEDANCES													
32M-01-18XBR (Source well)	VOCs and Manganese	VOCs and Manganese	VOCs and Manganese	VOCs and Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, EPH, Manganese and Arsenic	VOCs, VPH and Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese and Arsenic
32M-01-14XBR (Sentry well)	No Exceedances	Arsenic and Lead	Arsenic	No Exceedances	Arsenic	Arsenic	No Exceedances	Arsenic and Lead	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	Not Sampled
32M-01-14XOB (Sentry well)	No Exceedances	No Exceedances	Manganese and Arsenic	Manganese and Arsenic	No Exceedances	Arsenic	Manganese and Arsenic	Arsenic and Lead	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Manganese and Arsenic
32M-01-15XBR	No Exceedances	No Exceedances	Manganese and Arsenic	Manganese and Arsenic	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	1,4-DCB	No Exceedances	1,4-DCB	1,4-DCB	1,4-DCB
32M-01-17XBR	No Exceedances	No Exceedances	Manganese and Arsenic	Manganese and Arsenic	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	1,4-DCB	No Exceedances	No Exceedances	No Exceedances	No Exceedances
32Z-99-02X (Distant sentry well)	Not Sampled	Arsenic and Lead	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	Not Sampled	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	Not Sampled
SHL-15	Arsenic and Manganese	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	No Exceedances	No Exceedances	Arsenic	Not Sampled	Not Sampled	Not Sampled	Not Sampled
	AOC 43A WELLS - EXCEEDANCES													
43M-01-17XOB (Source well)	VOCs and Arsenic	Arsenic	No Exceedances	Arsenic	Arsenic	No Exceedances	No Exceedances	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled
43M-01-20XBR (Sentry well)	Manganese	Manganese	No Exceedances	Not Sampled	No Exceedances	No Exceedances	No Exceedances	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled

Notes:

1,4-DCB = 1,4-Dichlorobenzene

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.10
Exceedances Over Time
Areas of Contamination 32 and 43A
2002 to 2014

Well	June 2009	October 2009	May 2010	October 2010	June 2011	October 2011	May 2012	October 2012	May 2013	October 2013	June 2014
	AOC 32 WELLS - EXCEEDANCE										
32M-01-18XBR (Source well)	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, and Arsenic	VOCs, VPH, and Manganese	VOCs and VPH	VOCs and VPH	VOCs, VPH, and Manganese	VOCs and VPH	No Exceedances	No Exceedances	VOCs, VPH
32M-01-14XBR (Sentry well)	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances
32M-01-14XOB (Sentry well)	Manganese and Arsenic	Not Sampled	Arsenic	Not Sampled	Arsenic	Not Sampled	Arsenic	Not Sampled	Arsenic	Not Sampled	Arsenic
32M-01-15XBR	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances
32M-01-17XBR	No Exceedances	1,4-DCB	1,4-DCB	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances
32Z-99-02X (Distant sentry well)	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances
SHL-15	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled
	AOC 43A WELLS - EXCEEDANCE										
43M-01-17XOB (Source well)	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled
43M-01-20XBR (Sentry well)	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled

Notes:

1,4-DCB = 1,4-Dichlorobenzene

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 6.11
Summary of Cleanup Goal Exceedances
Areas of Contamination 32 and 43A - Well 32M-01-18XBR

Parameter	Units	Cleanup Goal	April 2002	October 2002	June 2003	December 2003	May 2004	October 2004	June 2005	October 2005	June 2006	October 2006	May 2007	October 2007	June 2008	October 2008	May 2009
Trichloroethene	µg/L	5	19	ND	ND	(3.4 QA)	5.2 QA	(3.4 QA)	ND	(0.6)	ND	ND	(4.2)	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	600	5,900	2,500	3,800	3,900	6,200	4,200	4,500	1,450	5,900	2,800	6,100	690	2,700	4,100	1,700
1,3-Dichlorobenzene[2]	µg/L	100	660	300	460	430	730	530	590	209	750	360	850	120	450	580	270
1,4-Dichlorobenzene	µg/L	5	450	200	310	280	470	320	370	120	490	210	550	67	270	390	180
Bromodichloromethane	µg/L	3	NC	NC	NC	ND	ND	ND	ND	ND	19	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	70	NC	NC	NC	ND	ND	ND	ND	ND	39	ND	ND	ND	ND	ND	ND
VPH C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	5,000	ND	(350)	(511)	5,100 QA	4,480	(470)	(686)	ND	ND	(2.5)	ND	ND	ND	(132 J)
VPH C_9-C_{10} Aromatics	µg/L	200	9,100	2,900	1,700	2,600	11,000	4,400	260	1,150	5,850	4,120	6,050	952	3,230	3,660	1,890
EPH C_9-C_{18} Alphatics	µg/L	700	920	(240)	(620)	940	2,300	1,100	1,400	(228)	1,340	785	854	(158)	(430)	(455)	(470)
Arsenic, Total	µg/L	10	ND	ND	(3.5)	(8.8)	10.4	(6.2)	24.4	ND	30	15	51	(3.1)	38	34	51
Arsenic, Dissolved	µg/L	10	ND	ND	(3.0)	NC	10.1	(6.3)	NC	NC	33	NC	NC	NC	NC	NC	NC
Manganese, Total	µg/L	3,500	7,730	9,260	14,100	11,000	17,400	13,400	16,700	11,600	18,000	16,000	18,200	10,200	14,800	18,900	29,400
Manganese, Dissolved	µg/L	3,500	7,500	8,960	14,200	13,900	18,100	12,500	NC	NC	19,000	NC	NC	NC	NC	NC	NC
Field Paramters - ORP[1]	mV	NS	120.37	216.33	111.90	45.1	NC	17.6	24.7	33.8	-2.0	14.9	-30.9	1.5	-40.1	60.9	437.7
Field Paramters - Turbidity	NTU	NS	NC	NC	NC	0.91	NC	1.63	0.51	0.50	0.10	0.65	1.9	0.40	0	3	17.7

Notes:

The number in parenthesis denotes that the concentration is below the cleanup goal.

QA= Result is reported from the QA lab analysis. The primary lab result has an elevated reporting limit due to the dilution of the sample or the primary lab result was outside the calibration range.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

The water quality data was not available for the May 2004 sampling event.

Historic documents were searched but the necessary information was not available.

[1] The ORP value was not corrected to SHE.

[2] The GW-1 Standard updated effective as of April 25, 2014.

Table 6.11
Summary of Cleanup Goal Exceedances
Areas of Contamination 32 and 43A - Well 32M-01-18XBR

Parameter	Units	Cleanup Goal	October 2009	May 2010	October 2010	June 2011	October 2011	May 2012	October 2012	May 2013	October 2013	June 2014
Trichloroethene	µg/L	5	ND	ND	ND	ND	ND	(0.60)	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	600	730	(300)	(570)	(340)	(260)	640 J	(340)	(7.46 J)	(7.30)	(598)
1,3-Dichlorobenzene[2]	µg/L	100	150	59	100	86	64	120 J	70	(7.10 J)	(2.12 J)	106
1,4-Dichlorobenzene	µg/L	5	100	26	62	50	37	69	42	(1.19 J)	(1.14 J)	71.2
Bromodichloromethane	µg/L	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	70	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VPH C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	(250)	ND	ND	(104)	(108)	(486)	ND	ND	ND	ND
VPH C_9-C_{10} Aromatics	µg/L	200	837	300	541	444	272	728	322	ND	ND	730
EPH C_9-C_{18} Alphatics	µg/L	700	(246)	ND	ND	ND	ND	(175)	ND	ND	ND	ND
Arsenic, Total	µg/L	10	18	18	(3.5 J)	(3 J)	(5)	(5)	(4 J)	(2 J)	(6)	(3 J)
Arsenic, Dissolved	µg/L	10	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Manganese, Total	µg/L	3,500	6,970	(2,360)	4,510	(2,300)	(1,150)	4,100	(1,540)	(27)	(137)	(1,990 J)
Manganese, Dissolved	µg/L	3,500	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Field Paramters - ORP[1]	mV	NS	120.7	-177.8	137.2	408.1	158.8	163.4	223.8	298.8	192	111.1
Field Paramters - Turbidity	NTU	NS	2.4	244.0	3.07	2.68	3.53	2.22	1.26	1.36	3.5	1.21

Notes:

The number in parenthesis denotes that the concentration is below the cleanup goal.

QA= Result is reported from the QA lab analysis. The primary lab result has an elevated reporting limit due to the dilution of the sample or the primary lab result was outside the calibration range.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

The water quality data was not available for the May 2004 sampling event.

Historic documents were searched but the necessary information was not available.

[1] The ORP value was not corrected to SHE.

[2] The GW-1 Standard updated effective as of April 25, 2014.

G.3 Defense Reutilization and Marketing Office Site Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens AOC 32/43A	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Source Removal via excavation and off site disposal/ treatment Institutional Controls		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Sites are in good condition. Monitoring wells installed by others, not identified on the plans were observed.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	Groundwater monitoring is scheduled for weekends when there is less truck traffic.
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview

Name of Interviewer: Elizabeth Anderson

Name of Interviewee: N/A - previously conducted

Date:

Position:

Owner ☐

Manager ☐

Other: Please Specify ☒

Location:

Site ☐

Office ☐

Phone: ☒

Telephone #

Item	Check One	Comments
Are there any extraction wells at the property?	Yes ☐ No ☒	No extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No ☒	No specific construction plans are known.
Are there any issues with site access for monitoring?	Yes ☐ No ☒	Site is active shipping terminal. Coordination with O'Reilly Auto Parts prior to site visits

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____



AOC 32 and 43 A



New drums on site for newly installed wells



Additional view of former DRMO site



Excessive crack sealing around monitoring wells noted on site.

G.4 Defense Reutilization and Marketing Office ARARs

Table 24
Synopsis of Federal and State ARARs for Monitored Natural Attenuation
Area of Contamination 32 and 43A
Devens, Massachusetts

Authority	Location Specific	Location Specific Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

Table 24
Synopsis of Federal and State ARARs for Monitored Natural Attenuation
Area of Contamination 32 and 43A
Devens, Massachusetts

Chemical Specific

Authority	Chemical Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11-141.16 and 141.50-141.521]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		
State Regulatory Authority	Groundwater(Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.01].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

Table 24
Synopsis of Federal and State ARARs for Monitored Natural Attenuation
Area of Contamination 32 and 43 A
Devens, Massachusetts

Action Specific

Authority	Action Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standard.	
State Regulatory Authority	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR)Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

Table 25
Synopsis of Federal and State ARARs for Excavation and Off-site Disposal
Area of Contamination 32 and 43A
Devens, Massachusetts

Location Specific

Location Specific Authority	Location Specific Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority	There are no location specific ARARs for the DRMO Yard.			
State Regulatory Authority	There are no location specific ARARs for the DRMO Yard.			

Table 25
Synopsis of Federal and State ARARs for Excavation and Off-site Disposal
Area of Contamination 32 and 43A
Devens, Massachusetts

Chemical Specific

Authority	Chemical Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority	For surface soil (0 to 10 inches)	Toxic Substance Control Act (TSCA) 40 CFR 761.125(c)(4)	TBC	Unrestricted access with less than 1 mg/kg PCBs.	
	For subsurface soil (below 10 inches)			Unrestricted access with less than 10 mg/kg PCBs.	
Federal Regulatory Authority	Soil	EPA Region III Risk Based Concentration Table	TBC	Exposure levels to numerous chemicals under specific scenarios.	
Federal Regulatory Authority	Soil	Resource Conservation and Recovery Act (RCRA) Corrective Action Levels 55 FR 30798, July 1990.	TBC	To establish the need for a corrective measure study. Numerous chemicals.	
Federal Regulatory Authority	Soil	Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. EPA OSWER Directive 9355.4-12, July 1994	TBC		
State Regulatory Authority	Soil	Background levels for soil.	TBC		
State Regulatory Authority	Soil	Massachusetts Contingency Plan (MCP) 310 CMR 40.09705(6)(a)	TBC	Total petroleum hydrocarbons not to exceed 500 mg/kg.	

G.5 Defense Reutilization and Marketing Office Statistical Analysis

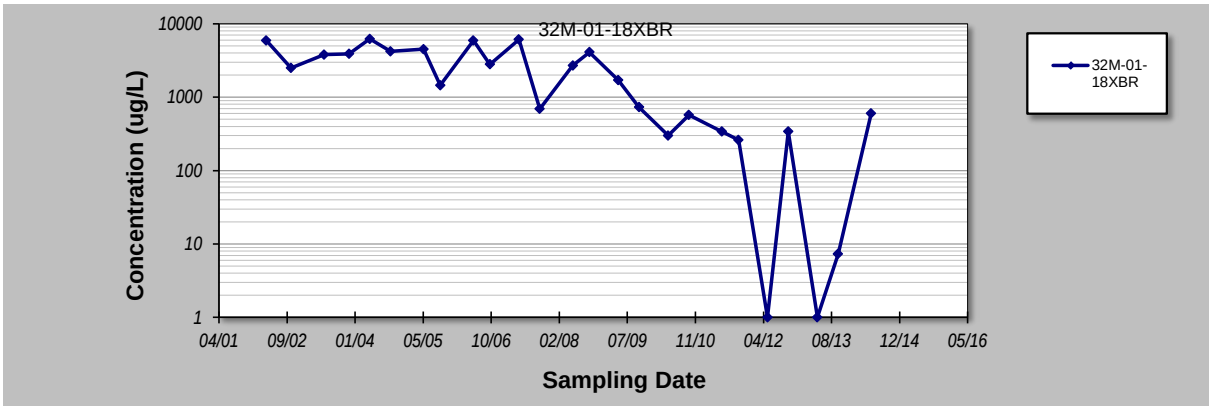
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 1-Jul-15
Facility Name: AOC 32 and AOC 43A Devens
Conducted By: J. Fitzgerald

Job ID:
Constituent: 1,2-Dichlorobenzene
Concentration Units: ug/L

Sampling Point ID: 32M-01-18XBR

Sampling Event	Sampling Date	1,2-DICHLOROBENZENE CONCENTRATION (ug/L)
1	Apr-02	5900
2	Oct-02	2,500
3	Jun-03	3800
4	Dec-03	3,900
5	May-04	6200
6	Oct-04	4200
7	Jun-05	4500.0
8	Oct-05	1450
9	Jun-06	5900.0
10	Oct-06	2800
11	May-07	6100
12	Oct-07	690
13	Jun-08	2700
14	Oct-08	4100
15	May-09	1700.00
16	Oct-09	730
17	May-10	300
18	Oct-10	570
19	Jun-11	340
20	Oct-11	260
21	May-12	1
22	Oct-12	340
23	May-13	1
24	Oct-13	7.3
25	Jun-14	598
26		
27		
28		
29		
30		
Coefficient of Variation:		0.92
Mann-Kendall Statistic (S):		-179
Confidence Factor:		>99.9%
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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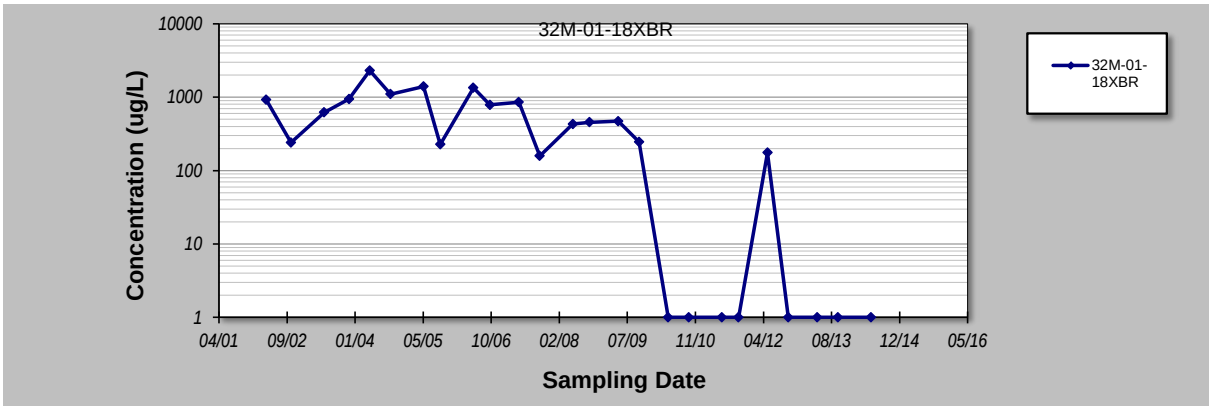
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 1-Jul-15
Facility Name: AOC 32 and AOC 43A Devens
Conducted By: J. Fitzgerald

Job ID:
Constituent: EPH C9-C18 Aliphatics
Concentration Units: ug/L

Sampling Point ID: 32M-01-18XBR

Sampling Event	Sampling Date	EPH C9-C18 ALIPHATICS CONCENTRATION (ug/L)
1	Apr-02	920
2	Oct-02	240
3	Jun-03	620
4	Dec-03	940
5	May-04	2300
6	Oct-04	1100
7	Jun-05	1400.0
8	Oct-05	228
9	Jun-06	1340.0
10	Oct-06	785
11	May-07	854
12	Oct-07	158
13	Jun-08	430
14	Oct-08	455
15	May-09	470.00
16	Oct-09	246
17	May-10	1
18	Oct-10	1
19	Jun-11	1
20	Oct-11	1
21	May-12	175
22	Oct-12	1
23	May-13	1
24	Oct-13	1
25	Jun-14	1
26		
27		
28		
29		
30		
Coefficient of Variation:		1.15
Mann-Kendall Statistic (S):		-172
Confidence Factor:		>99.9%
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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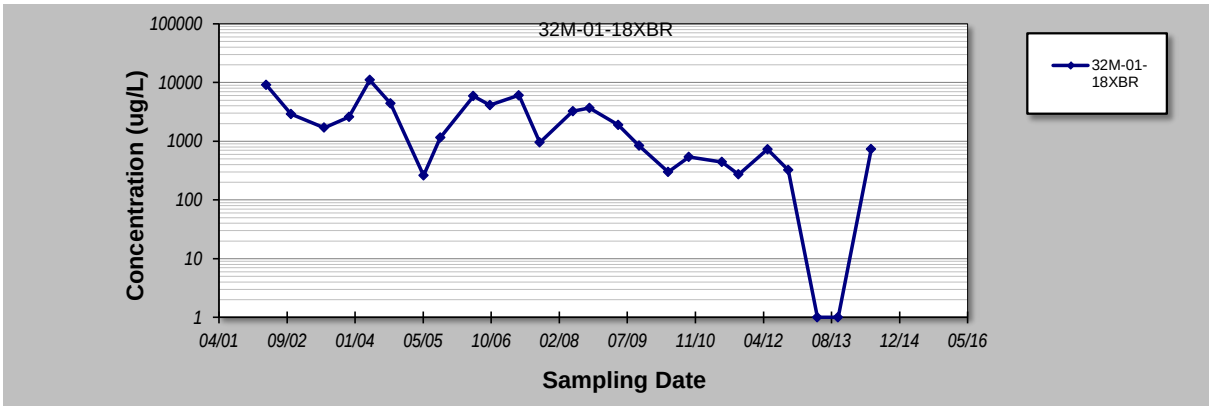
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 1-Jul-15
Facility Name: AOC 32 and AOC 43A Devens
Conducted By: J. Fitzgerald

Job ID:
Constituent: VPH C9-C10 Aromatics
Concentration Units: ug/L

Sampling Point ID: 32M-01-18XBR

Sampling Event	Sampling Date	VPH C9-C10 AROMATICS CONCENTRATION (ug/L)
1	Apr-02	9100
2	Oct-02	2,900
3	Jun-03	1700
4	Dec-03	2,600
5	May-04	11000
6	Oct-04	4400
7	Jun-05	260.0
8	Oct-05	1150
9	Jun-06	5850.0
10	Oct-06	4120
11	May-07	6050
12	Oct-07	952
13	Jun-08	3230
14	Oct-08	3660
15	May-09	1890.00
16	Oct-09	837
17	May-10	300
18	Oct-10	541
19	Jun-11	444
20	Oct-11	272
21	May-12	728
22	Oct-12	322
23	May-13	1
24	Oct-13	1
25	Jun-14	730
26		
27		
28		
29		
30		
Coefficient of Variation:		1.15
Mann-Kendall Statistic (S):		-159
Confidence Factor:		>99.9%
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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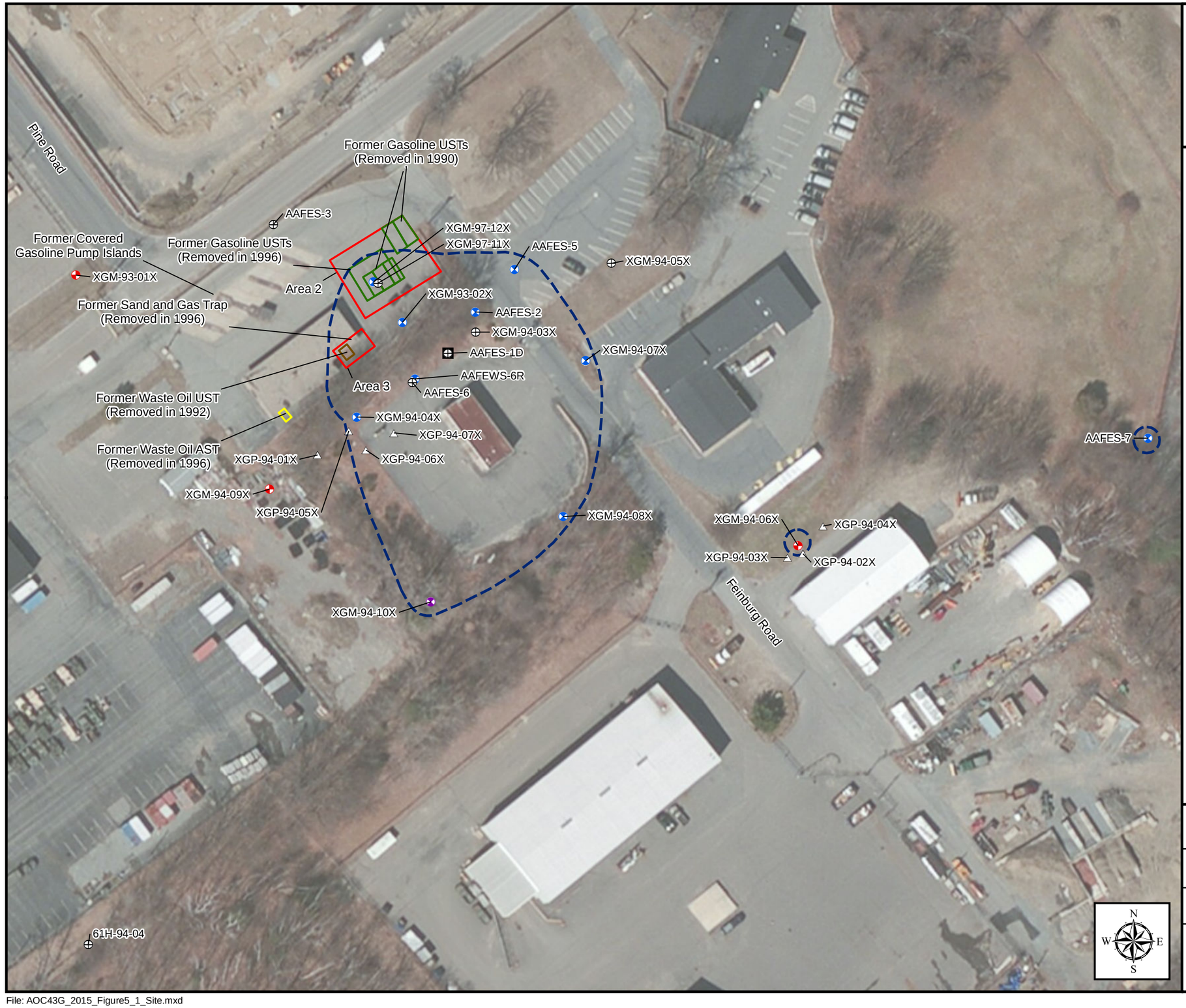
APPENDIX H – Historic Gas Station

H.1 Historic Gas Station

Figures

Figure 7.1
Site Layout
Area of Contamination 43G



Legend

- LTM Sample Well
- LTM Well - Gauge Only
- Piezometer - Abandoned
- Monitoring Well
- Monitoring Well - Abandoned
- Monitoring Well - Presumed Destroyed
- XGP-94-04X Well/Piezometer Identification
- Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on 1999 to 2011 analytical data)
- Former Gasoline UST(s)
- Former Waste Oil UST
- Former Waste Oil AST
- Former UST Area

Notes:
AST = Above ground storage tank
UST = Underground storage Tank
LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
AOC 43G

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

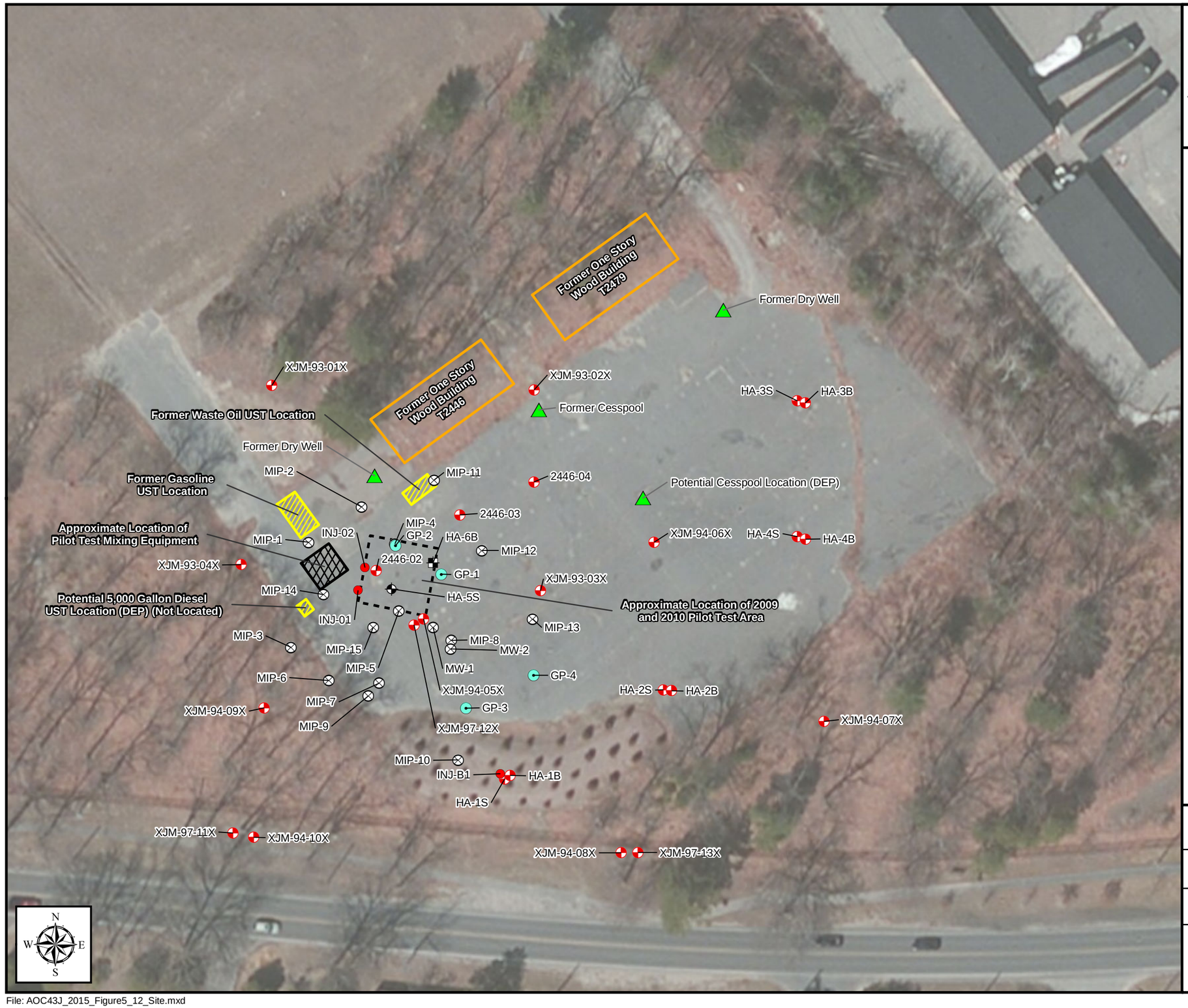
0 40 80
Feet

Date: 04/15/2015

Figure 7.1

File: AOC43G_2015_Figure5_1_Site.mxd

Figure 7.2
Site Layout
Subsurface Exploration Location Plan
AOC 43J



Legend

- Direct-Push Boring
- Membrane Interface Probe
- Monitoring Well
- Bedrock Monitoring Well
- Overburden Monitoring Well/Piezometer
- Injection Well
- Approximate Location of Potential Former Source Area Investigated
- Approximate Location of Former UST
- Approximate Location of 2009 and 2010 Pilot Test Area
- Approximate Location of Pilot Test Mixing Equipment
- Former Building
- XJM-94-06X Well Location Identification

References:
HGL. LTMMP 2010, Haley Aldrich Inc. 2015

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
AOC 43J

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 30 60
Feet

Date: 04/17/2015

Figure 7.2

File: AOC43J_2015_Figure5_12_Site.mxd

H.2 Historic Gas Station

Tables

Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2010

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	XGM-94-04X	Qual	XGM-94-07X	Qual	XGM-94-08X	Qual	XGM-97-12X	Qual	XGM-97-12X Duplicate	Qual
Metals SW6010B	Iron, Total	µg/L	9,100	NS	9,100	4,500		**12,000**		1,000		**16,000**		**16,000**	
	Manganese, Total	µg/L	375	NS	291	**6,490**		**3,870**		**2,070**		**2,110**		**2,090**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	**533**		159		50.0	U	**644**		**559**	
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	**243**		77.8		50.0	U	**2,470**	J	**1,470**	J
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	111		54.5		50.0	U	**922**		663	
	Benzene	µg/L	5	10,000	NS	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
	Ethylbenzene	µg/L	700	5,000	NS	5.13		2.0	U	2.0	U	112		88.7	
	m,p -Xylenes	µg/L	NS	NS	NS	2.0	U	2.0	U	2.0	U	85.4	J	63.2	J
	o -Xylene	µg/L	NS	NS	NS	2.0	U	2.0	U	2.0	U	24.5		20.0	U
	Total Xylenes	µg/L	10,000	5,000	NS	2.0	U	2.0	U	2.0	U	109.9	J	63.2	J
	Toluene	1,000	1,000[4]	40,000	NS	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
Alkalinity 2320B	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	160		120		120		140		140	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	12.48		15.6		13.2		16.31		NA	
	Temperature, Final	NS	° Celsius	NS	NS	13.9		15.96		13.74		15.96		NA	
	pH	NS	Std units	NS	NS	7.27		6.7		6.68		6.55		NA	
	Specific Conductance	NS	µS/cm	NS	NS	788		715		649		726		NA	
	ORP[5]	mV	NS	NS	NS	-212.0		-137.3		142.8		-81.4		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.92		1.61		0.46		0.3		NA	
	Turbidity	NTU	NS	NS	NS	1.1		40.0		8.01		3.4		NA	

Notes:

[1] Cleanup value as developed in the ROD (unless otherwise noted).

[2] From the RI.

[3] GW-3 standard effective June 26, 2009

[4] Cleanup goal is based on the respective GW-1 standards.

[5] The ORP value was not corrected to SHE.

[6] VPH Boundary Standards for aliphatics and aromatics.

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Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2011

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	AAFES-2	Qual	AAFES-5	Qual	AAFES-6R	Qual	AAFES-7	Qual	XGM-93-02X	Qual
Metals SW6010B	Iron, Total	µg/L	9,100	NS	9,100	**22,000**		40	J	1,100		NA		**12,000**	
	Manganese, Total	µg/L	375	NS	291	**3,700**		36		**1,830**		5	J	**3,020**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	**1,270**		50.0	U	50.0	U	NA		50.0	U
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	**1,050**		50.0	U	50.0	U	NA		50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	**1,080**		70.9		50.0	U	NA		85.1	
	Benzene	µg/L	5	10,000	NS	20.0	U	2.0	U	2.0	U	NA		2.0	U
	Ethylbenzene	µg/L	700	5,000	NS	45.2		2.0	U	2.0	U	NA		5.67	
	m,p -Xylenes	µg/L	NS	NS	NS	33.9		2.0	U	2.0	U	NA		2.0	U
	o -Xylene	µg/L	NS	NS	NS	20.0	U	2.0	U	2.0	U	NA		2.0	U
	Total Xylenes	µg/L	10,000	5,000	NS	33.9		2.0	U	2.0	U	NA		2.0	U
	Toluene	1,000	1,000[4]	40,000	NS	20.0	U	2.0	U	2.0	U	NA		2.0	U
Alkalinity 2320B	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	130		49		100		NA		120	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	13.99		15.11		13.87		13.79		14.79	
	Temperature, Final	NS	° Celsius	NS	NS	13.98		15.17		13.9		13.93		15.02	
	pH	NS	Std units	NS	NS	6.72		5.86		6.5		6.24		6.42	
	Specific Conductance	NS	µS/cm	NS	NS	1239		1160		1048		1041		1218	
	ORP[5]	mV	NS	NS	NS	-93.4		-153.1		-204.1		108.9		-180.3	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.37		1.83		0.35		1.55		0.5	
	Turbidity	NTU	NS	NS	NS	3.54		1.43		1.02		1.92		14.1	

Notes:

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[2] From the RI.

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Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2011

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	XGM-94-04X	Qual	XGM-94-07X	Qual	XGM-94-08X	Qual	XGM-97-12X	Qual	XGM-97-12X Duplicate	Qual
Metals SW6010B	Iron, Total	µg/L	9,100	NS	9,100	1,900		**13,000**		750		**27,000**		**28,000**	
	Manganese, Total	µg/L	375	NS	291	**2,140**		**6,060**		**2,780**		**3,540**		**3,730**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	**765**		50.0	U	50.0	U	**367**		**371**	
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	**469**		50.0	U	50.0	UJ	**463**		**485**	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	462		90.5		50.0	U	535		538	
	Benzene	µg/L	5	10,000	NS	10.0	U	2.0	U	2.0	U	**13.8**		**13.2**	
	Ethylbenzene	µg/L	700	5,000	NS	40.6		2.0	U	2.0	U	91.6		94.7	
	m,p -Xylenes	µg/L	NS	NS	NS	10.0	U	2.0	U	2.0	U	18.5		22.4	
	o -Xylene	µg/L	NS	NS	NS	10.0	U	2.0	U	2.0	U	10.0	U	10.5	
	Total Xylenes	µg/L	10,000	5,000	NS	10.0	U	2.0	U	2.0	U	18.5		32.9	
	Toluene	1,000	1,000[4]	40,000	NS	10.0	U	2.0	U	2.0	U	10.0	U	10.0	U
Alkalinity 2320B	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	140		88		110		140		140	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	14.47		15.54		14.32		15.41		NA	
	Temperature, Final	NS	° Celsius	NS	NS	14.37		15.49		14.31		15.33		NA	
	pH	NS	Std units	NS	NS	6.65		6.5		6.61		6.59		NA	
	Specific Conductance	NS	µS/cm	NS	NS	1077		1174		1190		1243		NA	
	ORP[5]	mV	NS	NS	NS	-31.8		-32.3		38.1		-75.4		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.19		2.37		0.13		0.31		NA	
	Turbidity	NTU	NS	NS	NS	1.74		38.7		4.18		4.44		NA	

Notes:

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[5] The ORP value was not corrected to SHE.

[6] VPH Boundary Standards for aliphatics and aromatics.

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Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2012

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	AAFES-2	Qual	AAFES-5	Qual	AAFES-6R	Qual	AAFES-7	Qual	XGM-93-02X	Qual
Metals (SW6010B)	Iron, Total	µg/L	9,100	NS	9,100	**18,000**		220		6,900		NA		6,000	
	Manganese, Total	µg/L	375	NS	291	**3,100**		206		**3,220**		**706**		**612**	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	**1,560**	J	50.0	U	215		NA		50.0	U
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	**1,090**	J	50.0	U	50.0	U			50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	542	J	50.0	U	50.0	U			50.0	U
	Benzene	µg/L	5	10,000	NS	**6.6**	J	2.0	U	2.0	U			2.0	U
	Ethylbenzene	µg/L	700	5,000	NS	33.7	J	2.0	U	2.0	U			2.0	U
	m,p -Xylenes	µg/L	NS	NS	NS	35.0	J	2.0	U	2.0	U			2.0	U
	o -Xylene	µg/L	NS	NS	NS	4.82	J	2.0	U	2.0	U			2.0	U
	Total Xylenes	µg/L	10,000	5,000	NS	39.82	J	2.0	U	2.0	U			2.0	U
	Toluene	1,000	1,000[4]	40,000	NS	7.70	J	2.0	U	2.0	U			2.0	U
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	140		67		140		NA		180	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	15.17		14.97		1.57		13.91		15.17	
	Temperature, Final	NS	° Celsius	NS	NS	14.79		15.3		15.01		14.00		14.57	
	pH	NS	Std units	NS	NS	7.15		6.19		6.79		6.49		6.48	
	Specific Conductance	NS	µS/cm	NS	NS	1,001		1,134		885		1,418		890	
	ORP[5]	mV	NS	NS	NS	-136.0		233.5		-74.4		231.10		-20.7	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.65		0.68		0.22		1.86		0.35	
	Turbidity	NTU	NS	NS	NS	3.19		2.08		9.63		1.95		37.4	

Notes:

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Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2012

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	XGM-94-04X	Qual	XGM-94-07X	Qual	XGM-94-08X	Qual	XGM-97-12X	Qual	XGM-97-12X Duplicate	Qual
Metals (SW6010B)	Iron, Total	µg/L	9,100	NS	9,100	1,000		**23,000**		2,300		**20,000**		**20,000**	
	Manganese, Total	µg/L	375	NS	291	**2,580**		**5,560**		**4,620**		**1,640**		**1,660**	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	**497**	J	66.0		50.0	U	**507**	J	**474**	J
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	**300**	J	50.0	U	50.0	U	**367**	J	**361**	J
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	80.7	J	50.0	U	50.0	U	275	J	244	J
	Benzene	µg/L	5	10,000	NS	2.0	U	2.0	U	2.0	U	3.03	J	2.92	J
	Ethylbenzene	µg/L	700	5,000	NS	25.7	J	2.0	U	2.0	U	20.0	J	13.8	J
	m,p -Xylenes	µg/L	NS	NS	NS	3.76	J	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	µg/L	NS	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	NS	3.76	J	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	1,000[4]	40,000	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.58	J
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	190		97		130		150		150	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	15.19		15.79		14.26		15.96			
	Temperature, Final	NS	° Celsius	NS	NS	16.20		16.25		14.39		16.48			
	pH	NS	Std units	NS	NS	7.10		6.64		7.04		6.53			
	Specific Conductance	NS	µS/cm	NS	NS	966		1,066		1,018		1,157		NA	
	ORP[5]	mV	NS	NS	NS	-105.0		-58.00		218.2		-96.8			
	Dissolved Oxygen	mg/L	NS	NS	NS	0.24		0.24		0.80		0.23			
	Turbidity	NTU	NS	NS	NS	0.26		77.8		9.8		4.18			

Notes:

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Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2013

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	AAFES-2	Q	AAFES-5	Q	AAFES-6R	Q	AAFES-7	Q	XGM-93-02X	Q
Metals (SW6010B)	Iron, Total	µg/L	9,100	NS	9,100	**19,000**		50	U	**9,200**		NA		**10,000**	
	Manganese, Total	µg/L	375	NS	291	**3,270**		127		**2,820**		**2,390**		**1,180**	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	**1,390**		50.0	U	287		NA		65.0	
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	**1,940**		50.0	U	50.0	U			50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	**1,650**		66.0		107				100.0	
	Benzene	µg/L	5	10,000	NS	**5.04**		2.0	U	2.0	U			2.0	U
	Ethylbenzene	µg/L	700	5,000	NS	42.6		2.0	U	2.0	U			2.0	U
	m,p -Xylenes	µg/L	NS	NS	NS	30.8		2.0	U	2.0	U			2.0	U
	o -Xylene	µg/L	NS	NS	NS	5.40		2.0	U	2.0	U			2.0	U
	Total Xylenes	µg/L	10,000	5,000	NS	36.20		2.0	U	2.0	U			2.0	U
	Toluene	1,000	1,000[4]	40,000	NS	7.54		2.0	U	2.0	U			2.0	U
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	142		55.1		125		NA		173	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	14.48		14.77		14.52		12.9		13.54	
	Temperature, Final	NS	° Celsius	NS	NS	14.53		14.49		14.4		12.50		13.3	
	pH	NS	Std units	NS	NS	7.01		6.01		6.74		6.36		6.75	
	Specific Conductance	NS	µS/cm	NS	NS	1,015		1,517		1,127		1,724		1,073	
	ORP[5]	mV	NS	NS	NS	-55.7		274.4		5		175.20		20.2	
	Dissolved Oxygen	mg/L	NS	NS	NS	1.21		1.71		0.68		5.2		0.46	
	Turbidity	NTU	NS	NS	NS	0.77		3.59		4.38		4.83		18.2	

Notes:

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Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2013

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	XGM-94-04X	Q	XGM-94-07X	Q	XGM-94-08X	Q	XGM-97-12X	Q	XGM-97-12X Duplicate	Q
Metals (SW6010B)	Iron, Total	µg/L	9,100	NS	9,100	2,200		**10,000**		910		**24,000**		**25,000**	
	Manganese, Total	µg/L	375	NS	291	**2,730**		**5,380**		**2,300**		**1,680**		**1,770**	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	**1,140**		120		50.0	U	**494**		**499**	
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	**769**		50.0	U	50.0	U	**840**		**835**	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	626		66.8		50.0	U	**724**		**718**	
	Benzene	µg/L	5	10,000	NS	2.61		2.0	U	2.0	U	3.87		3.86	
	Ethylbenzene	µg/L	700	5,000	NS	66.3		2.0	U	2.0	U	64.5		66.7	
	m,p -Xylenes	µg/L	NS	NS	NS	9.03		2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	µg/L	NS	NS	NS	4.04		2.0	U	2.0	U	2.0	U	2.0	U
	Total Xylenes	µg/L	10,000	5,000	NS	13.07		2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	1,000[4]	40,000	NS	2.0	U	2.0	U	2.0	U	2.54		2.50	
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	175		95.1		122		109		131	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	14.63		15.72		13.27		15.03			
	Temperature, Final	NS	° Celsius	NS	NS	14.60		15.08		13.72		14.88			
	pH	NS	Std units	NS	NS	7.10		6.68		6.84		6.54			
	Specific Conductance	NS	µS/cm	NS	NS	1,029		1,473		1,334		1,679		NA	
	ORP[5]	mV	NS	NS	NS	-13.1		21.3		241.3		-17.7			
	Dissolved Oxygen	mg/L	NS	NS	NS	0.64		1.31		1.10		0.17			
	Turbidity	NTU	NS	NS	NS	0.62		14.2		9.09		4.14			

Notes:

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Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2014

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	AAFES-2	Q	AAFES-5	Q	AAFES-6R	Q	AAFES-7	Q	XGM-93-02X	Q
Metals (SW6010B)	Iron, Total	µg/L	9,100	NS	9,100	19,400		50	U	8,240		53	J	9,580	
	Manganese, Total	µg/L	375	NS	291	3,460		32.5		3,000		1,640		1,570	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	1,250		50	U	188		NA		268	
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	1,090		50	U	50	U	NA		113	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	688		50	U	50	U	NA		76.6	
	Benzene	µg/L	5	10,000	NS	3.7		0.50	U	0.50	U	NA		0.77	J
	Ethylbenzene	µg/L	700	5,000	NS	31.1		0.50	U	0.50	U	NA		0.91	J
	m,p -Xylene	µg/L	NS	NS	NS	16.7		1.0	U	1.0	U	NA		1.0	U
	o -Xylene	µg/L	NS	NS	NS	3.4		0.50	U	0.50	U	NA		0.50	U
	Toluene	µg/L	1,000[4]	40,000	NS	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	140		43.9		119		NA		157	
Field Parameters	Temperature, Initial	°Celcius	NS	NS	NS	14.56		13.66		14.32		13.07		13.3	
	Temperature, Final	°Celcius	NS	NS	NS	14.78		14.15		14.25		13.09		13.36	
	pH	Std units	NS	NS	NS	6.96		5.83		6.55		6.18		6.71	
	Specific Conductance	µS/cm	NS	NS	NS	1,010		681		1,598		1,380		369	
	ORP[5]	mV	NS	NS	NS	-110.6		227.9		-29.1		119.2		-90.6	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.49		4.49		1.93		4.13		1.86	
	Turbidity	NTU	NS	NS	NS	3.78		3.7		4.67		4.91		17.1	

Notes:

0.333 = Cleanup goal exceedance

NS - No standard

NA - Not analyzed

[1] The cleanup values were developed in the ROD (unless otherwise noted).

[2] From the RI.

[3] The GW-3 standard was effective on June 2014

[4] The cleanup goal is based on the respective GW-1 standards.

[5] The ORP value was not corrected to SHE.

[6] The VPH boundary standards for aliphatics and aromatics.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 7.7
Groundwater Analytical Results
Area of Contamination 43G
October 2014

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	XGM-94-04X	Q	XGM-94-07X	Q	XGM-94-08X	Q	XGM-97-12X	Q	XGM-97-12X Duplicate	Q
Metals (SW6010B)	Iron, Total	µg/L	9,100	NS	9,100	684		6,820		147		25,800		25,800	
	Manganese, Total	µg/L	375	NS	291	1,510		6,940		3,210		2,080		2,130	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3,4,6]	50,000	NS	186		58.8		50	U	272		291	
	C_9-C_{10} Aromatics	µg/L	200 [6]	50,000	NS	76.8		50	U	50	U	253		272	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4,6]	50,000	NS	50	U	50	U	50	U	162		170	
	Benzene	µg/L	5	10,000	NS	0.5	U	0.50	U	0.50	U	1.5		1.7	
	Ethylbenzene	µg/L	700	5,000	NS	7.0		0.50	U	0.50	U	12.6		14.4	
	m,p -Xylene	µg/L	NS	NS	NS	1.2	U	1.0	U	1.0	U	1.0	U	1.0	U
	o -Xylene	µg/L	NS	NS	NS	0.7	J	0.50	U	0.50	U	0.50	U	0.50	U
	Toluene	µg/L	1,000[4]	40,000	NS	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Total Alkalinity (SM2320B)	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	170		78.1		119		141		138	
Field Parameters	Temperature, Initial	°Celcius	NS	NS	NS	14.16		14.27		13.23		15.95		NA	
	Temperature, Final	°Celcius	NS	NS	NS	14.18		14.71		13.3		15.48		NA	
	pH	Std units	NS	NS	NS	6.94		6.51		6.73		6.72		NA	
	Specific Conductance	µS/cm	NS	NS	NS	1,338		2,261		1,049		486		NA	
	ORP[5]	mV	NS	NS	NS	-43.0		-11.3		42.9		-99.3		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.34		0.92		0.22		0.49		NA	
	Turbidity	NTU	NS	NS	NS	1.86		141		4.49		7.60		NA	

Notes:

0.333 = Cleanup goal exceedance

NS - No standard

NA - Not analyzed

[1] The cleanup values were developed in the ROD (unless otherwise noted).

[2] From the RI.

[3] The GW-3 standard was effective on June 2014

[4] The cleanup goal is based on the respective GW-1 standards.

[5] The ORP value was not corrected to SHE.

[6] The VPH boundary standards for aliphatics and aromatics.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 7.8
Exceedances Over Time
Area of Contamination 43G
1999 to 2014

Well Number	12/99	11/00	11/01	11/02	11/03	10/04	10/05	10/06	10/07	10/08	11/09	10/10	10/11	10/12	10/13	10/14
Benzene- 5 µg/L Cleanup Goal																
AAFES-2	62	36	43	26	9	6.6	6.1	(1.3)	ND[2]	ND[2]	(3.93 J)	ND	ND	6.60 J	5.04	(3.7)
XGM-93-02X	81	32	12	140	24	39	29	18.5	8.8	(2.6)	(0.997 J)	ND	ND	ND	ND	(0.77 J)
XGM-97-12X	270	550	700	780	290	260	35.6	129	22.8	13.7 J	27.4J	ND	13.8	(3.03 J)	(3.87)	(1.5)
Toluene- 1,000 µg/L Cleanup Goal																
XGM-97-12X	(390)	1,100	(870)	1,000	(610)	(460)	(53.4)	(239)	(15.9)	(11.4 J)	(5.3 J)	ND	ND	ND	(2.54)	ND
C_5-C_8 Aliphatics[1] - 300 µg/L VPH Boundary Standards																
AAFES-2	ND	1,400*	ND	1,200	1,200	ND	2,070	1,430	1,400	ND[2]	ND	859	1,270	1,560 J	1,390	1,250
AAFES-6	370	420*	(290)	ND	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
AAFES-6R**	NC	NC	NC	NC	NC	NC	NC	(305)	ND[2]	ND	ND	(114)	ND	(215)	(287)	(188)
XGM-93-02X	ND	570*	(270)	790	410	ND	788	519	ND	ND[2]	ND	(124)	ND	ND	(65)	(268)
XGM-94-04X	ND	420*	(140)	ND	ND	ND	ND	ND	ND	ND	ND	533	765	497 J	1,140	(186)
XGM-97-12X	970	1,300	1,100	1,100	1,100	ND	2,370	1,740	1,230	ND[2]	4,050	644	367	507 J	494	(272)
C_9-C_{12} Aliphatics[1] - 700 µg/L VPH Boundary Standards																
AAFES-2	ND	(81)	ND	(200)	ND	(57)	5,220	987	1,000	1,020	950	768	1,080	(542 J)	1,650	(688)
XGM-93-02X	ND	(39)	ND	(58)	(33)	(34)	1,570	-268	(94)	(182)	(55.5)	ND	(85.1)	ND	(100)	(76.6)
XGM-97-12X	-96	ND	ND	(130)	ND	(90)	7,310	1,340	1,080	2,210	1,450	922	(535)	(275 J)	724	(162)
C_9-C_{10} Aromatics - 200 µg/L VPH Boundary Standards																
AAFES-2	9,400	7,200	5,300	13,000	6,600	6,700	3,130	3,710	2,420	2,120	2,660	1,870	1,050	1,090	1,940	1,090
XGM-93-02X	510	2,300	1,100	3,600	1,600	3,700	918	766	228	325	(110)	(73.4)	ND	ND	ND	(113)
XGM-94-04X	200	570	(170)	(28)	ND	ND	ND	ND	ND	ND	ND	243	469	300 J	769	(76.8)
XGM-97-12X	4,500	5,500	5,400	7,500	8,700	7,400	3,810	4,010	4,220	5,260	4,110	2,470 J	463	367 J	840	253
Iron, total - 9,100 µg/L Cleanup Goal																
AAFES-2	24,000	20,000	27,000	26,000	14,000	20,000	21,900	12,000	20,000	18,000	16,000	14,000	22,000	18,000	19,000	19,400
AAFES-6	11,000	9,200	13,000	9,400	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
AAFES-6R**	NC	NC	NC	NC	NC	NC	NC	11,000	11,000	(6,500)	(4,300)	(3,300)	(1,100)	(6,900)	9,200	(8,240)
XGM-93-02X	30,000	18,000	11,000	24,000	15,000	28,000	11,500	13,000	(5,800)	11,000	(8,500)	11,000	12,000	(6,000)	10,000	9,580
XGM-94-07X	(3,500)	(2,900)	(5,800)	(2,300)	(1,000)	(300)	(1,610)	(1,400)	(4,500)	9,300	(8,800)	12,000	13,000	23,000	10,000	(6,820)
XGM-94-08X	(4,800)	13,000	(4,500)	(4,600)	(3,200)	(2,500)	(4,520)	(6,100)	(4,600)	(2,200)	(1,300)	(1,000)	(750)	(2,300)	(910)	(147)
XGM-97-12X	32,000	26,000	33,000	46,000	33,000	32,000	20,100	18,000	22,000	25,000	25,000	16,000	27,000	20,000	24,000	25,800
Manganese, total[3] - 375 µg/L Cleanup Goal																
AAFES-2	4,600	3,900	4,800	3,700	3,100	4,000	3,590	2,700	3,790	3,600	3,320	2,490	3,700	3,100	3,270	3,460
AAFES-5	710	180*	(190)	(27)	(21)	(89)	(118)	(50)	(34)	ND	ND	(244)	(36)	(206)	(127)	(32.5)
AAFES-6	2,900	9,200	3,400	3,000	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
AAFES-6R**	NC	NC	NC	NC	NC	NC	NC	2,900	3,090	3,630	907	1,670	1,830	3,220	2,820	3,000
AAFES-7	NC	NC	NC	NC	NC	NC	NC	NC	NC	(106)/ND	(81)	(79)	(5 J)	706	2,390	1,640
XGM-93-02X	3,900	2,500	1,900	2,500	1,900	2,600	1,450	2,000	1,800	1,420	1,630	737	3,020	612	1,180	1,570
XGM-94-04X	2,900	2,200	3,400	2,000	1,400	1,400	1,580	1,100	559	(68)	2,730	6,490	2,140	2,580	2,730	1,510
XGM-94-07X	5,700	3,700	6,100	4,500	3,600	1,000	6,120	5,100	4,120	5,100	4,990	3,870	6,060	5,560	5,380	6,940
XGM-94-08X	4,500	4,600	4,900	3,600	3,600	3,800	7,260	4,200	3,380	3,100	2,150	2,070	2,780	4,620	2,300	3,210
XGM-94-10X	830	2,000	2,600	(31)	(120)	960	960	330	NC	NC	NC	NC	NC	NC	NC	NC
XGM-97-12X	6,300	4,100	4,200	3,900	4,100	3,000	437	1,800	2,070	3,060	2,390	2,110	3,540	1,640	1,680	2,080

Notes:

Number in parentheses denotes that concentration is below cleanup goal or VPH Boundary Standard.

* = Analyte detected 5 times of the amount detected in the equipment blank sample.

**=AAFES 6R was installed in January 2006 to replace abandoned well AAFES-6.

[1] Adjusted result used beginning with 2006 sample event.

[2] Detection limit was above the cleanup goal or VPH Boundary Standard.

[3] USEPA approved revised cleanup goal effective October 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

TABLE 7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME	ROD Established Clean-up Goals (µg/L)	2446-02											2446-03							
SAMPLING DATE		12/09/2011	05/18/2012	06/11/2012	08/15/2012	08/15/2012	04/19/2013	10/30/2013	10/31/2013	04/23/2014	04/23/2014	11/04/2014	12/06/2011	05/18/2012	06/11/2012	08/16/2012	04/18/2013	10/30/2013	04/23/2014	11/06/2014
UNIT SCREENED		OVERBURDEN											OVERBURDEN							
LOCATION		Source Area											Source Area							
						Duplicate					Duplicate									
DTW		3.91	4.68	6.23	7.46	7.46	4.66	9.98	9.98	3.92	3.92	5.83	6.11	9.42	6.27	8.96	5.95	10.75	4.91	7.97
Ref Elev (RB or PVC)		368.9	368.9	368.9	368.9	368.9	368.9	368.9	368.9	368.9	368.9	368.9	369.2	369.2	369.2	369.2	369.2	369.2	369.2	369.2
Elevation		365	362.4	362.4	362.4	362.4	364.24	358.92	358.92	364.98	364.98	363.07	363.1	359.78	362.93	360.24	363.25	358.45	364.29	361.23
Volatile Organic Compounds (ug/L)																				
1,1,2-Trichloroethane	NA	ND (1)	-	-	-	-	-	-	-	-	-	-	ND (10)	-	-	-	-	-	-	-
Benzene	NA	ND (0.5)	-	-	-	-	-	-	-	-	-	-	ND (5)	-	-	-	-	-	-	-
Toluene	NA	ND (1)	-	-	-	-	-	-	-	-	-	-	ND (10)	-	-	-	-	-	-	-
Ethylbenzene	NA	1	-	-	-	-	-	-	-	-	-	-	160	-	-	-	-	-	-	-
1,2-Dichlorobenzene	NA	ND (1)	-	-	-	-	-	-	-	-	-	-	ND (10)	-	-	-	-	-	-	-
Methyl Tert Butyl Ether	NA	ND (2)	-	-	-	-	-	-	-	-	-	-	ND (20)	-	-	-	-	-	-	-
m,p-Xylenes	NA	ND (2)	-	-	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-
o-Xylene	NA	ND (1)	-	-	-	-	-	-	-	-	-	-	ND (10)	-	-	-	-	-	-	-
Acetone	NA	ND (5)	-	-	-	-	-	-	-	-	-	-	ND (50)	-	-	-	-	-	-	-
n-Butylbenzene	NA	ND (2)	-	-	-	-	-	-	-	-	-	-	ND (20)	-	-	-	-	-	-	-
Naphthalene	NA	ND (2)	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	NA	ND (2)	-	-	-	-	-	-	-	-	-	-	ND (20)	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	NA	4.2	-	-	-	-	-	-	-	-	-	-	64	-	-	-	-	-	-	-
VPH (ug/L)																				
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	ND (50)	-	-	**4530**	**4620**	**2010**	**1540**	**-**	156	139	**1480**	**1340**	-	-	**1500**	**1730**	**779**	**587**	**444**
MADEP C9-C10 AROMATIC HYDROCARBONS	200	ND (50)	-	-	**1200**	**1320**	**1610**	ND (1000)	-	102	107	**873**	**404**	-	-	**514**	**740**	**725**	**401**	**503**
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	ND (50)	-	-	2120	2120	2700	2420	-	169	177	1280	402	-	-	752	990	1000	1000	555
Benzene	5	ND (2)	-	-	4.45	4.11	**ND (10)**	**ND (40)**	**-**	ND (2)	ND (2)	ND (10)	**ND (10)**	-	-	**ND (2)**	**ND (5)**	**ND (5)**	**ND (5)**	**ND (10)**
Ethylbenzene	700	ND (2)	-	-	105	110	526	ND (40)	-	4.14	4.74	484	119	-	-	130	257	366	170	126
Toluene	1000	ND (2)	-	-	ND (2)	ND (2)	ND (10)	ND (40)	-	ND (2)	ND (2)	ND (10)	ND (10)	-	-	4.02	ND (5)	ND (5)	ND (5)	ND (10)
o-Xylene	NA	ND (2)	-	-	19.7	20.7	48.1	ND (40)	-	ND (2)	ND (2)	ND (10)	ND (10)	-	-	7.72	10	10.3	ND (5)	ND (10)
m,p-Xylenes	NA	ND (2)	-	-	57.9	61.1	608	453	-	5.46	5.64	35	22.3	-	-	39.2	49.6	ND (5)	ND (5)	ND (10)
Total Xylenes	10000	ND	-	-	77.6	81.8	656.1	493	-	5.46	5.64	35	32.3	-	-	46.92	59.6	15.3	ND	ND
Methyl Tert Butyl Ether	NA	ND (3)	-	-	ND (3)	ND (3)	ND (15)	ND (60)	-	ND (3)	ND (3)	ND (15)	ND (15)	-	-	3.8	8.06	ND (7.5)	ND (7.5)	ND (15)
Naphthalene	NA	ND (4)	-	-	74.8	78.3	154	91.7	-	ND (4)	ND (4)	77.4	30.5	-	-	23.4	32.4	13.9	16.2	ND (20)
Total BTEX	NA	ND	-	-	187.05	195.91	1182.1	493	-	9.6	10.38	519	151.3	-	-	180.94	316.6	381.3	170	126
Dissolved Metals by MCP (mg/L)																				
Arsenic, Dissolved	0.01	ND (0.005)	-	-	0.006	ND (0.005)	-	-	**0.017**	-	-	**0.025**	**0.056**	-	-	0.035	-	0.041	-	ND (0.005)
Calcium, Dissolved	NA	-	14	700	300	310	410	-	570	220	220	440	-	28	28	24	120	150	49	320
Iron, Dissolved	9.1	0.09	-	-	ND (0.05)	ND (0.05)	-	-	0.05	-	-	**22**	**27**	-	-	**12**	-	5.2	-	**9.5**
Manganese, Dissolved	0.291	0.021	-	-	**0.328**	**8.23**	-	-	**22.5**	-	**-**	**50.5**	**7.64**	-	-	**2.23**	-	3.5	-	**9.72**
Sulfate (mg/L)	NA	14	-	-	16000	18000	2600	-	1900	510	520	1500	10	-	-	ND (10)	1400	1300	250	3600
Bromide (mg/L)	NA	ND (0.05)	-	-	ND (0.5)	ND (0.5)	-	-	0.475	-	-	ND (0.05)	ND (0.05)	-	-	ND (0.5)	-	ND (0.05)	-	ND (0.05)
Methane (ug/L)	NA	ND (5)	-	-	ND (5)	ND (5)	-	60.2	-	-	-	58.8	925	-	-	1060	-	862	-	617
Other (ug/L)	NA																			
Field Parameters																				
Conductivity (mS/cm)	NA	0.131	-	-	-	-	3.637	-	-	1.13	1.13	2.615	-	-	-	0.261	3.011	4	1.27	6.623
Temperature (° Celsius)	NA	-	-	-	-	-	-	-	-	10	10	18.2	-	-	-	-	-	18.5	9.8	16.6
Dissolved Oxygen (mg/L)	NA	1.47	-	-	-	-	4.17	-	-	1.78	1.78	0.44	-	-	-	0.3	-	0.38	0.16	0.08
ORP (mV)	NA	85.4	-	-	-	-	94	-21.8	-	-129	-129	-144	-	-	-	-80.2	-70.9	-220.2	-82	-141.7
pH (SU)	NA	6.18	-	-	-	-	6.23	-	-	6.37	6.37	6.67	-	-	-	6.33	6.72	6.95	6.61	6.91
Turbidity (NTU)	NA	-	-	-	-	-	-	-	-	4.99	4.99	4.11	-	-	-	-	-	4.1	3.27	3.82

NOTES:

1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

TABLE 7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME		2446-04				HA-1B								HA-1S								
SAMPLING DATE	**ROD Established**	12/06/2011	08/15/2012	10/29/2013	11/06/2014	12/08/2011	05/18/2012	06/11/2012	08/17/2012	04/18/2013	10/28/2013	04/24/2014	11/11/2014	12/08/2011	05/18/2012	06/11/2012	08/17/2012	04/18/2013	10/25/2013	04/24/2014	11/11/2014	
UNIT SCREENED	**Clean-up Goals (µg/L)**	OVERBURDEN				BEDROCK								OVERBURDEN								
LOCATION		Downgradient				Downgradient								Downgradient								
DTW		7.41	9.64	11.4	8.35	8.75	9.75	10.55	11.61	9.95	13.89	4.41	5.4	8.88	9.4	10.05	11.38	10.01	Duplicate 10.01	13.89	4.34	5.4
Ref Elev (RB or PVC)		369.4	369.4	369.4	369.4	371.5	371.5	371.5	371.51	371.51	371.5	371.5	371.5	371.4	371.4	371.4	371.38	371.38	371.38	371.5	371.5	371.5
Elevation		362	359.76	358	361.05	362.8	361.75	360.95	359.9	361.56	357.61	367.09	366.1	362.5	362	361.35	360	361.37	361.37	357.61	367.16	366.1
Volatile Organic Compounds (ug/L)					-																	
1,1,2-Trichloroethane	NA	ND (10)	-	-	-	ND (10)	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-
Benzene	NA	ND (5)	-	-	-	ND (5)	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-
Toluene	NA	ND (10)	-	-	-	ND (10)	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	-
Ethylbenzene	NA	27	-	-	-	130	-	-	-	-	-	-	-	570	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	NA	ND (10)	-	-	-	ND (10)	-	-	-	-	-	-	-	ND (10)	-	-	-	-	-	-	-	-
Methyl Tert Butyl Ether	NA	ND (20)	-	-	-	ND (20)	-	-	-	-	-	-	-	ND (20)	-	-	-	-	-	-	-	-
m,p-Xylenes	NA	ND (20)	-	-	-	91	-	-	-	-	-	-	-	330	-	-	-	-	-	-	-	-
o-Xylene	NA	11	-	-	-	ND (10)	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-
Acetone	NA	160	-	-	-	ND (50)	-	-	-	-	-	-	-	380	-	-	-	-	-	-	-	-
n-Butylbenzene	NA	ND (20)	-	-	-	ND (20)	-	-	-	-	-	-	-	ND (20)	-	-	-	-	-	-	-	-
Naphthalene	NA	ND (20)	-	-	-	ND (20)	-	-	-	-	-	-	-	47	-	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	NA	ND (20)	-	-	-	ND (20)	-	-	-	-	-	-	-	75	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	NA	ND (20)	-	-	-	62	-	-	-	-	-	-	-	220	-	-	-	-	-	-	-	-
VPH (ug/L)																						
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	**1730**	**2140**	311	175	**1480**	-	-	240	243	**480**	242	194	**4200**	-	-	**924**	**1700**	**1720**	**990**	**2120**	**741**
MADEP C9-C10 AROMATIC HYDROCARBONS	200	ND (250)	180	**281**	**221**	**638**	-	-	ND (50)	67.5	185	81.2	97.4	**1160**	-	-	**529**	**482**	**467**	**495**	**768**	**397**
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	450	258	229	175	332	-	-	ND (50)	109	162	98.8	95.3	1350	-	-	ND (250)	766	758	441	814	378
Benzene	5	**ND (10)**	2.42	ND (2)	3.39	**ND (10)**	-	-	ND (2)	ND (2)	2.4	ND (2)	ND (2)	**23.3**	-	-	**ND (10)**	ND (4)	ND (4)	3.4	ND (2)	2.76
Ethylbenzene	700	20.5	8.59	ND (2)	ND (2)	103	-	-	11	8.4	3.19	ND (2)	ND (2)	448	-	-	148	200	196	30	120	9.86
Toluene	1000	ND (10)	2.68	ND (2)	ND (2)	ND (10)	-	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	28.2	-	-	11.9	8.58	8.35	2.93	4.83	ND (2)
o-Xylene	NA	ND (10)	5.56	ND (2)	ND (2)	ND (10)	-	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	22	-	-	ND (10)	ND (4)	ND (4)	ND (2)	2.23	ND (2)
m,p-Xylenes	NA	10.4	11.9	ND (2)	ND (2)	75	-	-	4.66	ND (2)	ND (2)	ND (2)	ND (2)	255	-	-	50	ND (4)	ND (4)	ND (2)	ND (2)	ND (2)
Total Xylenes	10000	20.4	17.46	ND	ND	85	-	-	6.66	4	4	ND	ND	277	-	-	60	8	8	4	2.23	ND
Methyl Tert Butyl Ether	NA	ND (15)	8.62	ND (3)	ND (3)	ND (15)	-	-	ND (3)	ND (3)	3.12	ND (3)	ND (3)	ND (15)	-	-	18.2	30.4	30.4	9.94	20.4	4.21
Naphthalene	NA	25.6	31.9	ND (4)	ND (4)	22.8	-	-	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	52.6	-	-	ND (20)	8.93	9.84	4.58	ND (4)	ND (4)
Total BTEX	NA	40.9	31.15	ND	3.39	188	-	-	17.66	12.4	9.59	ND	ND	776.5	-	-	219.9	216.58	212.35	40.33	127.06	12.62
Dissolved Metals by MCP (mg/L)																						
Arsenic, Dissolved	0.01	**0.026**	**0.051**	**0.075**	**0.062**	**0.049**	-	-	0.005	-	**0.03**		**0.022**	**0.036**	-	-	**0.049**	-		**0.036**		**0.037**
Calcium, Dissolved	NA	-	54	84	91	-	24	530	410	380	280	410	160	-	31	270	180	43	43	110	44	59
Iron, Dissolved	9.1	**25**	**29**	**41**	**53**	8.9	-	-	ND (0.05)	-	8.7		5.4	**15**	-	-	**86**	-		**37**		**17**
Manganese, Dissolved	0.291	**5.07**	**4.4**	**5.94**	**6.13**	**4.13**	-	-	ND (0.01)	-	**46.1**		**27.2**	**11.8**	-	-	**85.8**	-		**45.4**		**18.7**
Sulfate (mg/L)	NA	ND (10)	ND (10)	290	810	ND (10)	-	-	4600	1800	1300	2700	800	ND (10)	-	-	1500	200	210	820	160	270
Bromide (mg/L)	NA	0.16	ND (0.5)	ND (0.05)	ND (0.05)	0.1	-	-	ND (1.2)	-	ND (0.05)		ND (0.05)	0.37	-	-	ND (1.2)	-		ND (0.05)		ND (0.05)
Methane (ug/L)	NA	1050	498	990	640	406	-	-	14.6	-	466		0.657	1200	-	-	529	-		597		444
Other (ug/L)	NA																					
Field Parameters																						
Conductivity (mS/cm)	NA	0.6	0.84	1.1	2.069	0.173	0.181	42.1	13.24	3.168	2.17	4.49	1.38	0.402	0.298	3.96	2.71	0.692		-	0.76	0.986
Temperature (° Celsius)	NA	-	-	-	17	-	-	-	-	-	14.2	13.1	14.6	-	-	-	-	-		-	10.7	15.4
Dissolved Oxygen (mg/L)	NA	0.25	0.31	0.4	0.06	0.49	0.11	9999	9999	2.83	0.51	0.17	0.01	0.5	0.12	0.25	0.55	-		-	0.09	0.01
ORP (mV)	NA	-73.9	-121.6	-92.2	-117	-77.6	-203.2	185	42.6	19.3	-84.6	-24	-45.4	-95.8	-124.1	-49.4	-69.7	-43.4		-	-82	-104.8
pH (SU)	NA	6.45	6.65	6.51	6.63	6.49	6.78	13.19	12.59	7.54	6.56	6.55	6.62	6.67	6.63	6.37	5.97	6.87		-	6.77	6.63
Turbidity (NTU)	NA	-	-	2.48	7.49	-	-	-	-	-	7.5	14.3	9.23	-	-	-	-	-		-	2.99	10

NOTES:

1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

TABLE 7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME		HA-2B				HA-2S				HA-3B				HA-3S				HA-4B			
SAMPLING DATE	**ROD Established**	12/09/2011	08/20/2012	10/25/2013	12/05/2014	12/09/2011	08/17/2012	10/24/2013	12/05/2014	12/08/2011	08/21/2012	10/25/2013	11/07/2014	12/06/2011	08/21/2012	10/24/2013	11/07/2014	12/08/2011	08/20/2012	10/25/2013	11/10/2014
UNIT SCREENED	**Clean-up Goals (µg/L)**	BEDROCK				OVERBURDEN				BEDROCK				OVERBURDEN				BEDROCK			
LOCATION		Downgradient				Downgradient				Downgradient				Downgradient				Downgradient			
DTW		5.55	8.41	10.83	6.98	6.75	7.75	9.84	7.84	5.45	7.89	10.4	6.9	8.25	8.36	11.31	8.31	5.88	8.18	10.49	6.88
Ref Elev (RB or PVC)		366.1	366.1	366.1	366.1	366	366	366	366	363.7	363.7	363.7	363.7	363.6	363.6	363.6	363.6	366.1	366.1	366.1	366.1
Elevation		360.6	357.69	355.27	359.12	359.3	358.25	356.16	358.16	358.3	355.81	353.3	356.8	355.4	355.24	352.29	355.29	360.2	357.92	355.61	359.22
Volatile Organic Compounds (ug/L)																					
1,1,2-Trichloroethane	NA	ND (1)	-	-	-	ND (10)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-
Benzene	NA	1.4	-	-	-	ND (5)	-	-	-	ND (0.5)	-	-	-	ND (0.5)	-	-	-	ND (0.5)	-	-	-
Toluene	NA	ND (1)	-	-	-	ND (10)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-
Ethylbenzene	NA	ND (1)	-	-	-	ND (10)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-
1,2-Dichlorobenzene	NA	ND (1)	-	-	-	ND (10)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-
Methyl Tert Butyl Ether	NA	ND (2)	-	-	-	ND (20)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-
m,p-Xylenes	NA	ND (2)	-	-	-	ND (20)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-
o-Xylene	NA	ND (1)	-	-	-	ND (10)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-
Acetone	NA	ND (5)	-	-	-	ND (50)	-	-	-	ND (5)	-	-	-	ND (5)	-	-	-	ND (5)	-	-	-
n-Butylbenzene	NA	ND (2)	-	-	-	ND (20)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-
Naphthalene	NA	ND (2)	-	-	-	ND (20)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-
1,3,5-Trimethylbenzene	NA	ND (2)	-	-	-	ND (20)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-
1,2,4-Trimethylbenzene	NA	ND (2)	-	-	-	ND (20)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-
VPH (ug/L)																					
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	121	314	ND (50)	ND (50)	**477**	ND (50)	ND (50)	67.5	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)
MADEP C9-C10 AROMATIC HYDROCARBONS	200	ND (50)	ND (50)	ND (50)	ND (50)	88.9	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	ND (50)	69.3	ND (50)	ND (50)	79.3	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)
Benzene	5	ND (2)	4.11	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Ethylbenzene	700	ND (2)	3.37	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Toluene	1000	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
o-Xylene	NA	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
m,p-Xylenes	NA	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Total Xylenes	10000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert Butyl Ether	NA	ND (3)	ND (3)	ND (3)	ND (3)	3.38	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
Naphthalene	NA	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)
Total BTEX	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Metals by MCP (mg/L)																					
Arsenic, Dissolved	0.01	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	**0.017**	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.006	0.006	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.006	0.009	0.009	ND (0.005)
Calcium, Dissolved	NA	-	48	88	120	-	39	100	130	-	28	28	24	-	52	68	66	-	24	26	20
Iron, Dissolved	9.1	0.07	0.17	0.25	0.27	1.6	0.1	0.08	1.4	ND (0.05)	ND (0.05)	0.48	0.29	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	0.06	0.05
Manganese, Dissolved	0.291	**0.63**	**0.939**	**2.78**	**3.51**	**4.61**	**0.663**	**2.8**	**3.24**	0.023	0.019	0.238	0.135	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	0.027	0.018	0.041	0.077
Sulfate (mg/L)	NA	ND (10)	56	370	690	ND (10)	10	150	490	ND (10)	ND (10)	ND (10)	12	24	23	29	31	ND (10)	ND (10)	ND (10)	ND (10)
Bromide (mg/L)	NA	0.55	ND (0.5)	0.281	0.166	0.16	ND (0.5)	-	-	ND (0.05)	ND (0.5)	-	-	ND (0.05)	ND (0.5)	-	-	0.05	ND (0.5)	-	-
Methane (ug/L)	NA	157	386	-	-	487	80.6	-	-	ND (5)	ND (5)	-	-	ND (5)	ND (5)	-	-	ND (5)	ND (5)	-	-
Other (ug/L)	NA																				
Field Parameters																					
Conductivity (mS/cm)	NA	-	-	-	-	-	-	-	-	-	-	-	0.3129	-	-	-	0.606	-	-	-	0.276
Temperature (° Celsius)	NA	-	-	-	-	-	-	-	-	-	-	-	16	-	-	-	16.7	-	-	-	16.1
Dissolved Oxygen (mg/L)	NA	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	0.43	-	-	-	0.04
ORP (mV)	NA	-	-	-	-	-	-	-	-	-	-	-	-160.5	-	-	-	47.7	-	-	-	-158.1
pH (SU)	NA	-	-	-	-	-	-	-	-	-	-	-	7.47	-	-	-	7.14	-	-	-	7.73
Turbidity (NTU)	NA	-	-	-	-	-	-	-	-	-	-	-	26.5	-	-	-	32.8	-	-	-	9.31

NOTES:

1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

TABLE 7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME		HA-4S				HA-5S						HA-6B						
SAMPLING DATE	**ROD Established**	12/08/2011	08/20/2012	10/24/2013	11/10/2014	12/05/2011	05/18/2012	06/11/2012	08/15/2012	10/30/2013	11/04/2014	12/05/2011	05/18/2012	06/11/2012	08/16/2012		10/30/2013	11/06/2014
UNIT SCREENED	**Clean-up Goals (µg/L)**		OVERBURDEN					OVERBURDEN							BEDROCK			
LOCATION			Downgradient					Source Area							Source Area			
																Duplicate		
DTW		7.05	7.42	10.65	7.35	4.91	5.1	5.35	7.84	10.28	6.15	5.55	5.29	5.83	7.98	7.98	10.51	6.45
Ref Elev (RB or PVC)		366.3	366.3	366.3	366.3	368.8	368.78	368.78	368.78	368.8	368.8	368.9	368.9	368.9	368.9	368.9	368.9	368.9
Elevation		359.3	358.88	355.65	358.95	363.9	363.68	363.43	360.94	358.52	362.65	360.2	363.61	363.07	360.92	360.92	358.39	362.45
Volatile Organic Compounds (ug/L)																		
1,1,2-Trichloroethane	NA	ND (1)	-	-	-	ND (1)	-	-	-	-	-	ND (10)	-	-	-	-	-	-
Benzene	NA	ND (0.5)	-	-	-	ND (0.5)	-	-	-	-	-	19	-	-	-	-	-	-
Toluene	NA	ND (1)	-	-	-	ND (1)	-	-	-	-	-	19	-	-	-	-	-	-
Ethylbenzene	NA	ND (1)	-	-	-	ND (1)	-	-	-	-	-	1000	-	-	-	-	-	-
1,2-Dichlorobenzene	NA	ND (1)	-	-	-	ND (1)	-	-	-	-	-	ND (10)	-	-	-	-	-	-
Methyl Tert Butyl Ether	NA	ND (2)	-	-	-	ND (2)	-	-	-	-	-	ND (20)	-	-	-	-	-	-
m,p-Xylenes	NA	ND (2)	-	-	-	2.6	-	-	-	-	-	460	-	-	-	-	-	-
o-Xylene	NA	ND (1)	-	-	-	2.8	-	-	-	-	-	26	-	-	-	-	-	-
Acetone	NA	ND (5)	-	-	-	12	-	-	-	-	-	ND (50)	-	-	-	-	-	-
n-Butylbenzene	NA	ND (2)	-	-	-	ND (2)	-	-	-	-	-	ND (20)	-	-	-	-	-	-
Naphthalene	NA	ND (2)	-	-	-	ND (2)	-	-	-	-	-	95	-	-	-	-	-	-
1,3,5-Trimethylbenzene	NA	ND (2)	-	-	-	ND (2)	-	-	-	-	-	93	-	-	-	-	-	-
1,2,4-Trimethylbenzene	NA	ND (2)	-	-	-	3.6	-	-	-	-	-	260	-	-	-	-	-	-
VPH (ug/L)																		
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	-	-	**4880**	**1790**	**909**	**4750**	-	-	**1410**	**888**	**931**	**715**
MADEP C9-C10 AROMATIC HYDROCARBONS	200	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	-	-	**886**	**1580**	**872**	**1310**	-	-	**610**	**1040**	**706**	**450**
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	-	-	1470	2040	1080	1850	-	-	1350	ND (250)	1210	438
Benzene	5	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	**11.8**	**ND (10)**	**ND (5)**	**28.2**	-	-	**ND (10)**	**ND (10)**	**ND (10)**	3.83
Ethylbenzene	700	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	64.3	190	301	**782**	-	-	321	510	480	42.3
Toluene	1000	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	11.9	30.7	ND (5)	20.3	-	-	22.6	35.5	ND (10)	2.28
o-Xylene	NA	ND (2)	ND (2)	ND (2)	ND (2)	2.87	-	-	35.2	162	13.5	26.2	-	-	ND (10)	14.2	ND (10)	ND (2)
m,p-Xylenes	NA	ND (2)	ND (2)	ND (2)	ND (2)	2.92	-	-	39.5	586	81.4	346	-	-	144	235	ND (10)	ND (2)
Total Xylenes	10000	ND	ND	ND	ND	5.79	-	-	74.7	748	94.9	372.2	-	-	154	249.2	ND	ND
Methyl Tert Butyl Ether	NA	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	-	-	ND (3)	ND (15)	ND (7.5)	ND (30)	-	-	ND (15)	16.1	ND (15)	8.98
Naphthalene	NA	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	-	-	24.6	137	135	104	-	-	66.4	89.4	ND (20)	4.6
Total BTEX	NA	ND	ND	ND	ND	5.79	-	-	162.7	968.7	395.9	1202.7	-	-	497.6	794.7	ND	48.41
Dissolved Metals by MCP (mg/L)																		
Arsenic, Dissolved	0.01	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	-	-	**0.015**	**0.021**	**0.014**	**0.067**	-	-	**0.028**	**0.027**	**0.046**	**0.01**
Calcium, Dissolved	NA	-	16	58	41	-	9.8	560	390	390	350	-	52	77	130	130	350	34
Iron, Dissolved	9.1	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	-	-	ND (0.05)	0.05	**9.5**	4.8	-	-	**94**	**94**	**73**	6.2
Manganese, Dissolved	0.291	ND (0.01)	ND (0.01)	0.019	ND (0.01)	0.012	-	-	**33.4**	**72**	**22.5**	**3.41**	-	-	**49.6**	**48.1**	**54**	**3.86**
Sulfate (mg/L)	NA	15	ND (10)	20	19	24	-	-	18000	2800	1100	ND (10)	-	-	1200	1400	3400	68
Bromide (mg/L)	NA	ND (0.05)	ND (0.5)	-	-	ND (0.05)	-	-	ND (0.5)	ND (0.05)	ND (0.05)	0.09	-	-	ND (0.5)	ND (0.5)	ND (0.05)	ND (0.05)
Methane (ug/L)	NA	ND (5)	ND (5)	-	-	ND (5)	-	-	5.74	-	-	1740	-	-	1040	1350	-	-
Other (ug/L)	NA																	
Field Parameters																		
Conductivity (mS/cm)	NA	-	-	-	0.531	0.15	-	-	30.9	5.03	2.114	0.59	-	-	2.94		5.43	0.574
Temperature (° Celsius)	NA	-	-	-	15.7	-	-	-	-	17.6	18	-	-	-	-		16.4	16.2
Dissolved Oxygen (mg/L)	NA	-	-	-	4.93	1.72	-	-	13.72	0.76	0.11	0.38	-	-	0.29		0.4	0.04
ORP (mV)	NA	-	-	-	76.7	102.5	-	-	273	-41.2	-166.2	-97.6	-	-	-86.6		-131	-127
pH (SU)	NA	-	-	-	7.36	6.07	-	-	6.86	6.2	6.63	7.14	-	-	6.2		6.39	6.62
Turbidity (NTU)	NA	-	-	-	5.07	-	-	-	-	44.1	21.6	-	-	-	-		4.17	3.64

NOTES:

1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

TABLE 7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME		INJ-01		XJM-93-01X						XJM-93-02X				XJM-93-03X					
SAMPLING DATE	**ROD Established**	05/18/2012	06/11/2012	12/06/2011	05/18/2012	06/11/2012	08/14/2012	10/24/2013	11/10/2014	12/06/2011	08/15/2012	10/24/2013	11/06/2014	12/09/2011	05/18/2012	06/11/2012	08/17/2012	10/29/2013	11/12/2014
UNIT SCREENED	**Clean-up Goals (µg/L)**	BEDROCK		OVERBURDEN						OVERBURDEN				OVERBURDEN					
LOCATION		Source Area		Upgradient						Downgradient				Downgradient					
DTW		4.14	4.28	8.24	5.8	6.06	6.25	8.99	5.65	9.66	12.41	13.49	10.91	5.41	5.99	6.23	14.6	9.92	6.52
Ref Elev (RB or PVC)		-	-	371.4	371.4	371.4	371.4	371.4	371.4	370.6	370.6	370.6	370.6	368	368	368	368	368	368
Elevation		-	-	363.16	365.6	365.34	365.15	362.41	365.75	360.9	358.19	357.11	359.69	362.6	362.01	361.77	353.4	358.08	361.48
Volatile Organic Compounds (ug/L)																			
1,1,2-Trichloroethane	NA	-	-	ND (1)	-	-	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Benzene	NA	-	-	ND (0.5)	-	-	-	-	-	ND (0.5)	-	-	-	ND (0.5)	-	-	-	-	-
Toluene	NA	-	-	ND (1)	-	-	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Ethylbenzene	NA	-	-	ND (1)	-	-	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
1,2-Dichlorobenzene	NA	-	-	ND (1)	-	-	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Methyl Tert Butyl Ether	NA	-	-	ND (2)	-	-	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
m,p-Xylenes	NA	-	-	ND (2)	-	-	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
o-Xylene	NA	-	-	ND (1)	-	-	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Acetone	NA	-	-	ND (5)	-	-	-	-	-	ND (5)	-	-	-	ND (5)	-	-	-	-	-
n-Butylbenzene	NA	-	-	ND (2)	-	-	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
Naphthalene	NA	-	-	ND (2)	-	-	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
1,3,5-Trimethylbenzene	NA	-	-	ND (2)	-	-	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
1,2,4-Trimethylbenzene	NA	-	-	ND (2)	-	-	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
VPH (ug/L)																			
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	-	-	ND (50)	-	-	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	-	-	ND (50)	ND (50)	55.5
MADEP C9-C10 AROMATIC HYDROCARBONS	200	-	-	ND (50)	-	-	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	69.4	ND (50)	ND (50)	-	-	ND (50)	ND (50)	ND (50)
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	-	-	ND (50)	-	-	ND (50)	ND (50)	ND (50)	ND (50)	60.6	ND (50)	ND (50)	ND (50)	-	-	ND (50)	ND (50)	72.3
Benzene	5	-	-	ND (2)	-	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	ND (2)	ND (2)	ND (2)
Ethylbenzene	700	-	-	ND (2)	-	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	ND (2)	ND (2)	ND (2)
Toluene	1000	-	-	ND (2)	-	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	ND (2)	ND (2)	ND (2)
o-Xylene	NA	-	-	ND (2)	-	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	ND (2)	ND (2)	ND (2)
m,p-Xylenes	NA	-	-	ND (2)	-	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	-	-	ND (2)	ND (2)	ND (2)
Total Xylenes	10000	-	-	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-	-	ND	ND	ND
Methyl Tert Butyl Ether	NA	-	-	ND (3)	-	-	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	-	-	ND (3)	ND (3)	ND (3)
Naphthalene	NA	-	-	ND (4)	-	-	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	-	-	ND (4)	ND (4)	ND (4)
Total BTEX	NA	-	-	ND			ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND
Dissolved Metals by MCP (mg/L)																			
Arsenic, Dissolved	0.01	-	-	ND (0.005)	-	-	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	-	-	ND (0.005)	0.006	**0.014**
Calcium, Dissolved	NA	22	270	-	25	30	33	46	21	-	37	51	18	-	7.9	1.9	1.1	22	87
Iron, Dissolved	9.1	-	-	ND (0.05)	-	-	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	0.78	0.12	ND (0.05)	-	-	0.28	1.6	**14**
Manganese, Dissolved	0.291	-	-	ND (0.01)	-	-	ND (0.01)	ND (0.01)	ND (0.01)	**1.34**	**1.85**	**9.87**	**0.652**	0.017	-	-	0.09	**0.89**	**5.22**
Sulfate (mg/L)	NA	-	-	27	-	-	15	10	11	25	22	220	63	ND (10)	-	-	ND (10)	31	460
Bromide (mg/L)	NA	-	-	ND (0.05)	-	-	ND (0.5)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.5)	-	-	ND (0.05)	-	-	ND (0.5)	-	-
Methane (ug/L)	NA	-	-	ND (5)	-	-	ND (5)	ND (5)	ND (0.5)	ND (5)	73	-	-	ND (5)	-	-	274	-	-
Other (ug/L)	NA																		
Field Parameters																			
Conductivity (mS/cm)	NA	-	-	-	-	-	-	-	0.2084	-	-	-	0.3236	-	-	-	-	-	1.383
Temperature (° Celsius)	NA	-	-	-	-	-	-	-	15.4	-	-	-	14.8	-	-	-	-	-	17.7
Dissolved Oxygen (mg/L)	NA	-	-	-	-	-	-	-	4.03	-	-	-	1.65	-	-	-	-	-	0
ORP (mV)	NA	-	-	-	-	-	-	-	103	-	-	-	157.3	-	-	-	-	-	-96.6
pH (SU)	NA	-	-	-	-	-	-	-	6.34	-	-	-	5.92	-	-	-	-	-	6.68
Turbidity (NTU)	NA	-	-	-	-	-	-	-	1.96	-	-	-	4.62	-	-	-	-	-	20.2

NOTES:
1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

TABLE 7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME		XJM-93-04X				XJM-94-05X								XJM-94-06X		XJM-94-07X			XJM-94-08X		
SAMPLING DATE	**ROD Established**	12/05/2011	08/15/2012	10/30/2013	11/10/2014	12/08/2011	05/18/2012	06/11/2012	08/16/2012	04/19/2013	10/31/2013	04/23/2014	11/05/2014	10/31/2013	11/05/2014	12/06/2011	08/21/2012	11/07/2014	12/07/2011	10/28/2013	11/11/2014
UNIT SCREENED	**Clean-up Goals (µg/L)**	BEDROCK				OVERBURDEN										OVERBURDEN			OVERBURDEN		
LOCATION		Upgradient				Source Area										Downgradient			Downgradient		
DTW		5.8	5.29	11.59	3.14	5.11	5.75	5.65	7.5	5.2	10.19	4.97	6.4	-	6.7	7.1	9.17	7.85	9.75	13.13	11.08
Ref Elev (RB or PVC)		371.2	371.2	371.2	371.2	368.5	368.5	368.5	368.5	368.5	368.5	368.5	368.5	-	-	365	365	365	369.3	369.3	369.3
Elevation		365.4	365.91	359.61	368.06	363.4	362.75	362.85	361	363.3	358.31	363.53	362.1	-	-	357.9	359.6	357.15	359.55	356.17	358.22
Volatile Organic Compounds (ug/L)																					
1,1,2-Trichloroethane	NA	ND (1)	-	-	-	11	-	-	-	-	-	-	-	-	-	ND (1)	-	-	ND (1)	-	-
Benzene	NA	ND (0.5)	-	-	-	ND (5)	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-	ND (0.5)	-	-
Toluene	NA	ND (1)	-	-	-	ND (10)	-	-	-	-	-	-	-	-	-	ND (1)	-	-	ND (1)	-	-
Ethylbenzene	NA	ND (1)	-	-	-	39	-	-	-	-	-	-	-	-	-	ND (1)	-	-	ND (1)	-	-
1,2-Dichlorobenzene	NA	ND (1)	-	-	-	ND (10)	-	-	-	-	-	-	-	-	-	ND (1)	-	-	ND (1)	-	-
Methyl Tert Butyl Ether	NA	ND (2)	-	-	-	ND (20)	-	-	-	-	-	-	-	-	-	ND (2)	-	-	ND (2)	-	-
m,p-Xylenes	NA	ND (2)	-	-	-	46	-	-	-	-	-	-	-	-	-	ND (2)	-	-	ND (2)	-	-
o-Xylene	NA	ND (1)	-	-	-	ND (10)	-	-	-	-	-	-	-	-	-	ND (1)	-	-	ND (1)	-	-
Acetone	NA	ND (5)	-	-	-	150	-	-	-	-	-	-	-	-	-	ND (5)	-	-	ND (5)	-	-
n-Butylbenzene	NA	ND (2)	-	-	-	ND (20)	-	-	-	-	-	-	-	-	-	ND (2)	-	-	ND (2)	-	-
Naphthalene	NA	ND (2)	-	-	-	ND (20)	-	-	-	-	-	-	-	-	-	ND (2)	-	-	ND (2)	-	-
1,3,5-Trimethylbenzene	NA	ND (2)	-	-	-	ND (20)	-	-	-	-	-	-	-	-	-	ND (2)	-	-	ND (2)	-	-
1,2,4-Trimethylbenzene	NA	ND (2)	-	-	-	92	-	-	-	-	-	-	-	-	-	ND (2)	-	-	ND (2)	-	-
VPH (ug/L)																					
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	ND (50)	ND (50)	68.6	ND (50)	**1320**	-	-	**598**	**473**	303	270	**748**	ND (50)	ND (50)	ND (50)	250	ND (50)	ND (50)	ND (50)	ND (50)
MADEP C9-C10 AROMATIC HYDROCARBONS	200	ND (50)	ND (50)	ND (50)	ND (50)	**375**	-	-	ND (50)	**644**	**479**	175	**760**	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	ND (50)	ND (50)	85.2	ND (50)	453	-	-	151	1160	487	631	1050	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)
Benzene	5	ND (2)	ND (2)	ND (2)	ND (2)	ND (10)	-	-	ND (2)	ND (10)	ND (4)	ND (4)	**ND (10)**	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Ethylbenzene	700	ND (2)	ND (2)	ND (2)	ND (2)	37.4	-	-	12.6	386	128	128	333	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Toluene	1000	ND (2)	ND (2)	ND (2)	ND (2)	ND (10)	-	-	ND (2)	ND (10)	ND (4)	ND (4)	ND (10)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
o-Xylene	NA	ND (2)	ND (2)	ND (2)	ND (2)	ND (10)	-	-	ND (2)	ND (10)	ND (4)	ND (4)	ND (10)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
m,p-Xylenes	NA	ND (2)	ND (2)	2.14	ND (2)	41.4	-	-	6.92	191	ND (4)	31	21.6	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Total Xylenes	10000	ND	ND	4.41	ND	51.4	-	-	8.92	201	8	31	21.6	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert Butyl Ether	NA	ND (3)	ND (3)	ND (3)	ND (3)	ND (15)	-	-	ND (3)	ND (15)	ND (6)	ND (6)	ND (15)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
Naphthalene	NA	ND (4)	ND (4)	ND (4)	ND (4)	ND (20)	-	-	ND (4)	82.8	43.8	17.1	62.2	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)
Total BTEX	NA	ND	ND	4.41	ND	88.8			21.52	587	136	159	354.6	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Metals by MCP (mg/L)																					
Arsenic, Dissolved	0.01	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.006	-	-	0.005	-	**0.033**	-	**0.04**	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)
Calcium, Dissolved	NA	-	26	24	13	-	27	220	410	120	110	110	120	65	51	-	290	77	-	64	53
Iron, Dissolved	9.1	ND (0.05)	0.05	ND (0.05)	ND (0.05)	0.94	-	-	0.12	-	8.5	-	**17**	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	0.06	ND (0.05)
Manganese, Dissolved	0.291	ND (0.01)	0.055	0.132	ND (0.01)	**1.21**	-	-	**1.75**	-	**7.28**	-	**3.4**	ND (0.01)	0.02	0.013	ND (0.01)	0.028	**1.22**	**1.27**	**0.604**
Sulfate (mg/L)	NA	ND (10)	30	-	-	ND (10)	-	-	1600	1200	540	960	1100	23	22	38	970	360	ND (10)	71	10
Bromide (mg/L)	NA	ND (0.05)	ND (0.5)	-	-	0.33	-	-	ND (0.5)	-	-	-	-	-	-	0.26	ND (1.2)	-	ND (0.05)	-	-
Methane (ug/L)	NA	ND (5)	ND (5)	-	-	832	-	-	17.2	-	22.5	-	0.615	-	-	-	-	-	91.7	-	-
Other (ug/L)	NA																				
Field Parameters																					
Conductivity (mS/cm)	NA	-	-	-	0.976	0.22	-	-	3.36	1.99	1.9	2.33	2.884	-	0.578	-	-	0.76	-	-	0.688
Temperature (° Celsius)	NA	-	-	-	14.2	-	-	-	-	-	18.8	10	18.4	-	18	-	-	12	-	-	14
Dissolved Oxygen (mg/L)	NA	-	-	-	3.8	3.1	-	-	9999	1.08	1.14	2.07	2.27	-	0.06	-	-	0.54	-	-	0.28
ORP (mV)	NA	-	-	-	113	-41	-	-	209.2	-16.7	-57.4	2	-111	-	45.8	-	-	13	-	-	52
pH (SU)	NA	-	-	-	6.33	6.68	-	-	7.03	6.27	6.58	6.45	6.77	-	6.81	-	-	6.49	-	-	7.04
Turbidity (NTU)	NA	-	-	-	4.91	-	-	-	-	-	41.2	19.9	5.22	-	2.32	-	-	3.56	-	-	3.66

NOTES:

1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

TABLE7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME		XJM-94-09X				XJM-94-10X				XJM-97-11X					
SAMPLING DATE	**ROD Established**	12/05/2011	08/17/2012	10/29/2013	11/10/2014	12/07/2011	08/22/2012	10/28/2013	11/11/2014	12/07/2011	08/22/2012	04/18/2013	10/28/2013	04/24/2014	11/11/2014
UNIT SCREENED	**Clean-up Goals (µg/L)**	OVERBURDEN				OVERBURDEN				BEDROCK					
LOCATION		Upgradient				Upgradient				Upgradient					
DTW		7.58	11.39	14.77	8.91	8.72	12.02	14.66	10.45	8.25	11.81	8.43	14.62	7.7	9.45
Ref Elev (RB or PVC)		371.6	371.6	371.6	371.6	371.4	371.4	371.4	371.4	371.5	371.5	371.5	371.5	371.5	371.5
Elevation		364	360.21	356.83	362.69	362.7	359.38	356.74	360.95	363.3	359.69	363.07	356.88	363.8	362.05
Volatile Organic Compounds (ug/L)															
1,1,2-Trichloroethane	NA	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Benzene	NA	ND (0.5)	-	-	-	ND (0.5)	-	-	-	ND (0.5)	-	-	-	-	-
Toluene	NA	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Ethylbenzene	NA	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
1,2-Dichlorobenzene	NA	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Methyl Tert Butyl Ether	NA	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
m,p-Xylenes	NA	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
o-Xylene	NA	ND (1)	-	-	-	ND (1)	-	-	-	ND (1)	-	-	-	-	-
Acetone	NA	ND (5)	-	-	-	ND (5)	-	-	-	ND (5)	-	-	-	-	-
n-Butylbenzene	NA	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
Naphthalene	NA	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
1,3,5-Trimethylbenzene	NA	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
1,2,4-Trimethylbenzene	NA	ND (2)	-	-	-	ND (2)	-	-	-	ND (2)	-	-	-	-	-
VPH (ug/L)															
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	**476**	72.9	**610**	ND (50)	72
MADEP C9-C10 AROMATIC HYDROCARBONS	200	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	72.9	ND (50)	186	ND (50)	ND (50)
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	53.6	ND (50)	ND (50)	ND (50)	102	ND (50)	172	ND (50)	ND (50)
Benzene	5	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	2.05	ND (2)	ND (2)
Ethylbenzene	700	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	15.8	ND (2)	ND (2)
Toluene	1000	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	2.55	ND (2)	ND (2)
o-Xylene	NA	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
m,p-Xylenes	NA	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Total Xylenes	10000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert Butyl Ether	NA	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	3.32	ND (3)	6.15	ND (3)	ND (3)
Naphthalene	NA	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	5.83	ND (4)	ND (4)
Total BTEX	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.4	ND	ND
Dissolved Metals by MCP (mg/L)															
Arsenic, Dissolved	0.01	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	-	ND (0.005)	-	ND (0.005)
Calcium, Dissolved	NA	-	10	13	11	-	-	42	38	-	-	37	44	43	38
Iron, Dissolved	9.1	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	-	ND (0.05)	-	0.07
Manganese, Dissolved	0.291	ND (0.01)	ND (0.01)	ND (0.01)	**0.778**	ND (0.01)	ND (0.01)	0.023	0.022	ND (0.01)	**2.41**	-	**4.05**	-	**3.11**
Sulfate (mg/L)	NA	ND (10)	ND (10)	-	-	13	12	14	16	11	120	14	80	18	51
Bromide (mg/L)	NA	ND (0.05)	ND (0.5)	-	-	ND (0.05)	ND (0.5)	-	-	ND (0.05)	ND (0.5)	-	-	-	-
Methane (ug/L)	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other (ug/L)	NA														
Field Parameters															
Conductivity (mS/cm)	NA	-	-	-	0.095	-	-	-	0.3173	0.303	0.413	0.2764	0.418	-	0.3456
Temperature (° Celsius)	NA	-	-	-	12.8	-	-	-	14.1	-	-	-	12.6	-	13.2
Dissolved Oxygen (mg/L)	NA	-	-	-	2.57	-	-	-	1.28	4.32	1.13	3.06	0.44	-	0.42
ORP (mV)	NA	-	-	-	156.5	-	-	-	45.3	89.4	192	66	-10.6	-	20.1
pH (SU)	NA	-	-	-	5.6	-	-	-	7.12	7	6.08	7.4	6.46	-	6.8
Turbidity (NTU)	NA	-	-	-	1.5	-	-	-	2.08	-	-	-	2.21	-	2.25

NOTES:

1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

TABLE 7.9
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENTS - 2011 THROUGH 2014
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-085

MONITORING LOCATION NAME		XJM-97-12X								XJM-97-13X			
SAMPLING DATE	**ROD Established**	12/08/2011	05/18/2012	06/11/2012	08/17/2012	04/19/2013	10/30/2013	04/23/2014	11/05/2014	12/07/2011	08/22/2012	10/28/2013	11/12/2014
UNIT SCREENED	**Clean-up Goals (µg/L)**	BEDROCK								BEDROCK			
LOCATION		Source Area								Downgradient			
DTW		4.71	5.5	5.5	11.28	5.15	10.14	4.54	5.97	8.6	7.5	13.65	9.47
Ref Elev (RB or PVC)		368.4	368.4	368.4	368.4	368.4	368.4	368.4	368.4	369.3	369.3	369.3	369.3
Elevation		363.7	362.9	362.9	357.12	363.25	358.26	363.86	362.43	360.7	361.8	355.65	359.83
Volatile Organic Compounds (ug/L)													
1,1,2-Trichloroethane	NA	32	-	-	-	-	-	-	-	ND (1)	-	-	-
Benzene	NA	8.4	-	-	-	-	-	-	-	ND (0.5)	-	-	-
Toluene	NA	32	-	-	-	-	-	-	-	ND (1)	-	-	-
Ethylbenzene	NA	330	-	-	-	-	-	-	-	ND (1)	-	-	-
1,2-Dichlorobenzene	NA	ND (5)	-	-	-	-	-	-	-	ND (1)	-	-	-
Methyl Tert Butyl Ether	NA	ND (10)	-	-	-	-	-	-	-	ND (2)	-	-	-
m,p-Xylenes	NA	300	-	-	-	-	-	-	-	ND (2)	-	-	-
o-Xylene	NA	ND (5)	-	-	-	-	-	-	-	ND (1)	-	-	-
Acetone	NA	ND (25)	-	-	-	-	-	-	-	ND (5)	-	-	-
n-Butylbenzene	NA	26	-	-	-	-	-	-	-	ND (2)	-	-	-
Naphthalene	NA	67	-	-	-	-	-	-	-	ND (2)	-	-	-
1,3,5-Trimethylbenzene	NA	120	-	-	-	-	-	-	-	ND (2)	-	-	-
1,2,4-Trimethylbenzene	NA	390	-	-	-	-	-	-	-	ND (2)	-	-	-
VPH (ug/L)													
MADEP C5-C8 ALIPHATIC HYDROCARBONS, ADJUSTED	400	**3440**	-	-	**1800**	**1830**	**658**	**1360**	**1950**	ND (50)	ND (50)	ND (50)	ND (50)
MADEP C9-C10 AROMATIC HYDROCARBONS	200	**1680**	-	-	**699**	**892**	**722**	**674**	**865**	ND (50)	ND (50)	ND (50)	ND (50)
MADEP C9-C12 ALIPHATIC HYDROCARBONS, ADJUSTED	4000	1610	-	-	1550	1790	1090	1830	900	ND (50)	ND (50)	ND (50)	ND (50)
Benzene	5	17.4	-	-	**ND (10)**	**ND (10)**	**ND (10)**	**ND (5)**	**ND (10)**	ND (2)	ND (2)	ND (2)	ND (2)
Ethylbenzene	700	286	-	-	410	**781**	393	346	131	ND (2)	ND (2)	ND (2)	ND (2)
Toluene	1000	33.3	-	-	25.2	ND (10)	ND (10)	ND (5)	ND (10)	ND (2)	ND (2)	ND (2)	ND (2)
o-Xylene	NA	ND (10)	-	-	ND (10)	ND (10)	ND (10)	ND (5)	ND (10)	ND (2)	ND (2)	ND (2)	ND (2)
m,p-Xylenes	NA	253	-	-	145	46.9	ND (10)	ND (5)	38.7	ND (2)	ND (2)	ND (2)	ND (2)
Total Xylenes	10000	263	-	-	155	56.9	20	ND	38.7	ND	ND	ND	ND
Methyl Tert Butyl Ether	NA	15.7	-	-	ND (15)	17.6	ND (15)	13.9	ND (15)	ND (3)	ND (3)	ND (3)	ND (3)
Naphthalene	NA	67.4	-	-	50	107	47.2	15.3	27.5	ND (4)	ND (4)	ND (4)	ND (4)
Total BTEX	NA	599.7			590.2	837.9	413	346	169.7	ND	ND	ND	ND
Dissolved Metals by MCP (mg/L)													
Arsenic, Dissolved	0.01	**0.041**	-	-	**0.044**	-	**0.042**	-	**0.011**	ND (0.005)	ND (0.005)	-	-
Calcium, Dissolved	NA	-	30	87	160	160	140	210	30	-	-	-	-
Iron, Dissolved	9.1	8	-	-	**140**	-	**31**	-	6.5	ND (0.05)	ND (0.05)	-	-
Manganese, Dissolved	0.291	**2.74**	-	-	**72.4**	-	**13.6**	-	**3.68**	0.014	0.013	-	-
Sulfate (mg/L)	NA	ND (10)	-	-	1900	1400	1200	1900	20	ND (10)	ND (10)	-	-
Bromide (mg/L)	NA	0.07	-	-	ND (1.2)	-	ND (0.05)	-	ND (0.05)	ND (0.05)	ND (0.5)	-	-
Methane (ug/L)	NA	1490	-	-	1020	-	1740	-	1380	-	-	-	-
Other (ug/L)	NA												
Field Parameters													
Conductivity (mS/cm)	NA	0.305	-	-	4.32	2.528	2.9	-	0.4501	-	-	-	0.2947
Temperature (° Celsius)	NA	-	-	-	-	-	17.4	-	17.3	-	-	-	12.6
Dissolved Oxygen (mg/L)	NA	0.4	-	-	0.56	0.46	0.43	-	0.23	-	-	-	0.01
ORP (mV)	NA	-189.5	-	-	-81.9	-92.8	-152	-	-115.9	-	-	-	-64.3
pH (SU)	NA	6.63	-	-	6.01	6.54	6.63	-	6.48	-	-	-	7.66
Turbidity (NTU)	NA	-	-	-	-	-	13.9	-	0.68	-	-	-	1.54

NOTES:
1. Table includes only those compounds that were detected in at least one sample.
2. **Bold values indicate that the detected value exceeds the ROD established clean-up goal.**
3. ND (5): Not detected; number in parentheses is the laboratory reporting limit.
4. D: Concentration of methane was quantified from diluted analysis.
5. "--" = Not analyzed.
6. Field parameters at 2446-02 were not collected in the August sampling round due to well running dry.

7. DO Values greater than 12.0 mg/L were recorded during the August 2012 sampling event but not presented as the probe is not accurate at those levels. Instead, DO is considered to be at saturation for those samples due to chemical oxidation by the OBC™ solution.

H.3 Historic Gas Station

Site Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens AOC 43G/43J	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Source Removal via excavation and off site disposal/ treatment Institutional Controls		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Sites are in good condition.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	AOC 43G located on Devens Base, access required through BRAC.
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview

Name of Interviewer: Elizabeth Anderson

Name of Interviewee: N/A - previously conducted

Date:

Position:

Owner ☐

Manager ☐

Other: Please Specify ☒

Location:

Site ☐

Office ☐

Phone: ☒

Telephone #

Item	Check One	Comments
Are there any extraction wells at the property?	Yes ☐ No ☒	No extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No ☒	No specific construction plans are known.
Are there any issues with site access for monitoring?	Yes ☐ No ☒	Site is located on the active Devens property. Access is through BRAC.

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____



Monitoring wells at former gas station



Monitoring well for AOC 43G



Monitoring well



Monitoring well between gas station and former car wash



Monitoring well behind overgrowth

H.4 Historic Gas Station

ARARs

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE, 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCL at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARs FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.01].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standard.	
StateGroundwater Regulatory Authority	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCL-s is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION To BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection;[310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR - National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARs FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs {40 CFR Parts 141.11 - 141.16 and 141.50 - 141.521	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARs FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Continued	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Disposal of treatment residues	RCRA, Land Disposal Restrictions [40 CFR 268]	Applicable	Land disposal of RCRA hazardous wastes without specified treatment is restricted. LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	SVE carbon would be tested to evaluate characteristics for proper disposal/reactivation.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Continued	SVE Treatment	Massachusetts Air Pollution Control Regulations [310 CMR 6.00-7.00]	Applicable	SVE system must reduce VOCs in air effluent stream by at least 95% by weight.	Emissions will be managed through engineering controls.

Notes:

CERCLA =Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 -141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs/TBC	TBC		

TABLE 12
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RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as-defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standards.	
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater Monitoring (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Massachusetts Hazardous Waste Management Rules	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions. progress of remediation.	A long-term groundwater monitoring program is to be implemented to monitor the

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

H.5 Historic Gas Station

43J Statistical Analysis

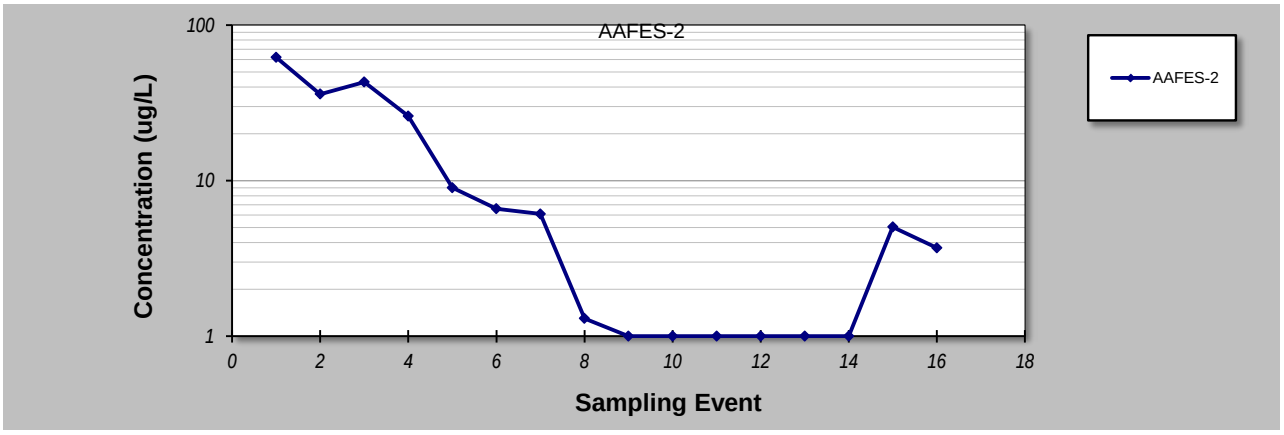
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **1-Jul-15**
Facility Name: **AOC 43G Devens**
Conducted By: **J. Fitzgerald**

Job ID:
Constituent: Benzene
Concentration Units: **ug/L**

Sampling Point ID: **AAFES-2**

Sampling Event	Sampling Date	AAFES-2 CONCENTRATION (ug/L)
1	**12/99**	62
2	**11/00**	36
3	**11/01**	43
4	**11/02**	26
5	**11/03**	9
6	**10/04**	6.6
7	**10/05**	6.1
8	**10/06**	1.3
9	**10/07**	1
10	**10/08**	1
11	**11/09**	1
12	**10/10**	1
13	**10/11**	1
14	**10/12**	1
15	**10/13**	5.04
16	**10/14**	3.7
17		
18		
19		
20		
Coefficient of Variation:		**1.46**
Mann-Kendall Statistic (S):		**-75**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.

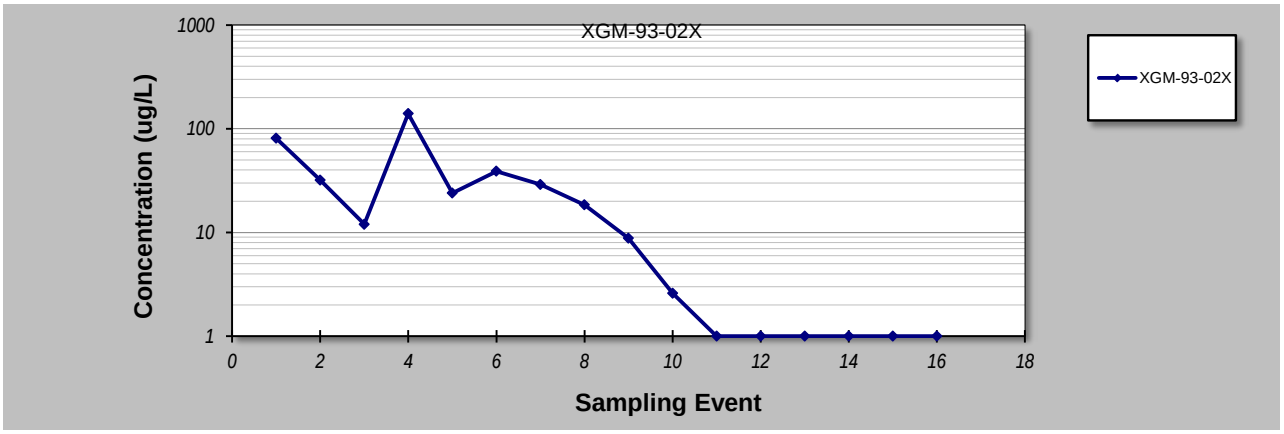
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **1-Jul-15**
Facility Name: **AOC 43G Devens**
Conducted By: **J. Fitzgerald**

Job ID:
Constituent: Benzene
Concentration Units: **ug/L**

Sampling Point ID: **XGM-93-02X**

Sampling Event	Sampling Date	XGM-93-02X CONCENTRATION (ug/L)
1	**12/99**	81
2	**11/00**	32
3	**11/01**	12
4	**11/02**	140
5	**11/03**	24
6	**10/04**	39
7	**10/05**	29
8	**10/06**	18.5
9	**10/07**	8.8
10	**10/08**	2.6
11	**11/09**	1
12	**10/10**	1
13	**10/11**	1
14	**10/12**	1
15	**10/13**	1
16	**10/14**	1
17		
18		
19		
20		
Coefficient of Variation:		**1.53**
Mann-Kendall Statistic (S):		**-85**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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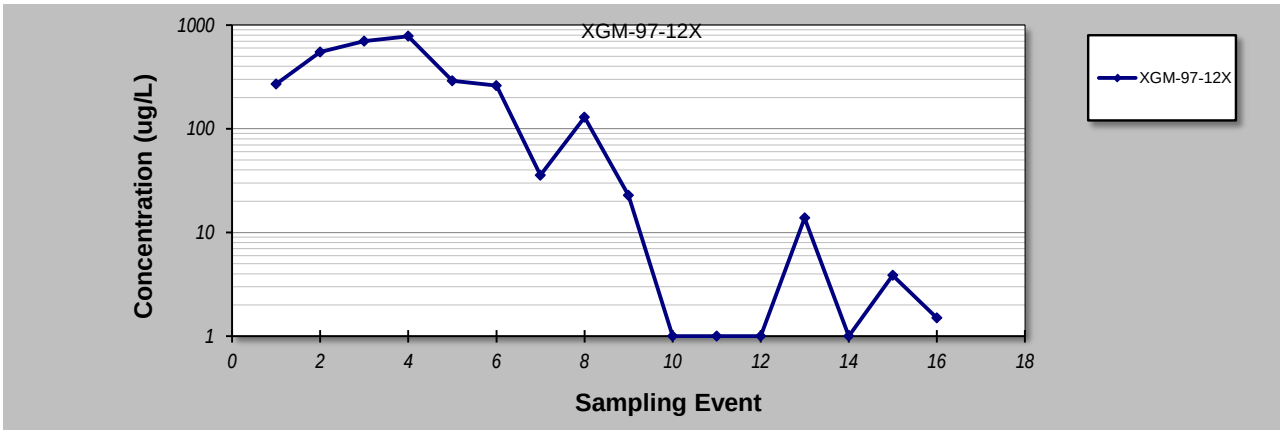
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **1-Jul-15**
Facility Name: **AOC 43G Devens**
Conducted By: **J. Fitzgerald**

Job ID:
Constituent: **Benzene**
Concentration Units: **ug/L**

Sampling Point ID: XGM-97-12X

Sampling Event	Sampling Date	BENZENE CONCENTRATION (ug/L)
1	**12/99**	270
2	**11/00**	550
3	**11/01**	700
4	**11/02**	780
5	**11/03**	290
6	**10/04**	260
7	**10/05**	35.6
8	**10/06**	129
9	**10/07**	22.8
10	**10/08**	1
11	**11/09**	1
12	**10/10**	1
13	**10/11**	13.8
14	**10/12**	1
15	**10/13**	3.87
16	**10/14**	1.5
17		
18		
19		
20		
Coefficient of Variation:		**1.39**
Mann-Kendall Statistic (S):		**-76**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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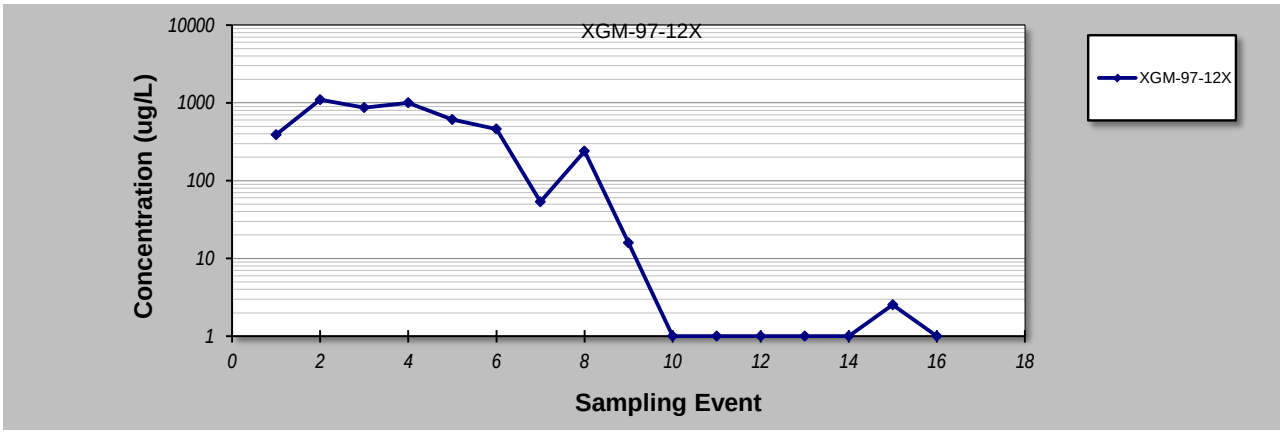
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **1-Jul-15**
Facility Name: **AOC 43G Devens**
Conducted By: **J. Fitzgerald**

Job ID:
Constituent: **Toluene**
Concentration Units: **ug/L**

Sampling Point ID: XGM-97-12X

Sampling Event	Sampling Date	TOLUENE CONCENTRATION (ug/L)
1	**12/99**	390
2	**11/00**	1,100
3	**11/01**	870
4	**11/02**	1,000
5	**11/03**	610
6	**10/04**	460
7	**10/05**	53.4
8	**10/06**	239
9	**10/07**	15.9
10	**10/08**	1
11	**11/09**	1
12	**10/10**	1
13	**10/11**	1
14	**10/12**	1
15	**10/13**	2.54
16	**10/14**	1
17		
18		
19		
20		
Coefficient of Variation:		**1.34**
Mann-Kendall Statistic (S):		**-81**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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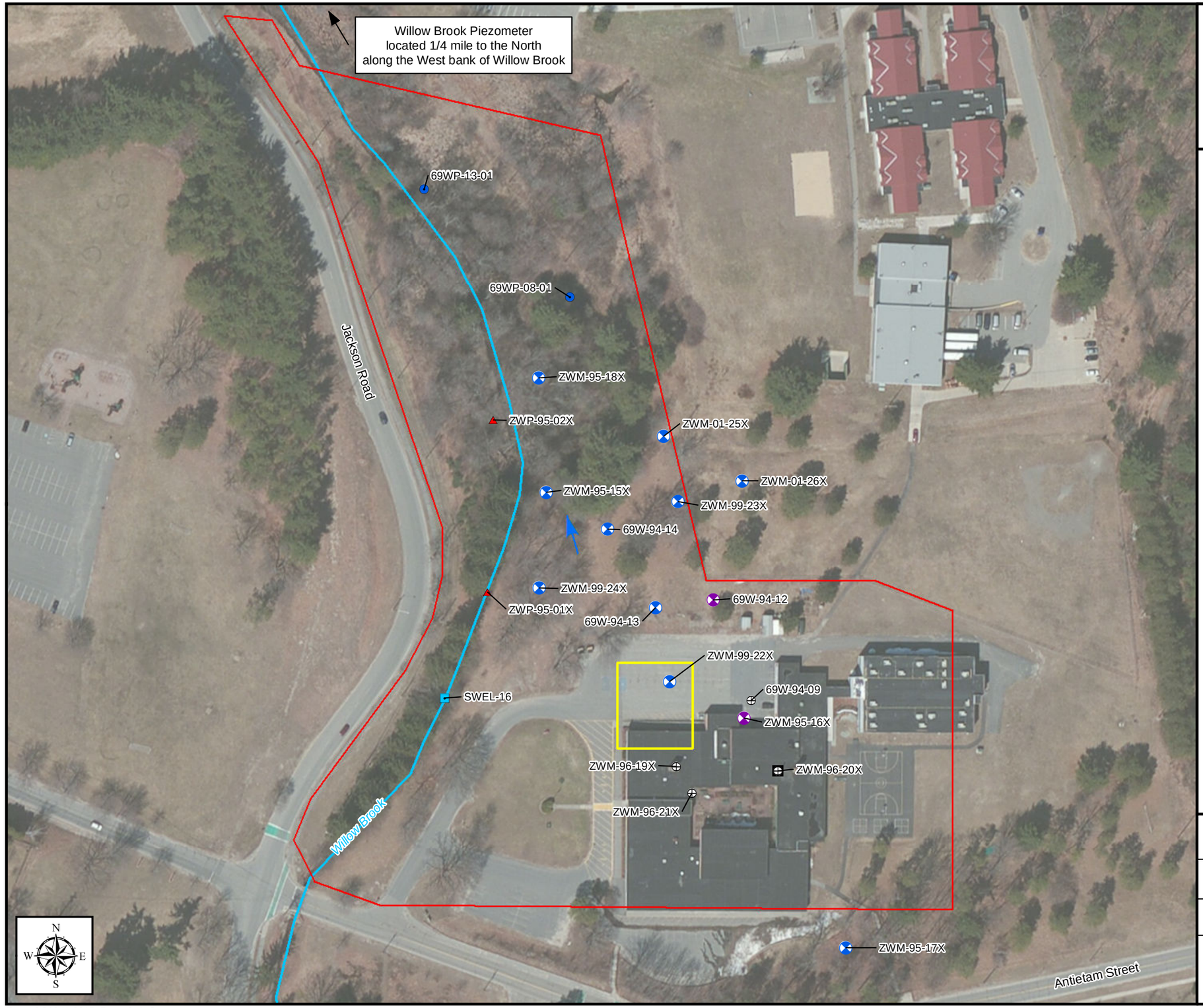
APPENDIX I – Former Elementary School Spill Site

I.1 Former

Elementary School

Spill Site Figures

Figure 8.1
Site Layout
Area of Contamination 69W



Legend

- LTM Sample Well
- LTM Sample Well Point
- LTM Well - Gauge Only
- LTM Piezometer
- Monitoring Well - Abandoned (2012)
- Monitoring Well - Presumed Destroyed
- Surface Water Elevation Location
- ZWM-01-26X — Well/Piezometer/Surface Water Elevation Location
- Parcel Boundary
- Groundwater Flow Direction (October 2012)
- Surface Water Course
- Excavated Soils Management Area

Notes:
LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five-Year Review
AOC 69W

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 60 120
Feet

Date: 04/15/2015

Figure 8.1

File: AOC69W_2015_Figure8_1_Site.mxd

I.2 Former

Elementary School

Spill Site Tables

Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2010

Method	Analyte	Units	Monitoring Criteria[1]	Groundwater Standard	Background	69W-94-13	Qual	69W-94-14	Qual	ZWM-95-15X	Qual	ZWM-95-17X	Qual	ZWM-99-22X	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	**127**		5	U	**13**		NA		**343**	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	8,400		43	J	5,000		NA		**12,000**	
	Manganese, Dissolved	µg/L	375	NS	291	**1,360**		47		**1,120**		NA		**1,750**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	NA		50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	95.1		50.0	U	50.0	U	NA		50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	142		50.0	U	50.0	U	NA		76.4	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	NA		100	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U	NA		100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	**339**		100	U	100	U	NA		**209**	
Field Parameter	Temperature, initial	°C	NS	NS	NS	16.23		15.37		15.21		11.66		18.15	
	Temperature, final	°C	NS	NS	NS	17.03		15.95		14.33		11.68		18.79	
	ORP[4]	mV	NS	NS	NS	-79.4		136.8		44.9		137.9		-79.0	
	pH	standard units	NS	NS	NS	6.54		5.87		5.87		6.24		6.4	
	Specific Conductance	µS/cm	NS	NS	NS	631		419		606		392		450	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.45		1.85		0.47		8.24		0.15	
	Turbidity	NTU	NS	NS	NS	13.9		0.39		0.90		1.0		1.00	

Notes:

[1] Monitoring Criteria is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2010

Method	Analyte	Units	Monitoring Criteria[1]	Groundwater Standard	Background	ZWM-99-22X Duplicate	Qual	ZWM-99-23X	Qual	ZWM-99-24X	Qual	ZWM-01-25X	Qual	ZWM-01-26X	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	**338**		**15**		5	U	5	U	NA	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	**12,000**		1,700		50	U	80		NA	
	Manganese, Dissolved	µg/L	375	NS	291	**1,740**		**523**		10	U	**1,490**		NA	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	50.0	U	NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	53.6		50.0	U	50.0	U	50.0	U	NA	
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	90.9		50.0	U	50.0	U	50.0	U	NA	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	100	U	NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U	100	U	NA	
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	**229**		100	U	100	U	100	U	NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	NA		15.95		14.77		14.99		14.19	
	Temperature, final	°C	NS	NS	NS	NA		15.98		15.01		16.08		15.02	
	ORP[4]	mV	NS	NS	NS	NA		56.0		127.9		162.3		120.4	
	pH	standard units	NS	NS	NS	NA		6.18		5.71		6.10		5.81	
	Specific Conductance	µS/cm	NS	NS	NS	NA		592		758		540		422	
	Dissolved Oxygen	mg/L	NS	NS	NS	NA		2.31		3.43		2.48		4.30	
	Turbidity	NTU	NS	NS	NS	NA		3.62		1.73		2.68		3.98	

Notes:

[1] Monitoring Criteria is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2010

Method	Analyte	Units	Monitoring Criteria[1]	Groundwater Standard	Background	ZWM-95-18X	Qual	69WP-08-01	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	5	U	NA	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	50	U	NA	
	Manganese, Dissolved	µg/L	375	NS	291	10	U	78	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	50.0	U	NA	
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	50.0	U	NA	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	NA	
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	100	U	NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	13.71		14.37	
	Temperature, final	°C	NS	NS	NS	13.48		14.70	
	ORP[4]	mV	NS	NS	NS	163.1		35.9	
	pH	standard units	NS	NS	NS	6.01		6.15	
	Specific Conductance	µS/cm	NS	NS	NS	618		528	
	Dissolved Oxygen	mg/L	NS	NS	NS	4.08		1.59	
	Turbidity	NTU	NS	NS	NS	1.56		13.9	

Notes:

[1] Monitoring Criteria is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2011

Method	Analyte	Units	Monitoring Criteria[1]	Groundwater Standard	Background	69W-94-13	Qual	69W-94-14	Qual	ZWM-95-15X	Qual	ZWM-95-17X	Qual	ZWM-99-22X	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	**120**		3	J	**41**		NA		**367**	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	**10,000**		50	U	8,300		NA		**21,000**	
	Manganese, Dissolved	µg/L	375	NS	291	**1,840**		29		**1,010**		NA		**2,160**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	NA		50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	56.6		50.0	U	50.0	U	NA		94.3	
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	66.7		50.0	U	50.0	U	NA		114	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	NA		100	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U	NA		100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	**242**		100	U	100	U	NA		**327**	
Field Parameter	Temperature, initial	°C	NS	NS	NS	17.71		17.75		15.40		12.76		19.82	
	Temperature, final	°C	NS	NS	NS	17.68		17.81		15.45		12.24		19.73	
	ORP[4]	mV	NS	NS	NS	-83.2		79.7		6.4		227.1		-80.7	
	pH	standard units	NS	NS	NS	6.64		5.95		5.81		6.29		6.4	
	Specific Conductance	µS/cm	NS	NS	NS	891		196		420		461		17	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.12		1.35		0.20		7.96		0.30	
	Turbidity	NTU	NS	NS	NS	4.5		1.78		4.78		0.8		4.80	

Notes:

[1] Monitoring Criteria is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2011

Method	Analyte	Units	Monitoring Criteria[1]	Groundwater Standard	Background	ZWM-99-22X Duplicate	Qual	ZWM-99-23X	Qual	ZWM-99-24X	Qual	ZWM-01-25X	Qual	ZWM-01-26X	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	**356**		**60**		5	U	**13**		NA	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	**20,000**		5,500		50	U	1,000		NA	
	Manganese, Dissolved	µg/L	375	NS	291	**2,080**		**1,720**		8	J	**2,820**		NA	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	50.0	U	NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	103		50.0	U	50.0	U	50.0	U	NA	
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	116		50.0	U	50.0	U	50.0	U	NA	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	100	U	NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U	100	U	NA	
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	**372**		100	U	100	U	100	U	NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	NA		17.56		16.09		17.01		16.35	
	Temperature, final	°C	NS	NS	NS	NA		17.37		16.13		17.13		16.16	
	ORP[4]	mV	NS	NS	NS	NA		-63.8		126.3		-21.3		75.0	
	pH	standard units	NS	NS	NS	NA		6.48		5.81		6.10		5.86	
	Specific Conductance	µS/cm	NS	NS	NS	NA		575		405		678		307	
	Dissolved Oxygen	mg/L	NS	NS	NS	NA		0.06		0.31		0.40		1.23	
	Turbidity	NTU	NS	NS	NS	NA		1.49		0.96		1.50		5.98	

Notes:

[1] Monitoring Criteria is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2011

Method	Analyte	Units	Monitoring Criteria[1]	Groundwater Standard	Background	ZWM-95-18X	Qual	69WP-08-01	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	2	J	NA	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	50	U	NA	
	Manganese, Dissolved	µg/L	375	NS	291	189		**2,190**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	50.0	U	NA	
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	50.0	U	NA	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	NA	
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	100	U	NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	15.09		16.53	
	Temperature, final	°C	NS	NS	NS	15.14		16.44	
	ORP[4]	mV	NS	NS	NS	154.9		-8.1	
	pH	standard units	NS	NS	NS	5.80		5.96	
	Specific Conductance	µS/cm	NS	NS	NS	492		419	
	Dissolved Oxygen	mg/L	NS	NS	NS	1.49		0.49	
	Turbidity	NTU	NS	NS	NS	0.62		4.2	

Notes:

[1] Monitoring Criteria is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2012

Method	Analyte	Units	Monitoring Criteria[1]	GW-3 Groundwater	Background	69W-94-13	Qual	69W-94-14	Qual	ZWM-95-15X	Qual	ZWM-95-17X	Qual	ZWM-99-22X	Qual	ZWM-99-22X Duplicate	Qual
Metals (SW6010C)	Arsenic, Dissolved	µg/L	10	900	10.5	**115**		5	U	**23**		NA		**299**		**296**	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	8,100		220		7,400				**16,000**		**16,000**	
	Manganese, Dissolved	µg/L	375	NS	291	**1,400**		99		**1,580**				**1,120**		**1,140**	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	NA		50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	94.7	J	50.0	U	50.0	U			71.2	J	74.2	
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	63.0	J	50.0	U	50.0	U			55.5	J	60.6	
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	NA		100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U			100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	**379**		100	U	100	U			**308**		**300**	
Field Parameter	Temperature, initial	°C	NS	NS	NS	17.75		17.14		14.67		12.44		19.78		NA	
	Temperature, final	°C	NS	NS	NS	17.74		16.78		14.56		12.33		19.13			
	ORP[4]	mV	NS	NS	NS	-69.0		223.4		33.4		223.7		-101.2			
	pH	standard units	NS	NS	NS	6.66		5.85		5.78		6.47		6.46			
	Specific Conductance	µS/cm	NS	NS	NS	652		549		395		273		576			
	Dissolved Oxygen	mg/L	NS	NS	NS	0.53		2.29		0.19		8.42		0.18			
	Turbidity	NTU	NS	NS	NS	14.3		2.29		11.2		0.77		3.07			

Notes:

[1] The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value from HLA (2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] The GW-3 standard was effective June 26, 2009.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2012

Method	Analyte	Units	Monitoring Criteria[1]	GW-3 Groundwater	Background	ZWM-99-23X	Qual	ZWM-99-24X	Qual	ZWM-01-25X	Qual	ZWM-01-26X	Qual	ZWM-95-18X	Qual	69WP-08-01	Qual
Metals (SW6010C)	Arsenic, Dissolved	µg/L	10	900	10.5	**29**		5	U	**19**		NA		5	U	5	U
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	3,000		50	U	1,300				50	U	1,800	
	Manganese, Dissolved	µg/L	375	NS	291	**500**		5	J	**2,540**				90		**904**	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	NA		50.0	U	NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	50.0	U	50.0	U	50.0	U			50.0	U		
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	50.0	U	50.0	U	50.0	U			50.0	U		
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	NA		100	U	NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U			100	U		
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	100	U	100	U	100	U			100	U		
Field Parameter	Temperature, initial	°C	NS	NS	NS	16.66		15.70		15.90		15.74		14.08		15.07	
	Temperature, final	°C	NS	NS	NS	16.57		15.76		16.20		15.48		14.17		15.08	
	ORP[4]	mV	NS	NS	NS	-33.1		297.4		23.4		222.8		264.7		-22.8	
	pH	standard units	NS	NS	NS	6.46		5.86		6.34		5.79		5.95		6.07	
	Specific Conductance	µS/cm	NS	NS	NS	383		370		524		484		521		458	
	Dissolved Oxygen	mg/L	NS	NS	NS	1.12		2.80		1.98		3.57		3.62		1.85	
	Turbidity	NTU	NS	NS	NS	2.71		0.70		1.86		2.34		1.53		10.33	

Notes:

[1] The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value from HLA (2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] The GW-3 standard was effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
November 2013

Method	Analyte	Units	Monitoring Criteria[1]	GW-3 Groundwater Standard	Background	69W-94-13	Q	69W-94-14	Q	ZWM-95-15X	Q	ZWM-95-17X	Q	ZWM-99-22X	Q	ZWM-99-22X (69W-DUP1) Duplicate	Q
Metals (SW6010C)	Arsenic, Dissolved	µg/L	10	900	10.5	**73**		5	U	**17**		NA		**233**	J	**17**	J
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	6,600		5	U	4,500				**15,000**	J	1,900	J
	Manganese, Dissolved	µg/L	375	NS	291	**1,730**		10	U	**1,280**				**998**		**1,070**	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	NA		50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	50.0	U	50.0	U	50.0	U			50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	87.6		50.0	U	50.0	U			119		127	J
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	NA		100	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U			100	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	**227**		100	U	100	U			**286**		**290**	
Field Parameter	Temperature, initial	°C	NS	NS	NS	15.35		15.43		13.55		12.31		17.34		NA	
	Temperature, final	°C	NS	NS	NS	15.37		15.20		13.31		12.05		17.24			
	ORP[4]	mV	NS	NS	NS	-25.9		154.0		80.6		134.6		-63.7			
	pH	standard units	NS	NS	NS	6.65		5.80		5.79		6.42		6.55			
	Specific Conductance	µS/cm	NS	NS	NS	850		615		732		272		381			
	Dissolved Oxygen	mg/L	NS	NS	NS	2.46		3.82		0.96		8.71		1.18			
	Turbidity	NTU	NS	NS	NS	11.2		1.45		4.5		0.78		4.07			

Notes:

[1] The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value from HLA (2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] The GW-3 standard was effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

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Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
November 2013

Method	Analyte	Units	Monitoring Criteria[1]	GW-3 Groundwater Standard	Background	ZWM-99-23X	Q	ZWM-99-24X	Q	ZWM-01-25X	Q	ZWM-01-26X	Q	ZWM-95-18X	Q	69WP-08-01	Q	69WP-13-01	Q
Metals (SW6010C)	Arsenic, Dissolved	µg/L	10	900	10.5	**27**		3	J	5		NA		5	U	2	J	NA	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	2,800		50	U	250				50	U	2,900			
	Manganese, Dissolved	µg/L	375	NS	291	**556**		10	U	**1,570**				**540**		237		235	
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	NA		50.0	U	NA		NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	50.0	U	50.0	U	50.0	U			50.0	U				
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	50.0	U	50.0	U	50.0	U			50.0	U				
EPH (EPH-04-1.1)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	100	U	NA		100	U	NA		NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	100	U			100	U				
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	100	U	100	U	100	U			100	U				
Field Parameter	Temperature, initial	°C	NS	NS	NS	15.61		14.08		14.47		14.22		13.64		13.66		11.77	
	Temperature, final	°C	NS	NS	NS	15.51		14.05		14.70		13.82		13.74		13.65		11.75	
	ORP[4]	mV	NS	NS	NS	-21.2		159.7		68.1		170.0		131.2		54.3		-50.1	
	pH	standard units	NS	NS	NS	6.57		5.71		6.24		5.92		5.86		6.25		6.31	
	Specific Conductance	µS/cm	NS	NS	NS	420		620		510		360		677		634		513	
	Dissolved Oxygen	mg/L	NS	NS	NS	1.78		3.86		4.38		4.30		5.14		2.10		0.70	
	Turbidity	NTU	NS	NS	NS	1.64		1.21		2.50		1.81		0.54		18.40		18.80	

Notes:

[1] The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value from HLA (2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] The GW-3 standard was effective June 26, 2009.

[4] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2014

Method	Analyte	Units	Monitoring Criteria[1]	GW-3 Groundwater Standard	Background	69W-94-13	Q	69W-94-14	Q	ZWM-95-15X	Q	ZWM-95-17X	Q	ZWM-99-22X	Q	ZWM-99-22X (69W-DUP)	Q
Metals (SW6010B)	Arsenic	µg/L	10	900	10.5	101		3.0	U	30.2		NA		172.0		182.0	
	Iron	µg/L	NS	NS	9,100[2]	10,300		116		7,000				19,900		19,000	
	Manganese	µg/L	375	NS	291	1,940	U	37.4	U	900	U			1,280	U	1,210	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	NA		NA		NA		NA		NA		NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS												
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS												
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	110	U	100	U	NA		110	U	110	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	110	U	100	U			110	U	110	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	252		110	U	100	U			332		305	
Field Parameters	Temperature, Initial	°Celcius	NS	NS	NS	16.67		16.1		13.71		12.12		18.98		NA	
	Temperature, Final	°Celcius	NS	NS	NS	16.59		16.02		13.73		12.06		18.47		NA	
	pH	Std units	NS	NS	NS	6.54		6.01		5.87		6.52		6.51		NA	
	Specific Conductance	µS/cm	NS	NS	NS	523		710		279		184		717		NA	
	ORP/Eh	mV	NS	NS	NS	-53.7		218.4		24.1		143.7		-101.0		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.2		3.91		0.48		7.57		0.17		NA	
	Turbidity	NTU	NS	NS	NS	8.18		1.36		3.39		1.09		2.8		NA	

Notes:

0.333 = Cleanup goal exceedance

0.716 = Detected result above GW-3 Standard, and/or Background

NS - No standard

NA - Not analyzed

[1] The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value from HLA (2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] The GW-3 standard was effective April 2014

[4] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 8.5
Groundwater Analytical Results
Area of Contamination 69W
October 2014

Method	Analyte	Units	Monitoring Criteria[1]	GW-3 Groundwater Standard	Background	ZWM-99-23X	Q	ZWM-99-24X	Q	ZWM-01-25X	Q	ZMW-95-18X	Q	69WP-08-01	Q	69WP-13-01	Q
Metals (SW6010B)	Arsenic	µg/L	10	900	10.5	19.5		3.0	U	3.0	U	3.0	U	3.0	U	NA	
	Iron	µg/L	NS	NS	9,100[2]	2,450		50	U	333		50	U	2,380		NA	
	Manganese	µg/L	375	NS	291	533	U	7.5	U	435	U	204	U	64.5	U	49.2	U
VPH (VPH-04-1.1)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	NA		NA		NA		NA		NA		NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS												
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS												
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	100	U	100	U	110	U	110	U	NA		NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	100	U	100	U	110	U	110	U				
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	100	U	100	U	110	U	110	U				
Field Parameters	Temperature, Initial	°Celcius	NS	NS	NS	16.20		14.56		14.70		13.48		14.11		12.52	
	Temperature, Final	°Celcius	NS	NS	NS	15.87		14.72		15.20		13.63		14.12		12.11	
	pH	Std units	NS	NS	NS	6.57		6.01		6.27		5.99		6.21		6.28	
	Specific Conductance	µS/cm	NS	NS	NS	598		245		775		699		649		701	
	ORP/Eh	mV	NS	NS	NS	-12.1		187.9		90.8		239.6		85		-157.7	
	Dissolved Oxygen	mg/L	NS	NS	NS	1.18		3.21		4.00		6.24		2.14		0.13	
	Turbidity	NTU	NS	NS	NS	5.0		1.55		4.70		0.33		16.90		4.63	

Notes:

0.333 = Cleanup goal exceedance

0.716 = Detected result above GW-3 Standard, and/or Background

NS - No standard

NA - Not analyzed

[1] The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value from HLA (2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] The GW-3 standard was effective April 2014

[4] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 8.6
Exceedances Over Time
Area of Contamination 69W
2000 to 2014

Well Number	Spring 2000	Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014
C_{11}-C_{22} Aromatics [1] - 200 µg/l Monitoring Criteria [2]																					
69W-94-13	690	1,400	720	790	1,900	290	ND	(160)	ND	(110)	ND	ND	209	311	(152)	225	339	242	379	227	252
ZWM-95-15X	ND	ND	ND	ND	1,400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND
ZWM-99-22X	2,500	1,400	2,100	370	620	210	380	330	270	400	320	280	627	(166)	356	276	209	327	308	286	332
ZWM-99-23X	(170)	520	200	(140)	(140)	ND	ND	ND	ND	ND	ND	ND	(174)	(107)	(80)	ND	ND	ND	ND	ND	ND
C_{9}-C_{10} Aromatics - 200 µg/l Monitoring Criteria [2]																					
69W-94-13	(120)	270	(160)	320	(150)	200	(62)	(140)	(130)	230	(110)	(140)	(84)	(144)	(81)	(105)	(142)	(66.7)	(63 J)	(87.6)	NC
ZWM-99-22X	620	(150)	550	(83)	(88)	(150)	840	450	650	600	460	460	330	(113)	217	(120)	(76.4)	(114)	(55.5 J)	(119)	NC
ZWM-99-23X	(46)	(62)	(40)	(34)	ND	ND	(53)	(59)	ND	ND	(100)	ND	ND	ND	(28)	(35.2)	ND	ND	ND	ND	NC
Arsenic, dissolved - 10 µg/l Monitoring Criteria [2]																					
69W-94-13	54	110	85	150	52	130	35	69	27	88	56	60	69	142	73	86	127	120	115	73	101
ZWM-95-15X	ND	(7.9)	ND	22	36	40	ND	16	(7.7)	30	ND	ND	ND	16	ND	ND	13	41	23	17	30.2
ZWM-99-22X	150	130	230	140	86	140	150	160	140	140	120	120	159	244	223	408	343	367	299	233 J	172
ZWM-99-23X	23	70	67	55	15	ND	27	ND	44	61	46	47	56	56	52	62	15	60	29	27	19.5
ZWM-99-25X	NA	NA	NA	(4.1 J)	ND	ND	(2.3 J)	ND	ND	(3.4 J)	ND	ND	(3 J)	(5)	(2.3 J)	(2 J)	ND	13	19	(5)	ND
Manganese, dissolved - 375 µg/l Monitoring Criteria [2]																					
69WP-08-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(174)	(89)	(78)	2,190	904	(237)	(64.5)
69W-94-13	2,300	1,700	1,500	1,600	2,100	2,400	2,800	4,100	2,500	1,300	3,000	1,600	2,600	1,120	1,940	2,110	1,360	1,840	1,400	1,730	1,940
ZWM-95-15X	(28)	1,300	(25)	(100)	1,500	2,200	1,600	970	4,600	980	850	(130)	860	1,230	438	502	1,120	1,010	1,580	1,280	900
ZWM-99-22X	2,000	1,800	2,300	2,400	2,000	1,500	2,700	2,300	3,100	1,900	3,400	3,200	3,700	3,120	3,790	2,660	1,750	2,160	1,120	998	1,280
ZWM-99-23X	4,200	3,600	5,800	1,500	550	1,700	5,300	4,300	2,500	2,300	5,200	2,500	2,700	1,320	2,500	3,080	523	1,720	500	556	533
ZWM-01-25X	NA	NA	NA	(280)	(61)	1,000	(89)	(230)	(140)	(300)	(140)	490	1,400	3,210	1,320	5,830	1,490	2,820	2,540	1,570	435

Notes:

The number in parentheses denotes that the concentration is below the cleanup goal.

[1] The unadjusted result was used beginning with the Spring 2006 sampling event.

[2] The monitoring criteria is based on the lower value between the site-specific cleanup goal and the MCP GW-1 Standard (310 CMR 40 Subpart P).

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

I.3 Former

Elementary School

Spill Site Site

Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens AOC 69W	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Source Removal via excavation and off site disposal/ treatment Institutional Controls		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Site is in good condition.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview

Name of Interviewer: Elizabeth Anderson

Name of Interviewee: N/A - previously conducted

Date:

Position:

Owner ☐

Manager ☐

Other: Please Specify ☒

Location:

Site ☐

Office ☐

Phone: ☒

Telephone #

Item	Check One	Comments
Are there any extraction wells at the property?	Yes ☐ No ☒	No extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No ☒	No specific construction plans are known.
Are there any issues with site access for monitoring?	Yes ☐ No ☒	Site is located on the active Devens property. Access is through BRAC.

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____


Parker







I.4 Former

Elementary School

Spill Site ARARs

TABLE 5
CHEMICAL-, LOCATION-, AND ACTION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE
AOC 69W

RECORD OF DECISION
DEVENS, MASSACHUSETTS

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
GROUNDWATER Federal	Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs; 40 CFR 141.11-141.16 and 141.50-141.52	Relevant and Appropriate	MCLs are enforceable standards (based in part on the availability and cost of treatment) that specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLGs are non-enforceable health based goals that specify the maximum concentration at which no known or anticipated adverse effects on human will occur	Long-term groundwater monitoring will ensure that site contaminants do not migrate off-site. Implementation of Institiutional Controls prohibiting installation of drinking water wells at the site will prevent exposure. In addition, arsenic concentrations are expected to decrease following the soil removal which eliminated the majority of the source of the aquifers reducing conditions.
State	Massachusetts Groundwater Quality Standards; 310 CMR 6.00	Relevant and Appropriate	These standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at AOC 69W is classified as Class I, fresh groundwaters designated as a source of potable water supply.	Long-term groundwater monitoring will ensure that site contaminants do not migrate off-site. Implementation of Institiutional Controls prohibiting installation of drinking water wells at the site will prevent exposure. In addition, arsenic concentrations are expected to decrease following the soil removal which eliminated the majority of the source of the

TABLE 5
CHEMICAL-, LOCATION-, AND ACTION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE
AOC 69W

RECORD OF DECISION
DEVENS, MASSACHUSETTS

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Massachusetts Drinking Water Regulations; 310 CMR 22.00	Relevant Appropriate	These regulations list Massachusetts MCLs which apply to drinking water distributed through a public water system.	Long-term groundwater monitoring will ensure that site contaminants do not migrate off-site. Implementation of Institiutional Controls prohibiting installation of drinking water wells at site will prevent exposure. In addition, arsenic concentrations are expected to decrease following the soil removal which eliminated the
	Massachusetts Hazardous Waste Management Regulations; 130 CMR 30.300	Applicable	These regulations contain requirements for generators including testing of wastes to determine if they are hazardous wastes and accumulation of hazardous waste prior to disposal.	Any hazardous waste (soils or groundwater) generated from long-term monitoring or excavation at AOC 69W will be managed in accordance with these regulations. Institutional Controls will limit contact to in-situ

APPENDIX J – Former Moore Army Airfield

J.1 Former

Moore Army

Airfield

Figures



Figure 9.1
Site Location
Former Fort Devens Army Installation

References: HGL. LTMMP 2012.
Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

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

Five Year Review Report
Former Fort Devens Army Installation

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

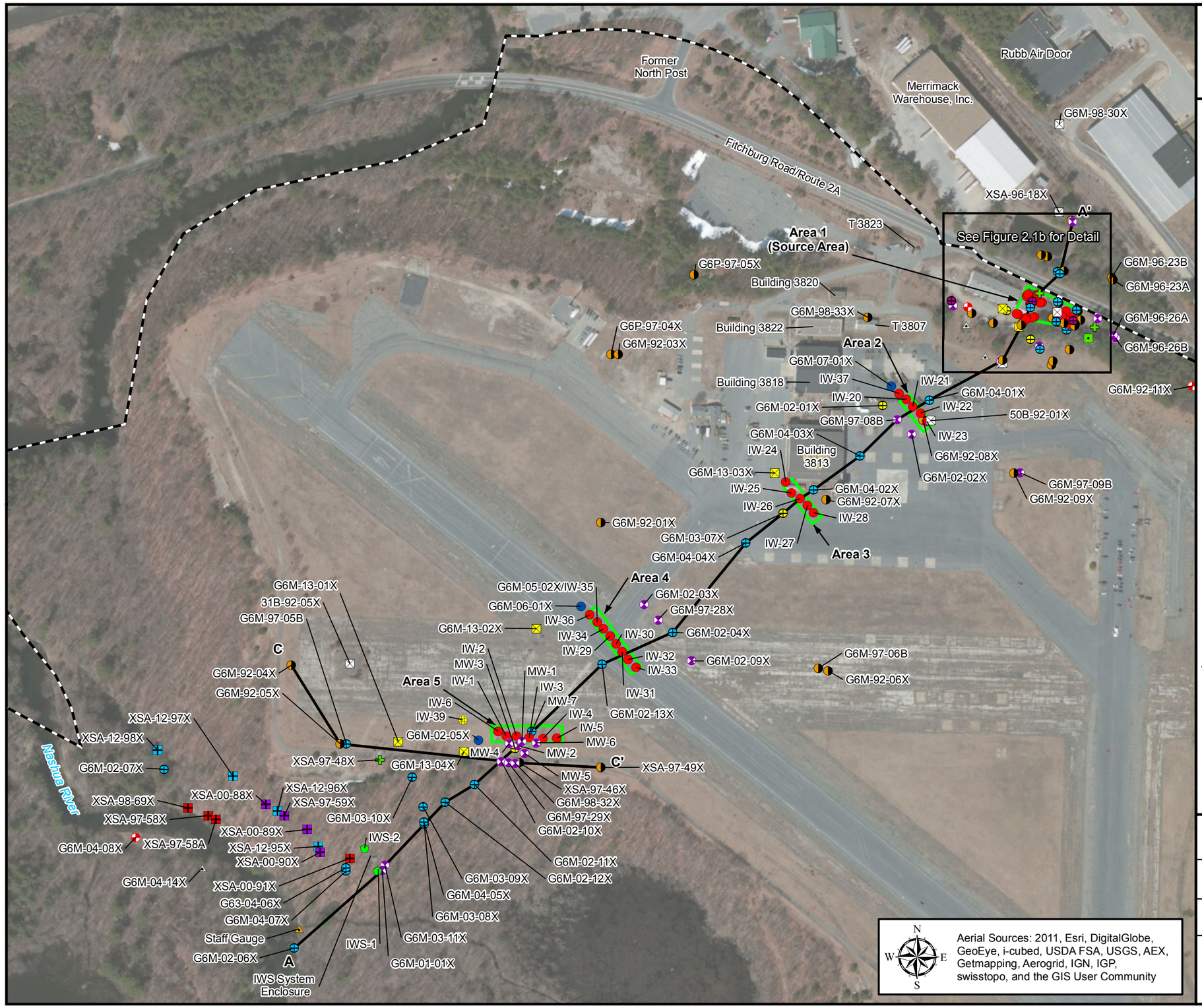
0 1,750 3,500
Feet

Date: 04/14/2015

Figure 9.1

H&S

Figure 9.2
Site Layout
Area of Contamination 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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Injection Well Installed 01/2014

G6M-92-11X Well/Gauge/Piezometer Identification

A——A' Cross Section

Former Fort Devens Boundary

ERD Injection Well Transect

Notes:
ERD = Enhanced reductive dechlorination
IWS = In-well stripping
LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Five Year Review Report
AOC 50

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

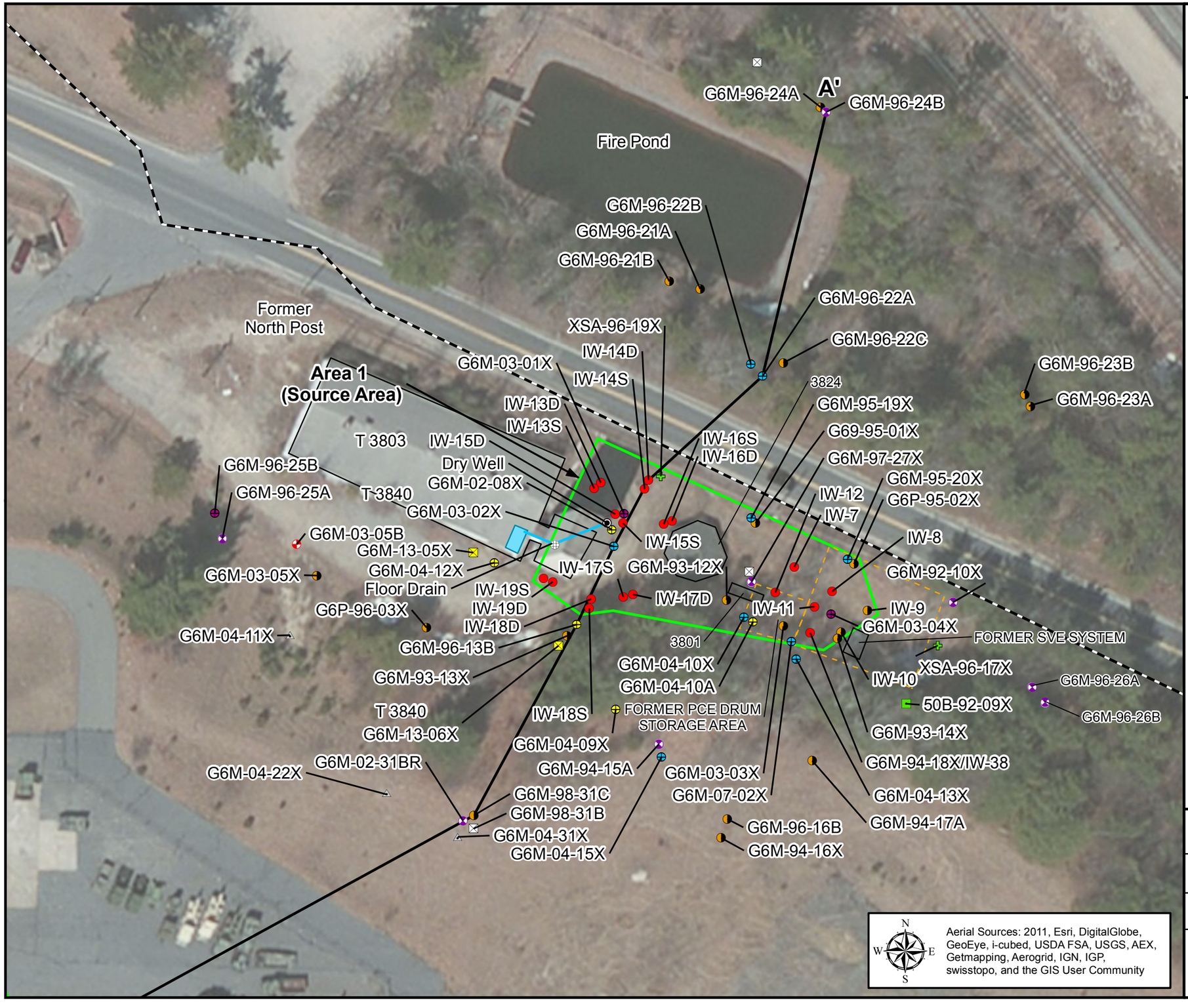
0 150 300
Feet

Date: 04/14/2015

Figure 9.2

H&S

Figure 9.3
Site Layout
Area of Contamination 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 - Destroyed
- Injection Well
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- A A' Cross Section
- Floor Drain Piping
- Janitor Sink
- Building Footprint
- Former Feature
- Former Fort Devens Boundary
- ERD Injection Well Transect

Notes:
ERD = Enhanced reductive dechlorination
IWS = In-well stripping
LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Five Year Review Report
AOC 50

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

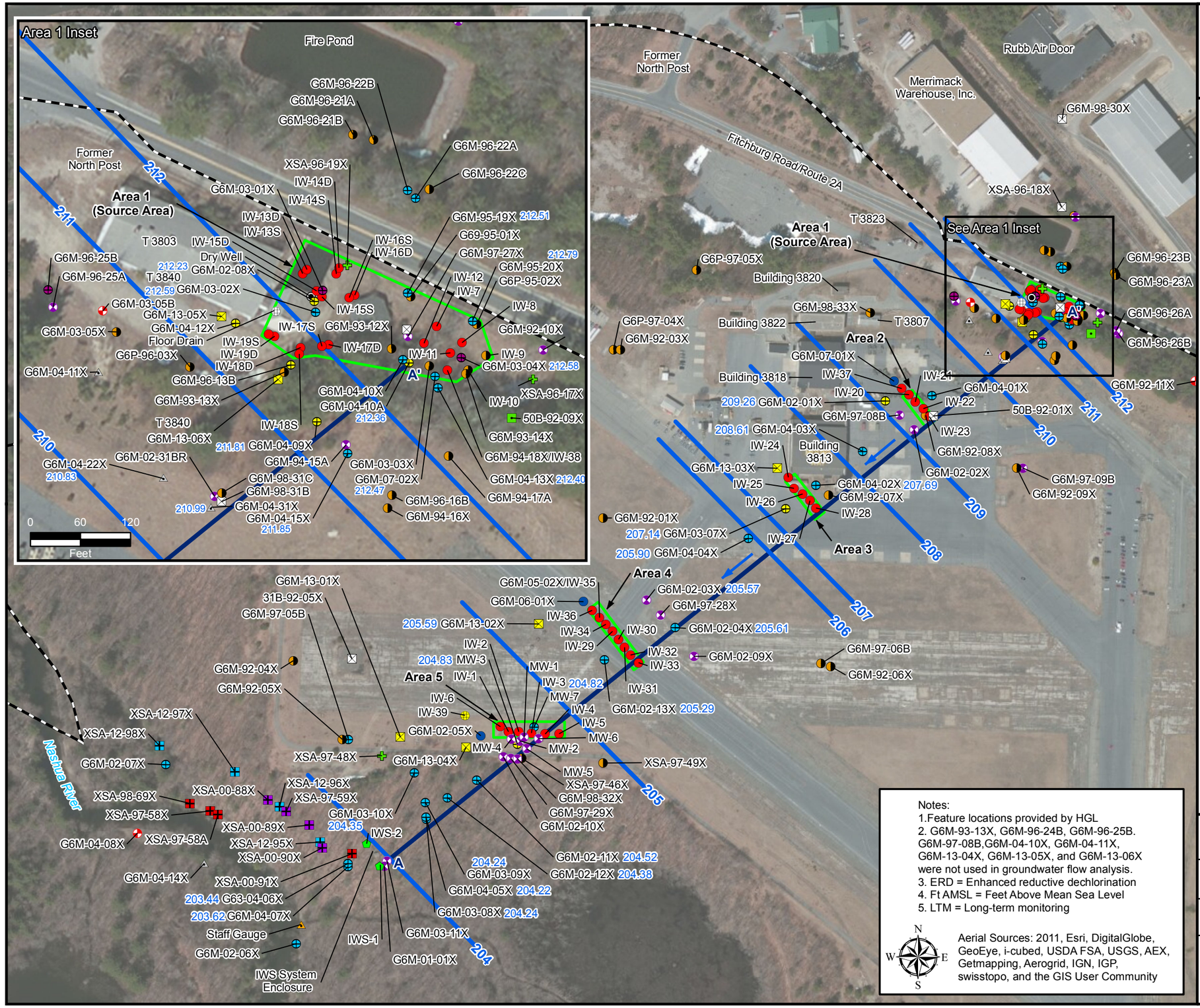
0 40 80
Feet

Date: 04/14/2015

Figure 9.3

H&S

Figure 9.4
Interpretive Water Table Elevations
June 2014



Notes:
1.Feature locations provided by HGL
2. G6M-93-13X, G6M-96-24B, G6M-96-25B. G6M-97-08B,G6M-04-10X, G6M-04-11X, G6M-13-04X, G6M-13-05X, and G6M-13-06X were not used in groundwater flow analysis.
3. ERD = Enhanced reductive dechlorination
4. Ft AMSL = Feet Above Mean Sea Level
5. LTM = Long-term monitoring

Aerial Sources: 2011, 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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X — Well/Gauge/Piezometer Identification
- 212.79 — Groundwater Elevation (ft amsl)
- Groundwater Flow Direction
- 211 — Groundwater Contour (Ft AMSL) (Interval = 1 FT)
- A — A' — Groundwater Gradient Calculation Location
- Former Fort Devens Boundary
- ERD Injection Well Transect

References:
HGL. LTMMP 2012.

Five Year Review Report
AOC 50

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

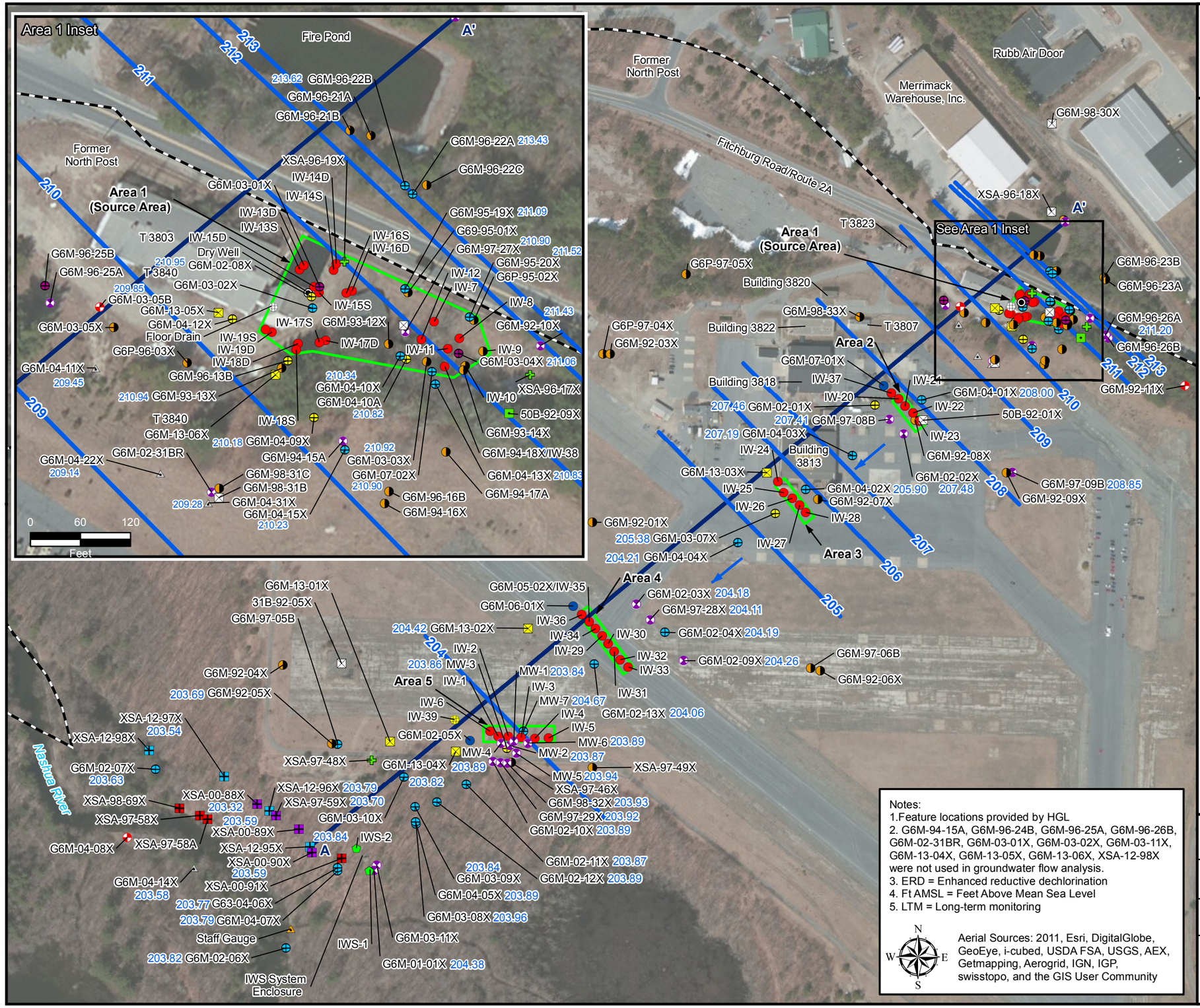
H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 150 300 Feet

Date: 04/14/2015

Figure 9.4

Figure 9.5
Interpretive Water Table Elevations
October 2014



Notes:
1.Feature locations provided by HGL
2. G6M-94-15A, G6M-96-24B, G6M-96-25A, G6M-96-26B, G6M-02-31BR, G6M-03-01X, G6M-03-02X, G6M-03-11X, G6M-13-04X, G6M-13-05X, G6M-13-06X, XSA-12-98X were not used in groundwater flow analysis.
3. ERD = Enhanced reductive dechlorination
4. Ft AMSL = Feet Above Mean Sea Level
5. LTM = Long-term monitoring

N W E S

Aerial Sources: 2011, 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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X — Well/Gauge/Piezometer Identification
- 212.79 — Groundwater Elevation (ft amsl)
- Groundwater Flow Direction
- 211 — Groundwater Contour (Ft AMSL) (Interval = 1 FT)
- A — A' — Groundwater Gradient Calculation Location
- Former Fort Devens Boundary
- ERD Injection Well Transect

References:
HGL. LTMMP 2012.

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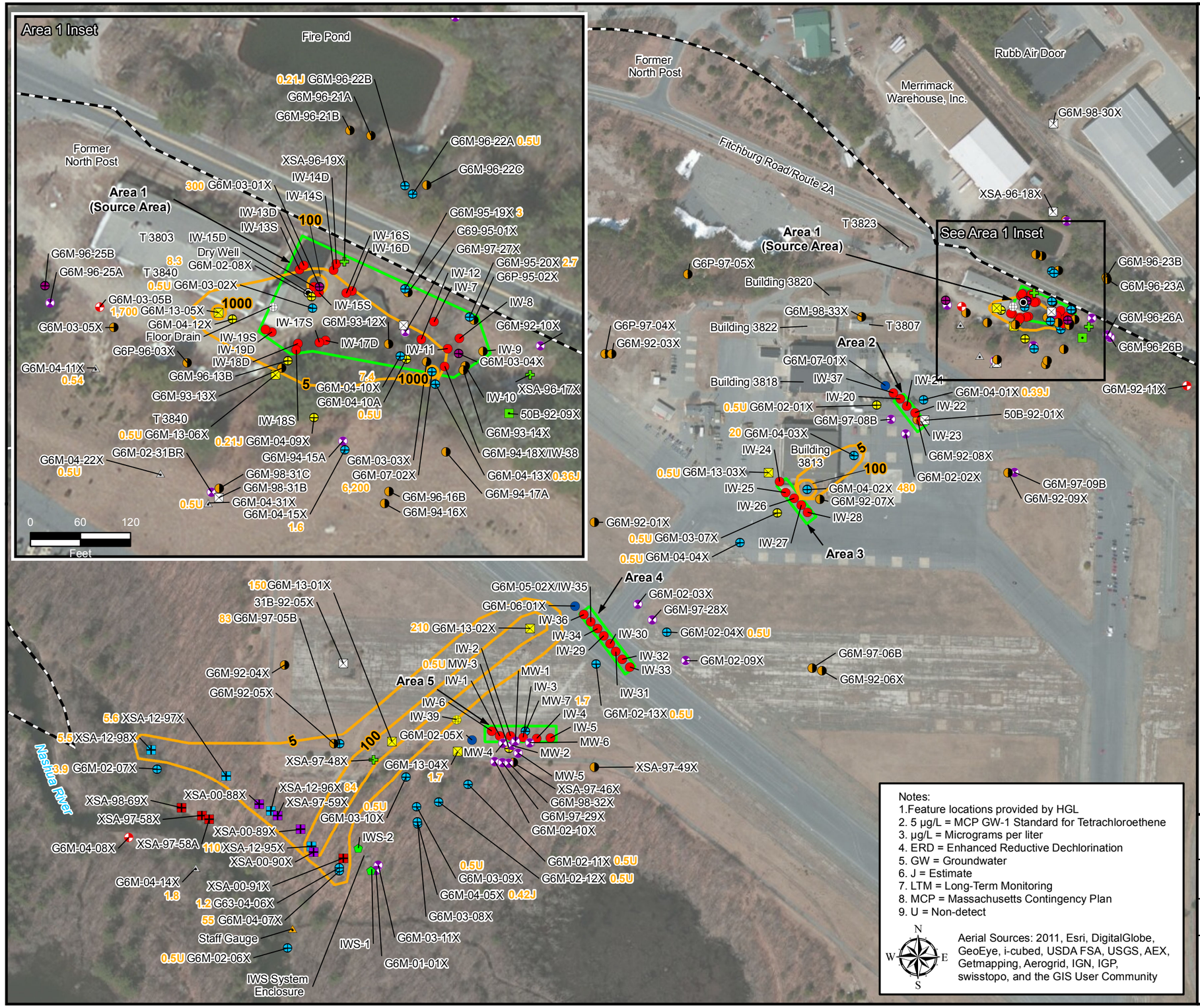
0 150 300
Feet

Date: 04/14/2015

Figure 9.5

Figure 9.6
Tetrachloroethene Concentrations in Groundwater Oct/Nov/Dec 2014



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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- 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

References:
HGL. LTMMP 2012.

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

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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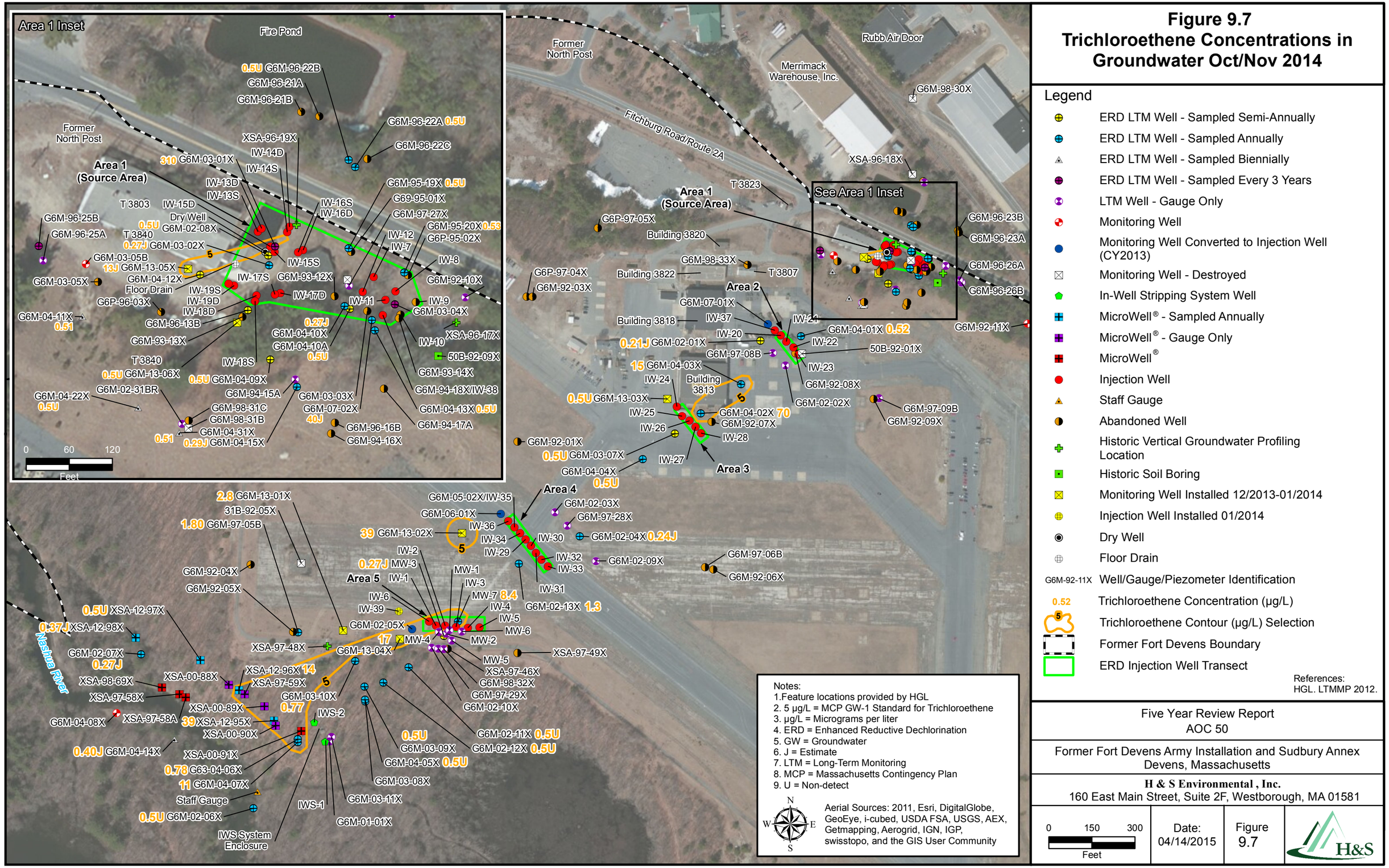
0 150 300
Feet

Date: 04/14/2015

Figure

Figure 9.7
Trichloroethene Concentrations in Groundwater Oct/Nov 2014



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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X — Well/Gauge/Piezometer Identification
- 0.52 — Trichloroethene Concentration (µg/L)
- 5 — Trichloroethene Contour (µg/L) Selection
- Former Fort Devens Boundary
- ERD Injection Well Transect

References:
HGL. LTMMP 2012.

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

Aerial Sources: 2011, 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

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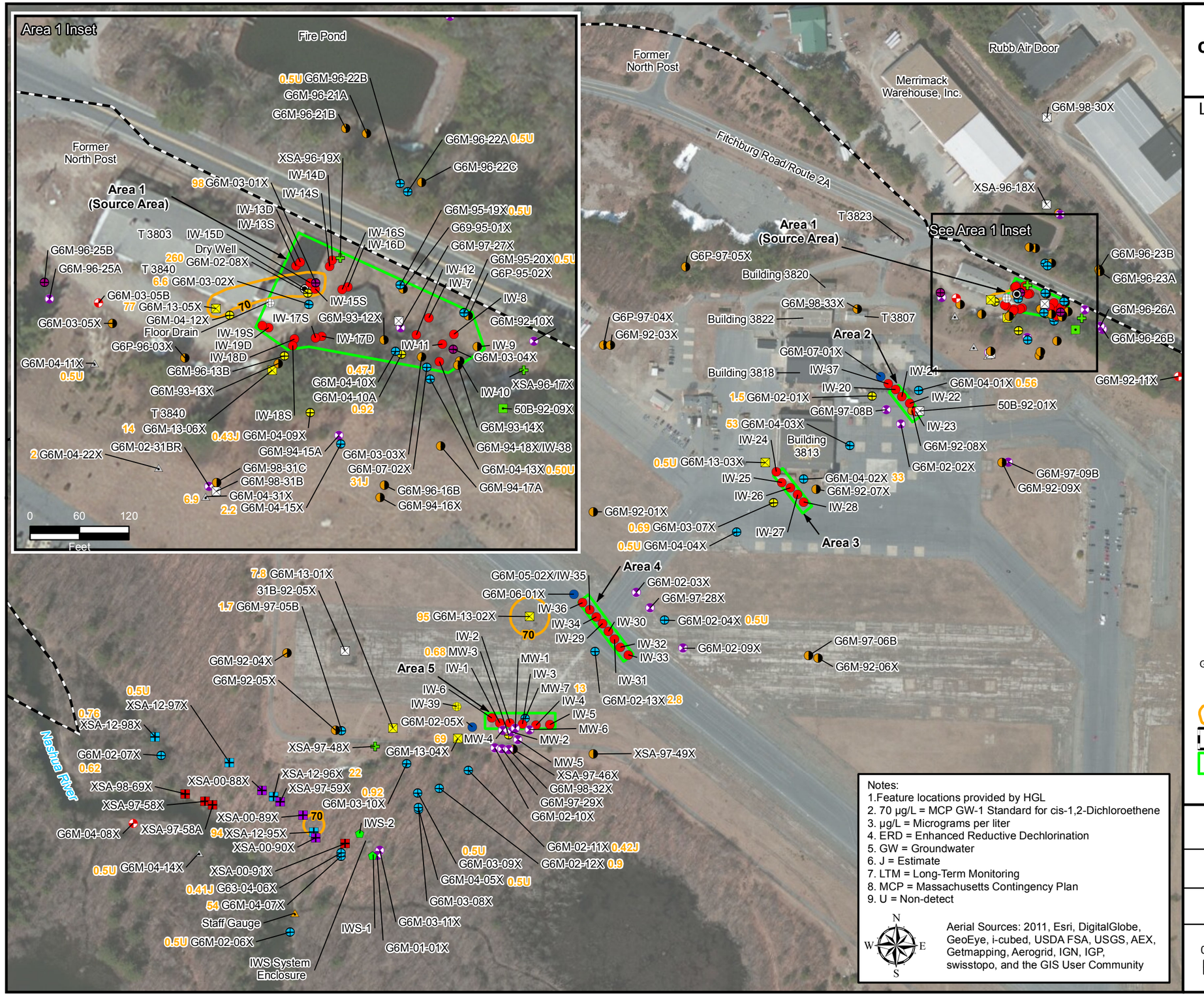
Figure 9.7

Figure 9.8
cis-1,2-Dichloroethene Concentrations in Groundwater Oct/Nov 2014



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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X — Well/Gauge/Piezometer Identification
- 0.56 — cis-1,2-Dichloroethene Concentration (µg/L)
- 70 — cis-1,2-Dichloroethene Contour (µg/L)
- Former Fort Devens Boundary
- ERD Injection Well Transect

References:
HGL. LTMMP 2012.

Notes:
1.Feature locations provided by HGL
2. 70 µg/L = MCP GW-1 Standard for cis-1,2-Dichloroethene
3. µg/L = Micrograms per liter
4. ERD = Enhanced Reductive Dechlorination
5. GW = Groundwater
6. J = Estimate
7. LTM = Long-Term Monitoring
8. MCP = Massachusetts Contingency Plan
9. U = Non-detect

N W E S

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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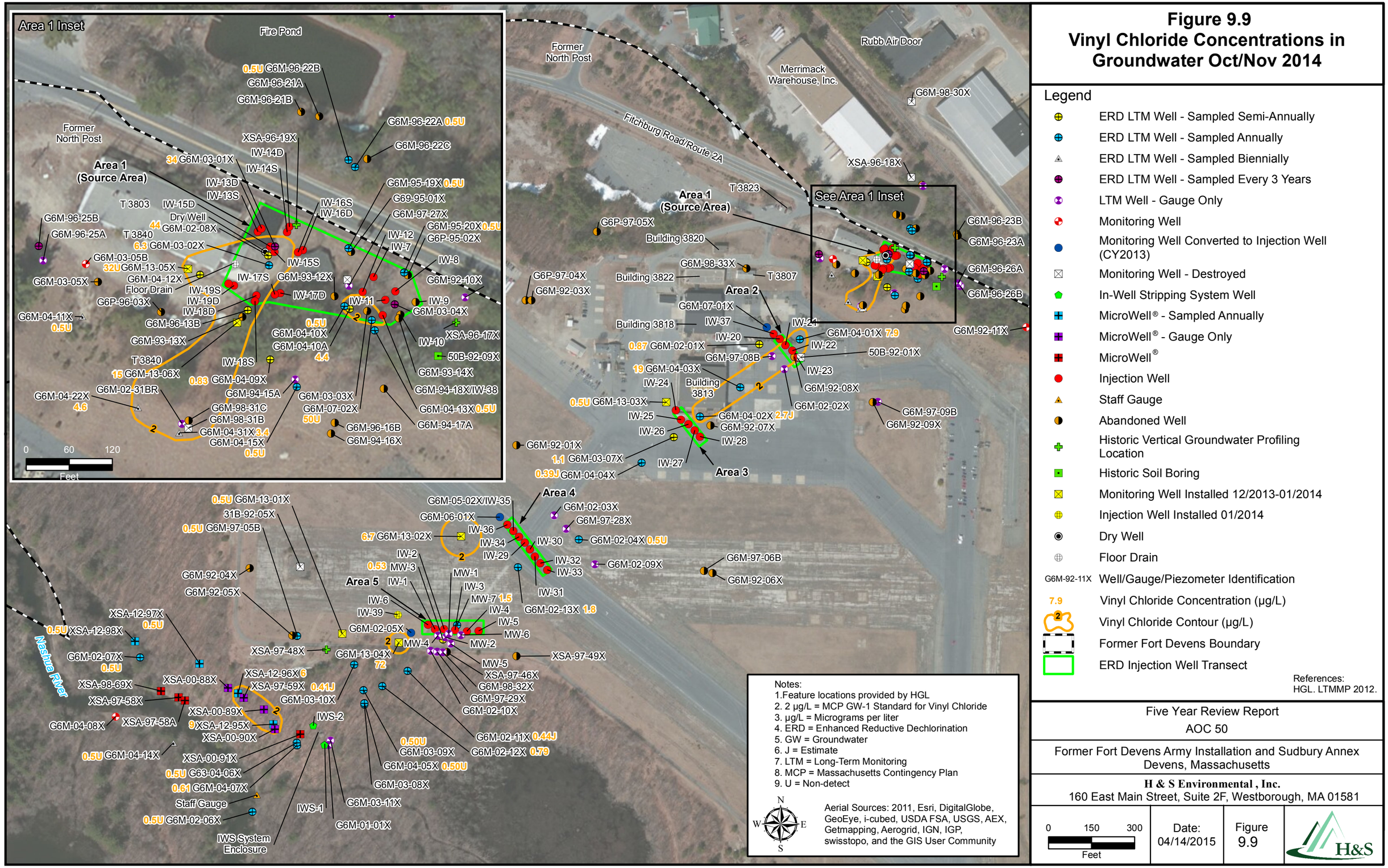
0 150 300 Feet

Date: 04/14/2015

Figure 9.8

Figure 9.9
Vinyl Chloride Concentrations in Groundwater Oct/Nov 2014



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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X — Well/Gauge/Piezometer Identification
- 7.9 — Vinyl Chloride Concentration (µg/L)
- 2 — Vinyl Chloride Contour (µg/L)
- Former Fort Devens Boundary
- ERD Injection Well Transect

References:
HGL. LTMMP 2012.

Notes:
1.Feature locations provided by HGL
2. 2 µg/L = MCP GW-1 Standard for Vinyl Chloride
3. µg/L = Micrograms per liter
4. ERD = Enhanced Reductive Dechlorination
5. GW = Groundwater
6. J = Estimate
7. LTM = Long-Term Monitoring
8. MCP = Massachusetts Contingency Plan
9. U = Non-detect

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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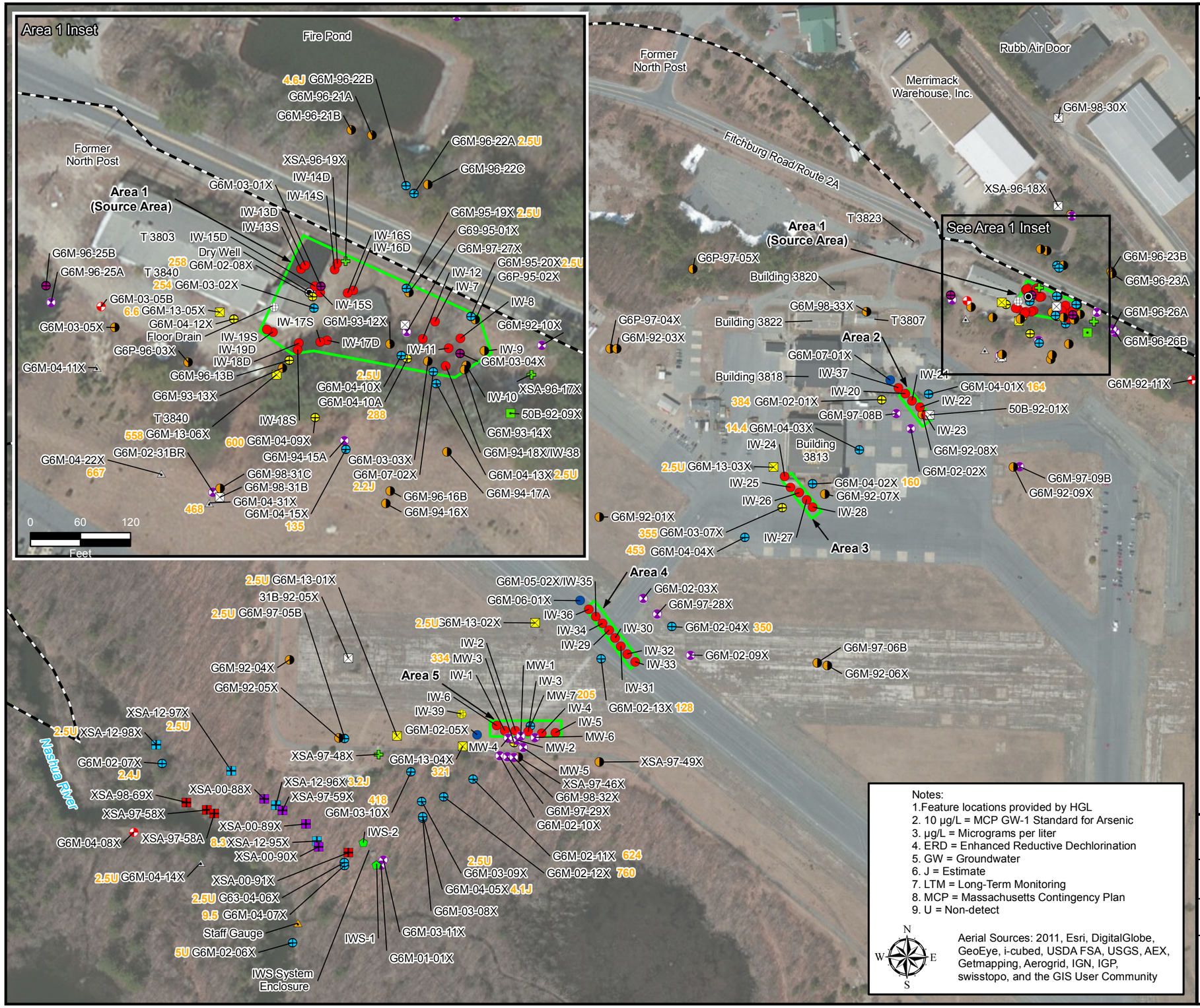
Figure 9.9

Figure 9.10
Dissolved Arsenic Concentrations in Groundwater Oct/Nov 2014



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 (CY2013)
- Monitoring Well - Destroyed
- In-Well Stripping System Well
- MicroWell® - Sampled Annually
- MicroWell® - Gauge Only
- MicroWell®
- Injection Well
- Staff Gauge
- Abandoned Well
- Historic Vertical Groundwater Profiling Location
- Historic Soil Boring
- Monitoring Well Installed 12/2013-01/2014
- Injection Well Installed 01/2014
- Dry Well
- Floor Drain
- G6M-92-11X Well/Gauge/Piezometer Identification
- 355 Dissolved Arsenic Concentration (µg/L)
- Former Fort Devens Boundary
- ERD Injection Well Transect

References:
HGL. LTMMP 2012.

Notes:
1.Feature locations provided by HGL
2. 10 µg/L = MCP GW-1 Standard for Arsenic
3. µg/L = Micrograms per liter
4. ERD = Enhanced Reductive Dechlorination
5. GW = Groundwater
6. J = Estimate
7. LTM = Long-Term Monitoring
8. MCP = Massachusetts Contingency Plan
9. U = Non-detect

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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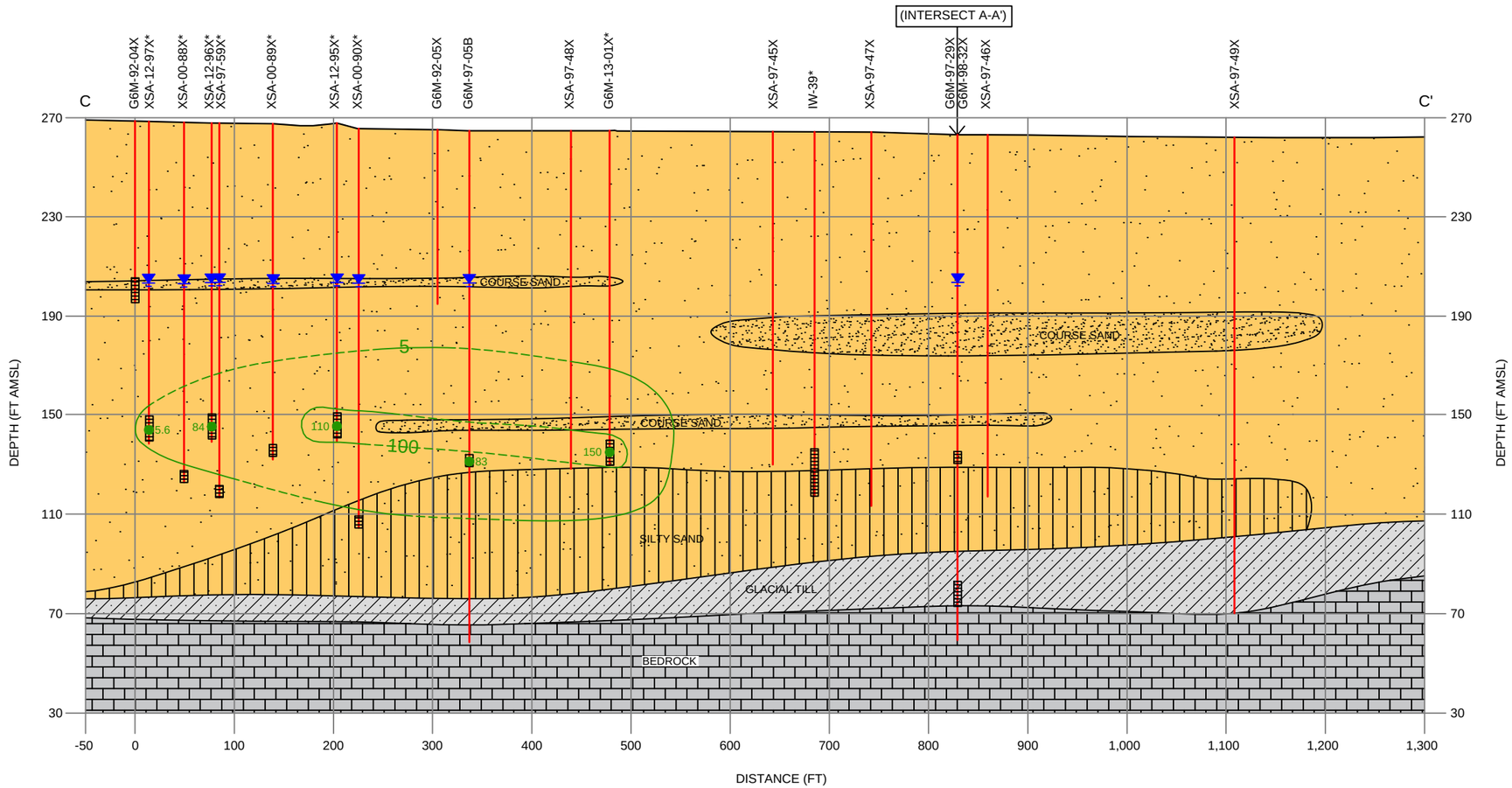
0 150 300
Feet

Date: 04/14/2015

Figure 9.10

Figure 9.11
Tetrachloroethene Plume in Groundwater (Cross Section C-C')
October/November 2014



Legend

- Fine Sand
- Coarse Sand
- Silty Sand
- Glacial Till
- Bedrock
- GW Elevation on 10/27/2014
- Well Screen Interval
- Soil Boring
- Lithology Boundary
- IW-39 — Boring/Well Identification
- 5.6 — Tetrachloroethene Sample Concentration (µg/L)
- Tetrachloroethene Contour (µg/L)

Notes

* = Not on cross section line. Relative projection on cross section C-C'.
FT = Feet
FT AMSL = Feet above mean sea level
µg/L = Micrograms per liter
Stratification lines represent approximate boundaries between soil types and the transition may be gradual.
Cross section features including well locations, screen location and lithology based on "Figure 4.6 Tetrachloroethene Plume in Groundwater (Cross Section C-C') October 2013 created by HGL on 03/31/2014

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Figure 9.11

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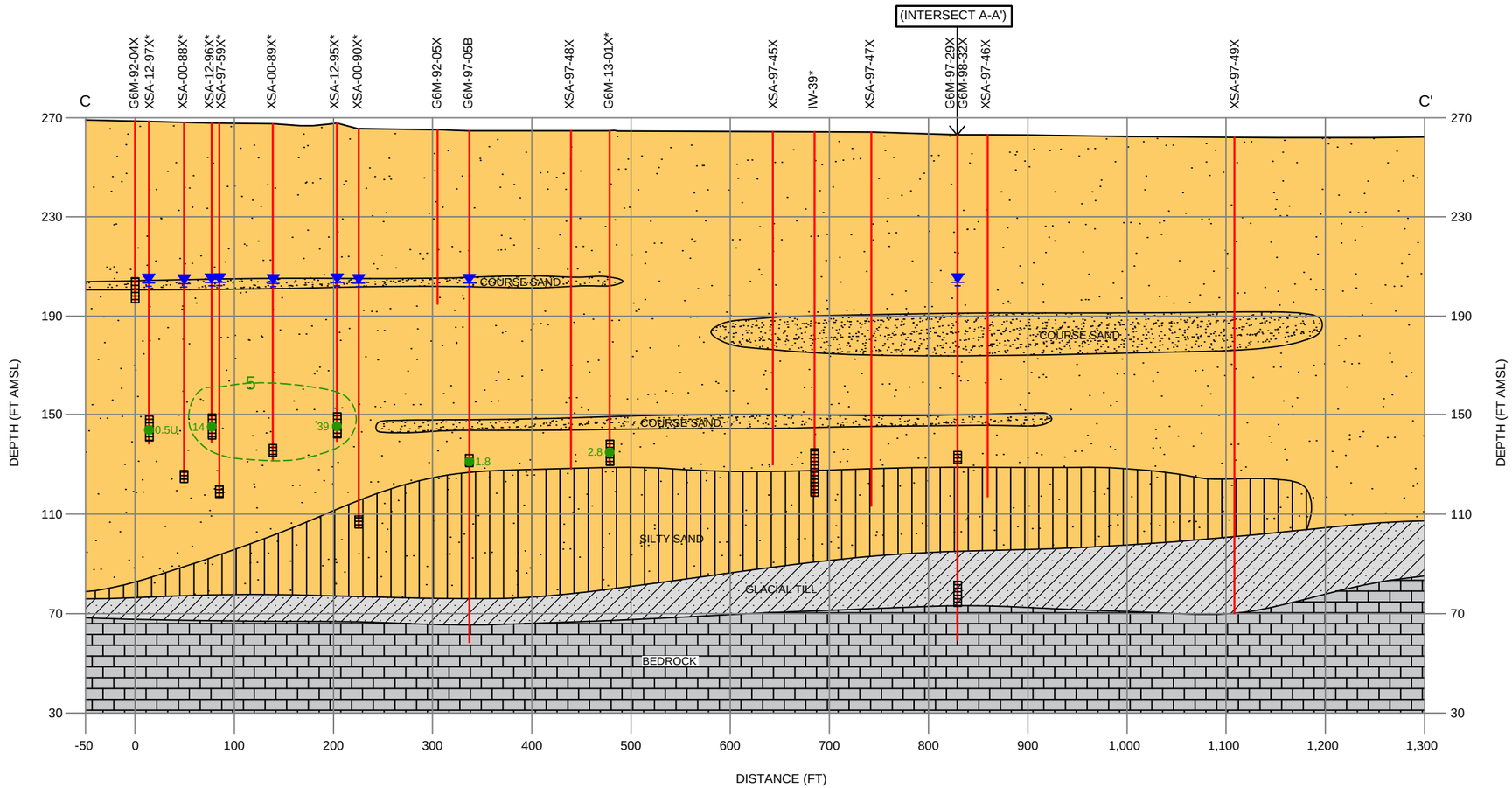
Figure 9.12
Trichloroethene Plume in Groundwater (Cross Section C-C')
October/November 2014



Legend

- Fine Sand
- Coarse Sand
- Silty Sand
- Glacial Till
- Bedrock
- GW Elevation on 10/27/2014
- Well Screen Interval
- Soil Boring
- Lithology Boundary
- IW-39 — Boring/Well Identification
- 14 ● — Trichloroethene Sample Concentration (µg/L)
- Trichloroethene Contour (µg/L)

Notes

* = Not on cross section line. Relative projection on cross section C-C'.
FT = Feet
FT AMSL = Feet above mean sea level
µg/L = Micrograms per liter
U = 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 based on "Figure 4.6 Tetrachloroethene Plume in Groundwater (Cross Section C-C') October 2013 created by HGL on 03/31/2014

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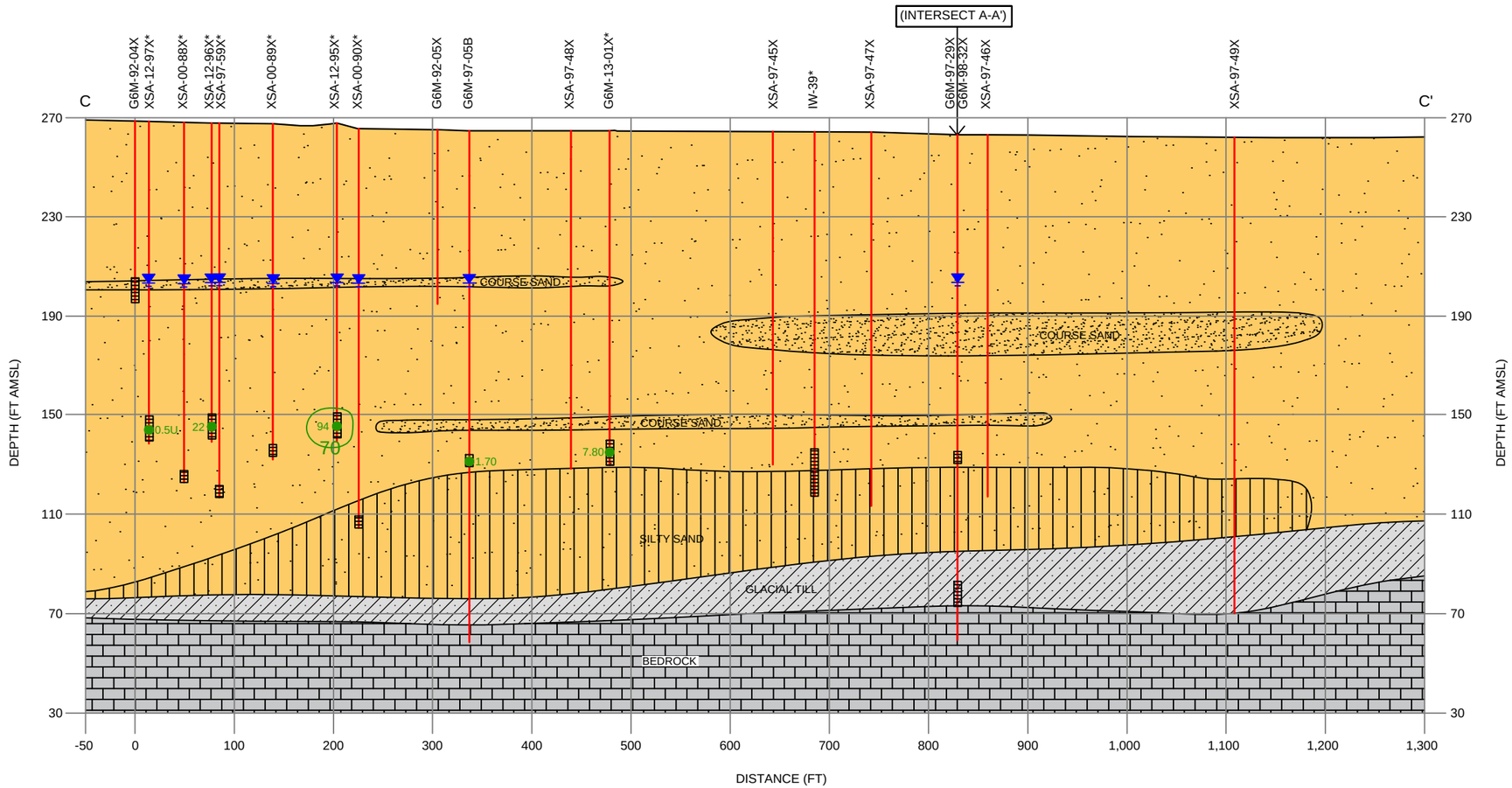
Figure 9.12

Figure 9.13
cis-1,2-Dichloroethene Plume in Groundwater (Cross Section C-C')
October/November 2014



Legend

- Fine Sand
- Coarse Sand
- Silty Sand
- Glacial Till
- Bedrock
- GW Elevation on 10/27/2014
- Well Screen Interval
- Soil Boring
- Lithology Boundary
- IW-39 Boring/Well Identification
- 22 cis-1,2-Dichloroethene Sample Concentration (µg/L)
- cis-1,2-Dichloroethene Contour (µg/L)

Notes

* = Not on cross section line. Relative projection on cross section C-C'.
FT = Feet
FT AMSL = Feet above mean sea level
µg/L = Micrograms per liter
U = 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 based on "Figure 4.6 Tetrachloroethene Plume in Groundwater (Cross Section C-C') October 2013 created by HGL on 03/31/2014

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Figure 9.13

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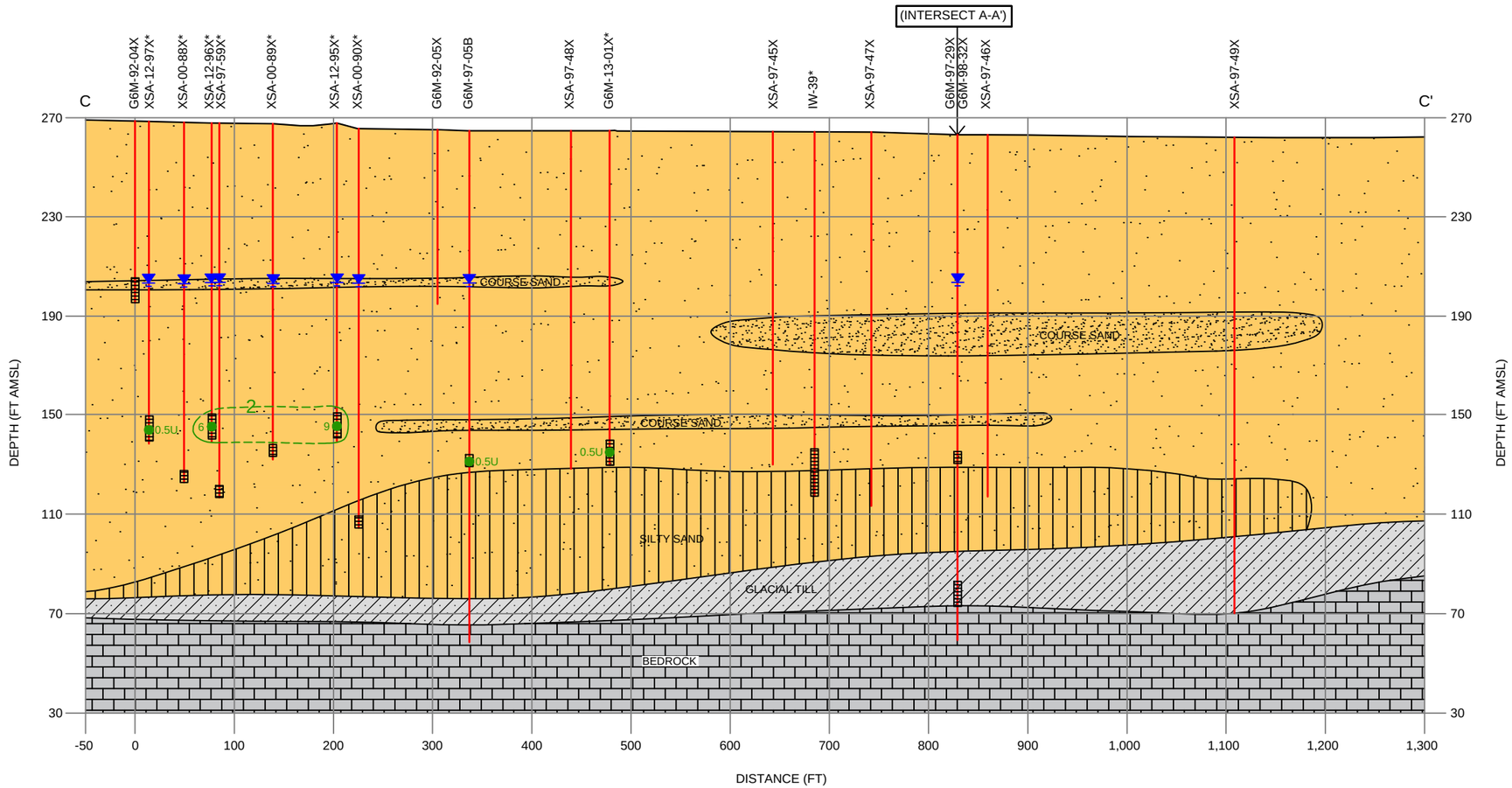
Figure 9.14
Vinyl Chloride Plume in Groundwater (Cross Section C-C')
October/November 2014



Legend

- Fine Sand
- Coarse Sand
- Silty Sand
- Glacial Till
- Bedrock
- GW Elevation on 10/27/2014
- Well Screen Interval
- Soil Boring
- Lithology Boundary
- IW-39 — Boring/Well Identification
- 22 ● — Vinyl Chloride Sample Concentration (µg/L)
- Vinyl Chloride Contour (µg/L)

Notes

* = Not on cross section line. Relative projection on cross section C-C'.
FT = Feet
FT AMSL = Feet above mean sea level
µg/L = Micrograms per liter
U = 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 based on "Figure 4.6 Tetrachloroethene Plume in Groundwater (Cross Section C-C') October 2013 created by HGL on 03/31/2014

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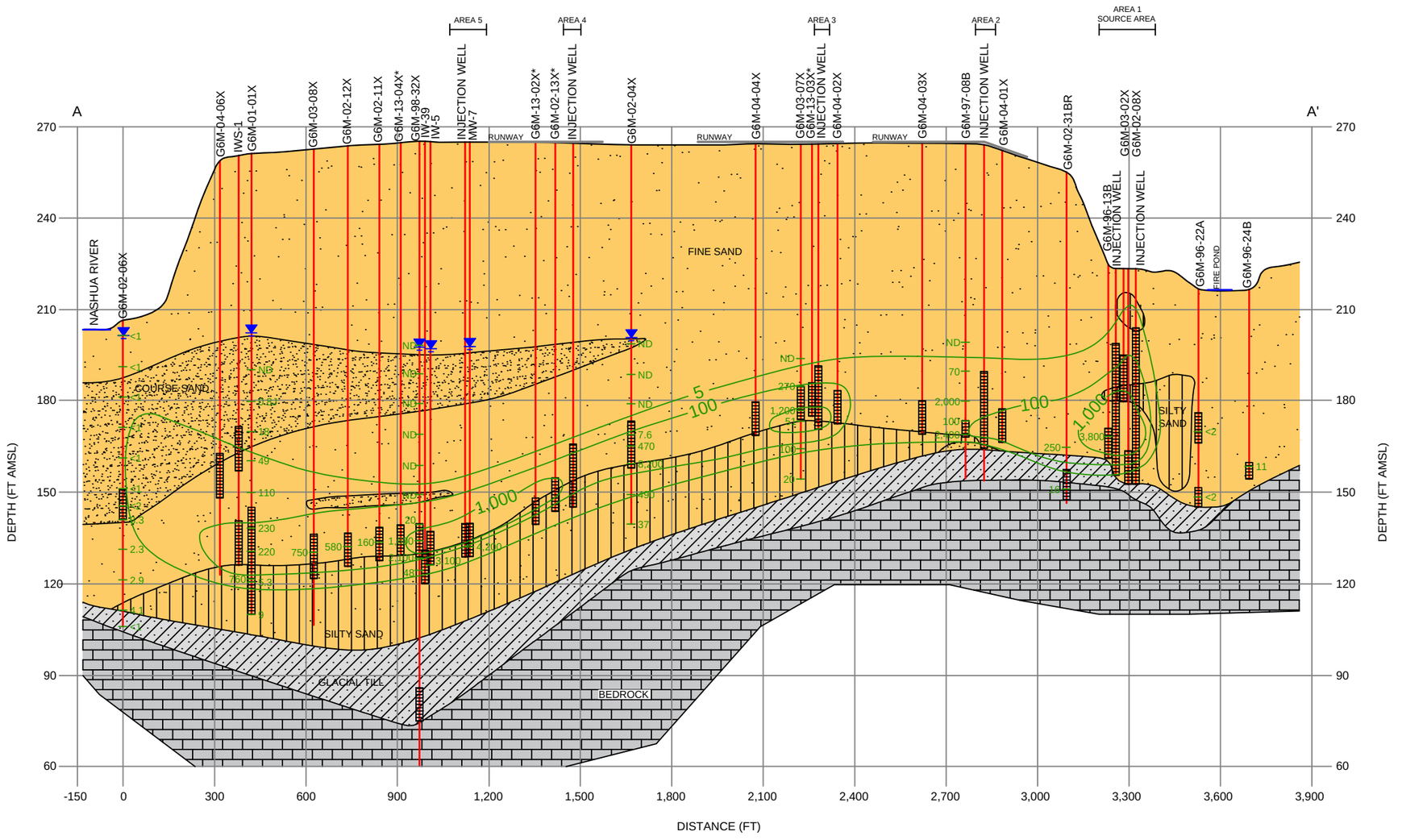
Figure 9.14

Figure 9.15
Tetrachloroethene Plume in Groundwater (Cross Section A-A') Prior to Full-Scale ERD Injections



Legend

- Fine Sand
- Coarse Sand
- Silty Sand
- Glacial Till
- Bedrock
- Groundwater Level
- Well Screen Interval
- Soil Boring
- Lithology Boundary
- MW-7 — Boring/Well Identification
- 20.0 — Tetrachloroethene Sample Concentration (µg/L)
- Tetrachloroethene Contour (µg/L)

Notes

* = Not on cross section line. Relative projection on cross section A-A'.
FT = Feet
FT AMSL = Feet above mean sea level
J = The analyte was detected at the reported concentration; The quantitation is an estimate
U = Non-Detect
µg/L = Micrograms per liter
Stratification lines represent approximate boundaries between soil types and the transition may be gradual.
Cross section features including well locations, screen location and lithology based on "Figure 4.10 Tetrachloroethene Plume in Groundwater (Cross Section A-A') Prior to ERD Injections" created by HGL on 03/31/2014

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Date: 04/14/2015

Figure 9.15

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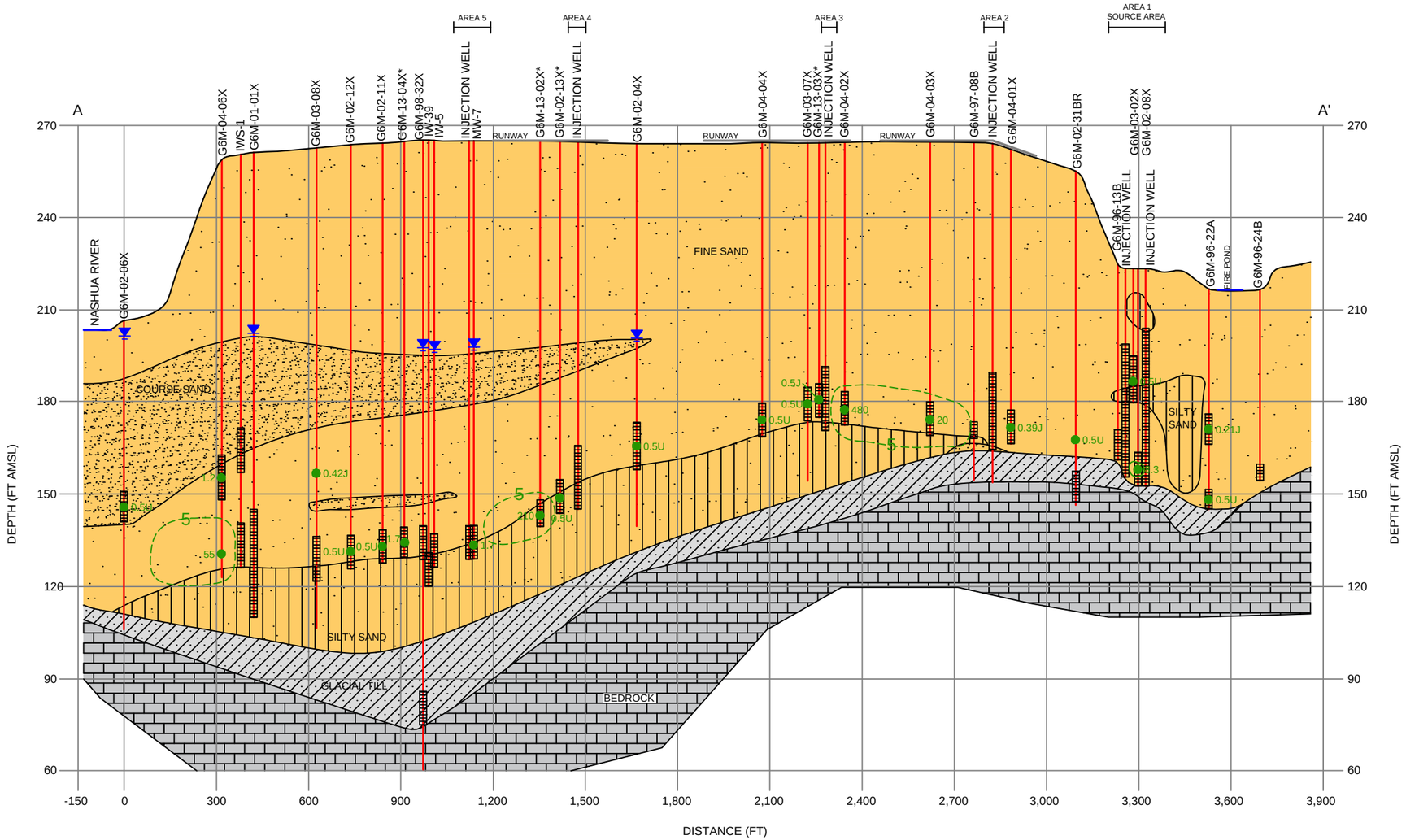
Figure 9.16
Tetrachloroethene Plume in Groundwater (Cross Section A-A')
October/November 2014



Legend

- Fine Sand
- Coarse Sand
- Silty Sand
- Glacial Till
- Bedrock
- Groundwater Level
- Well Screen Interval
- Soil Boring
- Lithology Boundary
- MW-7 — Boring/Well Identification
- 1.7 ● — Tetrachloroethene Sample Concentration (µg/L)
- Tetrachloroethene Contour (µg/L)

Notes

* = Not on cross section line. Relative projection on cross section A-A'.
FT = Feet
FT AMSL = Feet above mean sea level
J = The analyte was detected at the reported concentration; The quantitation is an estimate
U = Non-Detect
µg/L = Micrograms per liter
Stratification lines represent approximate boundaries between soil types and the transition may be gradual.
Cross section features including well locations, screen location and lithology based on "Figure 4.10 Tetrachloroethene Plume in Groundwater (Cross Section A-A') Prior to ERD Injections" created by HGL on 03/31/2014

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Figure 9.16

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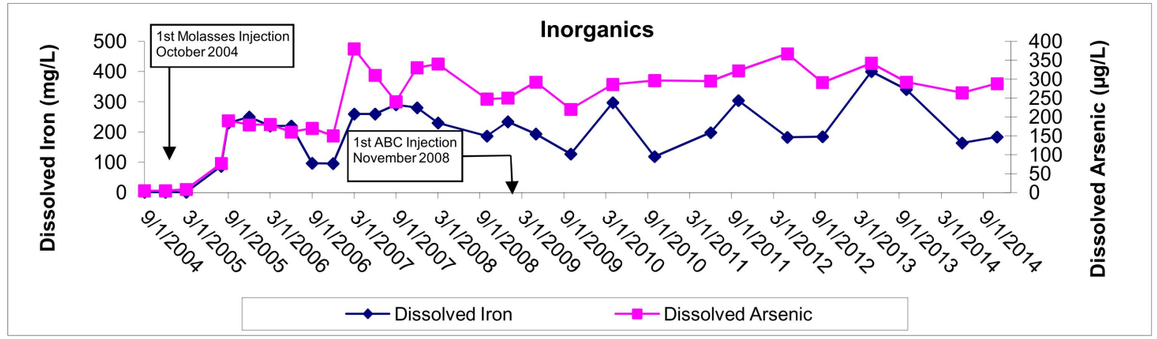

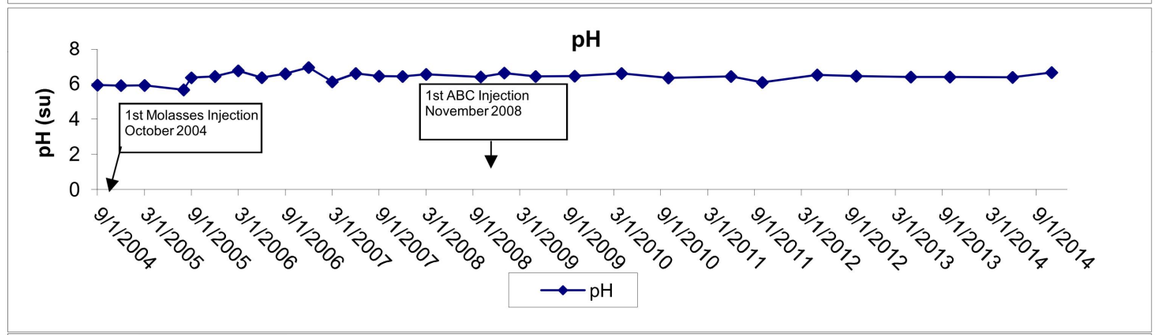

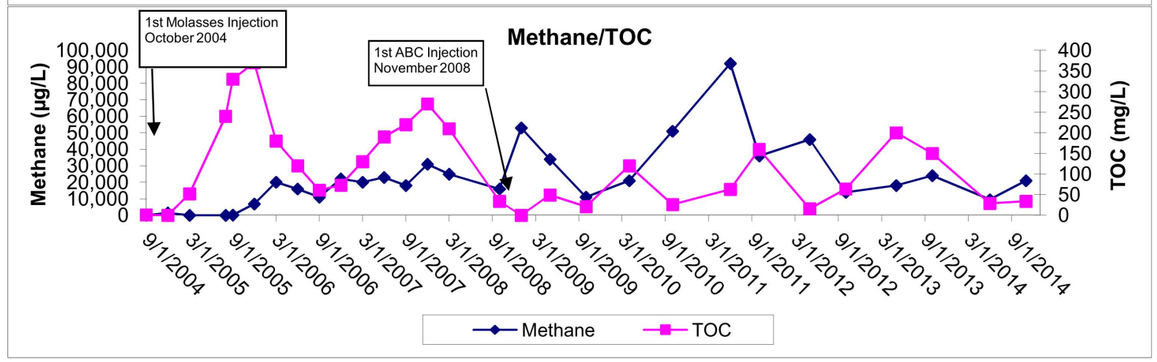

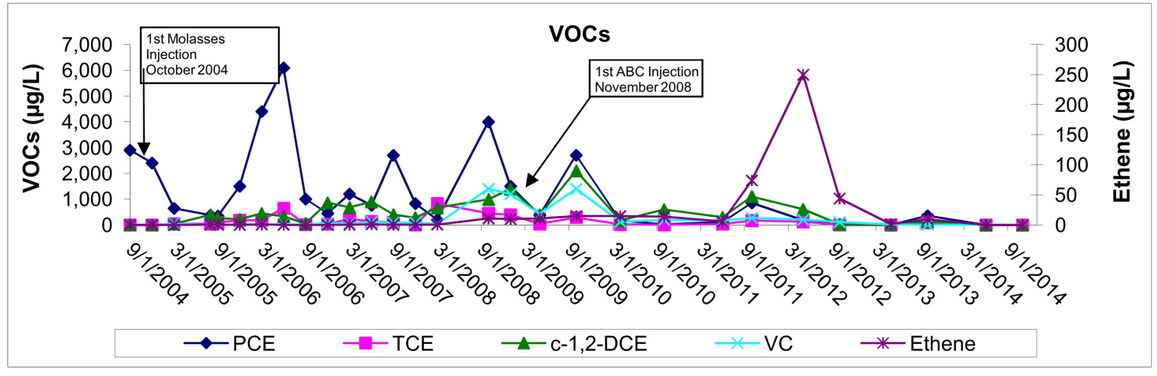

Figure 9.17
Former Drum Storage Area Monitoring Data
Well G6M-04-10A (23 feet Downgradient)

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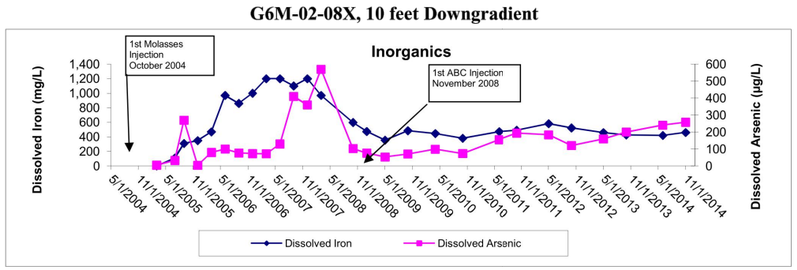

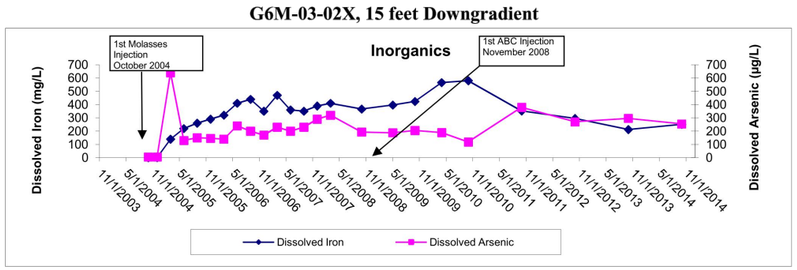

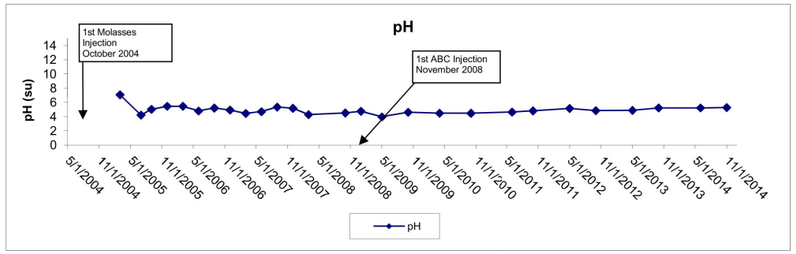

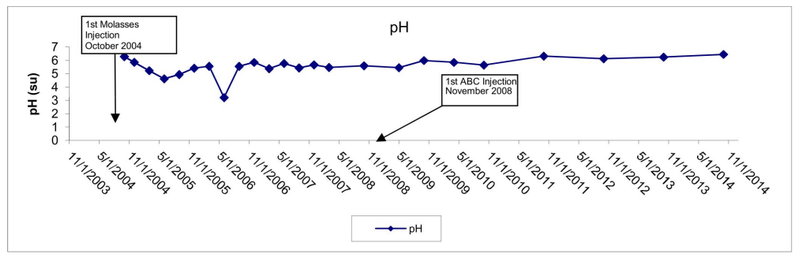

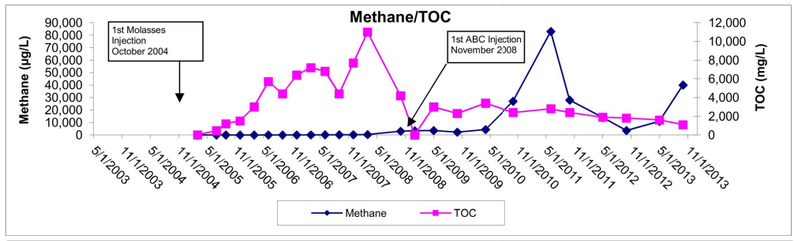

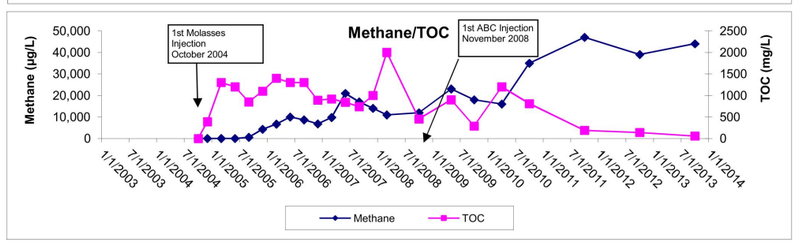

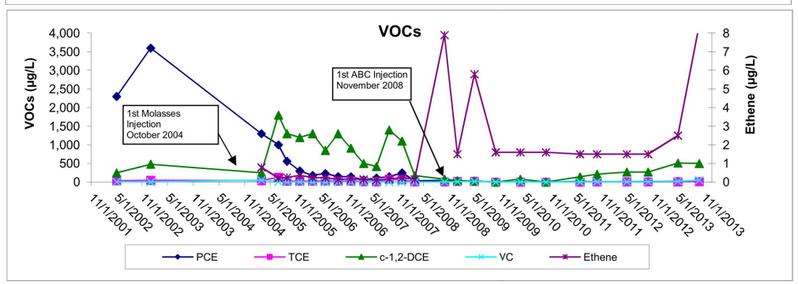

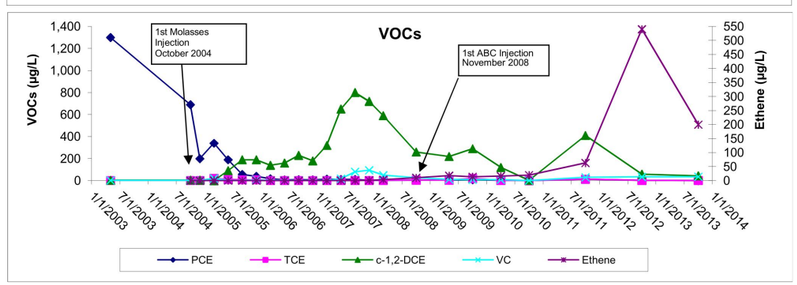

Figure 9.18
Former Dry Well Area Monitoring Data
Wells G6M-02-08X, G6M-03-02X, G6M-96-13B and G6M-13-06X

Five Year Review Report
AOC 50

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

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Date:	Figure
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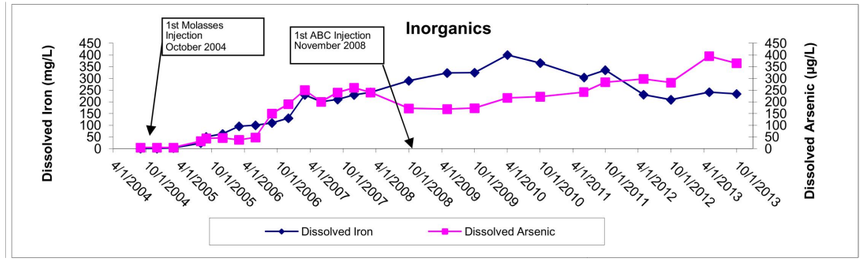
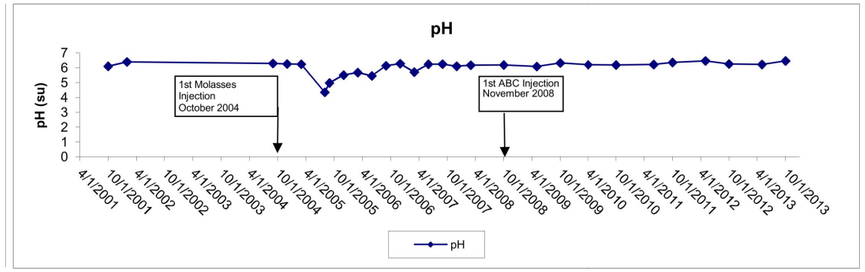
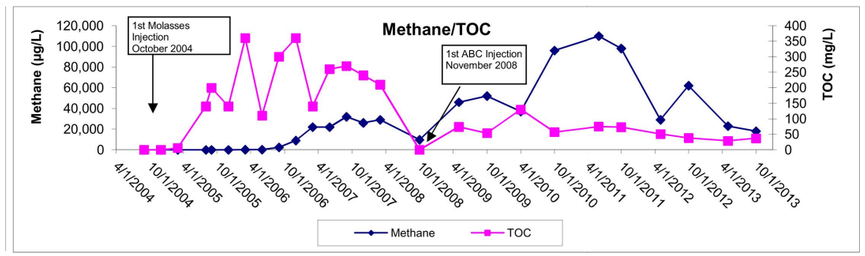
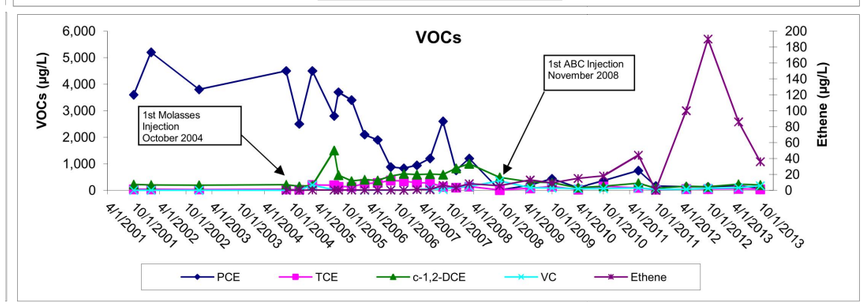
G6M-96-13B, 25 feet Downgradient

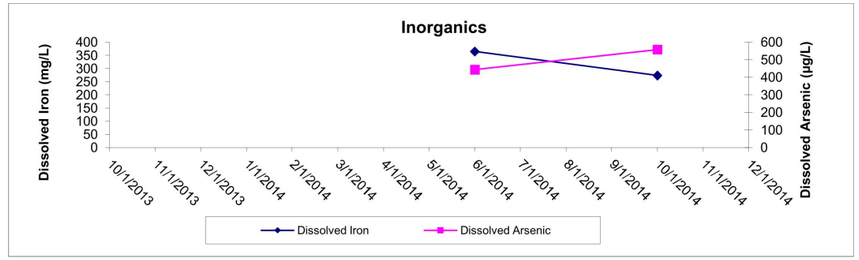


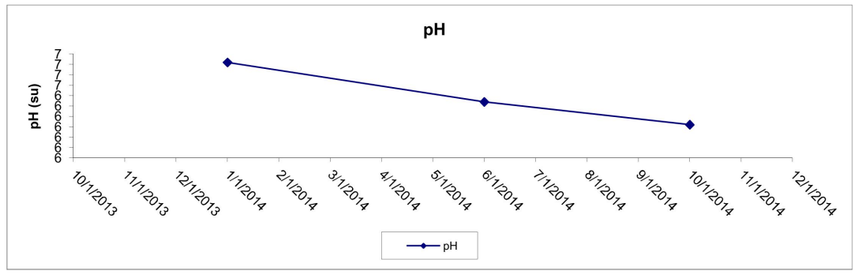


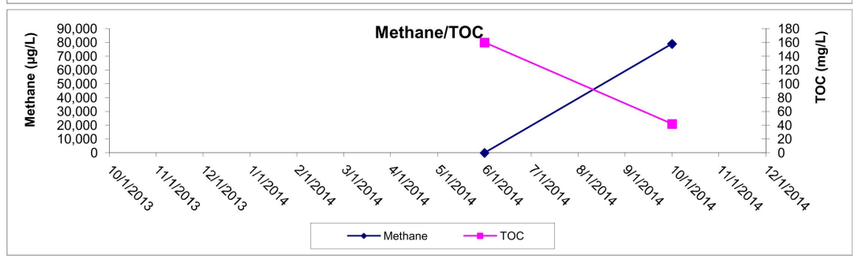




G6M-13-06X, 41 feeet Downgradient







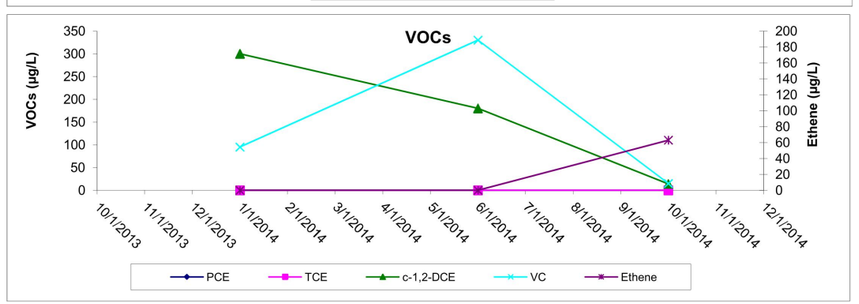


Figure 9.19
Former Dry Well Area Monitoring Data
Wells G6M-02-08X, G6M-03-02X, G6M-96-13B and G6M-13-06X

Five Year Review Report
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Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

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Date:	Figure
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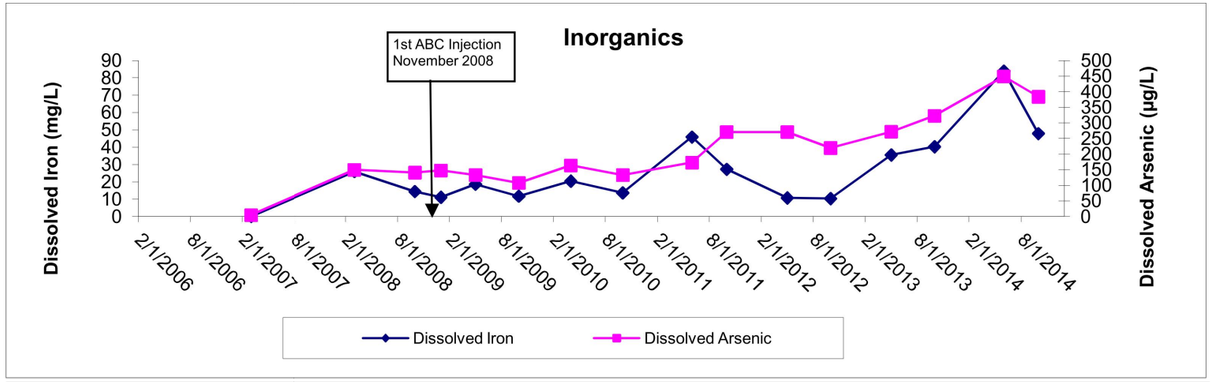

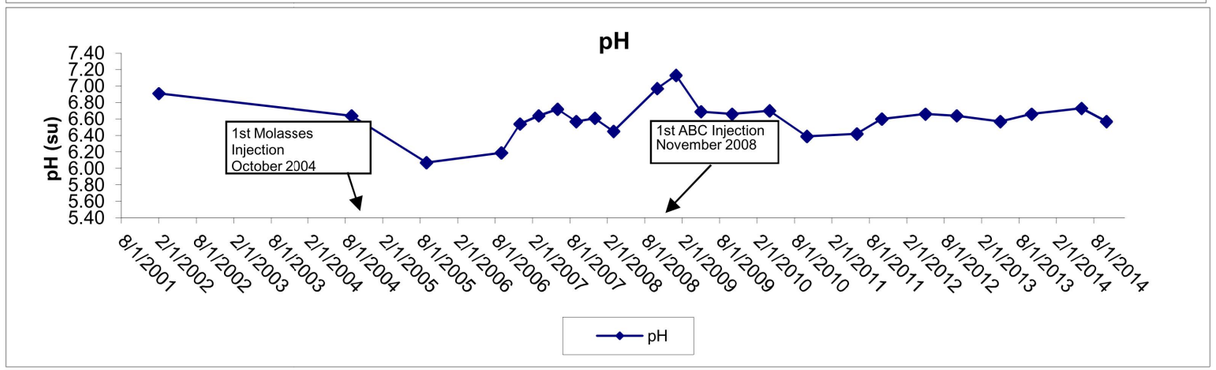

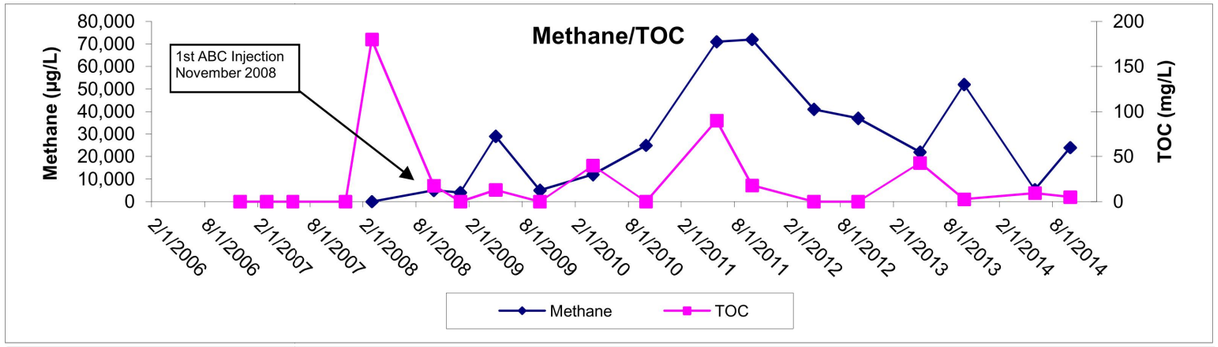

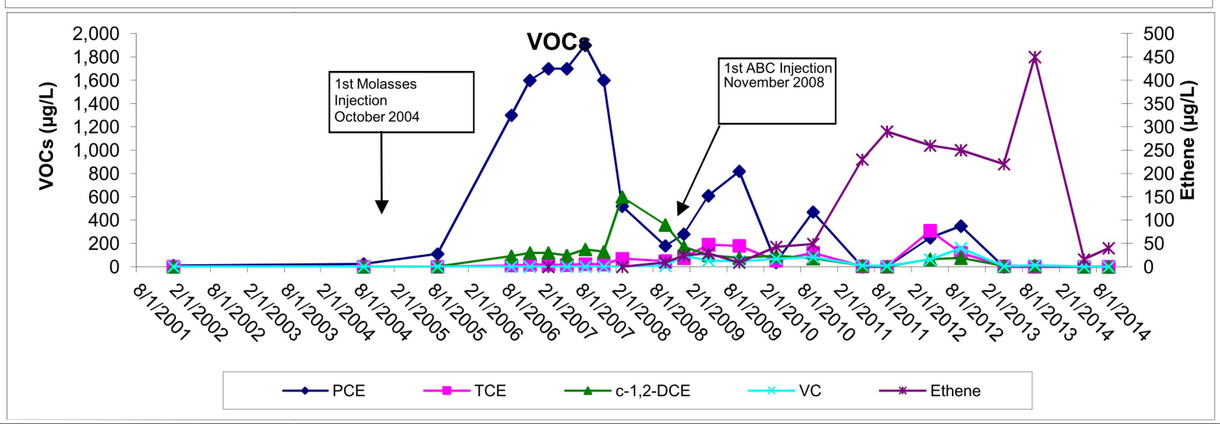

Figure 9.20
Area 2 Monitoring Data
Well G6M-02-01X (60 feet Downgradient)

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Former Fort Devens Army Installation and Sudbury Annex
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Date:	Figure
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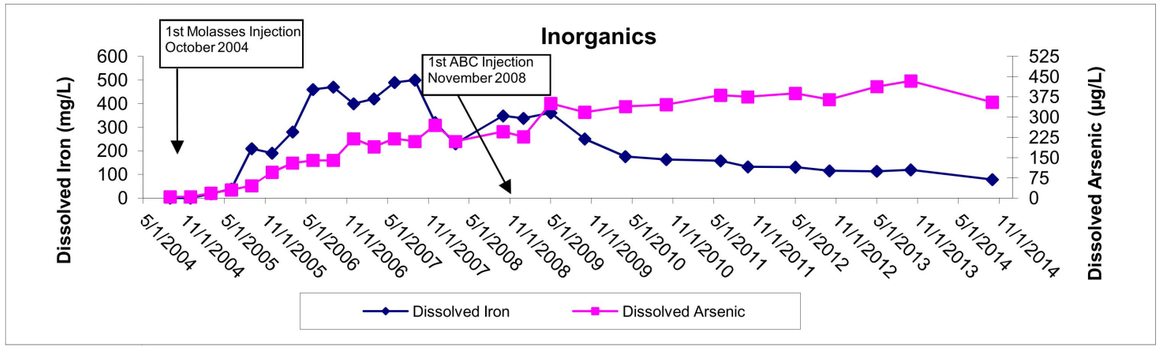

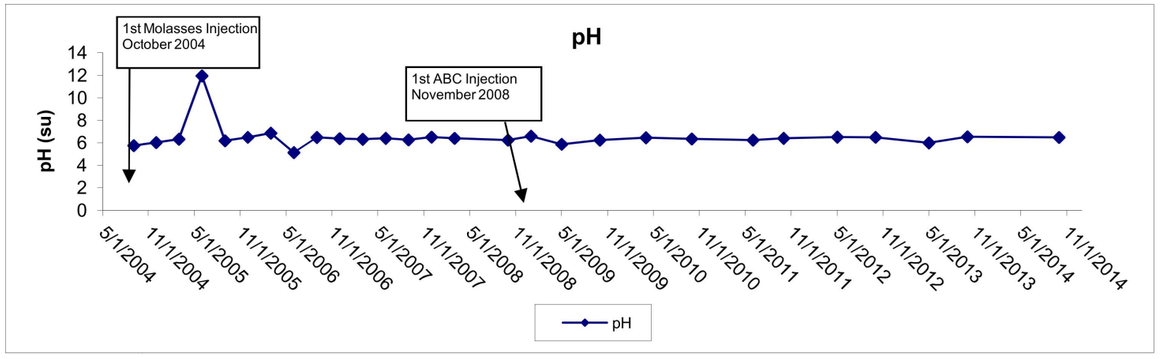

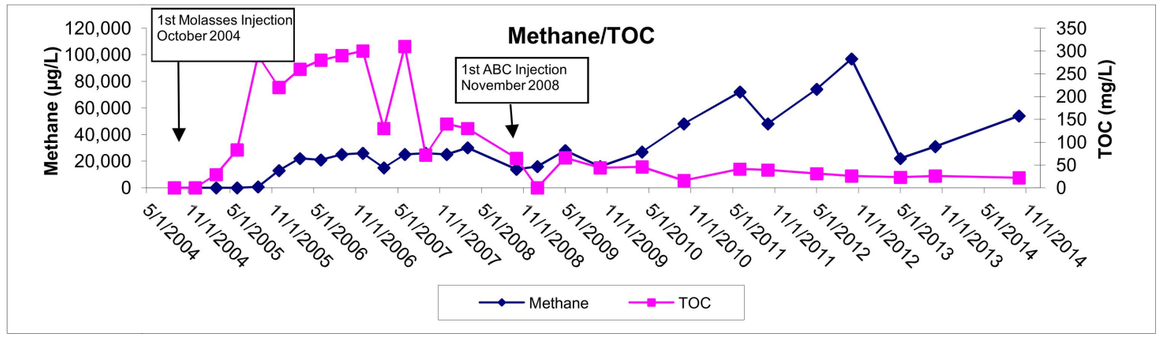

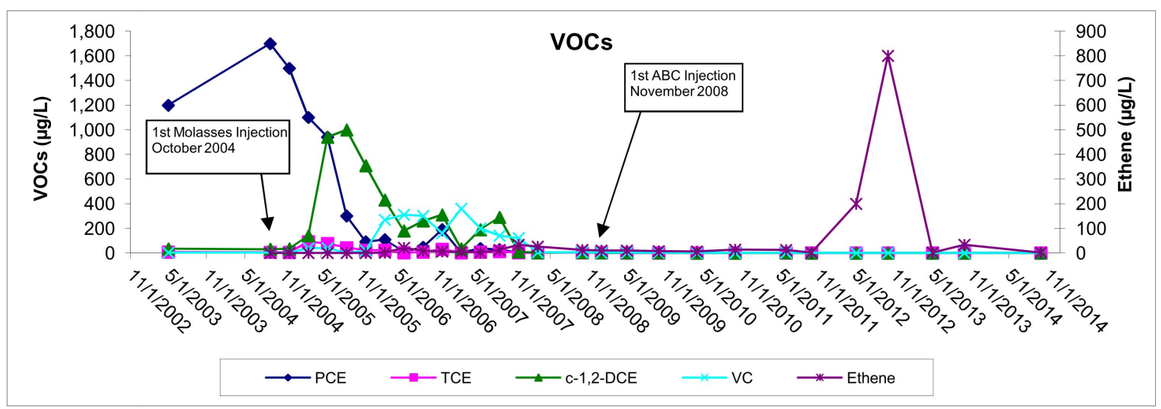

Figure 9.21
Area 3 Monitoring Data
Well G6M-03-07X (60 feet Downgradient)

Five Year Review Report
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Former Fort Devens Army Installation and Sudbury Annex
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Date:	Figure
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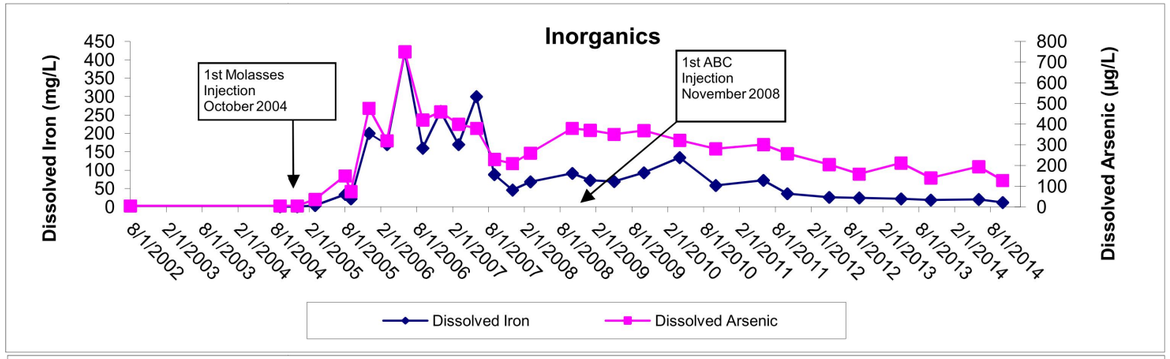

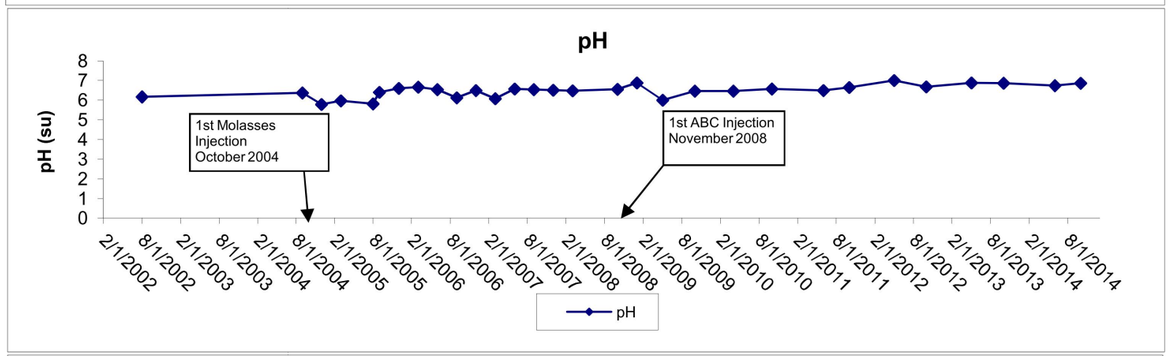

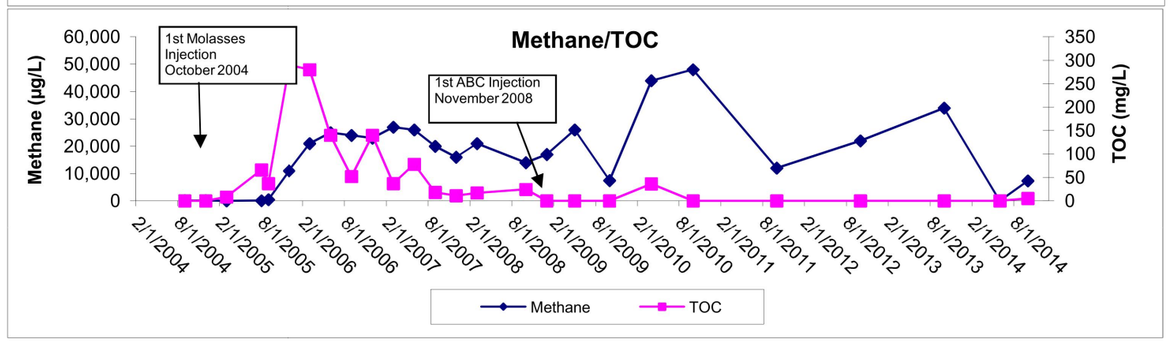

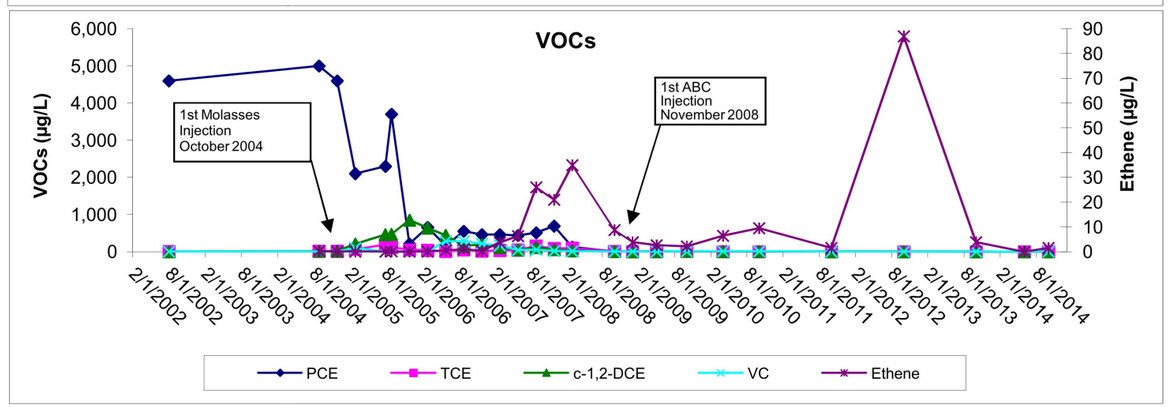

Figure 9.22
Area 4 Monitoring Data
Well G6M-02-13X (60 feet Downgradient)

Five Year Review Report
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Former Fort Devens Army Installation and Sudbury Annex
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Date:	Figure
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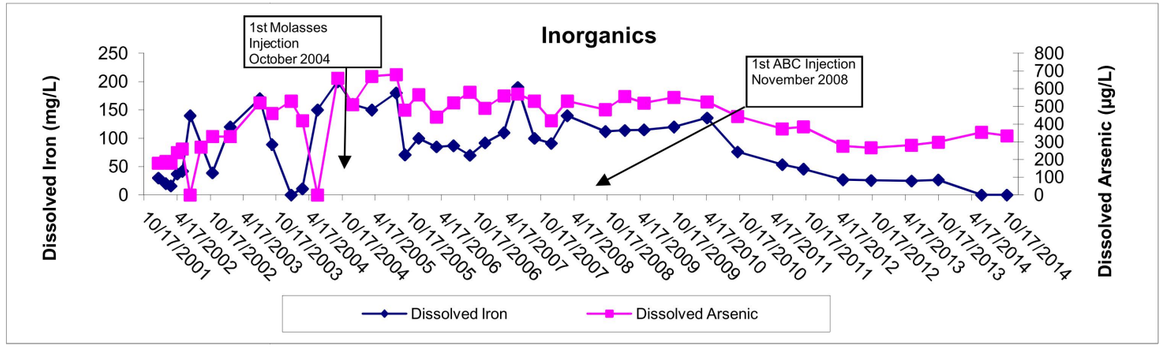

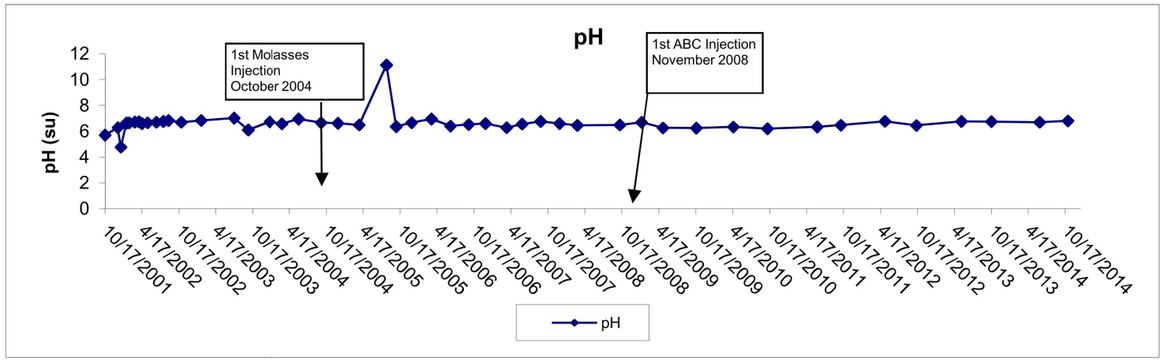

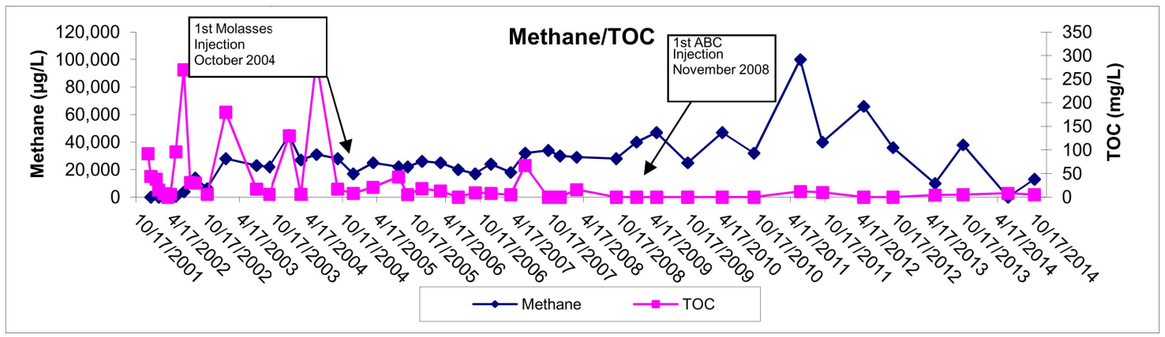

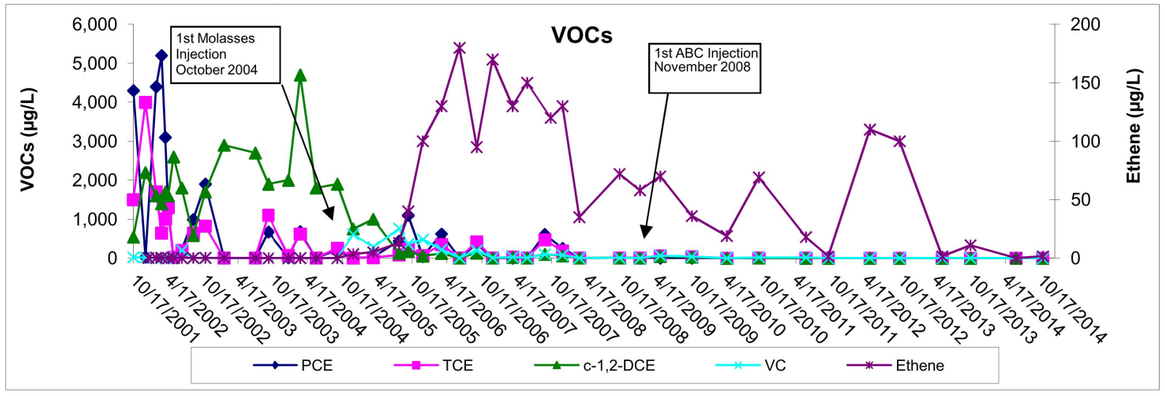

Figure 9.23
Area 5 Monitoring Data
Well MW-3 (40 feet Downgradient)

Five Year Review Report
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Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

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Date:	Figure
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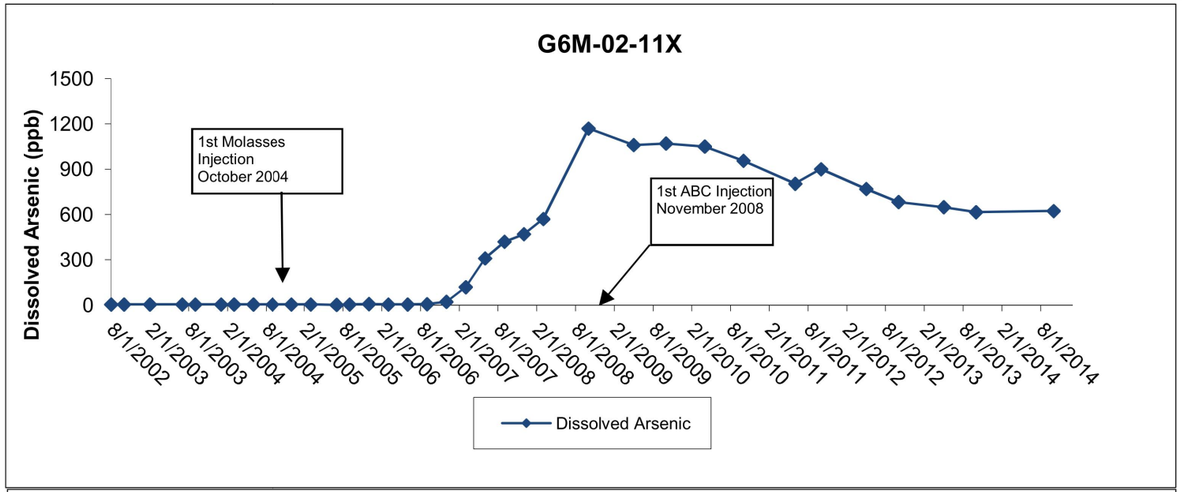

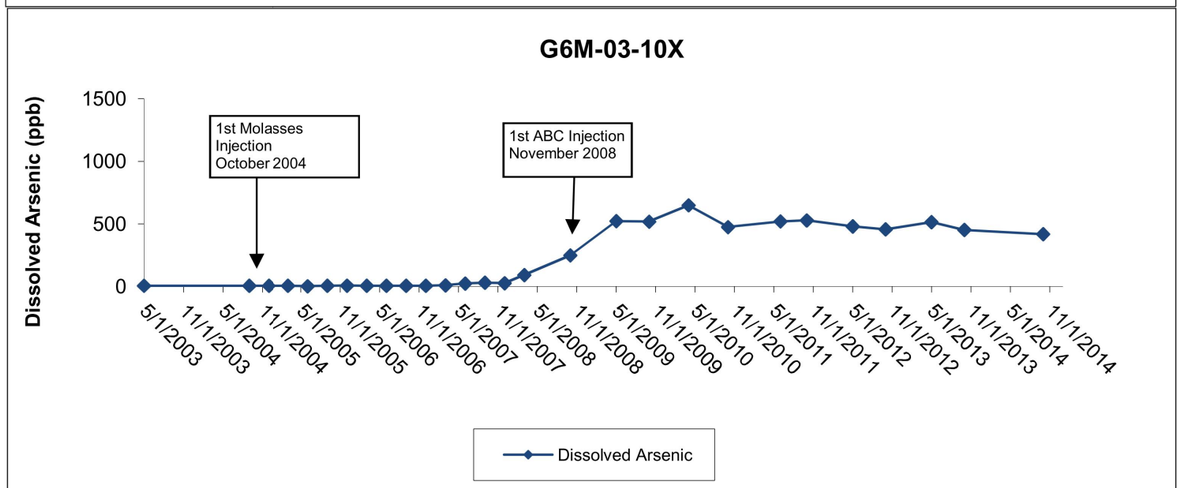

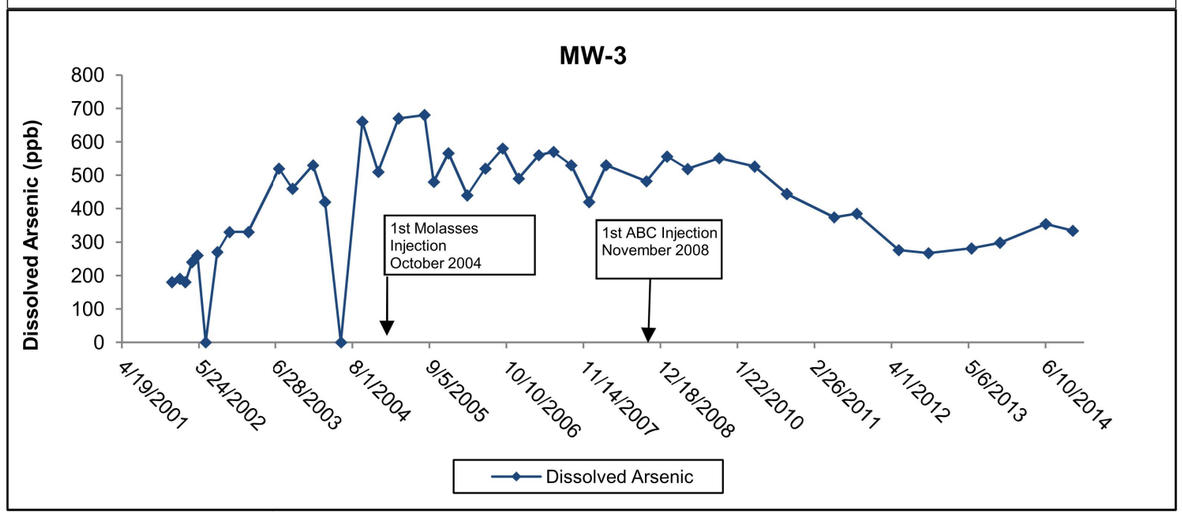

Figure 9.24
Area 5 Monitoring Data
Dissolved Arsenic

Five Year Review Report
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Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

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J.2 Former

Moore Army

Airfield

Tables

APPENDIX I
Groundwater Analytical Results
Area of Contamination 50
2001-2014

Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
North Plume	G6M-96-22A	10/16/2001	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-22A	2/28/2002	2U	2U	2U	2U	1U	2U	-	-	0.10U	-	-	-	-	-	-	-	-	-
	G6M-96-22A	9/21/2004	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	54	-	-	-
	G6M-96-22A	9/29/2005	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	52	-	-	-
	G6M-96-22A	9/20/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	42	-	-	-
	G6M-96-22A	9/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	6U	0.1U	78	-	-	-
	G6M-96-22A	10/17/2008	0.55	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	8U	0.2U	2,240	-	-	-
	G6M-96-22A	10/16/2009	0.25J	29	0.27J	0.5U	0.5U	0.5U	-	-	-	-	-	-	8U	0.2U	7,120	-	-	-
	G6M-96-22A	10/7/2010	0.22J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	7,670	-	-	-
	G6M-96-22A	10/7/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	6,860	-	-	-
	G6M-96-22A	10/15/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	12,400	-	-	-
	G6M-96-22A	10/18/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	6,010	-	-	-
	G6M-96-22A	11/4/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.0189U	3,160	-	-	-
North Plume	G6M-96-22B	10/19/2001	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-22B	2/28/2002	2U	2U	2U	2U	1U	2U	-	-	0.10U	-	-	-	-	-	-	-	-	-
	G6M-96-22B	1/31/2003	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-22B	9/21/2004	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	44	-	-	-
	G6M-96-22B	9/29/2005	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	48	-	-	-
	G6M-96-22B	9/20/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	44	-	-	-
	G6M-96-22B	9/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	6U	0.1U	40	-	-	-
	G6M-96-22B	10/17/2008	0.91	0.5U	0.24J	0.5U	0.5U	0.5U	-	-	-	-	-	-	8U	0.2U	67.3	-	-	-
	G6M-96-22B	10/16/2009	0.3J	23	0.32J	0.5U	0.5U	0.5U	-	-	-	-	-	-	8U	0.135U	25,500	-	-	-
	G6M-96-22B	10/7/2010	0.25J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	3.3J	0.1U	14,600	-	-	-
	G6M-96-22B	10/7/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	9,320	-	-	-
	G6M-96-22B	10/15/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.120U	9,980	-	-	-
	G6M-96-22B	10/18/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	3.2J	0.1U	14,100	-	-	-
	G6M-96-22B	11/4/2014	0.21J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	4.6J	0.0169U	7,180	-	-	-

APPENDIX I
Groundwater Analytical Results
Area of Contamination 50
2001-2014

Area of Concern	Well ID	Date	Laboratory Parameters																
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
North Plume	G6M-96-24B	10/16/2001	18	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	3/1/2002	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	1/31/2003	7.5	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	1/12/2004	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	9/24/2004	13B	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	12/17/2004	8.1	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	4/13/2005	8.2	1U	2.8	1U	1U	1U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	7/6/2005	7.6	2U	3	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	9/30/2005	7.2	2U	3.6	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	12/15/2005	7.4	2U	3.1	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	3/23/2006	4.2	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	6/23/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	9/22/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	12/14/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	3/30/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	6/13/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	9/13/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	12/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-24B	10/7/2008	0.4J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	46	0.13U	10	0.03UJ	-	8.0U	0.352U	448	1.3U	1.6U	15
	G6M-96-24B	1/22/2009	1.4U	2.3U	1.8U	1.3U	1.2U	1.3U	10UJ	32	0.13U	9.3	0.03U	0.24J	8.0U	226J	315	1.2U	1.5U	4.2
	G6M-96-24B	5/11/2009	0.29J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
FDW	G6M-02-08X	5/17/2002	2,300	35	250	2U	1U	5.8	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-08X	1/31/2003	3,600	46	480	2.3	1U	2.2	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-08X	3/31/2005	1,300	38J	250	50U	50U	50U	15	62	1.1	6.2	2U	-	5U	0.3J	770	0.049	0.79	1.2
	G6M-02-08X	7/5/2005	1,000	130	1,800	12U	12U	12U	450	350	0.05U	3.7	8.3	-	33	110	29,000	0.16	0.22	3
	G6M-02-08X	9/27/2005	560	26	1,300	1U	1.8	2.5	1,200	466	0.05U	320J	16	-	270	310J	75U	0.11	0.25	21
	G6M-02-08X	12/16/2005	300	24	1,200	4U	2U	4U	1,500	520	0.05U	57	9.4	-	4.4B	350J*	15U*	0.19	0.36	2.1
	G6M-02-08X	3/21/2006	180	25	1,300	2U	2.1	2.3	3,000	1,400	1U	245	14	-	80	470	40,000	0.084	0.24	15
	G6M-02-08X	6/21/2006	230	30	850	2U	1U	2U	5,700	1,800	1.67	759	40	-	100	970	44,000	0.14	0.23	19
	G6M-02-08X	9/20/2006	150	25	1,300	2U	1.6	2U	4,400	1,000	2U	655	16	-	77	860	29,000	0.072	0.14	11
	G6M-02-08X	12/12/2006	140	28	910	2U	1.1	2U	6,400	-	-	13.6	110	-	73	1,000	32,000	0.18	0.17	30
	G6M-02-08X	3/28/2007	60	14	500	2U	1U	2U	7,200	-	-	1,170	80	-	72	1,200	30,000J*	0.31	0.14	62
	G6M-02-08X	6/13/2007	110	8.4	420	2U	1U	2U	6,800	-	-	1,160	82	-	130	1,200	33,000	0.092	0.11	180
	G6M-02-08X	9/13/2007	140	74	1,400	2U	1U	2U	4,400	3,000	0.2U	890	200	-	410	1,100	37,000	0.22	0.17	120
	G6M-02-08X	12/10/2007	250	66	1,100	2U	2	3.3	7,700	-	-	414	120	-	360	1,200	42,000	0.14	0.23	240
FDW [2]	G6M-02-08X	3/10/2008	32	5.5	170	2U	1U	2U	11,000	-	-	770	16	-	570	970	20,000	0.36	0.15	280
	G6M-02-08X	10/6/2008	49	4.5J	81	5U	5U	5U	4,190	1,800	0.13U	610	0.75UJ	-	103J	598	7,630	6.3U	7.9U	3,000
	G6M-02-08X	1/21/2009	29	18U	39	11U	14U	11U	2,900J	3,000	0.13U	710	0.39	.24J	76	474J	6,650	1.2U	1.5U	3,400
	G6M-02-08X	5/7/2009	25	20U	29	20U	20U	20U	3,000	550J	0.092J	410	0.053	0.5UJ	53.2	356	5,130	1.3U	5.8	3,500
	G6M-02-08X	10/20/2009	0.5U	0.5U	0.31J	0.5U	0.5U	0.5U	2,300	40	1.3U	440	0.3UJ	0.12J	70.6	486	6,840	1.3U	1.6U	2,300J
	G6M-02-08X	4/21/2010	11J	2.0UJ	75J	2.0UJ	2.0UJ	2.0UJ	3,400	40	1.3U	130	0.28	0.22	98.9	447 J	8,720	1.3U	1.6U	4,400
	G6M-02-08X	10/7/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	2,400	860	2.6U	100	0.095	0.61J	73.4	381	8,080	1.3U	1.6U	27,000
	G6M-02-08X	6/9/2011	13	0.5U	140	0.5U	0.5U	1.6	2,800	1,100	6.5U	99J	0.38	-	155	473	14,000	1.2U	1.5U	83,000
	G6M-02-08X	10/4/2011	8.0U	8.0U	210	8.0U	8.0U	8.0U	2,400	230	0.13U	86	0.091	-	194	491	15,900	1.2U	1.5U	28,000
	G6M-02-08X	5/10/2012	9.8	8.0U	270	8.0U	8.0U	8.0U	1,900	730	0.13U	64	1.8	-	184	581	19,000	1.2U	1.5U	14,000
	G6M-02-08X	10/15/2012	12	4.0U	270	4.0U	4.0U	6.2	1,800	900	0.080J	37	0.096	-	121	523	20,300	1.2U	1.5U	3,600
	G6M-02-08X	5/23/2013	20	8.0U	510	8.0U	8.0U	24	1,600	610	0.041J	5.3	3.5J	-	160	460	18,200	1.2U	1.5U	11,000
	G6M-02-08X	10/22/2013	13U	13U	500	13U	13U	51	1,100	630	0.13U	8.9	3.8	-	200	428	15,400	3.6	84	40,000
	G6M-02-08X	6/12/2014	12	1.5	400	0.5U	0.7	140	670	700J	0.13U	1.0J	0.03U	-	241	420	10,100	1.3UJ	1.6UJ	9,400
	G6M-02-08X	11/3/2014	8.3	5U	260	5U	5U	44	1,400	590	0.13U	0.96J	0.03U	-	258	461	10,400	4.4	7.7	26,000

APPENDIX I
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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
FDW	G6M-03-02X	5/12/2003	1,300	2U	4.4	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-03-02X	10/11/2004	690	2U	5.6	2U	1U	2U	1U	12	3.7	20	1.7J	-	5U	1U	17	0.051	0.03	2.6
	G6M-03-02X	12/15/2004	200	2U	5	2U	1U	2U	390	29	2.4	30	2U	-	5U	1U	610	0.056	0.063	3.4
	G6M-03-02X	3/29/2005	340	20U	14J	20U	10U	20U	1,300	366	0.2U	230	6.7J*	-	640	140M	49,000	0.15	0.34	5.1
	G6M-03-02X	6/29/2005	190	11	91	2.5U	2.5U	2.5U	1,200	431	0.05U	74	11	-	130	220J*	35,000J*	0.29	0.65	43
	G6M-03-02X	9/29/2005	57	7.8	190	2.5U	2.5U	2.5U	850	345	0.05U	62	16	-	150	260J	37,000	0.2	0.29	560
	G6M-03-02X	12/15/2005	39	8U	190	8U	4U	8U	1,100	550	0.05U	66	16	-	146	290J*	38,000	0.17	0.26	4,300
	G6M-03-02X	3/21/2006	17	2U	140	2U	1U	2U	1,400	1,200	2U	88.4	8.8	-	140	320	37,000	0.016J	0.14	6,700
	G6M-03-02X	6/21/2006	8.2	2U	160	2U	1U	2U	1,300	1,000	1U	120	9.6	-	240	410	23,000	0.044	0.12	10,000
	G6M-03-02X	9/20/2006	9.7	2.3	230	2U	1U	2U	1,300	570	1U	115	8.4	-	200	440	21,000	0.05	0.2	8,700
	G6M-03-02X	12/12/2006	6.9	2U	180	2U	1U	2U	890	-	-	53	8	-	170	350	11,000	0.047	0.16	6,800
	G6M-03-02X	3/28/2007	13	2.2	320	2U	1U	2U	920	-	-	74.5	9.2	-	230	470	14,000J*	0.033	0.11	9,800
	G6M-03-02X	6/12/2007	11	2U	650	2U	1.4	17	840	-	-	39	8.4	-	200	360	10,000	0.025U	0.14	21,000
	G6M-03-02X	9/12/2007	12	2.1	800	2U	1U	81	740	790	0.2U	580	20	-	230	350	12,000	0.006J	0.6	17,000
	G6M-03-02X	12/10/2007	3.8	2U	720	2U	1.8	94	1,000	-	-	24.7	7	-	290	390	29,000	0.005J	1.4	14,000
	G6M-03-02X	3/10/2008	2U	2U	590	2U	1.8	50	2,000	-	-	50U	4.8	-	320	410	100,000	0.098	3.4	11,000
	G6M-03-02X	10/15/2008	5U	5U	260	5U	5U	27	454	860	0.13U	59	0.03UJ	-	193	366	108,000	1.2U	10	12,000
	G6M-03-02X	5/7/2009	4.0U	4.0U	220	4.0U	4.0U	12	900	1,100J	0.13U	44	0.03U	-	188	396	56,700	1.2U	18	23,000
	G6M-03-02X	10/19/2009	10U	20U	290	10U	10U	9.5J	290	920	0.13U	300	0.03U	-	205	423	43,400	1.3U	14	18,000
	G6M-03-02X	4/21/2010	2.0UJ	2.0UJ	120J	2.0UJ	2.0UJ	9.3J	1,200	1,000	0.13U	0.28J	0.03U	-	189	566J	39,600	1.3U	16	16,000
	G6M-03-02X	10/6/2010	0.5U	0.5U	3.2	0.5U	0.5U	0.42J	810	1,100	0.29	0.40J	0.03U	-	118	580	36,100	1.2U	20	35,000
	G6M-03-02X	10/4/2011	13U	13U	410	13U	13U	30	190	3,300	0.13U	0.51J	0.035	-	379	352	12,400	1.2U	63	47,000
	G6M-03-02X	10/11/2012	2.0U	2.0U	59	2.0U	2.0U	34	140	500	0.051J	5.0U	0.49	-	270	295	10,200	1.2U	540	39,000
	G6M-03-02X	10/22/2013	1.3U	1.3U	44	1.3U	1.3U	36	57	300	0.13U	5.0U	0.19	-	296	212	6,750	1.2U	200	44,000
	G6M-03-02X	10/30/2014	0.5U	0.27J	6.6	0.5U	0.5U	6.3	340	450	0.13U	0.23J	0.03U	-	254	251	6,090	1.2U	12	38,000
FDW	G6M-04-11X	9/20/2004	8.5	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	9/26/2005	7.8	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	9/20/2006	4	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	9/11/2007	2.1	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	10/17/2008	1.4	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	10/16/2009	1.1	53	1U	1U	1U	1U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	10/8/2010	0.41J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	10/6/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	10/16/2012	0.62	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-11X	10/31/2014	0.54	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
FDW	G6M-04-12X	9/20/2004	310	7.5	56	2U	1U	2U	-	-	-	-	-	-	5U*	1	44	-	-	-
	G6M-04-12X	9/26/2005	250	6.8	49	2U	1U	2U	-	-	-	-	-	-	15	1U	360	-	-	-
	G6M-04-12X	9/18/2006	470	9.4	60	2U	1U	2U	-	-	-	-	-	-	6.5	0.10U	550	-	-	-
	G6M-04-12X	9/10/2007	350	11	50	2U	1U	2U	-	-	-	-	-	-	2U	0.1U	580	-	-	-
	G6M-04-12X	10/16/2008	360	7.7J	35	10U	10U	10U	-	-	-	-	-	-	3.1J	0.2U	360	-	-	-
	G6M-04-12X	10/19/2009	170	22U	28	10U	10U	10U	-	-	-	-	-	-	2.3J	0.2U	308	-	-	-
	G6M-04-12X	10/8/2010	100	4.4	22	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	336	-	-	-
	G6M-04-12X	6/9/2011	180	3.9	19	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	209	-	-	-
	G6M-04-12X	10/4/2011	280	4.6	27	4.0U	4.0U	4.0U	-	-	-	-	-	-	5U	0.1U	200	-	-	-
	G6M-04-12X	5/9/2012	160	5.0U	12	5.0U	5.0U	5.0U	-	-	-	-	-	-	4.1J	0.1U	155	-	-	-
	G6M-04-12X	10/16/2012	120	5.0U	14	5.0U	5.0U	5.0U	-	-	-	-	-	-	5U	0.1U	156	-	-	-
	G6M-04-12X	5/22/2013	220	3.4J	18	5.0U	5.0U	5.0U	-	-	-	-	-	-	3.8J	0.1U	92.5	-	-	-
	G6M-04-12X	10/22/2013	190	3.7J	23	4.0U	4.0U	4.0U	-	-	-	-	-	-	5U	0.1U	106	-	-	-
	G6M-04-12X	6/10/2014	130	2.7	13	0.50U	0.50U	0.50U	-	-	-	-	-	-	5U	0.1U	75	-	-	-

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Area of Concern	Well ID	Date	Laboratory Parameters																
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
FDW	G6M-13-05X	1/30/2014	250	10U	16	10U	10U	10U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-13-05X	6/10/2014	1200	12	70	0.40J	0.54	0.50U	-	-	-	-	-	-	10.7	0.299 J	556	-	-	-
	G6M-13-05X	11/4/2014	1700	13J	77	32U	32U	32U	-	-	-	-	-	-	6.6	0.233	565	-	-	-
FDW	G6M-93-13X	10/15/2001	0.55J	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-93-13X	9/20/2004	3.8	2U	2U	2U	1U	2U	1U	23	1.3J*	10	2.7J*	-	5U	1	15U	0.0081	0.014	0.89
	G6M-93-13X	12/13/2004	2U	2U	2U	2U	1U	2U	5U	20	1.2	9.6M	2U	-	5U	1U	15U	0.005U	0.005U	3.8
	G6M-93-13X	3/29/2005	2U	2U	2U	2U	1U	2U	0.6J	22	0.2U	9.1	2U	-	5U	1UM	15U	0.0063	0.28	3.1
	G6M-93-13X	6/28/2005	2U	2U	2U	2U	1U	2U	4.9	41.2	0.081	8.2	1U	-	2U	1U	10U	0.023	0.02	9.4
	G6M-93-13X	9/26/2005	2U	2U	2U	2U	1U	2U	3.1	27	0.083	9.5	1U	-	5U	1U	15U	0.006J	0.018J	4.9
	G6M-93-13X	12/13/2005	2U	2U	2U	2U	1U	2U	4.4J	41	3.4	9.4	1U	-	5U	1U	15U*	0.008J	0.011J	9.3
	G6M-93-13X	3/21/2006	2U	2U	2U	2U	1U	2U	6.8	24	0.2U	6.83	1U	-	5U	0.1U	19	0.025U	0.046	9.5
	G6M-93-13X	6/19/2006	2U	2U	2U	2U	1U	2U	1.4J	46	0.2UH	4.42	1U	-	5U	0.1U	28	0.008J	0.008J	5.3
	G6M-93-13X	9/18/2006	2U	2U	2U	2U	1U	2U	4.6J	22	0.2U	7.76	1U	-	5U	0.10U	15U	0.006J	0.014J	5
	G6M-93-13X	12/11/2006	2U	2U	2U	2U	1U	2U	5U	-	-	6.55	1U	-	5U	0.1U	15U	0.008J	0.038	11
	G6M-93-13X	3/28/2007	2U	2U	2U	2U	1U	2U	5U*	-	-	5.74	1U	-	5U	0.1U	15U	0.005J	0.014J	9.6
	G6M-93-13X	6/11/2007	2U	2U	2U	2U	1U	2U	0.4J	-	-	8.96	1U	-	5U	0.1U	15U	0.034	0.3	13
	G6M-93-13X	9/11/2007	3	2U	2U	2U	1U	2U	0.7J	99	0.2U	12	1U	-	6U	0.1U	15U	0.005J	0.025U	2.8
	G6M-93-13X	12/10/2007	2U	2U	2U	2U	1U	2U	5U*	-	-	6.92	1U	-	5U	0.1U	15U	0.004J	0.007J	1.1
	G6M-93-13X	3/10/2008	2U	2U	2U	2U	1U	2U	34	-	-	100	1U	-	5U	0.2	12,000	0.008J	0.05	10
	G6M-93-13X	10/15/2008	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	110	3.6	34	0.03UJ	-	8.0U	0.2U	3,270	1.3U	1.6U	5.6
	G6M-93-13X	5/7/2009	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	67J	0.71	16	0.03U	-	3.5J	0.2U	50U	1.2U	1.5U	2.2
	G6M-93-13X	10/19/2009	0.5U	15	0.5U	0.5U	0.5U	0.5U	10U	54	0.058J	9.2	0.03UJ	-	8U	0.142U	50U	1.3U	1.6U	6
	G6M-93-13X	4/21/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	6.5J	140	0.13U	10	0.03U	-	5.0U	0.115U	25U	1.2U	1.5U	440
	G6M-93-13X	10/6/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	63	0.050J	11	0.03U	-	5U	0.1U	25U	1.2U	1.5U	16
FDW	G6M-95-19X	10/15/2001	110	6.6	42	1.5J	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-95-19X	9/20/2004	41	2.9	16	2U	1U	2U	-	-	-	-	-	-	5U	1	210	-	-	-
	G6M-95-19X	9/26/2005	21	2U	5.4	2U	1U	2U	-	-	-	-	-	-	8.3	1U	160	-	-	-
	G6M-95-19X	9/19/2006	12	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	160	-	-	-
	G6M-95-19X	9/12/2007	21	2U	4	2U	1U	2U	-	-	-	-	-	-	5U	0.1U	200	-	-	-
	G6M-95-19X	10/15/2008	14J	0.39J	1.6J	0.5U	0.5U	0.5U	-	-	-	-	-	-	8U	0.2U	212	-	-	-
	G6M-95-19X	10/16/2009	20U	540	20U	20U	20U	20U	-	-	-	-	-	-	8U	0.2U	153	-	-	-
**	G6M-95-19X	1/15/2010	6.9	0.5U	0.46J	0.75U	0.75U	1.0U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-95-19X	10/7/2010	1.8	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	186	-	-	-
	G6M-95-19X	10/7/2011	2.2	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	242	-	-	-
	G6M-95-19X	10/15/2012	3.3	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	1,450	-	-	-
	G6M-95-19X	10/18/2013	2.4	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	2,250	-	-	-
	G6M-95-19X	11/3/2014	3	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.0847U	1,190	-	-	-

APPENDIX I
Groundwater Analytical Results
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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
FDW	G6M-96-13B	10/15/2001	3,600	39	220	12	1U	1.1J	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-13B	2/25/2002	5,200	34	200	1.4J	1U	1.5J	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-13B	1/31/2003	3,800	31	190	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-13B	9/20/2004	4,500	35	210	2U	1U	2.1	1U	38	5.4J*	19	2	-	5U	1	15U	0.022	0.12	1.7
	G6M-96-13B	12/13/2004	2,500	24	150	2U	1U	2U	5U	35	5	31M	2U	-	5U	1U	23	0.05	0.025	24
	G6M-96-13B	3/28/2005	4,500	200U	180J	200U	200U	200U	5.7	47	0.46	17	2UJ*	-	5U	2.6M	1,600	0.17	0.22	37
	G6M-96-13B	8/10/2005	2,800	190	1,500	3.6	4.8	6.8	140	98.9	0.23	4.6	5.3	-	32	24J*	8,100	0.15	0.44	2.9
	G6M-96-13B	9/26/2005	3,700	140	570	5U	5U	5U	200	134	0.28	11	11	-	44	51J	12,000	0.054	0.33	18
	G6M-96-13B	12/13/2005	3,400	130	350	10U	5U	10U	140	150	0.05U	11	4.5	-	46.3	63J*	12,100	0.069	0.35	31
	G6M-96-13B	3/20/2006	2,100	250	400	2U	1.2	2.5	360	300	0.207	6.77	2.4	-	38	96	17,000	0.036	0.42	97
	G6M-96-13B	6/20/2006	1,900	280	370	2U	1U	3.5	110	310	0.2U	4.21	4.8	-	48J*	100	16,000	0.044	0.27	200
	G6M-96-13B	9/18/2006	880	370	530	2U	1.3	9.4	300	370	0.262	4.56	3	-	150	110	20,000	0.022J	0.43	2,400
	G6M-96-13B	12/11/2006	830	340	620	2U	1.6	7.3	360	-	-	6.06	1.2	-	190	130	27,000	0.020J	0.047	9,000
	G6M-96-13B	3/27/2007	940	290	590	2.6	2.1	26	140	-	-	4.3	1.6	-	250	230	35,000J*	0.025U	0.96	22,000
	G6M-96-13B	6/11/2007	1,200	280	610	2U	1.7	55	260	-	-	8.17	2.2	-	200	200	15U	0.025U	0.68	22,000
	G6M-96-13B	9/10/2007	2,600	130J*	590	2U	1.6	38	270	410	0.2U	580	2.8	-	240	210	25,000	0.036	6.3	32,000
	G6M-96-13B	12/11/2007	750	99	830	2U	1.5	110	240	-	-	429	2.4	-	260	230	25,000	0.005J	3.6	26,000
	G6M-96-13B	3/10/2008	1,200	140	1,000	2U	1.7	140	210	-	-	5U	2	-	240	240	26,000	0.025U	8.3	29,000
	G6M-96-13B	10/15/2008	7.3J	6.5J	490	10U	10U	350	91.8U	470	0.13U	21	0.03UJ	-	172	290	39,500	1.2U	5.7	9,700
	G6M-96-13B	5/7/2009	190	75	310	10U	10U	95	74	740J	0.13U	32	0.03U	-	169	323	38,600	1.2U	13	46,000
	G6M-96-13B	10/19/2009	440	140	290	10U	10U	89	54	630	0.022U	53	0.041	-	173	325	36,000	1.2U	9.2	52,000
	G6M-96-13B	4/21/2010	93	29	100	2.0U	2.0U	57	130	610	0.13U	0.71J	0.041	-	217	400J	39,100	1.3U	15	37,000
	G6M-96-13B	10/6/2010	360	150	150	1.5	0.70	65	57	95	0.045J	1.1J	0.03U	-	222	366	37,500	1.2U	18	96,000
	G6M-96-13B	6/9/2011	740	90	270	1.9	1.4	86	75	300	0.023J	0.49J	0.03U	-	242	304	25,100	3.7	44	110,000
	G6M-96-13B	10/4/2011	160	24	79	8.0U	8.0U	43	73	620	0.13U	0.35J	0.03U	-	284	335	25,300	1.2U	1.5U	98,000
	G6M-96-13B	5/9/2012	130	47	150	5.0U	5.0U	38	51	500	0.13U	0.58J	0.13	-	298	231	16,600	44	100	29,000
	G6M-96-13B	10/11/2012	130	48	130	5.0U	5.0U	76	38	480	0.13U	5.0U	0.14	-	282	209	17,100	81	190	62,000
	G6M-96-13B	5/22/2013	170	55	230	2.7J	5.0U	100	29	540J	0.13U	5.0U	0.12J	-	395	241	18,600	1.1U	86	23,000
	G6M-96-13B	10/17/2013	78	38	200	4.0U	4.0U	170	37	560	0.13U	5.0U	0.058	-	365	234	17,600	2.4	36	18,000
FDW	G6M-13-06X	1/30/2014	3.9J	8U	300	8U	8U	95	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-13-06X	6/12/2014	0.5U	0.44J	180	0.68	0.37J	330	160	710J	0.13U	0.68J	0.03U	-	444	365	16,900	1.3UJ	33J	18,000J
	G6M-13-06X	10/30/2014	0.5U	0.5U	14	0.7	0.5U	15	42	580	0.13U	0.42J	0.03U	-	558	274	12,500	1.2U	63	79,000
FDW	G6M-96-25B	10/15/2001	360	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	2/25/2002	130	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	2/27/2002	-	-	-	-	-	-	-	-	7.2	-	-	-	-	-	-	-	-	-
	G6M-96-25B	1/31/2003	52	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	9/20/2004	56	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	9/26/2005	40	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	9/19/2006	44	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	9/11/2007	16	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	10/17/2008	1.7	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	10/16/2009	1.9	38J	0.5UJ	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	10/8/2010	3.1	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	10/6/2011	0.58	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-96-25B	10/16/2012	2.0	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX I
Groundwater Analytical Results
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Area of Concern	Well ID	Date	Laboratory Parameters																
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
FDSA	G6M-04-09X	9/24/2004	7,400	4.2	9	2U	1U	2U	-	-	-	-	-	-	5U	1UJ	160	-	-	-
	G6M-04-09X	9/28/2005	3,200	5U	5U	5U	5U	5U	-	-	-	-	-	-	5U	1U	37	-	-	-
	G6M-04-09X	9/21/2006	190	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	50	-	-	-
	G6M-04-09X	9/12/2007	440	22	31	2U	1U	2U	-	-	-	-	-	-	5U	0.83	390	-	-	-
	G6M-04-09X	10/17/2008	4,000	330	410	50U	50U	44	-	-	-	-	-	-	63.4	13.3	5,700	-	-	-
	G6M-04-09X	10/21/2009	1,600	210	210	50U	50U	51	-	-	-	-	-	-	70.8	13	3,960	-	-	-
	G6M-04-09X	10/8/2010	1,000	420	990	0.79	0.89	7.8	-	-	-	-	-	-	69.9	14.3	15,300	-	-	-
	G6M-04-09X	6/9/2011	260	140	950	0.56	1.7	200	-	-	-	-	-	-	203	43.3	9,820	-	-	-
	G6M-04-09X	10/7/2011	20U	23	910	20U	20U	240	45	-	-	-	-	-	291	107	50,900	-	-	-
	G6M-04-09X	5/9/2012	970	250	510	40U	40U	340	9.1J	-	-	-	-	-	344	76.7	17,800	-	-	-
	G6M-04-09X	10/16/2012	260	70	100	20U	20U	350	3.0J	-	-	-	-	-	225	41.7	13,800	-	-	-
	G6M-04-09X	5/22/2013	5.9	3.6	5.9	0.81	0.5U	9.9	11	-	-	-	-	-	321	135	30,800	-	-	-
	G6M-04-09X	10/22/2013	0.5U	0.5U	52	0.53	0.5U	38	34	-	-	-	-	-	551	303	27,100	-	-	-
	G6M-04-09X	6/12/2014	1.4	0.75	12	0.6	0.5U	26	29	-	-	-	-	-	607	315	19,200	-	-	-
	G6M-04-09X	11/3/2014	0.21J	0.5U	0.43J	0.21J	0.5U	0.83	31	-	-	-	-	-	600	339	16,500	-	-	-
FDSA	G6M-04-10A	9/20/2004	2,900	2.5	3.4	2U	1U	2U	1U	41	4.5J*	22	2	-	5U	1	170	0.021	0.03	1.1
	G6M-04-10A	12/14/2004	2,400	2U	2U	2U	1U	2U	5U	25	1.7	13	2U	-	5U	1U	120	0.015	0.096	1500
	G6M-04-10A	3/30/2005	640	40U	40U	40U	40U	40U	52	107	0.33	16	2U	-	8.4	1.2	8,100	0.33	0.07	1.4
	G6M-04-10A	8/11/2005	380	45	390	2U	2U	2U	240	359	.05U	7.8	1U	-	77	87J*	50,000J*	0.24	0.23	3.4
	G6M-04-10A	9/27/2005	340	88	260	1U	1U	1U	330	442	0.084	3.0J	5.9	-	190	230J	76,000	0.08	0.15	110
	G6M-04-10A	12/14/2005	1,500	180	220	2U	1U	2U	370	480	0.05U	3.7	7.4	-	179	250J*	32,500	0.048	0.13	6,800
	G6M-04-10A	3/21/2006	4,400	180	450	2U	1U	8.3	180	390	0.2U	4.08	2	-	180	220	8,100	0.025U	0.69	20,000
	G6M-04-10A	6/20/2006	6,100	650	330	2U	1U	27	120	340	0.2U	4.32	3.2	-	160	220	5,700	0.025U	0.12	16,000
	G6M-04-10A	9/19/2006	1,000	15	59	2U	1U	14	61	150	0.311	5.2	1.2	-	170	97	5,000	0.23	0.11	11,000
	G6M-04-10A	12/13/2006	450	37	860	2U	1.2	76	73	-	-	1.82	1.6	-	150	96	4,800	0.025U	0.12	22,000
	G6M-04-10A	3/28/2007	1,200J*	230J*	680J*	2U	1.6J*	60J*	130	-	-	2.07	1U	-	380	260	27,000J*	0.65	0.26	20,000
	G6M-04-10A	6/12/2007	760	140	900	2U	2.1	130	190	-	-	1U	2.4	-	310	260	15,000	0.54	1.1	23,000
	G6M-04-10A	9/11/2007	2,700	99J*	400	2U	1U	91	220	440	0.2U	54	2.4	-	240	290	13,000	0.35	0.47	18,000
	G6M-04-10A	12/11/2007	830	8.8	280	2U	1U	90	270	-	-	3.57	3	-	330	280	12,000	0.3	0.52	31,000
	G6M-04-10A	3/10/2008	200	830	670	3.4	1.8	37	210	-	-	10	2.2	-	340	230	35,000	0.34	0.61	25,000
	G6M-04-10A	10/6/2008	4,000	450	990	100U	100U	1,400	34	210	0.13U	12	0.03UJ	-	247	187	9,100	1.3U	11	16,000
	G6M-04-10A	1/21/2009	1,500	390	1,400	1,100U	0.67J	1,200	46J	20U	0.13U	20	0.03UJ	0.10J	250	234J	8	1.2U	9.6	53,000
	G6M-04-10A	5/7/2009	380	41	390J	10U	10U	420	49	590J	0.13U	24	0.03U	0.13J	292	194	17,200	1.2U	11	34,000
	G6M-04-10A	10/20/2009	2,700	290	2,100	50U	50U	1,400	21	350	0.13U	8.7	0.03U	0.1J	220	127	8,960	1.3U	15	11,000
	G6M-04-10A	4/21/2010	170	21	170	4.0U	4.0U	130	120	670	0.017J	0.65J	0.03U	0.25	286	297J	18,200J	1.3U	15	21,000J
	G6M-04-10A	10/6/2010	25	10J	600	20U	20U	190	26	260	0.13U	0.98J	0.03U	0.23J	296	119	4,280	1.2U	14	51,000
	G6M-04-10A	6/9/2011	110	36	300	0.5U	0.5U	170	63	660	0.13U	1.2J	0.03U	-	295	198	9,140	1.2U	5.7	92,000
	G6M-04-10A	10/4/2011	850	170	1,100	40U	40U	270	160	750	0.13U	1.1J	0.22	-	322	304	17,600	1.2U	74	36,000
	G6M-04-10A	5/10/2012	180	120	610	20U	20U	200	16	340	0.13U	0.70J	0.10	-	367	183	6,700	1.1U	250	46,000
	G6M-04-10A	10/15/2012	2.0U	2.0U	26	2.0U	2.0U	110	64	340	0.092J	5.0U	0.13J	-	291	185	8,250	1.2U	44	14,000
	G6M-04-10A	5/23/2013	0.5U	0.5U	13	0.53	0.5U	15	200	650	0.11J	0.84J	0.1J	-	342	400	7,110	1.2U	1.5U	18,000
	G6M-04-10A	10/17/2013	360J	92J	130J	10U	10U	14J	150	650	0.13U	1.1J	0.034J	-	292	341	5,000	1.2U	9.4	24,000J
	G6M-04-10A	6/12/2014	0.5U	0.23J	1.4	0.5U	0.5U	5.1	29	200J	0.13U	17	0.03U	-	264	164	3,730	2.2J	1.6UJ	9,500J
	G6M-04-10A	11/3/2014	0.5U	0.5U	0.92	0.5U	0.5U	4.4	34	240	0.13U	16J	0.03U	-	288	184	2,100	1.2U	3.6J	21,000

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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
FDSA	G6M-04-10X	9/20/2004	70	7.5	32	2U	1U	2U	1U	11	6.7J*	21	3.4	-	5U	1	260	0.019	0.039	1
	G6M-04-10X	12/14/2004	65	7.8	35	2U	1U	2U	5U	10U	6.6	23	2U	-	5U	1U	200	0.022	0.053	2.2
	G6M-04-10X	3/31/2005	56	6.8	30	2U	2U	2U	0.4J	10U	1.5	25	2U	-	5U	1U	190	0.022	0.86	1.1
	G6M-04-10X	7/1/2005	50	5.4	23	2U	1U	2U	5.9	43.5	1.7	12	1U	-	4.2	1UJ*	10U	0.035	0.05	12
	G6M-04-10X	9/27/2005	48	4.7	23	2U	1U	2U	4	7.7	1.4	26	1U	-	5U	1U	170	0.010J	0.018J	16
	G6M-04-10X	12/14/2005	67	6.3	27	2U	1U	2U	5U	9.8	1.5	28	1U	-	5U	1U	164	0.016J	0.034	11
	G6M-04-10X	3/22/2006	76	9.1J*	32	2U	1U	2U	5.6	10U	1.44	23.6	1U	-	5U	.1U	200	0.015J	0.025J	25
	G6M-04-10X	6/20/2006	87	10	47	2U	1U	2U	5U	10U	1.69	25.2	1U	-	5U	0.1U	240	0.013J	0.012J	18
	G6M-04-10X	9/19/2006	65	6.8	32	2U	1U	2U	2.2J	8	1.27	22.2	1U	-	5U	0.10U	240	0.026	0.025J	13
	G6M-04-10X	12/13/2006	64	7.2	35	2U	1U	2U	5U	-	-	27	1U	-	5U	0.1U	280	0.008J	0.011J	28
	G6M-04-10X	3/28/2007	56	5.9	26	2U	1U	2U	5U*	-	-	27.9	1U	-	5U	0.21	290J*	0.017J	0.054	21
	G6M-04-10X	6/12/2007	28	2.4	9.9	2U	1U	2U	5U	-	-	31.2	1U	-	5U	0.1U	250	0.010J	0.065	18
	G6M-04-10X	9/11/2007	35	3.4	13	2U	1U	2U	5U	10U	1.4	2000	1U	-	6U	0.1U	270	0.008J	0.010J	13
FDSA	G6M-04-10X	12/11/2007	20	2U	6.4	2U	1U	2U	5U*	-	-	34.7	1U	-	5U	0.1U	230	0.010J	0.028	5.3
	G6M-04-10X	3/11/2008	22	2.1	9.7	2U	1U	2U	5U	-	-	28	1U	-	5U	0.16	250	0.004J	0.010J	4.1
	G6M-04-10X	10/15/2008	18	1.6	8.4	0.5U	0.5U	0.5U	10U	30	1.4	27	0.03U	-	8.0U	0.2U	265	1.2U	1.5U	6.1
	G6M-04-10X	5/7/2009	15	1.2	5	0.5U	0.5U	0.5U	10U	20UJ	1.2	33	0.03U	-	8.0U	0.2U	213	1.3U	1.6U	0.76
	G6M-04-10X	10/20/2009	9.8	4.8	5.2	0.5U	0.5U	0.27J	10U	20U	1.1	29	0.03U	-	8U	0.139U	197	1.3U	1.6U	19
	G6M-04-10X	4/21/2010	24	1.5	6.5	0.5U	0.5U	0.5U	10U	25	1.4	31	0.03U	-	5.0U	0.1U	200	1.3U	1.6U	87
	G6M-04-10X	10/6/2010	24	1.8	7.9	0.5U	0.5U	0.5U	10U	25	1.8	28	0.03U	-	5U	0.1U	208	1.2U	1.5U	3.7
	G6M-04-10X	10/4/2011	9.0	0.5U	1.9	0.5U	0.5U	0.5U	4.5J	20U	1.3	28	0.03U	-	5U	0.1U	173	1.2U	1.5U	47
	G6M-04-10X	10/15/2012	15.0	0.72	1.9	0.5U	0.5U	0.5U	10U	20U	1.2	35	0.03U	-	5U	0.103U	224	1.2U	1.5U	32
	G6M-04-10X	10/17/2013	6.2	0.28J	0.5J	0.5U	0.5U	0.5U	2.7J	20U	0.95	37	0.03U	-	3.3J	1.27	262	1.2U	1.5U	5,500
	G6M-04-10X	11/3/2014	7.4	0.27J	0.47J	0.5U	0.5U	0.5U	5U	20U	1.3J	30J	0.03U	-	2.5U	1.32	308	1.2U	1.5U	200
FDSA	G6M-04-13X	9/21/2004	8	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	350	-	-	-
	G6M-04-13X	9/26/2005	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	15U	-	-	-
	G6M-04-13X	9/18/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	15U	-	-	-
	G6M-04-13X	9/12/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	0.1U	15U	-	-	-
	G6M-04-13X	10/17/2008	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	8U	0.2U	50U	-	-	-
	G6M-04-13X	10/20/2009	25U	16J	25U	25U	25U	25U	-	-	-	-	-	-	2J	0.132U	50U	-	-	-
	G6M-04-13X	10/7/2010	0.29J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.102U	25U	-	-	-
	G6M-04-13X	10/4/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	14.0J	-	-	-
	G6M-04-13X	10/16/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	5.1J	-	-	-
	G6M-04-13X	10/22/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-04-13X	11/3/2014	0.36J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.0247U	7.5U	-	-	-
FDSA	G6M-04-15X	9/21/2004	5.2	2U	5.3	2U	1U	2U	-	-	-	-	-	-	5U*	4.8	8,100	-	-	-
	G6M-04-15X	9/28/2005	9.1	2U	6.4	2U	1U	2U	-	-	-	-	-	-	33	1.8	4,400	-	-	-
	G6M-04-15X	9/20/2006	3.5	2U	5.2	2U	1U	2U	-	-	-	-	-	-	20	2	4,300	-	-	-
	G6M-04-15X	9/11/2007	2.7	2U	2U	2U	1U	2U	-	-	-	-	-	-	18	0.75	2,100	-	-	-
	G6M-04-15X	10/17/2008	4.8	1.0	2.3	0.5U	0.5U	0.5U	-	-	-	-	-	-	36.3	3.01	3,010	-	-	-
	G6M-04-15X	10/19/2009	1.9	14	3	0.5U	0.5U	0.5U	-	-	-	-	-	-	48.9	5	3,130	-	-	-
	G6M-04-15X	10/8/2010	0.65	0.34J	3.2	0.5U	0.5U	0.5U	-	-	-	-	-	-	59.1	4.76	2,900	-	-	-
	G6M-04-15X	10/6/2011	0.52	0.5U	3.7	0.5U	0.5U	0.5U	-	-	-	-	-	-	55.5	3.75	3,470	-	-	-
	G6M-04-15X	10/16/2012	1.0	0.5U	3.9	0.5U	0.5U	0.5U	-	-	-	-	-	-	111	11.1	4,300	-	-	-
	G6M-04-15X	10/18/2013	0.97	0.27J	2.2	0.5U	0.5U	0.5U	-	-	-	-	-	-	112	14.5	3,530	-	-	-
	G6M-04-15X	11/4/2014	1.60	0.29J	2.2	0.5U	0.5U	0.5U	-	-	-	-	-	-	135	33.4	14,000	-	-	-

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			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
FDSA	G6M-94-18X	10/16/2001	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-94-18X	2/25/2002	6,400	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-94-18X	2/27/2002	2,800	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	-	-	-
	G6M-94-18X	2/4/2003	37,000	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-94-18X	9/20/2004	3,400	2U	2U	2U	1U	2U	1U	18	2	11	4	-	5U	1	15U	0.011	0.022	1.1
	G6M-94-18X	12/15/2004	2,300	2U	2U	2U	1U	2U	5U	110	1.6	10	2U	-	5U	1U	15U	0.005U	0.0085	9.1
	G6M-94-18X	3/31/2005	17,000	1,000U	1,000U	1,000U	1,000U	1,000U	1.1J	14.4	0.23	10	2U	-	5U	1U	15U	0.011	0.71	0.97
	G6M-94-18X	7/1/2005	2,000	2.5U	2.5U	2.5U	2.5U	2.5U	4.7J	14	0.13	9.2	1U	-	2U	1UJ*	10U	0.051	0.025	2.7
	G6M-94-18X	9/27/2005	710	1U	1U	1U	1U	1U	3.8	15.4	0.071	8.8J	1U	-	5U	1U	15U	0.032	0.04	0.48
	G6M-94-18X	12/16/2005	260	2U	2U	2U	1U	2U	6	10	0.068	14	1U	-	5U	1U	15U	0.042	0.15	0.17
	G6M-94-18X	3/21/2006	66	2U	2U	2U	1U	2U	5.5	12	0.2U	14.6	1U	-	5U	0.16	15U	0.025U	0.016J	23
	G6M-94-18X	6/20/2006	46	2U	2U	2U	1U	2U	1.6J	25U*	0.2U	11.3	1U	-	5U	100U	15U	0.004J	0.008J	6.5
	G6M-94-18X	9/18/2006	41	2U	2U	2U	1U	2U	4.9J	15	0.2U	9.66	1U	-	5U	0.10U	15U	0.006J	0.021J	19
	G6M-94-18X	12/12/2006	36	2U	2U	2U	1U	2U	2.2J	-	-	10.5	1U	-	5U	0.10U	15U	0.004J	0.052	15
	G6M-94-18X	3/29/2007	700	2U	2U	2U	1U	2U	2J	-	-	8.59	1U	-	5U	0.1U	15U	0.004J	0.018J	9.2
	G6M-94-18X	6/11/2007	2,100	2U	2U	2U	1U	2U	2.4J	-	-	11.5	1U	-	5U	0.1U	15U	0.007J	0.006J	0.22
	G6M-94-18X	9/12/2007	330	2U	2U	2U	1U	2U	0.6J	25	0.2U	6.1	1U	-	6U	0.1U	15U	0.025U	0.025U	2.6
FDSA	G6M-95-20X	10/16/2001	4.4	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-95-20X	2/25/2002	5	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-95-20X	2/27/2002	-	-	-	-	-	-	-	-	4.7	-	-	-	-	-	-	-	-	-
	G6M-95-20X	9/21/2004	2.8	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	15U	-	-	-
	G6M-95-20X	9/26/2005	2.3	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	15U	-	-	-
	G6M-95-20X	9/19/2006	2.2	2U	42	2U	1U	2U	-	-	-	-	-	-	71	350	39,000	-	-	-
	G6M-95-20X	9/12/2007	2U	2U	11	2U	1U	2U	-	-	-	-	-	-	160	110	15,000	-	-	-
	G6M-95-20X	10/15/2008	0.38J	0.2J	2.5	0.5U	0.5U	0.5U	-	-	-	-	-	-	97.2	45.6	5,250	-	-	-
	G6M-95-20X	10/16/2009	0.5U	37J	3.1	0.5U	0.5U	0.5U	-	-	-	-	-	-	166	206	7,660	-	-	-
	G6M-95-20X	10/6/2010	0.5U	0.5U	5.1	0.5U	0.5U	1.8	-	-	-	-	-	-	149	546	12,200	-	-	-
	G6M-95-20X	10/7/2011	0.5U	0.5U	1.5	0.5U	0.5U	0.5U	-	-	-	-	-	-	108	57.8	3,610	-	-	-
	G6M-95-20X	10/15/2012	0.5U	0.5U	1.0	0.5U	0.5U	0.5U	-	-	-	-	-	-	112	67.9	3,140	-	-	-
	G6M-95-20X	10/18/2013	0.5U	0.29J	0.59	0.5U	0.5U	0.5U	-	-	-	-	-	-	79.9	30	1,760	-	-	-
	G6M-95-20X	10/31/2014	2.7	0.53	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	7.9	20.3	1,160	-	-	-
FDSA	G6M-07-02X	12/12/2007	50	2U	2U	2U	1U	2U	5U*	-	-	16.2	1U	-	5U	0.1U	64	0.024J	0.022J	0.73
	G6M-07-02X	3/11/2008	1,800	2U	2U	2U	1U	2U	5U	-	-	26	1U	-	5U	0.1U	35	0.014J	0.019J	7.1
	G6M-07-02X	10/15/2008	170	5.0U	5.0U	5.0U	5.0U	5.0U	10U	20U	0.13U	11	0.030UJ	-	5.5J	0.2U	21.2J	1.2U	10	12,000
	G6M-07-02X	5/11/2009	46	0.5U	0.5U	0.5U	0.5U	0.5U	5.7J	20U	0.062	8.6J	0.030UJ	-	7.1	0.2U	5.8J	1.2U	1.5U	7
	G6M-07-02X	10/20/2009	30J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	20U	0.13U	7.2	0.03UJ	-	6.6	0.2U	50U	1.3U	1.6U	6.2J

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			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
FDSA	G6M-07-02X	4/21/2010	63	2U	2U	2U	2U	2U	10U	30	0.0098J	6.8	0.03U	-	6.2	0.176U	25U	1.2U	1.5U	3,200
	G6M-07-02X	10/6/2010	26J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	32	0.21	5.6	0.03U	-	3.4J	0.1U	25U	1.2U	1.5U	28
	G6M-07-02X	10/4/2011	700	0.5U	0.5U	0.5U	0.5U	0.5U	10U	31	0.13U	4.4J	0.03U	-	4.6J	0.1U	79.8	1.2U	1.5U	46,000
	G6M-07-02X	10/11/2012	90	190	6.4	5.0U	5.0U	5.0U	10U	20U	0.056J	6.4	0.03U	-	5U	0.286	40.1	1.2U	1.5U	46,000J
	G6M-07-02X	10/17/2013	1,000	8.7J	20U	20U	20U	20U	10U	21	0.13U	4.5J	0.03U	-	5U	0.1U	31.7	1.2U	1.5U	520J
	G6M-07-02X	11/3/2014	14,000	40J	31J	50U	50U	50U	5U	22	0.13U	4.2J	0.03U	-	2.2J	0.421J	43.3	1.2U	1.5U	6,200
Area 1	G6M-04-22X	9/21/2004	900	24	110	2U	1U	2U	-	-	-	-	-	-	5U	1U	990	-	-	-
	G6M-04-22X	9/28/2005	210	6.8	45	2.5	1U	2U	-	-	-	-	-	-	5U	1U	120	-	-	-
	G6M-04-22X	9/20/2006	200	8.7	54	2U	1U	2U	-	-	-	-	-	-	5U	0.43	4,500	-	-	-
	G6M-04-22X	9/11/2007	95	12	75	2U	1U	9.4	-	-	-	-	-	-	390	250	44,000	-	-	-
	G6M-04-22X	10/17/2008	18	3.7	53	0.44J	1U	26	-	-	-	-	-	-	439	421	15,900	-	-	-
	G6M-04-22X	10/19/2009	7.2	9.7	16	0.5U	0.5U	4.9	-	-	-	-	-	-	320	355	9,360	-	-	-
	G6M-04-22X	10/8/2010	0.39J	2.2	7.1	0.23J	0.5U	4.7	-	-	-	-	-	-	522	210	3,020	-	-	-
	G6M-04-22X	10/6/2011	0.5U	0.5U	13	0.5U	0.5U	7.5	-	-	-	-	-	-	534	232	15,800	-	-	-
	G6M-04-22X	10/12/2012	0.5U	0.5U	5.7	0.5U	0.5U	6.6	-	-	-	-	-	-	657	162	9,080	-	-	-
	G6M-04-22X	10/18/2013	-	-	-	-	-	-	-	-	-	-	-	-	767	-	-	-	-	-
	G6M-04-22X	11/4/2014	0.5U	0.5U	2	0.72	0.5U	4.6	-	-	-	-	-	-	667	150	1,600	-	-	-
Area 1	G6M-04-31X	9/21/2004	1,600	2U	4.2	2U	1U	2U	-	-	-	-	-	-	5U	1U	190	-	-	-
	G6M-04-31X	9/28/2005	1,900	5U	5.2	5U	5U	5U	-	-	-	-	-	-	5U	1U	35	-	-	-
	G6M-04-31X	9/20/2006	600	6.1	2.5	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	15U	-	-	-
	G6M-04-31X	9/11/2007	340	260	330	2.8	1.3	2U	-	-	-	-	-	-	5U	0.1	890	-	-	-
	G6M-04-31X	10/17/2008	110	72	340	20U	20U	730	-	-	-	-	-	-	103	68.4	9,710	-	-	-
	G6M-04-31X	10/21/2009	86	11	270	10U	10U	560	-	-	-	-	-	-	311	181	16,900	-	-	-
	G6M-04-31X	10/8/2010	3.1	1.1	7.4	0.30J	0.5U	31	-	-	-	-	-	-	428	127	9,620	-	-	-
	G6M-04-31X	10/6/2011	18	5.3	38	0.5U	0.5U	37	-	-	-	-	-	-	635	223	15,800	-	-	-
	G6M-04-31X	10/12/2012	25	31	61	2.0U	2.0U	72	-	-	-	-	-	-	556	181	8,940	-	-	-
	G6M-04-31X	10/18/2013	-	-	-	-	-	-	-	-	-	-	-	-	498	-	-	-	-	-
	G6M-04-31X	11/4/2014	0.5U	0.51	6.9	0.23J	0.5U	3.4	-	-	-	-	-	-	468	121	9,690	-	-	-
Area 1	G6M-03-01X	10/21/2009	380	65	670	25U	25U	25U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-03-01X	10/16/2012	200	60	200	10U	10U	550	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-03-01X	6/12/2014	0.29J	37	19	0.59	0.51	68	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-03-01X	10/31/2014	300	310	98	0.5U	0.5U	34	-	-	-	-	-	-	-	-	-	-	-	-
Area 1	G6M-03-04X	10/21/2009	4.2U	4.0U	81	4.0U	4.0U	4.1	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-03-04X	10/16/2012	0.5U	0.5U	0.5U	0.5U	0.5U	1.3	-	-	-	-	-	-	-	-	-	-	-	-
Area 2	G6M-02-01X	2/28/2002	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	9/23/2004	24B	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	9/30/2005	110	2U	3.1	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	9/20/2006	1,300	12	91	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	12/14/2006	1,600	18	120	2U	1U	2U	5U	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	3/30/2007	1,700	19	120	2U	1U	2U	3.3J	-	-	9.43	1U	-	5U	0.1U	120J*	0.012J	0.081	-
	G6M-02-01X	6/14/2007	1,700	16	97	2U	1U	2U	1.9J	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	9/14/2007	1,900	24	150	2U	1U	2U		-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	12/13/2007	1,600	21J*	130J*	2U	1U	2U	3.6J	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-01X	3/14/2008	520	70	600	2U	2.2	2U	180	-	-	5U	1U	-	150	26	23000	0.052	0.16	12
	G6M-02-01X	10/7/2008	180	49	360	10U	10U	10U	17.7	200	0.13U	11	0.03UJ	-	141	14.5	5,880	6.3U	9.5	5,000
	G6M-02-01X	1/21/2009	280	76U	170	1.3U	1.2J	94U	11J	170	0.13U	7.0U	0.03U	0.25J	148	11,200J	4,500	1.3U	24	4,000
	G6M-02-01X	5/6/2009	610	190	100	10U	10U	54	13	220J	0.059J	8.4	0.03U	0.38J	133	18.7	3,950	1.2U	29	29,000
	G6M-02-01X	10/20/2009	820	180	76	40U	40U	47	4.6J	130	0.074J	7.6	0.03UJ	0.12J	108	11.8	2,470	1.3U	9	5,000J
	G6M-02-01X	4/21/2010	37J	53J	95J	2U	2U	69J	40	280J	0.024J	4.0J	0.03U	0.20	164	20.5J	4,480	1.3U	43	12,000J
	G6M-02-01X	10/6/2010	470	120	72	1.4	1.4	84	10U	120	0.13U	5.2	0.03U	0.78J	133	13.7	3,050	1.2U	49	25,000
	G6M-02-01X	6/9/2011	0.5U	4.3	11	0.69	0.5U	12	90	400	0.11J	3.3J	0.03U	-	173	45.9	7,380	1.2U	230	71,000
	G6M-02-01X	10/5/2011	0.5U	0.88	3.6	0.5U	0.5U	7.3	18	190	0.13U	1.4J	0.03U	-	271	27.3	5,470	1.2U	290	72,000J
	G6M-02-01X	5/9/2012	250	310	65	8.0U	8.0U	63	2.3J	86	0.13U	6.8	0.081	-	271	10.8	2,050	1.1U	260	41,000
	G6M-02-01X	10/10/2012	350	120	75	10U	10U	160	10U	120 J	0.13U	6.5	0.36 J	-	220	10.4	2,080	1.2U	250	37,000J
	G6M-02-01X	5/21/2013	0.25J	4.7	8.4	0.67	0.5U	5.2	43	240J	0.13UJ	3.0J	0.076J	-	272	35.6	7,450	1.2U	220	22,000
	G6M-02-01X	10/17/2013	0.5U	2.4	11	0.58	0.5U	14	2.6J	140	0.13U	5.0U	0.078	-	323	40.3	4,000	1.2U	450J	52,000
	G6M-02-01X	6/11/2014	0.5U	0.5U	1.4	0.5U	0.5U	2.6	9.5J	210J	0.13U	1.2U	0.030U	-	449	83.9J	4,260	1.3UJ	16J	5,300J
	G6M-02-01X	10/30/2014	0.5U	0.21J	1.5	0.5U	0.5U	0.87	5U	86	0.13U	2.3J	0.03U	-	384	47.9	1,820	15	40	24,000

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			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 2	G6M-04-01X	9/23/2004	250B	3.6	21	2U	1U	2U	-	-	-	-	-	-	5U	1U	220	-	-	-
	G6M-04-01X	9/28/2005	140	2U	9.2	2U	1U	2U	-	-	-	-	-	-	5.1	1U	170	-	-	-
	G6M-04-01X	9/20/2006	150	2U	7.2	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	220	-	-	-
	G6M-04-01X	9/14/2007	290	2U	8.6	2U	1U	2U	-	-	-	-	-	-	6U	0.1U	130	-	-	-
	G6M-04-01X	10/20/2008	270J	11J	10UJ	10UJ	10UJ	10UJ	-	-	-	-	-	-	8UJ	0.2UJ	53.1J	-	-	-
	G6M-04-01X	10/20/2009	190	130	360	13U	13U	15	-	-	-	-	-	-	8U	0.107U	113	-	-	-
	G6M-04-01X	10/7/2010	27	19	120	0.68	0.29J	140	-	-	-	-	-	-	5U	1.05	164	-	-	-
	G6M-04-01X	10/5/2011	14	7.6	36	0.71	0.5U	160	-	-	-	-	-	-	3.7J	0.381	261	-	-	-
	G6M-04-01X	10/12/2012	5.5	4.0U	18	4.0U	4.0U	130	-	-	-	-	-	-	3.5 J	0.742	925	-	-	-
	G6M-04-01X	10/17/2013	0.5U	0.78	0.99	0.29J	0.5U	14	-	-	-	-	-	-	6	1.06	8,890	-	-	-
	G6M-04-01X	10/31/2014	0.39J	0.52	0.56	0.37J	0.5U	7.9	-	-	-	-	-	-	164	59.4	28,900	-	-	-
Area 2	G6M-04-03X	9/23/2004	440	2U	3.3	2U	1U	2U	1.4	53	5.1	23	2.2	-	5U	1U	3,100	0.22	0.036	100
	G6M-04-03X	9/27/2005	680	14	10	1U	1U	1U	6	81.5	0.35	38J	1U	-	5U	0.6J	3,500	0.19	0.32	52
	G6M-04-03X	9/22/2006	2,600	420	6.3	2U	1U	2U	7.2	190	0.2U	16.6	1U	-	5U	0.10U	2,900	0.049	0.3	17
	G6M-04-03X	9/14/2007	770	68	2.7	2U	1U	2U	1.6J	100	0.2U	24	1U	-	38	0.87	2,300	0.062	0.11	3
	G6M-04-03X	10/16/2008	160	18	7.6	5U	5U	5U	10U	150J	0.10U	8	0.03U	-	94.8	0.2U	930	1.3U	1.6U	6.2J
	G6M-04-03X	10/15/2009	16	8.4	8.6	0.5U	0.5U	0.5U	10U	240	0.13U	7U	0.03U	-	148	2.02	3,270	1.3U	1.6U	2,000
	G6M-04-03X	10/7/2010	300	52	94	0.62	0.25J	29	10U	120	0.13U	4.8J	0.03U	-	133	5.47	3,910	1.2U	3.5	29,000
	G6M-04-03X	10/5/2011	7.3	1.8	7.5	0.5U	0.5U	4.6	3.1J	130	0.13U	6.0	0.03U	-	72.9	0.19U	559	1.2U	1.5U	29,000
	G6M-04-03X	10/10/2012	8.7	1.9	6.3	0.5U	0.5U	16	10U	160	0.096J	8.0	0.03U	-	65.8	0.261	1,320	1.2U	170	38,000
	G6M-04-03X	10/17/2013	190	87	200	4U	4U	86	2.5J	67	0.13U	8.6	0.03U	-	31.6	32.7	8,450	1.2U	270	51,000
	G6M-04-03X	10/30/2014	20	15	53	0.38J	0.5U	19	4.7J	420	0.13U	7.5	0.03U	-	14.4	0.29	114	1.2U	17	6,700

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			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 2	G6M-97-08B	10/18/2001	92	6.1	36	1.6J	1U	2U	-	-	-	0	-	-	-	-	-	-	-	-
	G6M-97-08B	2/26/2002	100	5.9	32	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-97-08B	9/22/2004	220	9.3	41	2U	1U	2U	1U	10U	6.1	12	1.5J	-	5U	1U	26	0.0075	0.005U	1.3
	G6M-97-08B	12/16/2004	200	7.7	41	2U	1U	2U	5U	10U	6.1	12	5.4	-	5U	1U	25	0.13	0.072	0.92
	G6M-97-08B	3/30/2005	95	3.4J	16	4U	2U	4U	0.4J	12	0.8	7	2U	-	5U	1U	21	0.015	0.032	0.54
	G6M-97-08B	6/28/2005	140	8	36	1.4	1U	2U	7.1	16.7	1.4	12	1U	-	2U	1J	27	0.016	0.041	35
	G6M-97-08B	9/27/2005	180	7.5	42	2U	1U	2U	4.4	15.9	1.3	16	1U	-	5U	1U	33	0.013J	0.027	0.39
	G6M-97-08B	12/12/2005	120	5.7	27	2U	1U	2U	0.6J	23	0.05UJ*	13	1U	-	5U	1U	28.1	0.04	0.11	26
	G6M-97-08B	3/23/2006	240	8.8	44	2U	1U	2U	5U	13	1.25	13.7	1U	-	5U	0.1U	46	0.022J	0.13	12
	G6M-97-08B	6/21/2006	220	11	35	2U	1U	2U	16	66	0.809	13.5	1	-	5U	0.17	1,300	0.019J	0.086	24
	G6M-97-08B	9/19/2006	190	14	55	2U	1U	2U	270	300	0.2U	23.6	2.8	-	130	21	13,000	0.078	0.13	18
	G6M-97-08B	12/13/2006	200	11	75	2U	1U	2U	440	-	-	49.6	2.8	-	160	83	20,000	0.004J	0.038	1,700
	G6M-97-08B	3/30/2007	200	8.5	46	2U	1U	2U	620	-	-	126	4.6	-	130	170	26,000J*	0.028	0.19	6,000
	G6M-97-08B	6/14/2007	140	5.5	37	2U	1U	2U	760	-	-	120	6.4	-	100	370	24,000	0.025U	0.021J	7,900
	G6M-97-08B	9/12/2007	170	8.4	43	2U	1U	3	630	650	0.2U	1500	3.2	-	120	370	18,000	0.004J	0.05	8,400
	G6M-97-08B	12/14/2007	150J*	5.7J*	31J*	2UJ*	1UJ*	4.5J*	520	-	-	92	5.6	-	150	280	12,000	0.006J	0.054	10,000
	G6M-97-08B	3/12/2008	150	6.5	32	2U	1U	6.8	270	-	-	38	2.8	-	160	190	8,100	0.008J	0.15	9,800
Area 2	G6M-07-01X	10/15/2008	26	0.24J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-07-01X	10/20/2009	21	15	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-07-01X	10/7/2010	50	0.31J	0.25J	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-07-01X	10/5/2011	11	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	11.5J	-	-	-
	G6M-07-01X	10/12/2012	19	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	.0886 J	10.8 J	-	-	-
	G6M-07-01X	10/17/2013	15	0.37J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	5.4J	-	-	-

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			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 3	G6M-03-07X	5/12/2003	1,200	7.2	34	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-03-07X	9/24/2004	1,700	6.3	31	2U	1U	2U	1U	10U	4.3J*	12	1.6J	-	5U	1UJ*	20	0.035	0.28	5.7
	G6M-03-07X	12/16/2004	1,500	6	35	2U	1U	2U	5U	10U	4.2	12	2.9	-	5U	1U	190	0.026	0.08	0.39
	G6M-03-07X	3/30/2005	1,100	91	140	40U	20U	40U	29	76	0.33	8	2U	-	18	18	10,000	0.078	0.21	1.8
	G6M-03-07X	6/29/2005	940	78	940	40U	20U	40U	83	118	0.079	6.4	1U	-	31	39J*	15,000J*	0.06	0.34	3.9
	G6M-03-07X	9/29/2005	300	44	1000	2.3	2.7	1U	290	307	0.05U	3.2	12	-	46	210J	30,000	0.068	0.45	660
	G6M-03-07X	12/12/2005	92	22	710	20U	10U	20U	220	320	0.05UJ*	2U	6.2	-	96.1	190	46,600	0.078	0.13	13,000
	G6M-03-07X	3/24/2006	110	23	430	2U	2	270	260	590	0.2U	1	8.6	-	130	280	48,000	0.010J	2	22,000
	G6M-03-07X	6/21/2006	9.5	3.6	180	2U	1U	310	280	570	0.2U	1U	4.8	-	140MSA	460	59,000	0.073	21	21,000
	G6M-03-07X	9/19/2006	47	7.9	260	2U	1U	300	290	460	0.926	1.27	5	-	140	470	44,000	0.037	9.2	25,000
	G6M-03-07X	12/14/2006	190	30	310	2U	1.3	160	300	-	-	2.44	2.8	-	220	400	38,000	0.025	5.9	26,000
	G6M-03-07X	3/29/2007	2U	2U	35	2U	1U	360	130	-	-	1U	4.4	-	190	420	20,000J*	0.08	5.1	15,000
	G6M-03-07X	6/14/2007	37	8.1	190	2U	1U	200	310	-	-	10.5	2.4	-	220	490	37,000	0.025U	2.3	25,000
	G6M-03-07X	9/13/2007	27	13	290	2.2	1.1	140	72	560	0.2U	420	4.8	-	210	500	29,000	0.008J	12	26,000
	G6M-03-07X	12/14/2007	2.6	2U	9.8	3	1U	120	140	-	-	10U	4	-	270	320	12,000	0.010J	34	25,000
	G6M-03-07X	3/14/2008	2U	2U	2.3	2U	1U	4.3	130	-	-	5U	4	-	210	230	11,000	0.11	26	30,000
	G6M-03-07X	10/7/2008	5U	2.2J	5U	21	5U	5U	64.3	190	190	24	0.03UJ	-	246	348	5,370	6.3U	12	14,000
	G6M-03-07X	1/22/2009	1.4U	2.3U	1.7J	15	1.7U	3.6	110J	20U	0.13U	37	0.03U	0.10R	227	338J	5,000	1.2U	10	16,000
	G6M-03-07X	5/6/2009	0.5U	0.5U	1.8	20	0.5U	2.6	66	720J	0.025J	32	0.03U	0.1UJ	351	361	5,500	1.2U	9.9	28,000
	G6M-03-07X	10/15/2009	0.27J	0.5U	2.3	19	0.5U	2.2	44	550	0.13U	30	0.03UJ	0.16J	318	251	4,870	1.1U	7.3	16,000
	G6M-03-07X	4/21/2010	0.5U	0.5U	0.88	5.3	0.5U	1.3	46	320	0.13U	0.11J	0.03U	0.53	339	176J	2,000	1.3U	6.3	27,000
	G6M-03-07X	10/5/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	16	35	0.13U	0.27J	0.03U	0.18J	346	164	4,650	1.2U	14	48,000
	G6M-03-07X	6/8/2011	0.5U	0.5U	1.7	7.8	0.5U	2.1	41	460	0.13U	5.0U	0.10	-	381	158	3,540	1.2U	13	72,000
	G6M-03-07X	10/5/2011	0.5U	0.5U	0.86	5.6	0.5U	1.4	39	320	0.13U	5.0U	0.049	-	375	133	2,500	1.2U	1.5U	48,000
	G6M-03-07X	5/9/2012	0.5U	0.5U	1.2	4.4	0.5U	0.92	31	320	0.13U	0.35J	0.063	-	388	131	3,090	1.2U	200	74,000
	G6M-03-07X	10/11/2012	0.5U	0.5U	0.74	3.4	0.5U	1.5	26	270	0.027J	5.0U	0.04	-	365	116	2,900	1.2U	800	97,000
	G6M-03-07X	5/21/2013	0.5U	0.5U	1	3.4	0.5U	0.77	23	180J	0.13UJ	5.0U	0.03UJ	-	413	114	2,150	1.2U	1.5U	22,000
	G6M-03-07X	10/16/2013	0.5U	0.5U	0.86	2.9	0.5U	1.3	26	340	0.13U	5.0U	0.065	-	434	120	2,340	1.2U	33	31,000
	G6M-03-07X	6/11/2014	0.40J	0.5U	0.72	3	0.5U	2.5	45	260J	0.13U	0.52U	0.03J	-	422	105J	1,670	1.3UJ	3.5J	10,000J
	G6M-03-07X	10/30/2014	0.5U	0.5U	0.69	2.8	0.5U	1.1	22	180	0.13U	0.38J	0.03U	-	355	78.5	1,400	1.2U	1.8	54,000
Area 3	G6M-04-02X	9/23/2004	1,900	2U	3.8	2U	1U	2U	-	-	-	-	-	-	5U	1U	86	-	-	-
	G6M-04-02X	9/28/2005	1,800	5U	5U	5U	5U	5U	-	-	-	-	-	-	5U	1U	15U	-	-	-
	G6M-04-02X	9/20/2006	1,100	170	2.2	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	24	-	-	-
	G6M-04-02X	9/14/2007	710	98	290	21	1U	2U	-	-	-	-	-	-	48	16	13,000	-	-	-
	G6M-04-02X	10/16/2008	320	47	290	5U	5U	5U	-	-	-	-	-	-	135	56.6	6,530	-	-	-
	G6M-04-02X	10/15/2009	400	110	15	8U	8U	8U	-	-	-	-	-	-	78.3	20.8	3,580	-	-	-
	G6M-04-02X	10/6/2010	380	54	27	20U	20U	20U	-	-	-	-	-	-	182	40.2	5,530	-	-	-
	G6M-04-02X	6/8/2011	-	-	-	-	-	-	-	-	-	-	-	-	317	42.7	4,540	-	-	-
	G6M-04-02X	10/5/2011	630	93	13U	13U	13U	13U	-	-	-	-	-	-	172	18.1	4,370	-	-	-
	G6M-04-02X	5/8/2012	-	-	-	-	-	-	-	-	-	-	-	-	225	15.5	3,980	-	-	-
	G6M-04-02X	10/12/2012	160	30	5.0U	5.0U	5.0U	5.0U	-	-	-	-	-	-	228	16.9	4,890	-	-	-
	G6M-04-02X	5/21/2013	-	-	-	-	-	-	-	-	-	-	-	-	143	7.29	5,400	-	-	-
	G6M-04-02X	10/17/2013	140	31	5.7	4.0U	4.0U	4.0U	-	-	-	-	-	-	231	20.6	6,800	-	-	-
	G6M-04-02X	6/11/2014	-	-	-	-	-	-	-	-	-	-	-	-	137	13.9J	5,900	-	-	-
	G6M-04-02X	10/30/2014	480	70	33	0.5U	0.5U	2.7J	-	-	-	-	-	-	160	40.5	5,980	-	-	-
Area 3	G6M-13-03X	1/30/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-13-03X	10/30/2014	0.5J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.0285U	407	-	-	-

APPENDIX I
Groundwater Analytical Results
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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 3	G6M-04-04X	9/24/2004	2,300	7.8	24	2U	1U	2U	1U	10U	5.5	20	2U	-	5U	1UJ*	560	0.037	0.12	13
	G6M-04-04X	9/29/2005	1,600	5.4	15	2.5U	2.5U	2.5U	0.5J	5.3	1.4	23	1U	-	5U	1U	430	0.018J	0.06	0.44
	G6M-04-04X	9/19/2006	1,600	45	260	2U	1U	2U	120	190	0.2U	10.2	1.6	-	110	84	31,000	0.12	0.095	33
	G6M-04-04X	9/13/2007	600	130	210	2	1.2	300	63	270	0.2U	890	1.2	-	280	130	25,000	0.005J	7	18,000
	G6M-04-04X	10/16/2008	6.0	8.1	48	2.8	2.5U	150J	34.6U	520	0.10U	7	0.03UJ	-	523	248	19,300	1.3U	62	18,000
	G6M-04-04X	10/15/2009	0.5U	0.5U	4.8	5.2	0.5U	6.9	32	520	0.13U	23J	0.03UJ	-	615	239	16,800	1.3U	61	38,000J
	G6M-04-04X	10/5/2010	0.5U	0.5U	2.8	2.6	0.5U	3.2	15	81J	0.13U	5.0U	0.03U	-	529	155	16,900	1.2U	210	52,000J
	G6M-04-04X	10/5/2011	0.5U	0.5U	1.1	4.1	0.5U	2.7	17	350J	0.13U	5.0U	0.049	-	615	145	16,400	1.2U	160	31,000J
	G6M-04-04X	10/11/2012	0.5U	0.5U	0.80	3.7	0.5U	2.6	13	220	0.13U	5.0U	0.052	-	590	133	15,700	1.3U	460	51,000
	G6M-04-04X	10/16/2013	0.5U	0.5U	1.8	3.1	0.5U	3.0	11	240	0.13U	0.94J	0.049	-	601	114	11,000	3.5	420	44,000
	G6M-04-04X	10/30/2014	0.5U	0.5U	0.5U	1.7	0.5U	0.39J	9.0J	180	0.098J	0.18J	0.03U	-	453	113	8,520	1.2U	85	43,000
Area 4	G6M-02-03X	2/26/2002	210	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-03X	9/23/2004	48	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-03X	9/29/2005	12	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-03X	9/18/2006	10	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
Area 4	G6M-02-04X	2/26/2002	470	0.88J	1.3J	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-04X	9/23/2004	170B	2U	2.9	2U	1U	2U	-	-	-	-	-	-	5U	1U	15U	-	-	-
	G6M-02-04X	9/28/2005	150	2U	6.2	2U	1U	2U	-	-	-	-	-	-	5U	1U	15U	-	-	-
	G6M-02-04X	9/20/2006	48	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	15U	-	-	-
	G6M-02-04X	9/13/2007	21	4.2	2U	2U	1U	2U	-	-	-	-	-	-	6U	0.1U	15	-	-	-
	G6M-02-04X	10/16/2008	9.0	2.5U	150	2.5U	2.5U	2.5U	-	-	-	-	-	-	78.2	8.56	7,370	-	-	-
	G6M-02-04X	10/15/2009	5U	17	120	5U	5U	10	-	-	-	-	-	-	309	82	10,900	-	-	-
	G6M-02-04X	10/4/2010	5.3	2.6	2.1	0.5U	0.5U	0.5U	-	-	-	-	-	-	101	20.2	1,240	-	-	-
	G6M-02-04X	6/9/2011	-	-	-	-	-	-	-	-	-	-	-	-	246	28.2	3,180	-	-	-
	G6M-02-04X	10/6/2011	0.69	0.80	0.67	0.5U	0.5U	0.5U	-	-	-	-	-	-	292	35.6	2,480	-	-	-
	G6M-02-04X	5/9/2012	-	-	-	-	-	-	-	-	-	-	-	-	451	43.4	2,510	-	-	-
	G6M-02-04X	10/9/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	374	30	1,860	-	-	-
	G6M-02-04X	5/21/2013	-	-	-	-	-	-	-	-	-	-	-	-	313	28.1	1,890	-	-	-
	G6M-02-04X	10/16/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	370	23.9	1,390	-	-	-
	G6M-02-04X	6/11/2014	-	-	-	-	-	-	-	-	-	-	-	-	175	14.2	997	-	-	-
	G6M-02-04X	11/3/2014	0.5U	0.24J	0.5U	0.5U	0.5U	0.5U							350	15.6	971	-	-	-
Area 4	G6M-02-13X	8/2/2002	4,600	4	2U	2U	1U	2U	-	-	-	-	-	-	5U	-	-	-	-	-
	G6M-02-13X	9/23/2004	5,000	13	16	2U	1U	2U	1U	31	2.3	17	1.8J	-	5U	1U	1,200	0.27	0.15	57
	G6M-02-13X	12/13/2004	4,600	14	21	2U	1U	2U	5U	34	2.5	16M	2U	-	5U	1U	1,300	0.27	0.11	88
	G6M-02-13X	3/30/2005	2,100	64J	210	100U	50U	100U	8.1	60	0.23	13	2U	-	36	4.2	4,000	0.16	0.11	38
	G6M-02-13X	8/11/2005	2,300	190	460	5.9	2U	2U	66	230	0.05U	2.3	1U	-	150	34J*	12,000J*	0.026	0.045	46
	G6M-02-13X	9/29/2005	3,700	120	470	10U	10U	10U	37	110	0.05U	8.9	2.4	-	74	22	6,800	0.16	0.12	420
	G6M-02-13X	12/14/2005	210	50	850	2U	2	2U	290	420	0.083	2U	8.2	-	477	200J*	36,200	0.057	0.087	11,000
	G6M-02-13X	3/22/2006	660	37J*	640	2U	1U	2U	280	480	0.2U	8.08	3	-	320	170	29,000	0.025U	0.009J	21,000
	G6M-02-13X	6/22/2006	160	8.8	440	2U	1U	280	140	480	0.2U	1.15	20	-	750	420	30,000	0.025J	0.51	25,000
	G6M-02-13X	9/18/2006	550	52	160	2U	1U	280	52	140	0.2U	8.09	2.8	-	420	160	9,900	0.15	1.1	24,000
	G6M-02-13X	12/14/2006	460	20	190	2U	1U	220	140	-	-	4.25	3.6	-	460	260	12,000	0.025	0.35	23,000
	G6M-02-13X	3/27/2007	460	39	120	2U	1U	170	37	-	-	9.74	1.6	-	400	170	8,400J*	0.031	3.7	27,000
	G6M-02-13X	6/13/2007	440	45	48	2U	1U	46	78	-	-	12.7	3.6	-	380	300	9,400	0.025U	6.3	26,000
	G6M-02-13X	9/13/2007	510	150	120	2U	1U	53	18	74	0.2U	480	1U	-	230	88	4,800	0.14	26	20,000
	G6M-02-13X	12/14/2007	690	84J*	58J*	2U	1U	21J*	11	-	-	13	1U	-	210	46	4,500	0.068	21	16,000
	G6M-02-13X	3/12/2008	130	96	29	2U	1U	12	17	-	-	9	1U	-	260	68	7,600	0.092	35	21,000
	G6M-02-13X	10/6/2008	5U	9.7	7.9	5U	5U	7.5	24.3	300	0.13U	11	0.03UJ	-	380	91	4,940	6.5U	8.8	14,000
	G6M-02-13X	1/21/2009	1.4U	5	5.4	1.3U	1.7U	5.7	11J	200	0.13U	14	0.03U	0.35J	371	72.1J	3,990	.25U	3.8	17,000
	G6M-02-13X	5/6/2009	0.5U	5.1	9.8	0.24J	0.5U	6.2	9.4J	300J	0.012J	12	0.03U	0.51J	351	69.4	3,820	1.2U	2.6	26,000
	G6M-02-13X	10/15/2009	0.92	8.6	16	0.7	0.5U	8.5	7J	370	0.13U	13	0.03UJ	0.26	369	93.3	6,800	1.2U	2.2	7,400
	G6M-02-13X	4/20/2010	0.5U	0.29J	14	0.42J	0.5U	13	36	500	0.13U	5.0U	0.03U	0.43	322	134J	5,790	1.3U	6.4	44,000
	G6M-02-13X	10/4/2010	0.30J	1.6	8.3	0.24J	0.5U	8.4	10U	370	0.046J	3.3J	0.03U	0.61	281	58.5	4,690	1.2U	9.5	48,000
	G6M-02-13X	6/9/2011	-	-	-	-	-	-	-	-	-	-	-	-	302	72.3	6,820	-	-	-
	G6M-02-13X	10/6/2011	0.5U	0.5U	0.96	0.5U	0.5U	2.4	6.7J	110	0.13U	0.45J	0.056	-	258	36.2	5,690	1.2U	1.5U	12,000

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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 4	G6M-02-13X	5/9/2012	-	-	-	-	-	-	-	-	-	-	-	-	205	25.9	6,670	-	-	-
	G6M-02-13X	10/11/2012	0.5U	0.83	0.69	0.5U	0.5U	0.5U	2.7J	380	0.013J	5.0U	0.03U	-	159	24.9	8,190	1.3U	87	22,000
	G6M-02-13X	5/21/2013	-	-	-	-	-	-	-	-	-	-	-	-	212	22.3	12,500	-	-	-
	G6M-02-13X	10/16/2013	0.5U	0.78	1.8	0.27J	0.5U	1.1	2.5J	350	0.13U	5.0U	0.037	-	140	19.1	11,400	1.8	3.9	34,000
	G6M-02-13X	6/11/2014	-	-	-	-	-	-	-	-	-	-	-	-	195	20.4	15,800	-	-	-
	G6M-02-13X	10/29/2014	0.5U	1.3	2.8	0.5U	0.5U	1.8	5U	280	0.13U	0.61J	0.03U	-	128	12J	7,920J	1.2U	1.5U	7,300
Area 4	G6M-06-01X	3/30/2006	30	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-06-01X	3/30/2007	72	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-06-01X	9/13/2007	83	2U	2.1	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-06-01X	12/14/2007	110	2U	2.3	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-06-01X	10/16/2008	71	1.8	1.4	1U	1U	1U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-06-01X	10/15/2009	170	28	6.3J	8U	8U	8U	-	-	-	-	-	-	8U	0.321	50U	-	-	-
	G6M-06-01X	10/4/2010	120	3.4J	7.2	4U	4U	4U	-	-	-	-	-	-	5U	0.211U	33.2U	-	-	-
	G6M-06-01X	6/8/2011	190	7.7	7.2	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-06-01X	10/6/2011	96	30	46	1.3U	1.3U	3.5	-	-	-	-	-	-	3.7J	0.139	38.5	-	-	-
	G6M-06-01X	5/8/2012	310	18	16	10U	10U	10U	-	-	-	-	-	-	5U	0.1U	9.4J	-	-	-
	G6M-06-01X	10/10/2012	180	7.6	9.1	4.0U	4.0U	4.0U	-	-	-	-	-	-	5U	0.0522 J	8.8 J	-	-	-
	G6M-06-01X	5/21/2013	170	30	17	5.0U	5.0U	2.0J	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
Area 4	G6M-13-02X	1/30/2014	120	20	34	0.34J	0.5U	14	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-13-02X	6/11/2014	170	54	81	0.53	0.29J	6	-	-	-	-	-	-	3.2J	0.472	32.5	-	-	-
	G6M-13-02X	11/3/2014	210	39	95	5U	5U	6.7	-	-	-	-	-	-	2.5U	0.146UJ	20.3J	-	-	-
Area 5	G6M-02-05X	2/28/2002	130	2U	1.9J	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-05X	1/30/2003	170	2U	2.3	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-05X	9/30/2005	200	2U	2.6	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-05X	9/22/2006	350	2U	2.2	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-05X	9/12/2007	510	50	7.9	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-05X	10/20/2008	390	17	4.4J	10U	10U	10U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-05X	10/19/2009	370	53	10U	10U	10U	10U	10U	57	0.26	19	0.03U	-	49.2	3.82	2,490	1.3U	1.6U	410
	G6M-02-05X	10/5/2010	240	100	4.0J	5U	5U	5U	10U	20U	0.025J	13	0.03U	0.59J	71.2	5.42	2,420	1.2U	1.5U	160
	G6M-02-05X	6/8/2011	200	230	78	3.7	0.62	18J	2.6J	180	0.13U	11	0.03U	-	105	8.58	2,700	1.2U	10	5,400
	G6M-02-05X	10/6/2011	37	140	59	2.0U	2.0U	25	2.1J	530	0.012J	14	0.03U	-	125	10.8	2,300	1.2U	15	6,600
	G6M-02-05X	10/6/2011	37	140	59	2.0U	2.0U	25	2.1J	530	0.012J	14	0.03U	-	125	10.8	2,300	1.2U	15	6,600
	G6M-02-05X	5/9/2012	140	68	17	0.5U	0.5U	0.5U	10U	75	0.13U	14	0.03U	-	103	8.63	2,060	1.3U	1.6U	3,900
	G6M-02-05X	10/10/2012	94	44	16	2.0U	2.0U	2.0U	10U	64	0.11J	14	0.03U	-	73	6.78	1,460	1.2U	1.5U	4,400
	G6M-02-05X	5/21/2013	38J	33J	78	0.48J	0.30J	2.3	10U	100J	0.13UJ	12	0.03UJ	-	84.1	8.43	1,310	1.2U	1.5U	2,200
Area 5	G6M-02-06X	3/1/2002	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-06X	9/24/2004	5.5B	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-06X	9/30/2005	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-06X	9/21/2006	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-06X	9/14/2007	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-06X	10/20/2008	0.47J	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-06X	10/14/2009	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	8U	0.2U	50U	-	-	-
	G6M-02-06X	10/5/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-02-06X	10/7/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5J	0.1U	25U	-	-	-
	G6M-02-06X	10/10/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-02-06X	10/15/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-02-06X	10/30/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.155U	6.0J	-	-	-

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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 5	G6M-02-07X	2/26/2002	24	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-07X	9/23/2004	26B	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-07X	9/30/2005	16	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-07X	9/21/2006	11	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-07X	9/13/2007	12	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-07X	10/20/2008	9.8J	0.27J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-07X	10/15/2009	6.7J	210	10U	10U	10U	10U	-	-	-	-	-	-	8U	0.127U	50U	-	-	-
**	G6M-02-07X	1/15/2010	5.7	0.5U	0.5U	0.75U	0.75U	1.0U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-07X	10/5/2010	4.7	0.24J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-02-07X	10/3/2011	3.6	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-02-07X	10/11/2012	4.6	0.5U	0.57	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.0278J	25U	-	-	-
	G6M-02-07X	10/15/2013	1.1	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.9J	0.1U	5.1J	-	-	-
	G6M-02-07X	10/29/2014	3.9	0.27J	0.62	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.4J	0.025U	7.8J	-	-	-
Area 5	G6M-02-11X	8/1/2002	450	2.8	2U	2U	1U	2U	-	-	-	-	-	-	5U	-	-	-	-	-
	G6M-02-11X	8/28/2002	540J	2U	2U	2U	1U	2U	5U	44	-	-	-	-	5U	-	-	-	-	-
	G6M-02-11X	10/29/2002	970	22	3	2U	1U	2U	5U	51	0.10U	17	2.0U	-	5U	1U	1700	-	-	-
	G6M-02-11X	2/3/2003	710	22	2U	20U	1U	2U	5U	65	-	-	-	-	5U	1U	-	-	-	-
	G6M-02-11X	7/16/2003	530	54	33	2U	1U	2U	5U	120	-	16M	2.0U	-	5U	1U	-	0.005U	0.014	460
	G6M-02-11X	9/26/2003	590	31	37	2U	1U	2U	19	-	-	-	-	-	5U	-	1,700	0.005U	0.005U	1,200
	G6M-02-11X	1/8/2004	300	15	49	2U	1U	2U	5U	150	-	12J	2.0U	-	5U	1U	1,900	0.005U	0.0093	2,300
	G6M-02-11X	3/10/2004	160	11	53	2U	1U	2U	1.8	130	-	9.6M	2U	-	5U	1U	2,200	0.005U	0.068	14,000
	G6M-02-11X	6/4/2004	440	23	54	2U	1U	2U	2.4J	110	-	12M	1.9J	-	5U	1U	1,900	0.005U	0.01	2,300
	G6M-02-11X	9/22/2004	540	50	140	2U	1U	2U	1.2	100	0.5U	12	1.5J	-	5U	1U	2,400	0.005U	0.005U	13,000
	G6M-02-11X	12/15/2004	760	47	120	2U	1U	2U	5U	95	1	15	2U	-	5U	1U	2,100	0.005U	0.021	9,700
	G6M-02-11X	3/28/2005	1,100	41	45	40U	40U	40U	3.6J	90	0.2U	13	2UJ*	-	5U	1UM	2,200	0.005U	0.065	10,000
Area 5	G6M-02-11X	7/1/2005	1,500	90	280	10U	10U	10U	9.4	98.4	0.05U	14	1U	-	2.1	1UJ*	1,800	0.028	0.42	15,000
	G6M-02-11X	9/27/2005	240	78	260	2U	1U	16	3.4	148	0.05U	5.9J	1U	-	5U	1U	2,500	0.020J	8.1	21,000
	G6M-02-11X	12/12/2005	220	28	50	2U	1U	9.1	5.5	270	1.3J*	3.5	1U	-	7.8	0.2J	3,100	0.082	29	24,000
	G6M-02-11X	3/21/2006	520	94	230	2.3	1U	60	8.2	120	0.2U	8.81	1U	-	5U	0.1U	1,500	0.025U	34	17,000
	G6M-02-11X	6/22/2006	130	44	20	20	1U	9.2	6.1	210	0.2U	2.45	1U	-	5U	1U*	6,300	0.051	78	22,000
	G6M-02-11X	9/22/2006	37	17	8.6	2.8	1U	4	9.8	180	0.2U	4.87	1U	-	6.9	0.58	9,300	0.089	15	21,000
	G6M-02-11X	12/13/2006	45	7.9	3.6	4.4	1U	2U	9.3	-	-	1.06	1.2	-	22	1	16,000	0.24	19	28,000
	G6M-02-11X	3/27/2007	38	21	3.6	9.8	1U	2U	10	-	-	-	-	-	120	7.1	24,000J*	6.8	28	23,000
	G6M-02-11X	6/13/2007	30	28	12	10	1U	2.8	12	-	-	9.62	1.6	-	310	6.8	18,000	4.8	33	27,000
	G6M-02-11X	9/11/2007	4.4	24	7.9	12	1U	4.3	14	270	0.2U	470	1U	-	420	18	18,000	2.8	36	30,000
	G6M-02-11X	12/13/2007	2.8J*	19J*	6J*	5.5J*	1U	4.4J*	15	-	-	5U	1	-	470	47	18,000	8.3	16	29,000
	G6M-02-11X	3/11/2008	2U	6.2	2.5	9.7	1U	2U	17	-	-	5U	2.8	-	570	59	27,000	24	5.8	28,000
	G6M-02-11X	10/16/2008	1.3	7.3	6.9	0.8	0.5U	2.2	21.2U	240	0.10U	9.3	0.03U	-	1,170	116	8,420	1.2U	5.4	39,000
	G6M-02-11X	5/7/2009	0.5U	0.76	0.47J	0.92	0.5U	0.5U	31	370J	0.13U	17	0.03U	-	1,060	125	3,950	3.1	3.5	42,000
	G6M-02-11X	10/14/2009	0.23J	1.4	0.58	0.63	0.5U	0.46J	8.7J	430	0.13U	9.7	0.03U	-	1,070	126	2,390	1.2U	1.5U	55,000
	G6M-02-11X	4/20/2010	0.5U	1.6	24	0.24J	0.5U	5.8	8.7J	500	0.13U	5U	0.03U	-	1,050	106J	3,760	1.2U	2.0	17,000
	G6M-02-11X	10/5/2010	0.5U	0.94	0.52	0.38J	0.5U	0.66	10U	700	0.13U	1.4J	0.03U	-	956	93.8	1,590	1.2U	1.5U	47,000
	G6M-02-11X	6/9/2011	-	-	-	-	-	-	-	-	-	-	-	-	804	91.6	2,480	-	-	-
	G6M-02-11X	10/3/2011	0.5U	0.5U	0.64	0.5U	0.5U	1.2	7.6J	520	0.13U	5U	0.03U	-	901	99.9	2,670	1.2U	1.5U	19,000
	G6M-02-11X	5/8/2012	-	-	-	-	-	-	-	-	-	-	-	-	769	84.2	2,560	-	-	-
	G6M-02-11X	10/10/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	4.2J	390	0.11J	1.3J	0.03U	-	683	69.9	1,840	3.9	1.5U	12,000
	G6M-02-11X	5/21/2013	-	-	-	-	-	-	-	-	-	-	-	-	649	59.5	3,660	-	-	-
	G6M-02-11X	10/16/2013	0.5U	0.5U	0.26J	0.20J	0.5U	0.5U	4.2J	320	0.13U	5.0U	0.03U	-	616	53	3,230	17	1.6U	56,000
	G6M-02-11X	6/11/2014	-	-	-	-	-	-	-	-	-	-	-	-	573	50	8,010	-	-	-
	G6M-02-11X	10/29/2014	0.5U	0.5U	0.42J	0.34J	0.5U	0.44J	5U	340	0.13U	0.17J	0.03U	-	624	64.3J	4,860J	8.1J	1.5U	15,000

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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 5	G6M-02-12X	8/1/2002	330	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	-	-	-	-	-
	G6M-02-12X	8/28/2002	520	6.5	2U	2U	1U	2U	5U	54	-	-	-	-	5U	-	-	-	-	-
	G6M-02-12X	10/29/2002	790	10	2U	2U	1U	2U	2.0J	40	0.10U	17	2.0U	-	5U	1U	1,100	-	-	-
	G6M-02-12X	2/3/2003	580	4	2U	2U	1U	2U	5U	52	-	-	-	-	5U	1U	-	-	-	-
	G6M-02-12X	7/14/2003	-	-	-	-	-	-	5U	-	-	-	-	-	-	-	-	-	-	-
	G6M-02-12X	9/22/2004	1,000	43	110	2U	1U	2U	1U	84	0.5U	13	2U	-	5U	1U	450	0.005U	0.005U	2,900
	G6M-02-12X	9/27/2005	1,100	38	250	1.4	1U	5.4	3.5	106	0.05U	13J	1U	-	5U	1U	690	0.025U	1.1	14,000
	G6M-02-12X	9/21/2006	190	88	64	23	1U	67	7.6	170	0.2U	5.72	1U	-	5U	0.37	3,200	0.038	46	15,000
	G6M-02-12X	9/12/2007	62	50	28	4.4	1U	18	2.6J	180	0.2U	340	1	-	20U	0.58	5,500	0.4	8.4	11,000
	G6M-02-12X	10/16/2008	0.37J	7.1	18	1.6	0.5U	4.8	10U	310	0.10U	7U	0.03U	-	174	11.8	15,800	1.2U	3.1	19,000
	G6M-02-12X	10/14/2009	0.5U	0.3J	13	0.74	0.5U	1.6	4.6J	350	0.13U	7U	0.03U	-	540	24.4	11,000	1.3U	1.6U	6,900
	G6M-02-12X	10/5/2010	0.5U	0.5U	5.6	0.27J	0.5U	1.5	10U	810	0.050J	2.8J	0.03U	-	1,040	72.2	13,700	1.2U	2	40,000
	G6M-02-12X	10/4/2011	0.5U	0.5U	6.3	0.5U	0.5U	4.3	6.4J	440	0.13U	0.33J	0.03U	-	1,020	71.2	9,540	1.2U	1.5U	21,000
	G6M-02-12X	10/10/2012	0.5U	0.5U	1.0	0.5U	0.5U	1.0	4.0J	320	0.13U	0.59J	0.03U	-	865	65.8	5,010	1.8	1.5U	14,000
	G6M-02-12X	10/16/2013	0.5U	0.5U	0.7	0.21J	0.5U	0.54	4.2J	83	0.13U	5.0U	0.03U	-	809	61.3	4,910	10	1.5U	55,000
	G6M-02-12X	10/29/2014	0.5U	0.5U	0.9	0.56	0.5U	0.79	6.2J	330	0.13U	0.22J	0.03U	-	760	56J	4,870J	9.2	1.5U	25,000
Area 5	G6M-03-08X	5/14/2003	750	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	-	-	-	-
	G6M-03-08X	9/22/2004	690	6.3	5.4	2U	1U	2U	1U	16	8.3	13	1.5J	-	5U	1U	15U	0.005U	0.005U	1.8
	G6M-03-08X	12/16/2004	1,100	11	9.6	2U	1U	2U	5U	20	5.7	13	2.9	-	5U	1U	17	0.069	0.03	4.7
	G6M-03-08X	3/31/2005	340	20U	9.6J	20U	20U	20U	0.3J	12	2.3	17	2U	-	5U	1U	15U	0.011	0.45	14
	G6M-03-08X	7/6/2005	780	8.2	15	2U	1U	2U	5.5	28.6	1.8	14	1U	-	4U	1U	10U	0.11	0.068	410
	G6M-03-08X	9/28/2005	620	4.8	14	1U	1U	1U	5U	28.3	1.6	12	1U	-	5U	1U	15U	0.025U	0.009J	2,400M
	G6M-03-08X	12/14/2005	700	8	17	2U	1U	2U	5U	32	1.2	12	1U	-	5U	1U	15UJ	0.025U	0.025U	7,000
	G6M-03-08X	3/22/2006	1,100	21J*	34	2.6	1U	2U	6.5	29	0.586	11.7	1U	-	5U	0.1U	15U	0.025U	0.006J	12,000
	G6M-03-08X	6/21/2006	610	16	48	2U	1U	2U	5U	41J*	0.33	10.2	1U	-	5U	1.8	42	0.004J	0.14	16,000
	G6M-03-08X	9/21/2006	660	47	110	2U	1U	5.2	3.2J	41	0.228	9.64	1U	-	5U	0.10U	15U	0.023J	0.55	14,000
	G6M-03-08X	12/12/2006	750	45	120	2U	1U	7.8	5U	-	-	-	-	-	5U	.01U	15U	0.013	0.59	16,000
	G6M-03-08X	3/29/2007	570	37	74	2U	1U	11	5U*	-	-	-	-	-	5U	0.1U	15U	0.006J	0.72	14,000
	G6M-03-08X	6/12/2007	740	55	88	2U	1U	14	0.6J	-	-	-	-	-	5U	0.1U	15U	0.025U	0.7	15,000
	G6M-03-08X	9/10/2007	520	75	75	2U	1U	21	5U	42	0.2U	200	1U	-	2U	0.1U	15U	0.025U	1.7	14,000
	G6M-03-08X	12/11/2007	390	53	49	2U	1U	15	5U*	-	-	-	-	-	5U	0.1U	20	0.004J	1.6	15,000
	G6M-03-08X	3/13/2008	390	5	10	2U	1U	2U	5U	-	-	-	-	-	5U	0.1U	20	0.003J	0.051	2,800
	G6M-03-08X	10/20/2008	290	61	140	5U	5U	26	10U	110	0.13U	14	0.03U	-	8U	0.2U	33.2	1.3U	2.1	21,000
	G6M-03-08X	5/6/2009	120	38	150	4.0U	4.0U	15	10U	190J	0.13U	10	0.03U	-	3.1J	0.2U	144	1.2U	1.6	37,000
	G6M-03-08X	10/14/2009	5U	20	120	5U	5U	11	10U	240	0.13U	8.3	0.03U	-	8.0U	0.139U	1,470	1.3U	1.6U	7,300J
	G6M-03-08X	4/20/2010	26J	9.9J	88J	2UJ	2UJ	1.5J	10U	250	0.13U	7.8	0.03U	-	9.0	0.194U	6,520	1.3U	1.6U	3,500
	G6M-03-08X	10/4/2010	8.2	5.2	80	2U	2U	3.5	10U	360	0.13U	5.5	0.03U	-	3.4J	0.132U	11,300	1.2U	1.5U	890
	G6M-03-08X	6/8/2011	-	-	-	-	-	-	-	-	-	-	-	-	14.1	0.266	16,100	-	-	-
	G6M-03-08X	10/3/2011	4.3	3.4	62	2.5U	2.5U	9.6	10U	360	0.13U	3.2J	0.03U	-	5.1J	0.194J	16,800	1.2U	1.5U	590
	G6M-03-08X	5/8/2012	-	-	-	-	-	-	-	-	-	-	-	-	5.0U	0.127U	17,700	-	-	-
	G6M-03-08X	10/9/2012	0.5U	0.78	9.8	0.76	0.5U	7.4	2.5J	380	0.13U	1.4J	0.03U	-	5U	0.152	18,600	1.3U	3.6	110
	G6M-03-08X	5/22/2013	-	-	-	-	-	-	-	-	-	-	-	-	3.1J	0.117U	12,500	-	-	-
	G6M-03-08X	10/15/2013	0.5U	0.87	2.8	1.2	0.5U	1.6	3.0J	450	0.13U	5.0U	0.03U	-	5.2	0.121U	12,300	1.8	1.5U	360
	G6M-03-08X	6/12/2014	-	-	-	-	-	-	-	-	-	-	-	-	4.3J	0.152	9,850	-	-	-

APPENDIX I
Groundwater Analytical Results
Area of Contamination 50
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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 5	G6M-03-09X	5/14/2003	2U	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1U	-	-	-	-
	G6M-03-09X	9/23/2004	3.7B	2U	2U	2U	1U	2U	1U	23	19	15	2.2	-	5U	1U	15U	0.005U	0.005U	1.9
	G6M-03-09X	12/14/2004	2U	2U	2U	2U	1U	2U	5U	25	11	15	2U	-	5U	1U	15U	0.015	0.026	2
	G6M-03-09X	3/29/2005	1.5J	2U	2U	2U	1U	2U	0.3J	18	1.5	13	2U	-	5U	1UM	15U	0.013	0.26	1.4
	G6M-03-09X	6/30/2005	5.8	2U	2U	2U	1U	2U	15	25.1	1.3	13	1U	-	2U	1UJ*	10U	0.077	0.032	1.2
	G6M-03-09X	9/28/2005	2U	2U	2U	2U	1U	2U	4J	38.2	3.7	13	1U	-	5U	1U	15U	0.006J	0.009J	29M
	G6M-03-09X	12/13/2005	2U	2U	2U	2U	1U	2U	5U*	53	0.05U	13	1U	-	5U	1U	15U*	0.005J	0.014J	790
	G6M-03-09X	3/22/2006	2U	2U	2U	2U	1U	2U	7.9	36	1.81	12.1	1U	-	5U	0.1U	20	0.006J	0.016J	39
	G6M-03-09X	6/23/2006	2U	2U	2U	2U	1U	2U	5U	39	2.65	13.2	1U	-	5U	0.1U	15U	0.025U	0.042	390
	G6M-03-09X	9/21/2006	2U	2U	2U	2U	1U	2U	0.8J	36	2.51	9.19	1UJ*	-	5U	0.10U	15U	0.014J	0.12	140
	G6M-03-09X	12/13/2006	2U	2U	2U	2U	1U	2U	5U	-	-	-	-	-	5U	0.10U	15U	0.025U	0.019J	870
	G6M-03-09X	3/29/2007	2U	2U	2U	2U	1U	2U	1.8J	-	-	-	-	-	5U	0.1U	15U	0.006J	0.032	1,600
	G6M-03-09X	6/13/2007	3.8	2U	2U	2U	1U	2U	0.5J	-	-	-	-	-	5U	0.1U	15U	0.005J	0.011J	870
	G6M-03-09X	9/10/2007	2U	2U	2U	2U	1U	2U	5U	53	2.01	20	1U	-	6U	0.1U	15U	0.025U	0.025U	18,000
	G6M-03-09X	12/11/2007	2U	2U	2U	2U	1U	2U	5U*	-	-	-	-	-	5U	0.1U	15U	0.006J	0.022J	2,200
	G6M-03-09X	3/12/2008	2U	2U	2U	2U	1U	2U	5U	-	-	-	-	-	5U	0.11	18	0.027	0.016J	5,200
	G6M-03-09X	10/20/2008	0.37J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	48	0.84	19	0.03U	-	8U	0.2U	50U	1.3U	1.6U	1,600
	G6M-03-09X	5/6/2009	0.78	0.5U	0.5U	0.5U	0.5U	0.5U	10U	52J	0.9	14	0.03U	-	8U	0.2U	50U	1.2U	1.5U	340
	G6M-03-09X	10/14/2009	0.35J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	53	0.32	13	0.03U	-	8U	0.2U	50U	1.2U	1.5U	230
	G6M-03-09X	4/20/2010	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	10U	90	0.13U	12	0.03U	-	5U	0.1U	25U	1.3U	1.6U	700
	G6M-03-09X	10/4/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	44	0.86	12	0.03U	-	5U	0.1U	25U	1.2U	1.5U	35J
	G6M-03-09X	6/8/2011	-	-	-	-	-	-	-	-	-	-	-	-	5U	1.68	11.4J	-	-	-
	G6M-03-09X	10/3/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	35	0.39	11	0.03U	-	20U	0.2U	50U	1.2U	1.5U	230
	G6M-03-09X	5/8/2012	-	-	-	-	-	-	-	-	-	-	-	-	5.0U	0.1U	25U	-	-	-
	G6M-03-09X	10/9/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	25	2.8	8.9	0.03U	-	5U	0.1U	6.2 J	1.3U	1.6U	2.6
	G6M-03-09X	5/22/2013	-	-	-	-	-	-	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-03-09X	10/15/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	29	0.82	10	0.03U	-	5U	0.1U	9.6J	1.2U	1.5U	7,600
	G6M-03-09X	6/12/2014	-	-	-	-	-	-	-	-	-	-	-	-	5U	0.0219U	7.4J	-	-	-
	G6M-03-09X	10/28/2014	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	5U	35	1.6	11	0.03U	-	2.5U	0.268J	13.4J	1.4	1.5U	20
Area 5	G6M-03-10X	5/14/2003	15	2U	2U	2U	1U	2U	-	-	-	-	-	-	5U	1.0U	-	-	-	-
	G6M-03-10X	9/22/2004	27	2U	2U	2U	1U	2U	1U	51	2.8	12	1.5J	-	5U	1U	340	0.05	0.68	680
	G6M-03-10X	12/14/2004	19	2U	44	2U	1U	2U	5U	110	3.8	21	2U	-	5U	1U	880	0.02	0.025	1.9
	G6M-03-10X	3/29/2005	14	0.98J	68	1.2J	1U	2U	5.9	146	0.2U	12	2U	-	5U	1UM	1,200	0.005U	0.38	2,600
	G6M-03-10X	6/30/2005	3.6	2U	2U	2U	1U	2U	19	199	0.1	11	1U	-	2U	1UJ*	1,900	0.026	0.021	8,600
	G6M-03-10X	9/28/2005	6.7	2U	2U	2U	1U	2U	0.6J	140	0.2	16	1U	-	5U	1U	720	0.025U	0.020J	1,100M
	G6M-03-10X	12/13/2005	3.4	2U	2U	2U	1U	2U	5U*	250	0.48	8.4	1U	-	6.9	1U*	3,020	0.009J	0.027	12,000
	G6M-03-10X	3/23/2006	9.9	2U	2U	2U	1U	2U	3.5J	170	0.2U	8.9	1U	-	5U	0.22	3,800	0.020J	0.052	7,000
	G6M-03-10X	6/22/2006	2.6	2U	2U	2U	1U	2U	5J	200	0.2U	4.44	1U	-	5U	0.74	7,300	0.004J	0.042	14,000
	G6M-03-10X	9/20/2006	2.2	2U	2U	2U	1U	2U	6	180	0.2U	6.95	1U	-	5U	0.21	6,200	0.006J	0.14	14,000
	G6M-03-10X	12/13/2006	2.8	2U	3.4	2U	1U	2U	2J	-	-	-	-	-	5U	0.27	8,500	0.025U	0.025U	20,000
	G6M-03-10X	3/29/2007	2.2	2.1	4.2	2U	1U	2U	4.8J	-	-	-	-	-	8.6	0.3	9,100J*	0.007J	0.16	24,000
	G6M-03-10X	6/11/2007	2.5	2U	4.1	2U	1U	2U	6.7	-	-	-	-	-	23	1	11,000	0.025U	0.095	29,000
	G6M-03-10X	9/10/2007	2U	2U	3.8	2U	1U	2U	3.5J	150	0.2U	290	1U	-	29	0.4	8,100	0.1	0.057	620
	G6M-03-10X	12/12/2007	2U	2U	2.8	2U	1U	2U	5.8	-	-	-	-	-	26	0.33	9,200	0.025U	0.043	20,000
	G6M-03-10X	3/11/2008	16	8.7	16	2U	1U	4	5J	-	-	-	-	-	91	15	9,200	0.04	59	28,000
	G6M-03-10X	10/20/2008	1.0	2.0	5.4	0.5U	0.5U	1.0	170	170	0.13U	8.3	0.03U	-	248	7.07	10,300	1.3U	1.6U	21,000
	G6M-03-10X	5/6/2009	1	5	9.1	0.5U	0.5U	1.5	11	230J	0.0076J	9.3	0.03U	-	522	54.4	9,210	1.2U	1.5U	31,000
	G6M-03-10X	10/14/2009	0.6	3.7	10	0.5U	0.5U	2.2	7.4J	310	0.13U	21	0.03U	-	518	57.8	7,410	1.3U	1.6U	9,000J
	G6M-03-10X	4/20/2010	1.2	5.6	2.0	0.21J	0.5U	1.1	4.7J	130	0.13U	6.5	0.03U	-	648	60.5J	4,910	1.2U	1.5U	4,100
	G6M-03-10X	10/4/2010	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	230	0.13U	5.9	0.03U	-	475	58.1	5,650	1.2U	6.2	20,000
	G6M-03-10X	6/9/2011	-	-	-	-	-	-	-	-	-	-	-	-	520	53.9	2,550	-	-	-
	G6M-03-10X	10/3/2011	0.5U	2.7	1.2	0.5U	0.5U	0.53	3.0J	100	0.21	7.6	0.030U	-	528	54.5	3,980	1.2U	1.5U	9,800
	G6M-03-10X	5/8/2012	-	-	-	-	-	-	-	-	-	-	-	-	480	56	4,070	-	-	-
	G6M-03-10X	10/9/2012	0.5U	0.55	0.5U	0.5U	0.5U	0.5U	10U	100	0.13U	8.4	0.03U	-	456	47.5	2,280	22	1.6U	13,000
	G6M-03-10X	5/22/2013	-	-	-	-	-	-	-	-	-	-	-	-	514	57.1	2,340	-	-	-
	G6M-03-10X	10/15/2013	0.5U	0.68	0.52	0.5U	0.5U	0.5U	10U	80	0.042U	9.2	0.03U	-	452	50.6	2,770	1.8	1.5U	23,000
	G6M-03-10X	6/12/2014	-	-	-	-	-	-	-	-	-	-	-	-	510	51.9	2,400	-	-	-
	G6M-03-10X	10/29/2014	0.5U	0.77	0.92	0.5U	0.5U	0.41J	5U	92	0.13U	8.6	0.03U	-	418	42.9J	3,090J	1.2U	1.5U	14,000
Area 5	G6M-04-05X	9/22/2004	140	2U	2U	2U	1U	2U	1U	14	4.9	14	2U	-	5U	1U	15U*	0.005U	0.0092	1.3
	G6M-04-05X	12/15/2004	17	2U	2U	2U	1U	2U	5U	14	7.5	13	2U	-	5U	1U	15U	0.005U	0.016	1.4
	G6M-04-05X	3/30/2005	130	10U	10U	10U	5U	10U	0.5J	14	1.2	10	2U	-	5U	1U	15U	0.0074	0.028	15

APPENDIX I
Groundwater Analytical Results
Area of Contamination 50
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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
	G6M-04-05X	6/30/2005	200	2U	2U	2U	1U	2U	2.4	15.9	0.87	8.9	1U	-	2U	1UJ*	10U	0.041	0.022	96
	G6M-04-05X	9/29/2005	110	2U	2U	2U	1U	2U	5U	3.3	0.98	14	1U	-	5U	1U	33	0.006J	0.012J	220
	G6M-04-05X	12/14/2005	36	2U	2U	2U	1U	2U	5U	21	1.6	11	1U	-	5U	1U	15U	0.007J	0.016J	550
	G6M-04-05X	3/22/2006	330	2U	2U	2U	1U	2U	3.4J	13	1.11	9.33	1U	-	5U	0.1U	15U	0.025U	0.019J	2,200
	G6M-04-05X	6/22/2006	38	2U	2U	2U	1U	2U	5U	22J*	1.82	9.01	1U	-	5U	0.1U	15U	0.025U	0.082	33
	G6M-04-05X	9/22/2006	30	2U	2U	2U	1U	2U	5U	15	1.51	10.8	1U	-	5U	0.10U	15U	0.009J	0.084	140
	G6M-04-05X	12/12/2006	8.7	2U	2U	2U	1U	2U	5U	-	-	-	-	-	5U	0.1U	15U	0.025U	0.010J	850
	G6M-04-05X	3/29/2007	16	2U	2U	2U	1U	2U	1.4J	-	-	-	-	-	5U	0.12	15U	0.025U	0.022J	460
Area 5	G6M-04-05X	6/12/2007	12	2U	2U	2U	1U	2U	0.4J	-	-	-	-	-	5U	0.1U	15U	0.005J	0.041	330
	G6M-04-05X	9/10/2007	43	2U	2U	2U	1U	2U	5U	20	1.61	17	1U	-	2U	0.1U	15U	0.24	0.089	340
	G6M-04-05X	12/11/2007	7.2	2U	2U	2U	1U	2U	5U*	-	-	-	-	-	5U	0.19	15U	0.025U	0.013J	1,900
	G6M-04-05X	3/13/2008	2.5	2U	2U	2U	1U	2U	5U	-	-	-	-	-	5U	0.1U	17	0.009J	0.020J	1,300
	G6M-04-05X	10/20/2008	3.7	0.5U	0.5U	0.5U	0.5U	0.5U	10U	30	1.5	10	0.03U	-	8U	0.2U	50U	1.3U	1.6U	3,300
	G6M-04-05X	5/6/2009	16	0.38J	0.84	0.5U	0.5U	0.27J	10U	49J	0.37	17	0.03U	-	8U	0.2U	50U	1.3U	1.6U	2,200
	G6M-04-05X	10/14/2009	8.2	0.5U	0.29J	0.5U	0.5U	0.5U	10U	29	0.39	15	0.03U	-	8.0U	0.127U	60U	1.3U	1.6U	2,000J
	G6M-04-05X	4/20/2010	2.3J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	10U	80	0.30	15	0.03U	-	5U	0.1U	25U	1.2U	1.5U	3,200
	G6M-04-05X	10/4/2010	0.28J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	30	1.7	13	0.03U	-	5U	0.1U	25U	1.2U	1.5U	18
	G6M-04-05X	6/8/2011	-	-	-	-	-	-	-	-	-	-	-	-	5U	0.1U	12.7J	-	-	-
	G6M-04-05X	10/3/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	2.3J	39	0.47	19	0.03U	-	20U	0.2U	11.4J	1.2U	1.5U	2,000
	G6M-04-05X	5/8/2012	-	-	-	-	-	-	-	-	-	-	-	-	5.0U	0.1U	10.9J	-	-	-
	G6M-04-05X	10/9/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	32	0.063J	16	0.03U	-	5U	0.1U	21.8 J	1.3U	1.6U	1,800
	G6M-04-05X	5/22/2013	-	-	-	-	-	-	-	-	-	-	-	-	2.7J	0.1U	25U	-	-	-
	G6M-04-05X	10/15/2013	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	60	0.13U	18	0.03U	-	5U	0.1U	15.4J	1.3U	1.6U	28,000
	G6M-04-05X	6/12/2014	-	-	-	-	-	-	-	-	-	-	-	-	2.4J	0.195U	13.3J	-	-	-
	G6M-04-05X	10/28/2014	0.42J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	39	0.31	13	0.03U	-	4.1J	0.0293	12.2JJ	2.8	1.6	48
Area 5	G6M-04-06X	9/22/2004	160	2U	2U	2U	1U	2U	1U	110	5.3	8.7	2U	-	5U*	1U	15U	0.056	0.005U	3.4
	G6M-04-06X	12/16/2004	24	2U	2U	2U	1U	2U	5U	54	7.9	10	2.9	-	21	1U	15U	0.017	0.028	0.47
	G6M-04-06X	3/30/2005	37	2U	2U	2U	1U	2U	5U	37	2	12	2U	-	7.5	1U	15U	0.0087	0.051	0.58
	G6M-04-06X	7/1/2005	140	2U	2U	2U	1U	2U	2.8J	10.3	1.5	25	1U	-	2U	1UJ*	190	0.034	0.056	9.7
	G6M-04-06X	9/29/2005	32	2U	2U	2U	1U	2U	5.4	70.4	1.9	12	1U	-	11	1U	15U	0.009J	0.018J	0.7
	G6M-04-06X	12/15/2005	26	2U	2U	2U	1U	2U	7.6	39	1.9	12	1U	-	80.9	1U	150	0.009J	0.022J	3.3
	G6M-04-06X	3/23/2006	100	2U	2U	2U	1U	2U	5U	23	1.71	9.29	1U	-	5U	0.1U	15U	0.006J	0.036	3.1
	G6M-04-06X	6/23/2006	190	2U	2U	2U	1U	2U	5U	41	1.69	9.43	1U	-	13J*	0.1U	15U	0.012J	0.041	10
	G6M-04-06X	9/21/2006	45	2U	2U	2U	1U	2U	1.9J	31	1.03	10.9	1U	-	5U	0.10U	15U	0.016J	0.11	6.3
	G6M-04-06X	12/11/2006	37	2U	2U	2U	1U	2U	5U	-	-	-	-	-	5U	0.1U	15U	0.010J	0.044	4.3
	G6M-04-06X	3/29/2007	18	2U	2U	2U	1U	2U	5U*	-	-	-	-	-	5U	0.1U	15U	0.011J	0.021J	13
	G6M-04-06X	6/12/2007	25	2U	3.5	2U	1U	2U	5U	-	-	-	-	-	5U	0.1U	15U	0.010J	0.061	19
	G6M-04-06X	9/10/2007	23	2U	3	2U	1U	2U	5U	38	1.32	82	1U	-	8U	0.1U	15U	0.005J	0.007J	0.13
	G6M-04-06X	12/12/2007	22	2U	6.3	2U	1U	2U	5U*	-	-	-	-	-	5U	0.1U	15U	0.004J	0.025U	0.21
	G6M-04-06X	3/14/2008	14	2U	2.4	2U	1U	2U	5U	-	-	-	-	-	5U	0.1U	15U	0.005J	0.025U	2.8
	G6M-04-06X	10/16/2008	24	0.68	2.2	0.5U	0.5U	0.5U	10U	34	1.47U	11	0.03U	-	8.5	0.2U	11.5J	1.3U	1.6U	2
	G6M-04-06X	5/6/2009	13	0.51	1.8	0.5U	0.5U	0.5U	10U	44	1.3	14	0.03U	-	6.9	0.2U	50U	1.3U	1.6U	1.6
	G6M-04-06X	10/14/2009	10	0.46J	1.8	0.5U	0.5U	0.5U	10U	44	1.3	11	0.03U	-	7.4U	0.2U	50U	1.3U	1.6U	22J
	G6M-04-06X	4/20/2010	3.0J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	10U	60	1.8	11	0.03U	-	7.3	0.1U	25U	1.2U	1.5U	150
	G6M-04-06X	10/4/2010	0.95	0.5U	0.5U	0.5U	0.5U	0.5U	10U	57	1.8	9.1	0.03U	-	6.1	0.1U	25U	1.2U	1.5U	2,000
	G6M-04-06X	10/3/2011	4.0	0.5U	2.0	0.5U	0.5U	0.5U	10U	71	0.74	11	0.03U	-	4.7J	0.2U	10.7J	1.2U	1.5U	9,200
	G6M-04-06X	10/9/2012	3.7	0.5U	0.5U	0.5U	0.5U	0.5U	10U	62	0.48	16	0.03U	-	5U	0.1U	21.2 J	1.2U	1.5U	14,000
	G6M-04-06X	10/15/2013	4.5	0.37J	0.55	0.5U	0.5U	0.5U	10U	140	0.13U	12	0.03U	-	5U	0.1U	88.2	1.2U	1.5U	36,000
	G6M-04-06X	10/28/2014	1.2	0.78	0.41J	0.5U	0.5U	0.5U	5U	70	0.29	15	0.03U	-	2.5U	0.0243U	157J	8.1J	1.5U	1,200

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Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 5	G6M-04-07X	9/22/2004	900	2.7	8.4	2U	1U	2U	1U	56	5.4	32	2U	-	5U	1U	260	0.061	0.12	3.1
	G6M-04-07X	12/17/2004	1,100	2	9.3	2U	1U	2U	0.6J	43	6.4M	14	2U	-	28	1U	47	0.11	2.2	2.1
	G6M-04-07X	3/29/2005	240	10U	10U	10U	5U	10U	0.5J	43.2	1.5	14	2U	-	12	1UM	27	0.031	0.64	1.9
	G6M-04-07X	7/5/2005	170	2U	2U	2U	1U	2U	5U*	41.1	1.7	14	1U	-	4	1U	37	0.07	0.042	1.8
	G6M-04-07X	9/29/2005	470	3	8.3	2U	1U	2U	5U	1U	1.9	16	1U	-	5U	1U	43	0.010J	0.010J	2.4
	G6M-04-07X	12/14/2005	390	2U	2	2U	1U	2U	6.1	40	1.6	13	1U	-	3.8B	1U	17.9	0.006	0.016	7.9
	G6M-04-07X	3/23/2006	260	2U	2U	2U	1U	2U	5U	36	1.57	13.3	1U	-	5U	0.1U	15U	0.005J	0.029	250
	G6M-04-07X	6/23/2006	150	2U	2U	2U	1U	2U	0.3J	30	1.28	12.5	1U	-	5U	0.1U	24	0.005J	0.022J	22
	G6M-04-07X	9/21/2006	110	2U	2U	2U	1U	2U	3.4J	32	2.54	10	1U	-	5U	0.10U	19	0.014J	0.088	2.4
	G6M-04-07X	12/11/2006	87	2U	2U	2U	1U	2U	5U	-	-	-	-	-	5U	0.10U	15	0.007J	0.033	2.2
	G6M-04-07X	3/29/2007	45	2U	2U	2U	1U	2U	5U*	-	-	-	-	-	5U	0.1U	17J*	0.006J	0.018J	5.2
	G6M-04-07X	6/12/2007	44	2U	2U	2U	1U	2U	1.2J	-	-	-	-	-	5U	0.67	18	0.010J	0.079	46
	G6M-04-07X	9/10/2007	25	2U	2U	2U	1U	2U	5U	19	1.89	45	1U	-	2U	0.1U	15U	0.006J	0.006J	0.11
	G6M-04-07X	12/12/2007	23	2U	2U	2U	1U	2U	5U*	-	-	-	-	-	5U	0.1U	15U	0.004J	0.013J	0.48
	G6M-04-07X	3/13/2008	19	2U	2U	2U	1U	2U	5U	-	-	-	-	-	5.2	0.1U	15U	0.003J	0.025U	1.6
	G6M-04-07X	10/16/2008	11	0.5U	0.5U	0.5U	0.5U	0.5U	10U	28	1.81U	10	0.03U	-	8.0U	0.2U	15.1J	1.2U	1.5U	390
	G6M-04-07X	5/6/2009	2.2	0.5U	0.5U	0.5U	0.5U	0.5U	10U	41J	2.3	12	0.03U	-	2.9J	0.2U	50U	1.3U	1.6U	660
	G6M-04-07X	10/14/2009	1.3	0.5U	0.5U	0.5U	0.5U	0.5U	10U	32	1.9	15	0.03U	-	8U	0.2U	50U	1.3U	1.6U	2,500J
	G6M-04-07X	4/20/2010	13J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	0.5UJ	10U	50	1.5	12	0.03U	-	5U	0.1U	31.8U	1.3U	1.6U	630
	G6M-04-07X	10/4/2010	19	2.2	4.5	0.5U	0.5U	0.5U	10U	43	1.1	10	0.03U	-	5U	0.1U	25U	1.2U	1.5U	5,100
	G6M-04-07X	6/8/2011	-	-	-	-	-	-	-	-	-	-	-	-	5U	0.148	67.9	-	-	-
	G6M-04-07X	10/3/2011	8.7	1.2	2.2	0.5U	0.5U	0.5U	10U	53	0.59	12	0.03U	-	20U	0.2U	68.0	1.2U	1.5U	8,300
	G6M-04-07X	5/8/2012	-	-	-	-	-	-	-	-	-	-	-	-	4.0J	0.1U	27.2	-	-	-
	G6M-04-07X	10/9/2012	31J	6.2	33J	0.5U	0.5U	0.97	10U	99	0.5	10	0.03U	-	5U	0.1U	35.4	1.2U	1.5U	6,400
	G6M-04-07X	5/22/2013	-	-	-	-	-	-	-	-	-	-	-	-	3.9J	0.1U	51.4	-	-	-
	G6M-04-07X	10/15/2013	26	5.7	16	0.5U	0.5U	0.5U	10U	110	0.30	11	0.03U	-	3.8J	0.1U	3,480	1.2U	1.5U	37,000
	G6M-04-07X	6/10/2014	-	-	-	-	-	-	-	-	-	-	-	-	3.0J	0.0208UJ	6,710	-	-	-
	G6M-04-07X	10/28/2014	55	11	54	0.31J	0.5U	0.61	5U	130	0.13	9.6	0.03U	-	9.5	0.195J	4,370J	1.3U	1.6U	4,900
Area 5	G6M-04-08X	9/24/2004	4.2B	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
Area 5	G6M-04-14X	11/16/2004	12	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-14X	9/27/2005	6.9	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-14X	9/21/2006	9.4	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-14X	10/1/2007	7.1	2U	2U	2U	1U	2U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-14X	10/21/2008	7.1J	0.21J	0.5UJ	0.5UJ	0.5UJ	0.5UJ	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-14X	10/15/2009	4.5J	250	10U	10U	10U	10U	-	-	-	-	-	-	-	-	-	-	-	-
**	G6M-04-14X	1/15/2010	4.5	0.22J	0.5U	0.75U	0.75U	1.0U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-14X	10/8/2010	2.4	0.25J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-04-14X	10/5/2011	2.2	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	6.8	0.1U	25U	-	-	-
	G6M-04-14X	10/15/2012	3.3	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	9.6	0.194	7.7J	-	-	-
	G6M-04-14X	10/18/2013	1.7	0.34J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	8.2	0.1U	7.5U	-	-	-
	G6M-04-14X	10/31/2014	1.8	0.40J	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.0507U	7.5U	-	-	-

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Area of Concern	Well ID	Date	Laboratory Parameters																
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 5	MW-3	10/17/2001	4,300	1,500	540	20U	10U	20U	-	-	-	-	-	-	-	-	-	-	-	-
	MW-3	12/19/2001	26	4,000	2,200	20U	6.5J	20U	92	-	-	0.43J	-	-	-	-	-	-	-	-
	MW-3	1/3/2002	-	-	-	-	-	-	44	-	-	-	-	-	180	30	-	0.063	0.21	18
	MW-3	1/31/2002	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-	-	-	-
	MW-3	2/13/2002	4,400	1,700	1,600	1.6J	3.7	2U	15	-	0.10U	14	1.0J	-	190	20	8,300	0.079	0.29	53
	MW-3	3/13/2002	5,200	640	1,400	1.4J	2.8	2U	7.3	-	0.10U	15	2.0U	-	180	16	8,400	0.093	0.37	66
	MW-3	4/2/2002	3,100	1,000	1,700	2.2	4	2U	3.3J	-	-	-	-	-	-	-	-	-	-	-
	MW-3	4/17/2002	1,200	1,300	1,600	1.2J	3.4	2U	6.1	-	3	7.9J	1.6J	-	240	37	17,000	0.025	0.087	54
	MW-3	5/15/2002	31	23	2,600	3.5	6.7	2U	96	-	0.10U	3.9	1.6J	-	260	42	19,000	0.052	0.24	560
	MW-3	6/27/2002	200U	200UJ	1,800	200UJ	100UJ	200UJ*	270	-	14	4.4J	2.0U	-	490J*	140	37,000J	0.021	0.082	3,900
	MW-3	7/31/2002	-	-	-	-	-	-	31	-	-	-	-	-	-	-	-	-	-	-
	MW-3	8/26/2002	990	640	580	2.1	4.4	2U	30	320	-	-	-	-	270	-	-	0.053	0.16	14,000
	MW-3	10/28/2002	1,900	820	1,700	3.9	4.2	2U	6.3	190	0.10U	10	2.0U	-	330	39	9,700	0.3	0.23	6,300
	MW-3	2/3/2003	3	2U	2,900	2U	7.1	2U	180	580	-	1.0U		-	330	120	-	0.005U	0.26	28,000
	MW-3	7/16/2003	2.4	2U	2,700	2U	7.5	2.5	17	450	-	4.0UB	2.0U	-	520	170	-	0.005U	0.1	23,000
	MW-3	9/24/2003	670	1,100	1,900	2.4	6.9	2U	5.9	-	-	-	-	-	460	89	7,900	0.005U	0.012	22,000
	MW-3	1/9/2004	9.7	64	2,000	2U	5.6	2U	130	500J	-	1.0U	2.0U	-	530	200J	15,000	0.005U	0.005U	45,000
	MW-3	3/11/2004	680	620	4,700	2U	7.6	2U	6.1	200	-	4.4	2U	-	420	11	8,400	0.005U	0.005U	27,000
	MW-3	6/2/2004	2U	2U	1,800	2U	4.5	2U	290	810	-	0.98JM	2U	-	670MSA	150	23,000	0.005U	0.014	31,000
	MW-3	9/21/2004	210	250	1,900	2U	5.2	3.5	17	310	1J*	4.3J*	2UM	-	660	200J*	7,200	0.086	0.005U	28,000
	MW-3	12/13/2004	2U	2U	750	2U	1U	610	8	210	1.1	1.4M	2U	-	510	160	5,400	0.092	3.5	17,000
	MW-3	3/28/2005	23J	16J	1,000	50U	50U	280	21	405	0.2U	1U	7.5J*	-	670	150M	7,300	0.005U	5.1	25,000
	MW-3	8/10/2005	440	80	120	2U	5.1	760	43	338	0.05U	2U	8	-	680	180	4,400	0.061J*	13	22,000
	MW-3	9/27/2005	1,100	240	180	1.8	9.1	360	5.6	96.8	0.05U	9.9J	3.4	-	480	71J	2,500	0.020J	40	22,000
	MW-3	12/12/2005	37	67	52	20U	10U	480	18	180	0.083J*	2U	5.6	-	566	100	-	0.055	100	26,000
	MW-3	3/20/2006	620	350	120	3.1	3.9	220	13	110	0.2U	6.31	1U	-	440	85	3,600	0.025U	130	25,000
	MW-3	6/22/2006	2U	2U	4	7.6	1U	6.1	4J	98	0.2U	1U	1U	-	520	87	3,300	0.023J	180	20,000
	MW-3	9/20/2006	360	420	130	12	5.6	200	9.6	70	0.2U	7.88	1.4	-	580	70	3,300	0.015J	95	17,000
	MW-3	12/12/2006	2U	3.1	3.1	16	1U	7.1	7.8	-	-	1U	1U	-	490	92	3,700	0.032	170	24,000
	MW-3	3/27/2007	2U	31	19	12	1U	27	5.2	-	-	3.18	1U	-	560	110	3,300J*	0.025U	130	18,000
	MW-3	6/11/2007	2U	5	5.4	15	1U	8	67	-	-	12.1	2.2	-	570	190	5,000	0.038	150	32,000
	MW-3	9/11/2007	610	470	100	6.4	2.6	97	-	150	0.2U	400	1U	-	530	100	3,600	-	-	-
	MW-3	10/12/2007	-	-	-	-	-	-	3.8J	-	-	-	-	-	-	-	-	0.025U	120	34,000
	MW-3	12/13/2007	250	180	59	8.8	2.4	78	4.1J	-	-	10	1U	-	420	91	4,400	0.016J	130	30,000
	MW-3	3/10/2008	2U	2U	2U	8.3	1U	2U	16	-	-	5U	2.4	-	530	140	3,300	18	35	29,000
	MW-3	10/6/2008	5U	5U	5U	11	5U	5U	10U	210	0.13U	7.0U	0.03UJ	-	482	112	3,720	1.3U	72	28,000
	MW-3	1/21/2009	1.4U	2.3U	1.6J	9.2	1.2U	1.9	10UJ	160	0.13U	7.0U	0.03U	0.15J	556	114J	3,350	3.2	58	40,000
	MW-3	5/7/2009	2.0U	59	48	17	2.0U	66	7.0J	360J	0.13U	22	0.03U	0.11J	519	115	3,630	1.3	70	47,000
	MW-3	10/19/2009	2U	35	25	9.4	2U	40	6.7J	490	0.13U	28	0.03UJ	0.36	551	120	5,330	1.2U	36	25,000
	MW-3	4/20/2010	0.5UJ	0.48J	0.47J	4.7J	0.5UJ	2.5J	9.0J	440	0.13U	3.4J	0.03U	0.63	526	136J	3,200	10	19	47,000
	MW-3	10/5/2010	0.5U	4.8	3.4	7.5	0.5U	20	10U	750	0.13U	4.5J	0.03U	0.50J	444	76	3,560	1.2U	69	32,000
	MW-3	6/8/2011	0.5U	0.66	0.93	4.4	0.5U	17	12	690	0.13U	1.7J	0.03U	-	374	53.6	2,570	4.5	18	100,000
	MW-3	10/3/2011	0.5U	0.5U	0.52	1.7	0.5U	1.0	10	730	0.13U	0.74J	0.03U	-	385	45.8	2,760	1.2U	1.5U	40,000
	MW-3	5/8/2012	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	7.5J	600	0.13U	0.82J	0.03U	-	276	27	3,140	51	110	66,000
	MW-3	10/10/2012	0.5U	0.5U	0.5U	0.54	0.5U	1.2	5.6J	520	0.13U	1.4J	0.03U	-	267	25.7	4,810	61	100	36,000
	MW-3	5/21/2013	0.5U	0.5U	0.30J	0.39J	0.5U	0.75	4.3J	530J	0.13UJ	0.64J	0.03UJ	-	281	24.7	6,460	1.2U	1.5U	10,000
	MW-3	10/16/2013	0.5U	0.21J	0.36J	0.32J	0.5U	0.94	5.2J	510	0.13U	1.9J	0.03U	-	298	26.6	7,970	12	11	38,000
	MW-3	6/11/2014	0.5U	0.5U	0.5U	0.37J	0.5U	0.83	8.3J	330J	0.13U	1.2U	0.03U	-	354	34.3J	11,100	2.9J	1.6UJ	5,100J
	MW-3	10/29/2014	0.5U	0.27J	0.68	0.38J	0.5U	0.53	5.2J	370	0.13U	2.4J	0.03U	-	334	30.1J	10,500J	3.8	1.5U	13,000

APPENDIX I
Groundwater Analytical Results
Area of Contamination 50
2001-2014

Area of Concern	Well ID	Date	Laboratory Parameters																	
			PCE	TCE	*cis*-1,2-DCE	*trans*-1,2-DCE	1,1-DCE	VC	TOC[1]	Alkalinity	Nitrate	Sulfate	Sulfide	Phosphate	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)		
Area 5	MW-7	2/14/2002	5,900	4.5	2U	2U	1U	2U	-	-	-	20	0.6J	-	5U	1U	170J	0.12	0.08	8.4
	MW-7	3/14/2002	5,700	4.2	2U	2U	1U	2U	2.0J	-	4.1	22J	2.0U	-	5U	1U	1,000U	0.094	0.18	5.9J
	MW-7	4/17/2002	4,200	2.9	2U	2U	1U	2U	5U	-	4.2	18J	1.6J	-	2.3J	1U	1,000U	0.072	0.2	6
	MW-7	5/16/2002	5,700	4.3	2U	2U	1U	2U	5U	-	4.3	18J	2.0UJ	-	5U	1U	1,000U	0.097	0.2	9
	MW-7	6/27/2002	5,300	3.8J*	2UH	2UH	10H	2UH	5U	-	4.2	19J	2.0U	-	5U	1U	170UJ	-	-	-
	MW-7	8/27/2002	4,700	3.5	2U	2U	1U	2U	5U	29	-	-	-	-	5U	-	-	-	-	-
	MW-7	10/30/2002	5,400	2.7	2U	2U	1U	2U	5U	23	4.9	16	2.0U	-	5U	1U	200J	0.047	0.18	20
Area 5	MW-7	12/14/2002	-	-	-	-	-	-	5U	-	-	-	-	-	-	-	-	-	-	-
	MW-7	1/30/2003	4,700	3.1	2U	2U	1U	2U	5U	19	-	16	-	-	5U	1U	-	0.044	0.075	23
	MW-7	9/24/2003	4,200	3.3	2U	2U	1U	2U	5U	-	-	-	-	-	5U	1U	140	0.015	0.027	58
	MW-7	1/8/2004	4,300	2.8	2U	2U	1U	2U	5U	27	-	14J	2.0U	-	5U	1U	130	0.011	0.026	25
	MW-7	3/12/2004	3,100	2.7	2U	2U	1U	2U	1U	24	-	15M	2U	-	5U	1U	120	0.02	0.28	6.3
	MW-7	6/3/2004	2,900	2.6	2U	2U	1U	2U	1.5J	24	-	15M	2U	-	5U	1U	110	0.012	0.034	34
	MW-7	9/21/2004	2,900	3.4	3.1	2U	1U	2U	-	-	-	-	-	-	5U	1U	110	-	-	-
	MW-7	9/27/2005	1,600	3.7	5.8	2.5U	2.5U	2.5U	-	-	-	-	-	-	5U	0.2J	110	-	-	-
	MW-7	9/22/2006	4,400	9.8	7.7	2U	1U	2U	-	-	-	-	-	-	5U	0.10U	100	-	-	-
	MW-7	9/11/2007	1,200	11	22	2U	1U	2U	-	-	-	-	-	-	6U	0.1U	110	-	-	-
	MW-7	10/20/2008	600	40	150	20U	20U	20U	-	-	-	-	-	-	8U	0.2U	166	-	-	-
	MW-7	10/19/2009	97	33	270	10U	10U	10U	-	-	-	-	-	-	4.2J	1.7	2,170	-	-	-
	MW-7	10/6/2010	45	9.5	120	2.5U	2.5U	3.1	-	-	-	-	-	-	5.7	1.46	2,090	-	-	-
	MW-7	10/6/2011	1.6	3.7	20	0.5U	0.5U	6.8	-	-	-	-	-	-	52.9	5.44	5,070	-	-	-
	MW-7	10/12/2012	2.3	2.3	9.9	0.70	0.5U	11	-	-	-	-	-	-	140	20.5	9,900	-	-	-
	MW-7	10/17/2013	1.5	6.9	13	0.24J	0.5U	2.2	-	-	-	-	-	-	156	20.9	9,360	-	-	-
	MW-7	11/3/2014	1.7	8.4	13	0.27J	0.5U	1.5	-	-	-	-	-	-	205	29.9	15,300	-	-	-
Area 5	G6M-97-05B	10/3/2011	5.7	0.58	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-97-05B	10/12/2012	13	0.73	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.0194 J	25U	-	-	-
	G6M-97-05B	10/16/2013	26	0.70	0.63	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	0.1U	25U	-	-	-
	G6M-97-05B	10/28/2014	83	1.80	1.7	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.0293U	25UJ	-	-	-
Area 5	XSA-00-88X	7/1/2010	-	-	-	-	-	-	-	-	-	-	-	-	5U	-	-	-	-	-
	XSA-00-88X	10/3/2011	6.4	0.5U	0.87	0.5U	0.5U	0.5U	-	-	-	-	-	-	20U	22.2	274	-	-	-
Area 5	XSA-00-89X	7/1/2010	-	-	-	-	-	-	-	-	-	-	-	-	5U	-	-	-	-	-
	XSA-00-89X	10/3/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	20U	2.03	556	-	-	-
Area 5	XSA-00-90X	7/1/2010	-	-	-	-	-	-	-	-	-	-	-	-	5U	-	-	-	-	-
	XSA-00-90X	10/3/2011	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	20U	1.27	12.4J	-	-	-
Area 5	XSA-97-59X	7/1/2010	-	-	-	-	-	-	-	-	-	-	-	-	5U	-	-	-	-	-
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	-	-	-
	XSA-12-97X	10/16/2013	2.9	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	5U	2.25	29.3	-	-	-
	XSA-12-97X	10/30/2014	5.6	0.5U	0.5U	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.435	9.1J	-	-	-
Area 5	XSA-12-96X	10/10/2012	120	4.4	14	2.0U	2.0U	2.0U	-	-	-	-	-	-	5U	3.13	96.8	-	-	-
	XSA-12-96X	10/15/2013	100	11	17	2.5U	2.5U	3.7	-	-	-	-	-	-	3.7J	0.94	2,840	-	-	-
	XSA-12-96X	10/28/2014	84	14	22	2.3	0.36J	6	-	-	-	-	-	-	3.2J	0.925J	5,720J	-	-	-
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	-	-	-
	XSA-12-98X	10/16/2013	5.2	0.34J	0.47J	0.5U	0.5U	0.5U	-	-	-	-	-	-	3.1J	0.1U	6.6J	-	-	-
	XSA-12-98X	10/29/2014	5.5	0.37J	0.76	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.313	5.6J	-	-	-
Area 5	XSA-12-95X	10/12/2012	290	36	66	5.0U	5.0U	10	-	-	-	-	-	-	4.6J	9.53	11,800	-	-	-
	XSA-12-95X	10/15/2013	160	51	100	4.7J	5.0U	6.5	-	-	-	-	-	-	12.8	5.17	9,890	-	-	-
	XSA-12-95X	10/28/2014	110	39	94	5	0.47J	9	-	-	-	-	-	-	8.3	4.47J	9,310J	-	-	-
Area 5	G6M-13-04X	1/30/2014	41	51	68	2.7	0.90 J	150	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-13-04X	6/10/2014	25	31	29	2.7	0.66	130	2.5J	280J	0.13U	9.3 B	0.030U	-	360	49J	5,900	2.7J	12J	3,600J
	G6M-13-04X	10/29/2014	1.7	17	69	1.6	0.56	72	13	310	0.13U	3.5J	0.03U	-	321	5.45J	6,170J	4.7	41	32,000
Area 5	G6M-13-01X	1/30/2014	12	0.42 J	0.73	0.5U	0.5U	0.5U	-	-	-	-	-	-	-	-	-	-	-	-
	G6M-13-01X	10/28/2014	150	2.8	7.80	0.5U	0.5U	0.5U	-	-	-	-	-	-	2.5U	0.025U	26.8J	-	-	-
Area 5	IW-39	1/30/2014	180	4.4	15	4U	4U	4U	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

* Value qualified from reported laboratory data based on data validation results.

** Analyzed by AlphaLabs. Contract Laboratory is Mitkem Labs.

1 Total Organic Carbon

2 Monitoring well has a documented molasses content.

\- Analyte was not sampled.

J.3 Former

Moore Army

Airfield

Site Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens AOC 50	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Operation and Maintenance (SVE, ERD, IWS) Institutional Controls		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Sites are in good condition.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	Monitoring events are scheduled around Massachusetts State Police training.
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview

Name of Interviewer: Elizabeth Anderson

Name of Interviewee: N/A - previously conducted

Date:

Position:

Owner ☐

Manager ☐

Other: Please Specify ☒ _____

Location:

Site ☐

Office ☐

Phone: ☒

Telephone #

Item	Check One	Comments
Are there any extraction wells at the property?	Yes ☐ No ☒	No extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No ☒	No specific construction plans are known.
Are there any issues with site access for monitoring?	Yes ☐ No ☒	Site is used by Massachusetts State Police for roadway and driver training activities.

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____


3840


T-3824





J.4 Former

Moore Army

Airfield

ARARs

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal					
Chemical	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, Maximum Contaminant Levels [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53]	Relevant and Appropriate	The National Primary Drinking Water Regulations (NPDWR) establish maximum contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking-water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health-based goals that are always set equal to or lower than MCLs.	The MCLs for the chemicals of concern (COCs) will be met through active remediation of groundwater in selected areas of the plumes.
Chemical	Surface Water	Clean Water Act, Ambient Water Quality Criteria, 33 USC 1314, 40 CFR 131.36(b)(1), 63 Fed. Reg. 68359	To be considered	National recommended criteria for surface water quality establishes numerous criteria for constituents	Ambient water quality criteria were evaluated during the assessment of potential ecological risks and the development of preliminary remediation goals for AOC 50

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State					
Chemical	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected and set forth water-quality criteria necessary to maintain the designated uses. Groundwater at Devens RFTA is classified GW-1. Groundwaters assigned to this class are fresh groundwaters designated as a source of potable water supply.	314 CMR 6.00 will be met by achieving MMCLs for COCs. The MMCLs for COCs will be met through active remediation of groundwater plume. Groundwater monitoring will be performed to measure changes in COC. State groundwater quality standards that are more stringent that Federal MCLs will be used as remediation goals.
Chemical	Groundwater	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.00]	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list Massachusetts Maximum Contaminant Level (MMCLs), which apply to water delivered to any user of a public water-supply system as defined in 310 CMR 22.00.	Devens groundwater is classified GW-1 and is designated as a source of potable water supply. State MCLs that are more stringent than Federal MCLs will be used as remediation goals.
State					
Chemical	Surface water	Massachusetts Surface Water Quality Standards [314 CMR 4.00]	Relevant and Appropriate	The Massachusetts Surface Water Quality Standards list Massachusetts surface water standards, which apply to discharge to the waters of the Commonwealth from any source. These standards: designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected; prescribe the minimum water quality criteria required to sustain the designated uses; and contain regulations necessary to achieve the designated uses and maintain existing water quality.	Massachusetts Surface Water Quality Standards were considered during the assessment of acceptable risk levels and the development of preliminary remediation goals for AOC 50.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal					
Location	Groundwater	Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]	Applicable, if remedial actions are performed within floodplain	Requires federal agencies to evaluate potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/ construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Monitoring wells may be constructed in the floodplain. All construction in the floodplain will be conducted in a manner that minimizes harm and preserves and restores the natural and beneficial values of the floodplain. Appropriate federal agencies will be contacted and allowed to review the proposed work plan for the remedial action prior to implementation of the action.
Federal					
Location	Wetlands	Protection of Wetland Executive Order 11990 [40 CFR 6, Appendix A]	Applicable, if remedial actions are performed within wetlands	Requires federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance natural and beneficial values of wetlands. If remediation is required within the wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Monitoring wells may be constructed in the wetlands. Construction will be performed in a manner that minimizes adverse effects on wetlands, to the extent practicable.
Location	Wetlands	Clean Water Act, Dredge or Fill Requirements Section 404 [33 CRF Part 230; 40 CRF Part 230]	Applicable if remedial actions are performed in U.S. water or within a floodplain	Section 404 of the CWA regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials.	Any construction will be performed to minimize adverse effects on aquatic ecosystem.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal (cont.)					
Location	Surface water, Endangered species, Migratory species	Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302]	Applicable	Requires that the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service be consulted in the alteration of a body of water, such as if installation of monitoring wells in a wetland and/or discharge of pollutants into a wetland will occur as a result of off-site remedial activities. Requires consultation with state agencies to devise measures to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Construction will be performed in a manner that minimizes adverse effects on wildlife resources and habitat. Measures will be developed to prevent or mitigate project-related impacts to habitat and wildlife. The USFWS, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions.
State					
Location	Groundwater	Massachusetts Wetland Protection Act [310 CMR 10.00]	Relevant and Appropriate	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as area within the riverfront area or the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100-foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet or bordering vegetated wetlands. Loss may be permitted with replication of any lost area within two growing seasons.	Any proposed remedial actions within riverfront area (defined as the river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away), wetlands, or the 100-foot buffer will be developed and evaluated to minimize adverse effects on wetlands and to attain compliance with the substantive requirements of these regulations.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal					
Action	Groundwater Injection	Safe Drinking Water Act (SDWA) Regulations, Underground Injection Control Program (40 CFR Parts 144, 146, 147, and 1000)	Relevant and Appropriate	These regulations outline minimum program and performance standards for underground injection programs.	The regulation applies and would be complied with because the alternative includes injection into the aquifer.
Action	Investigation derived waste	USEPA OSWER Publication 9345.303FS, January 1992	To be considered	Management of IDW must ensure protection of human health and the environment.	IDW produced from remedial activities will be managed in compliance with this guidance.
Federal					
Action	Hazardous Waste	RCRA Regulations. Identification and Listing of Hazardous Waste (40 CFR Part 261)	Applicable	Defines listed and characteristic hazardous wastes subject to RCRA. These regulations would apply when determining whether or not waste on site is hazardous either by being listed or exhibiting a hazardous characteristic as described in the regulations.	Groundwater treatment residues will be evaluated against the criteria and definitions of hazardous waste. The criteria and definition of hazardous waste refers to those wastes subject to regulations as hazardous wastes under 40 CFR parts 124 and 264. IDW produced during remedial activities will be managed in accordance with these regulations.
Action	Hazardous Waste	Standards Applicable to Generators of Hazardous Waste (RCRA 40 CFR 262)	Applicable	These regulations establish standards for generators of hazardous waste. RCRA Subtitle C established standards applicable to treatment, storage, and disposal of hazardous waste and closure of hazardous waste facilities.	Treatment residues will be tested to determine whether they contain characteristic hazardous waste. If so, management of the hazardous waste would comply with substantive requirements of these regulations.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State					
Action	Hazardous Waste	Massachusetts Hazardous Waste Management Rules; 310 CMR 30.000	Relevant and Appropriate	This requirement sets standards for generators of hazardous waste that address (1) accumulating waste, (2) preparing hazardous waste for shipment, and (3) preparing the uniform hazardous waste manifest. Massachusetts specifies requirements for very small quantity generators, as well as small and large quantity generators.	If RCRA-characteristic hazardous wastes are generated, the material will be managed in accordance with these requirements.

Notes:
ARARs = Applicable, Relevant and Appropriate Regulations
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
COC= Chemical of Concern
CWA = Clean Water Act
IDW = Investigation derived waste
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level
NOI = Notice of Intent
NPDWR = National Primary Drinking Water Regulations
NSDWR = National Secondary Drinking Water Regulations
OSWER = Office of Solid Waste and Emergency Response
RCRA = Resource Conservation and Recovery Act
RFTA=Reserves Forces Training Area
SDWA = Safe Drinking Water Act
SMCL = Secondary Maximum Contaminant Level
USEPA = U.S. Environmental Protection Agency

J.5 Former Moore

Army Airfield

Statistical

Analysis

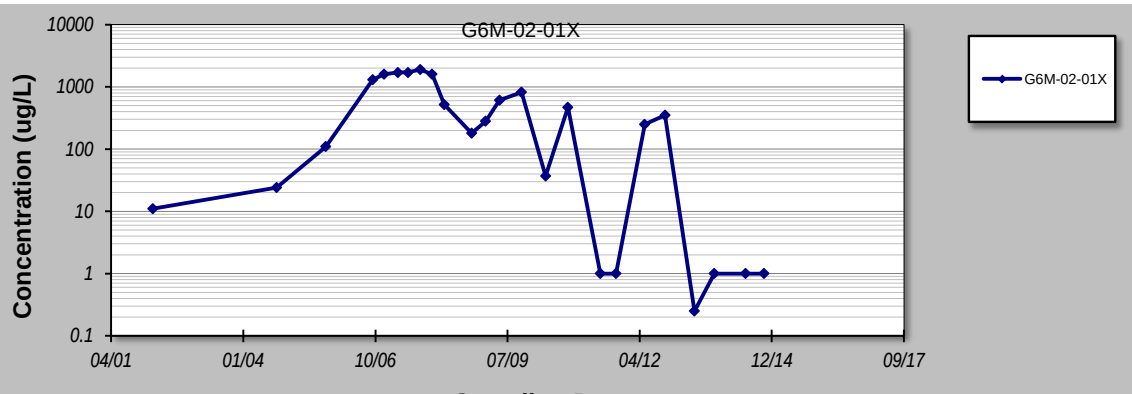
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-01X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	2/28/2002	11
2	9/23/2004	**24**
3	9/30/2005	110
4	9/20/2006	1,300
5	12/14/2006	1,600
6	3/30/2007	1,700
7	6/14/2007	1,700
8	9/14/2007	1,900
9	12/13/2007	1,600
10	3/14/2008	520
11	10/7/2008	180
12	1/21/2009	280
13	5/6/2009	610
14	10/20/2009	820
15	4/21/2010	**37**
16	10/6/2010	470
17	6/9/2011	**1**
18	10/5/2011	**1**
19	5/9/2012	250
20	10/10/2012	350
21	5/21/2013	**0.25**
22	10/17/2013	**1**
23	6/11/2014	**1**
24	10/30/2014	**1**
25		
Coefficient of Variation:		**1.20**
Mann-Kendall Statistic (S):		**-102**
Confidence Factor:		**99.4%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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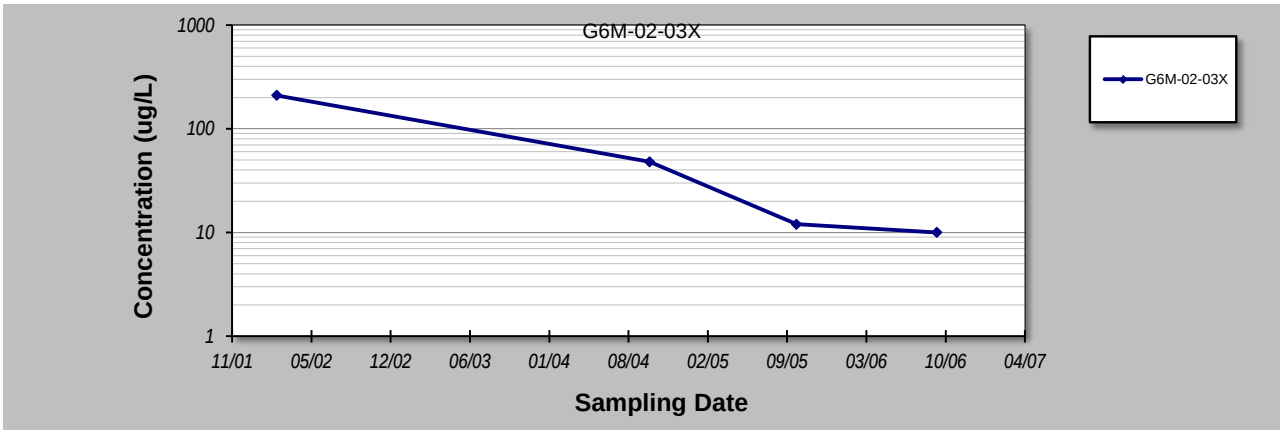
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-03X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	2/26/2002	210
2	9/23/2004	48
3	9/29/2005	12
4	9/18/2006	10
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.36**
Mann-Kendall Statistic (S):		**-6**
Confidence Factor:		**95.8%**
Concentration Trend:		Decreasing



Notes:

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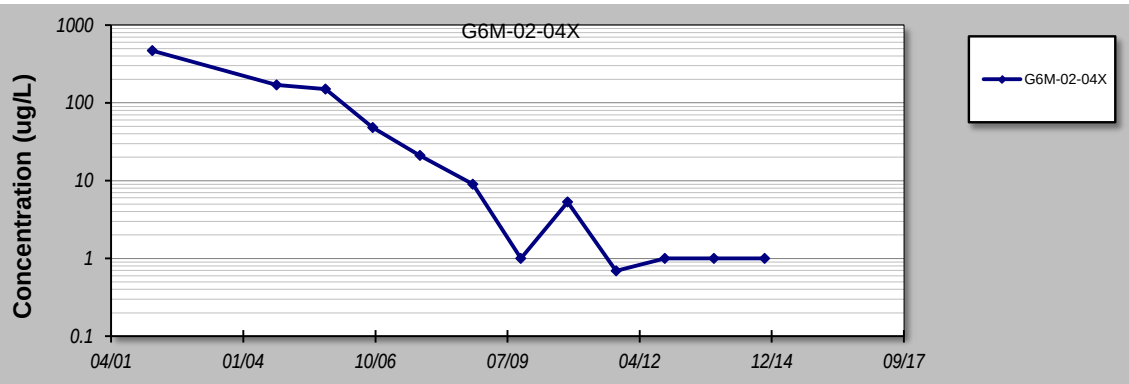
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-04X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	2/26/2002	470
2	9/23/2004	**170**
3	9/28/2005	150
4	9/20/2006	48
5	9/13/2007	21
6	10/16/2008	9.0
7	10/15/2009	**1**
8	10/4/2010	5.3
9	6/9/2011	-
10	10/6/2011	0.69
11	5/9/2012	-
12	10/9/2012	**1**
13	5/21/2013	-
14	10/16/2013	**1**
15	6/11/2014	-
16	11/3/2014	**1**
17		
18		
19		
20		
Coefficient of Variation:		**1.89**
Mann-Kendall Statistic (S):		**-52**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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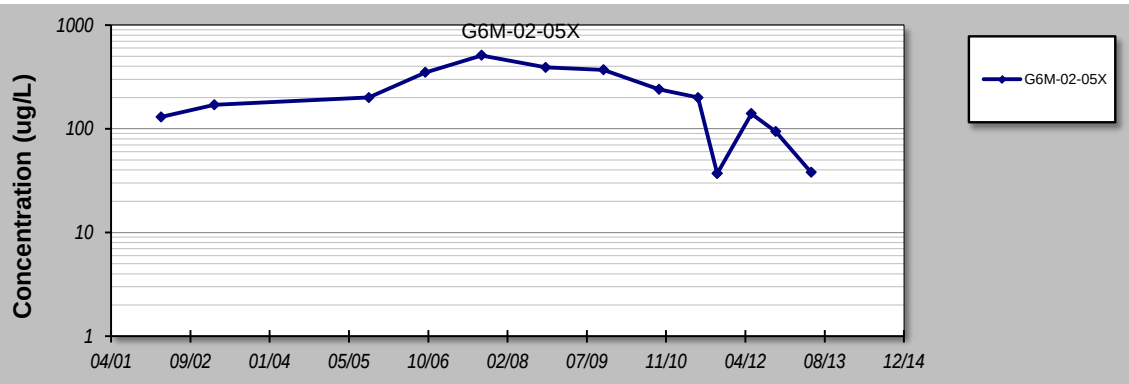
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-05X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	2/28/2002	130
2	1/30/2003	170
3	9/30/2005	200
4	9/22/2006	350
5	9/12/2007	510
6	10/20/2008	390
7	10/19/2009	370
8	10/5/2010	240
9	6/8/2011	200
10	10/6/2011	37
11	10/6/2011	37
12	5/9/2012	140
13	10/10/2012	94
14	5/21/2013	**38**
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.71**
Mann-Kendall Statistic (S):		**-29**
Confidence Factor:		**93.7%**
Concentration Trend:		Prob. Decreasing



Notes:

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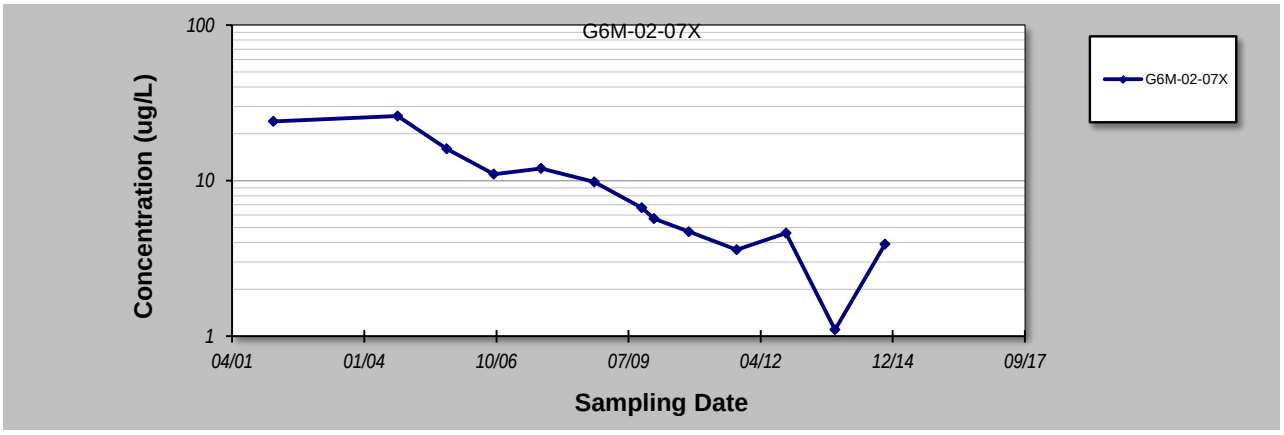
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-07X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	2/26/2002	24
2	9/23/2004	**26**
3	9/30/2005	16
4	9/21/2006	11
5	9/13/2007	12
6	10/20/2008	**9.8**
7	10/15/2009	**6.7**
8	1/15/2010	5.7
9	10/5/2010	4.7
10	10/3/2011	3.6
11	10/11/2012	4.6
12	10/15/2013	1.1
13	10/29/2014	3.9
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.79**
Mann-Kendall Statistic (S):		**-68**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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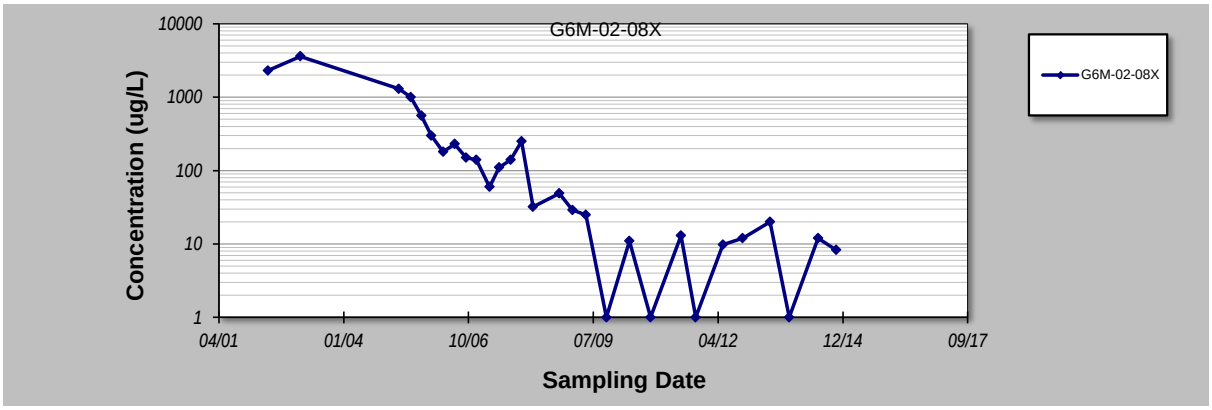
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 10-Jun-15
Facility Name: Devens AOC 50
Conducted By:

Job ID:
Constituent: PCE
Concentration Units: ug/L

Sampling Point ID: G6M-02-08X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	5/17/2002	2,300
2	1/31/2003	3,600
3	3/31/2005	1,300
4	7/5/2005	1,000
5	9/27/2005	560
6	12/16/2005	300
7	3/21/2006	180
8	6/21/2006	230
9	9/20/2006	150
10	12/12/2006	140
11	3/28/2007	60
12	6/13/2007	110
13	9/13/2007	140
14	12/10/2007	250
15	3/10/2008	32
16	10/6/2008	49
17	1/21/2009	29
18	5/7/2009	25
19	10/20/2009	1
20	4/21/2010	11
21	10/7/2010	1
22	6/9/2011	13
23	10/4/2011	1
24	5/10/2012	9.8
25	10/15/2012	12
26	5/23/2013	20
27	10/22/2013	1
28	6/12/2014	12
29	11/3/2014	8.3
30		
Coefficient of Variation:		2.19
Mann-Kendall Statistic (S):		-314
Confidence Factor:		>99.9%
Concentration Trend:		Decreasing



Notes:

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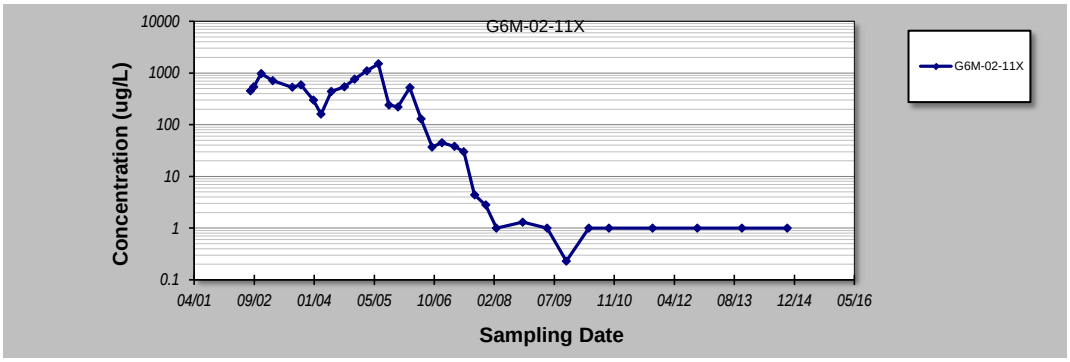
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-11X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	8/1/2002	450
2	8/28/2002	**540**
3	10/29/2002	970
4	2/3/2003	710
5	7/16/2003	530
6	9/26/2003	590
7	1/8/2004	300
8	3/10/2004	160
9	6/4/2004	440
10	9/22/2004	540
11	12/15/2004	760
12	3/28/2005	1,100
13	7/1/2005	1,500
14	9/27/2005	240
15	12/12/2005	220
16	3/21/2006	520
17	6/22/2006	130
18	9/22/2006	37
19	12/13/2006	45
20	3/27/2007	38
21	6/13/2007	30
22	9/11/2007	4.4
23	12/13/2007	**2.8**
24	3/11/2008	**1**
25	10/16/2008	1.3
26	5/7/2009	**1**
27	10/14/2009	**0.23**
28	4/20/2010	**1**
29	10/5/2010	**1**
30	6/9/2011	-
31	10/3/2011	**1**
32	5/8/2012	-
33	10/10/2012	**1**
34	5/21/2013	-
35	10/16/2013	**1**
36	6/11/2014	-
37	10/29/2014	**1**
38		
39		
40		
Coefficient of Variation:		**1.28**
Mann-Kendall Statistic (S):		**-369**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



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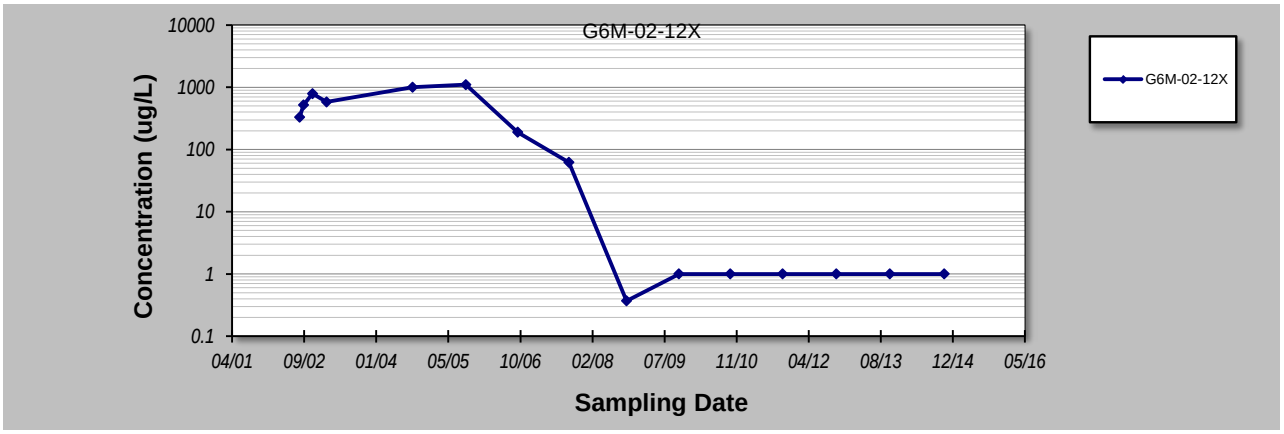
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-12X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	8/1/2002	330
2	8/28/2002	520
3	10/29/2002	790
4	2/3/2003	580
5	7/14/2003	-
6	9/22/2004	1,000
7	9/27/2005	1,100
8	9/21/2006	190
9	9/12/2007	62
10	10/16/2008	**0.37**
11	10/14/2009	**1**
12	10/5/2010	**1**
13	10/4/2011	**1**
14	10/10/2012	**1**
15	10/16/2013	**1**
16	10/29/2014	**1**
17		
18		
19		
20		
Coefficient of Variation:		**1.30**
Mann-Kendall Statistic (S):		**-50**
Confidence Factor:		**99.3%**
Concentration Trend:		Decreasing



Notes:

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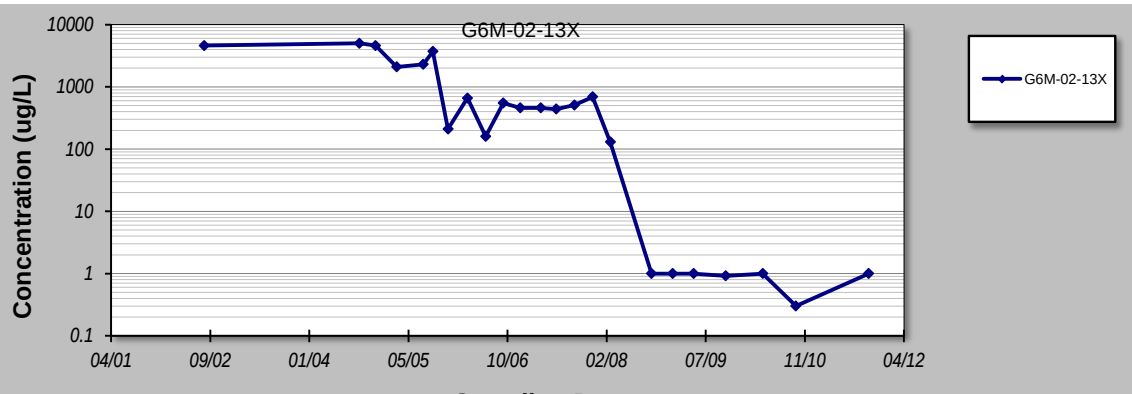
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-13X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	8/2/2002	4,600
2	9/23/2004	5,000
3	12/13/2004	4,600
4	3/30/2005	2,100
5	8/11/2005	2,300
6	9/29/2005	3,700
7	12/14/2005	210
8	3/22/2006	660
9	6/22/2006	160
10	9/18/2006	550
11	12/14/2006	460
12	3/27/2007	460
13	6/13/2007	440
14	9/13/2007	510
15	12/14/2007	690
16	3/12/2008	130
17	10/6/2008	**1**
18	1/21/2009	**1**
19	5/6/2009	**1**
20	10/15/2009	0.92
21	4/20/2010	**1**
22	10/4/2010	0.3
23	6/9/2011	-
24	10/6/2011	**1**
25		
Coefficient of Variation:		**1.45**
Mann-Kendall Statistic (S):		**-183**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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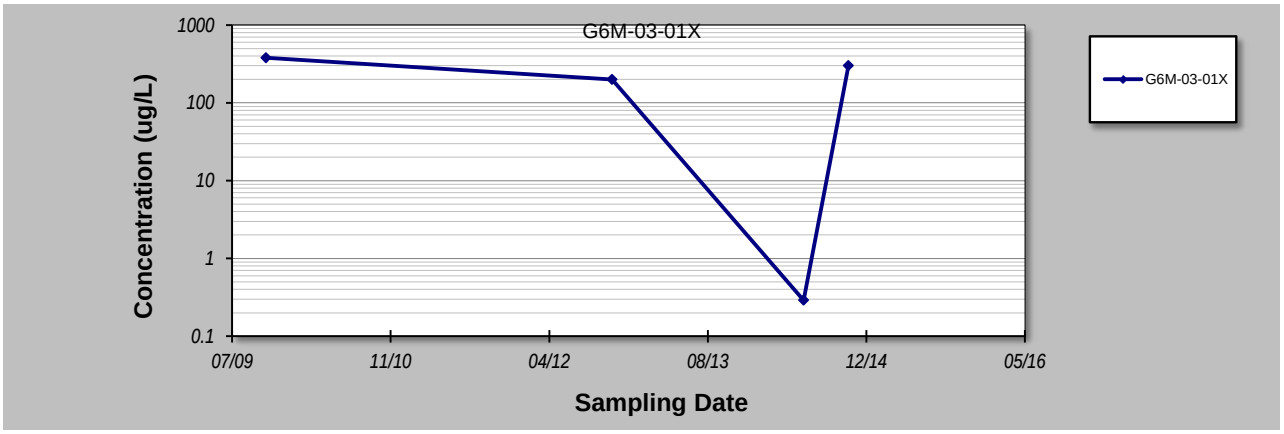
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-03-01X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/21/2009	380
2	10/16/2012	200
3	6/12/2014	**0.29**
4	10/31/2014	300
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.75**
Mann-Kendall Statistic (S):		**-2**
Confidence Factor:		**62.5%**
Concentration Trend:		Stable



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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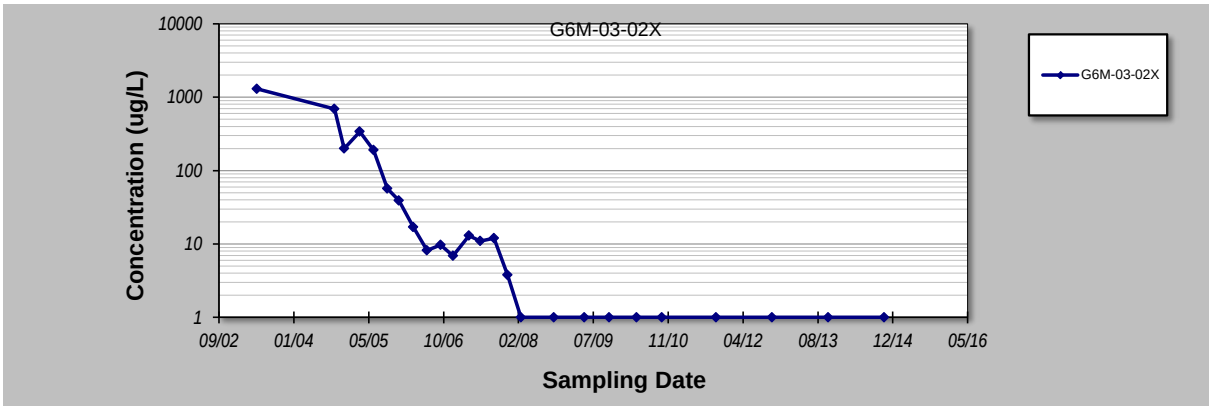
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-03-02X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	5/12/2003	1,300
2	10/11/2004	690
3	12/15/2004	200
4	3/29/2005	340
5	6/29/2005	190
6	9/29/2005	57
7	12/15/2005	39
8	3/21/2006	17
9	6/21/2006	8.2
10	9/20/2006	9.7
11	12/12/2006	6.9
12	3/28/2007	13
13	6/12/2007	11
14	9/12/2007	12
15	12/10/2007	3.8
16	3/10/2008	**1**
17	10/15/2008	**1**
18	5/7/2009	**1**
19	10/19/2009	**1**
20	4/21/2010	**1**
21	10/6/2010	**1**
22	10/4/2011	**1**
23	10/11/2012	**1**
24	10/22/2013	**1**
25	10/30/2014	**1**
26		
27		
28		
29		
30		
Coefficient of Variation:		**2.50**
Mann-Kendall Statistic (S):		**-231**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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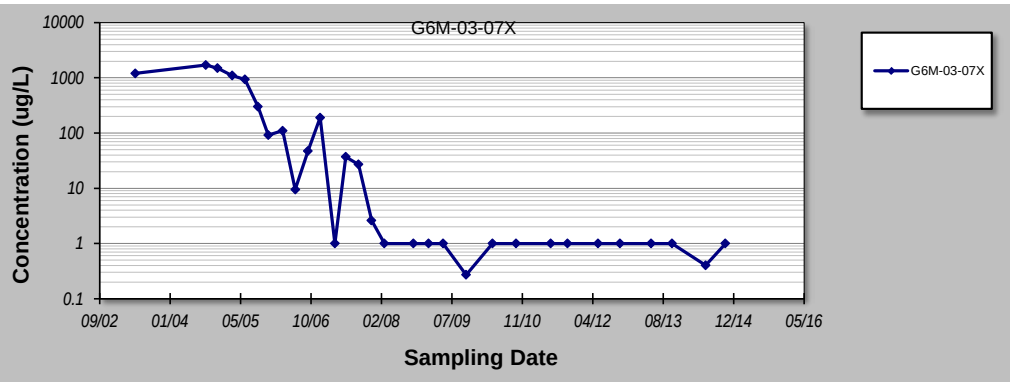
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-03-07X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	5/12/2003	1,200
2	9/24/2004	1,700
3	12/16/2004	1,500
4	3/30/2005	1,100
5	6/29/2005	940
6	9/29/2005	300
7	12/12/2005	92
8	3/24/2006	110
9	6/21/2006	9.5
10	9/19/2006	47
11	12/14/2006	190
12	3/29/2007	**1**
13	6/14/2007	37
14	9/13/2007	27
15	12/14/2007	2.6
16	3/14/2008	**1**
17	10/7/2008	**1**
18	1/22/2009	**1**
19	5/6/2009	**1**
20	10/15/2009	**0.27**
21	4/21/2010	**1**
22	10/5/2010	**1**
23	6/8/2011	**1**
24	10/5/2011	**1**
25	5/9/2012	**1**
26	10/11/2012	**1**
27	5/21/2013	**1**
28	10/16/2013	**1**
29	6/11/2014	**0.40**
30	10/30/2014	**1**
31		
32		
33		
34		
35		
Coefficient of Variation:		2.04
Mann-Kendall Statistic (S):		-296
Confidence Factor:		>99.9%
Concentration Trend:		Decreasing



Notes:

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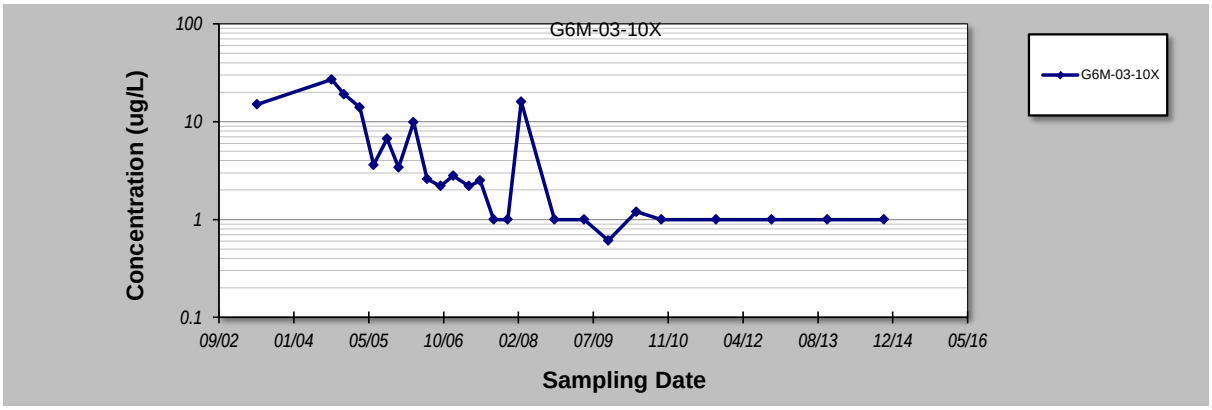
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-03-10X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	5/14/2003	15
2	9/22/2004	27
3	12/14/2004	19
4	3/29/2005	14
5	6/30/2005	3.6
6	9/28/2005	6.7
7	12/13/2005	3.4
8	3/23/2006	9.9
9	6/22/2006	2.6
10	9/20/2006	2.2
11	12/13/2006	2.8
12	3/29/2007	2.2
13	6/11/2007	2.5
14	9/10/2007	**1**
15	12/12/2007	**1**
16	3/11/2008	16
17	10/20/2008	1.0
18	5/6/2009	1
19	10/14/2009	0.6
20	4/20/2010	1.2
21	10/4/2010	**1**
22	6/9/2011	-
23	10/3/2011	**1**
24	5/8/2012	-
25	10/9/2012	**1**
26	5/22/2013	-
27	10/15/2013	**1**
28	6/12/2014	-
29	10/29/2014	**1**
30		
Coefficient of Variation:		**1.29**
Mann-Kendall Statistic (S):		**-197**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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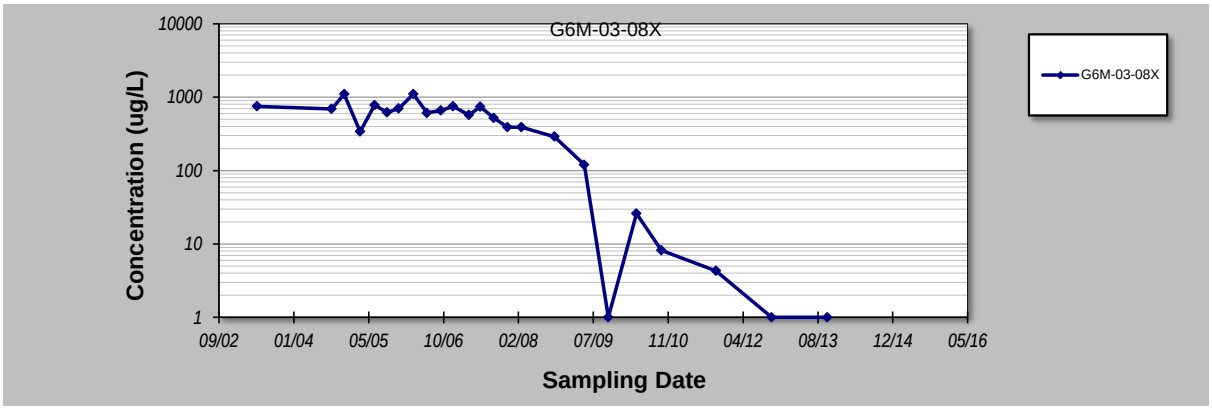
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-03-08X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	5/14/2003	750
2	9/22/2004	690
3	12/16/2004	1,100
4	3/31/2005	340
5	7/6/2005	780
6	9/28/2005	620
7	12/14/2005	700
8	3/22/2006	1,100
9	6/21/2006	610
10	9/21/2006	660
11	12/12/2006	750
12	3/29/2007	570
13	6/12/2007	740
14	9/10/2007	520
15	12/11/2007	390
16	3/13/2008	390
17	10/20/2008	290
18	5/6/2009	120
19	10/14/2009	**1**
20	4/20/2010	**26**
21	10/4/2010	8.2
22	6/8/2011	-
23	10/3/2011	4.3
24	5/8/2012	-
25	10/9/2012	1
26	5/22/2013	-
27	10/15/2013	**1**
28	6/12/2014	-
29		
30		
Coefficient of Variation:		**0.75**
Mann-Kendall Statistic (S):		**-192**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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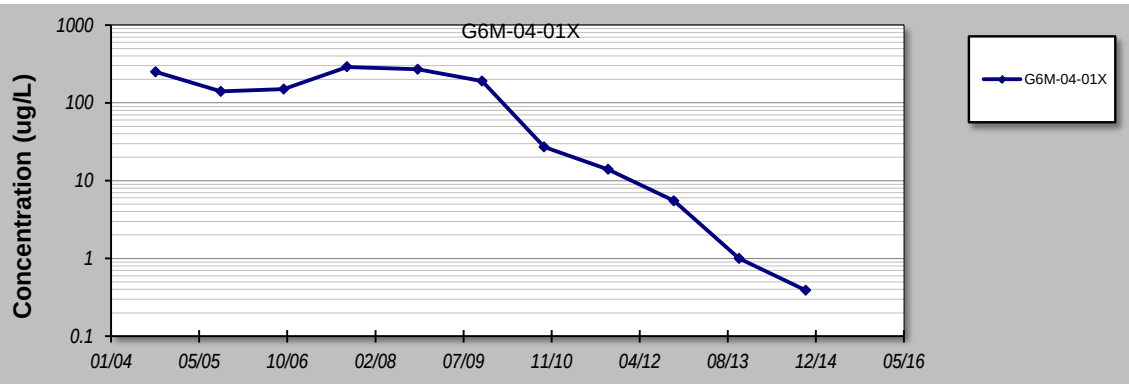
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-01X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/23/2004	**250**
2	9/28/2005	140
3	9/20/2006	150
4	9/14/2007	290
5	10/20/2008	**270**
6	10/20/2009	190
7	10/7/2010	27
8	10/5/2011	14
9	10/12/2012	5.5
10	10/17/2013	**1**
11	10/31/2014	**0.39**
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.96**
Mann-Kendall Statistic (S):		**-37**
Confidence Factor:		**99.8%**
Concentration Trend:		Decreasing



Notes:

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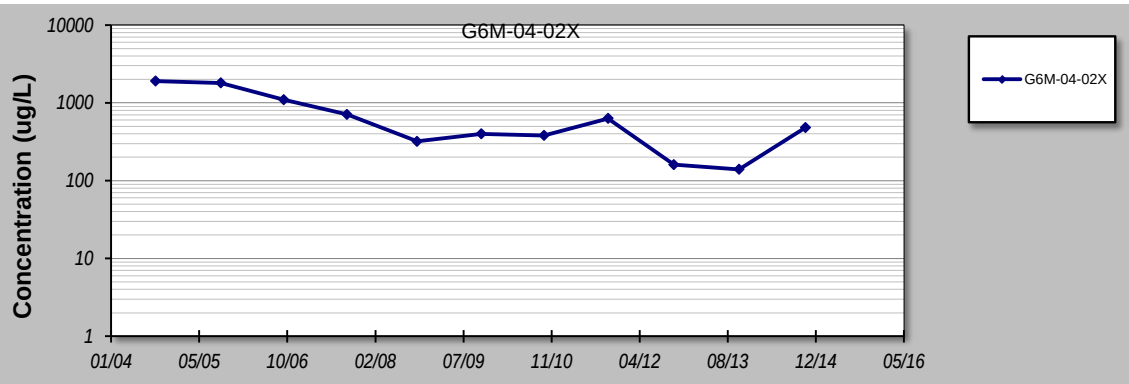
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-02X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/23/2004	1,900
2	9/28/2005	1,800
3	9/20/2006	1,100
4	9/14/2007	710
5	10/16/2008	320
6	10/15/2009	400
7	10/6/2010	380
8	6/8/2011	-
9	10/5/2011	630
10	5/8/2012	-
11	10/12/2012	160
12	5/21/2013	-
13	10/17/2013	140
14	6/11/2014	-
15	10/30/2014	480
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.85**
Mann-Kendall Statistic (S):		**-35**
Confidence Factor:		**99.7%**
Concentration Trend:		Decreasing



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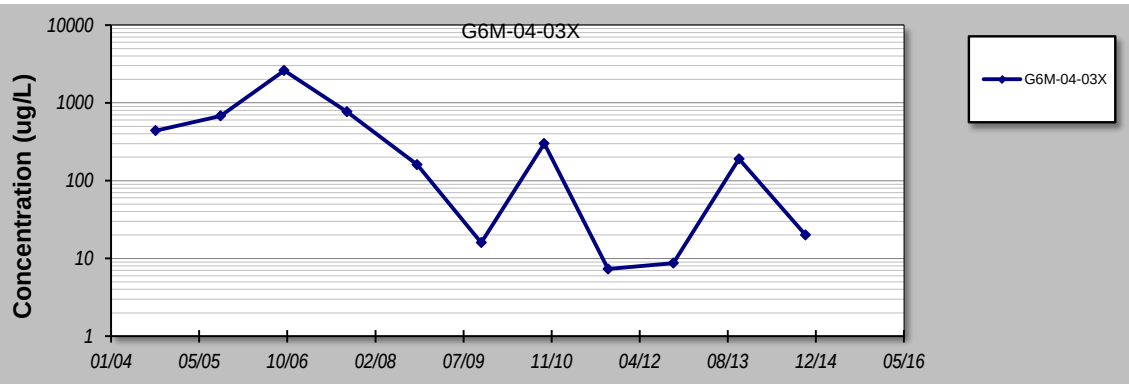
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-03X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/23/2004	440
2	9/27/2005	680
3	9/22/2006	2,600
4	9/14/2007	770
5	10/16/2008	160
6	10/15/2009	16
7	10/7/2010	300
8	10/5/2011	7.3
9	10/10/2012	8.7
10	10/17/2013	190
11	10/30/2014	20
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.60**
Mann-Kendall Statistic (S):		**-25**
Confidence Factor:		**97.0%**
Concentration Trend:		Decreasing



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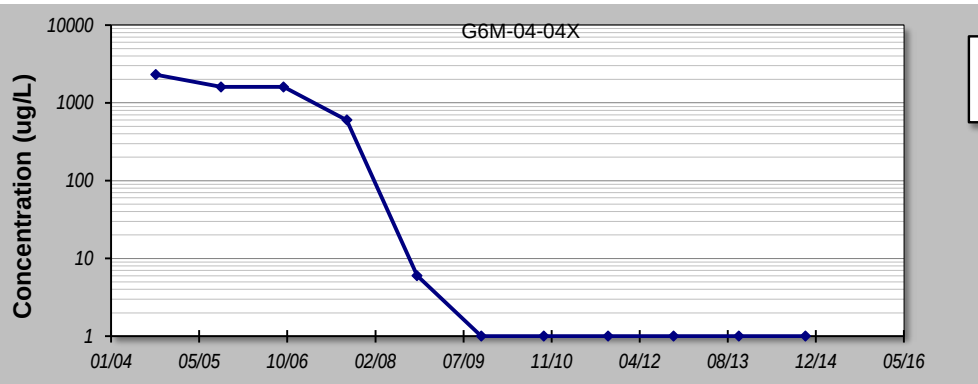
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-04X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/24/2004	2,300
2	9/29/2005	1,600
3	9/19/2006	1,600
4	9/13/2007	600
5	10/16/2008	6.0
6	10/15/2009	1.0
7	10/5/2010	**1**
8	10/5/2011	**1**
9	10/11/2012	**1**
10	10/16/2013	**1**
11	10/30/2014	**1**
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.55**
Mann-Kendall Statistic (S):		**-39**
Confidence Factor:		**99.9%**
Concentration Trend:		Decreasing



Notes:

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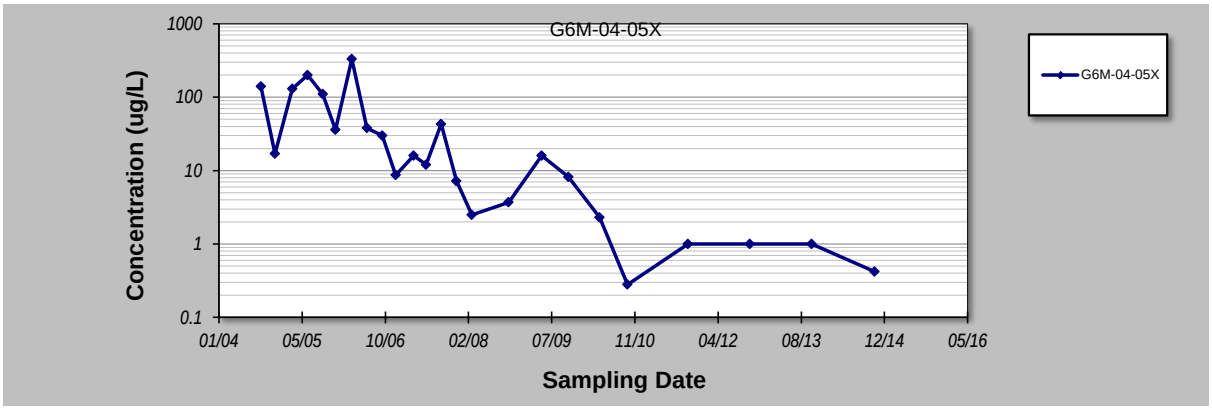
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 10-Jun-15
Facility Name: Devens AOC 50
Conducted By:

Job ID:
Constituent: PCE
Concentration Units: ug/L

Sampling Point ID: G6M-04-05X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/22/2004	140
2	12/15/2004	17
3	3/30/2005	130
4	6/30/2005	200
5	9/29/2005	110
6	12/14/2005	36
7	3/22/2006	330
8	6/22/2006	38
9	9/22/2006	30
10	12/12/2006	8.7
11	3/29/2007	16
12	6/12/2007	12
13	9/10/2007	43
14	12/11/2007	7.2
15	3/13/2008	2.5
16	10/20/2008	3.7
17	5/6/2009	16
18	10/14/2009	8.2
19	4/20/2010	**2.3**
20	10/4/2010	**0.28**
21	6/8/2011	-
22	10/3/2011	**1**
23	5/8/2012	-
24	10/9/2012	**1**
25	5/22/2013	-
26	10/15/2013	**1**
27	6/12/2014	-
28	10/28/2014	**0.42**
29		
30		
Coefficient of Variation:		**1.67**
Mann-Kendall Statistic (S):		**-198**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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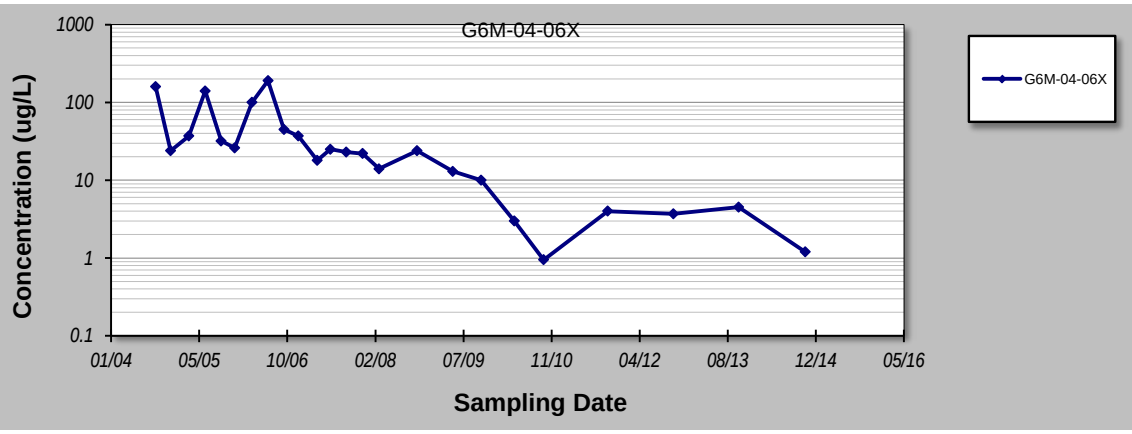
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-06X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/22/2004	160
2	12/16/2004	24
3	3/30/2005	37
4	7/1/2005	140
5	9/29/2005	32
6	12/15/2005	26
7	3/23/2006	100
8	6/23/2006	190
9	9/21/2006	45
10	12/11/2006	37
11	3/29/2007	18
12	6/12/2007	25
13	9/10/2007	23
14	12/12/2007	22
15	3/14/2008	14
16	10/16/2008	24
17	5/6/2009	13
18	10/14/2009	10
19	4/20/2010	**3**
20	10/4/2010	0.95
21	10/3/2011	4.0
22	10/9/2012	3.7
23	10/15/2013	4.5
24	10/28/2014	1.2
25		
Coefficient of Variation:		**1.31**
Mann-Kendall Statistic (S):		**-194**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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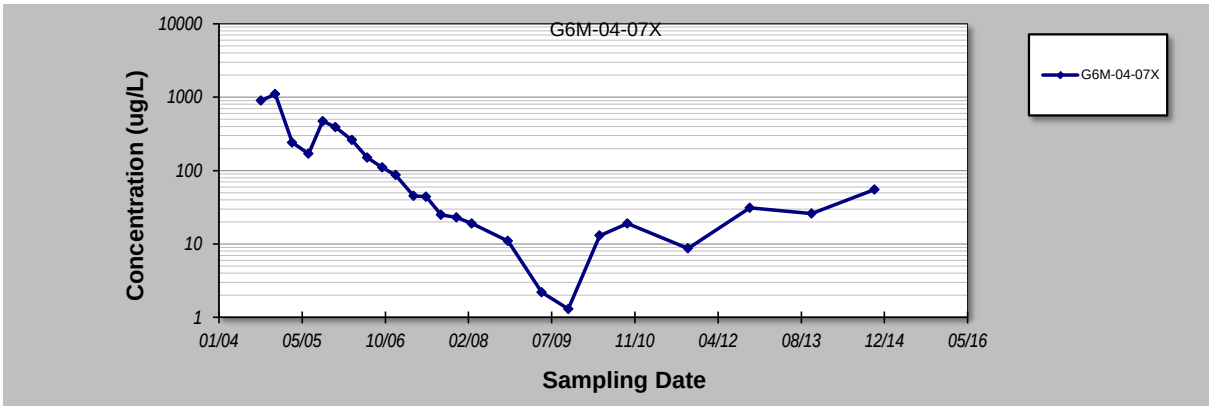
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 10-Jun-15
Facility Name: Devens AOC 50
Conducted By:

Job ID:
Constituent: PCE
Concentration Units: ug/L

Sampling Point ID: G6M-04-07X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/22/2004	900
2	12/17/2004	1,100
3	3/29/2005	240
4	7/5/2005	170
5	9/29/2005	470
6	12/14/2005	390
7	3/23/2006	260
8	6/23/2006	150
9	9/21/2006	110
10	12/11/2006	87
11	3/29/2007	45
12	6/12/2007	44
13	9/10/2007	25
14	12/12/2007	23
15	3/13/2008	19
16	10/16/2008	11
17	5/6/2009	2.2
18	10/14/2009	1.3
19	4/20/2010	**13**
20	10/4/2010	19
21	6/8/2011	-
22	10/3/2011	8.7
23	5/8/2012	-
24	10/9/2012	**31**
25	5/22/2013	-
26	10/15/2013	26
27	6/10/2014	-
28	10/28/2014	55
29		
30		
Coefficient of Variation:		**1.63**
Mann-Kendall Statistic (S):		**-181**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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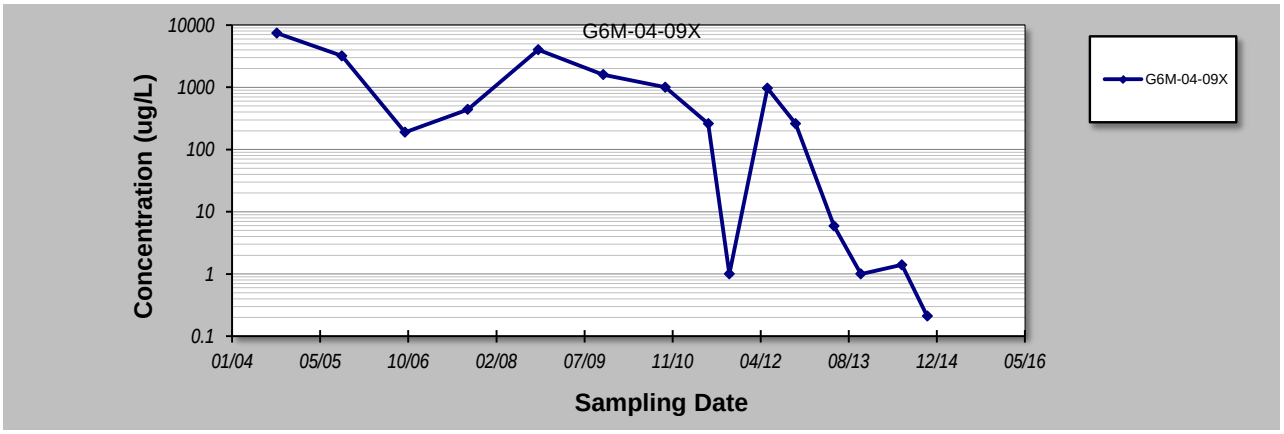
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-09X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/24/2004	7,400
2	9/28/2005	3,200
3	9/21/2006	190
4	9/12/2007	440
5	10/17/2008	4,000
6	10/21/2009	1,600
7	10/8/2010	1,000
8	6/9/2011	260
9	10/7/2011	**1**
10	5/9/2012	970
11	10/16/2012	260
12	5/22/2013	5.9
13	10/22/2013	**1**
14	6/12/2014	1.4
15	11/3/2014	**0.21**
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.62**
Mann-Kendall Statistic (S):		**-67**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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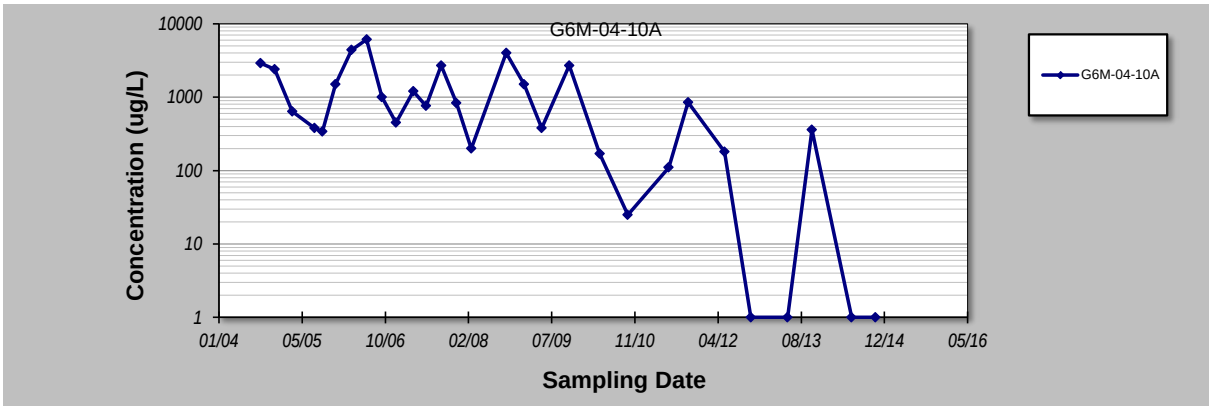
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 10-Jun-15
Facility Name: Devens AOC 50
Conducted By:

Job ID:
Constituent: PCE
Concentration Units: ug/L

Sampling Point ID: G6M-04-10A

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/20/2004	2,900
2	12/14/2004	2,400
3	3/30/2005	640
4	8/11/2005	380
5	9/27/2005	340
6	12/14/2005	1,500
7	3/21/2006	4,400
8	6/20/2006	6,100
9	9/19/2006	1,000
10	12/13/2006	450
11	3/28/2007	**1,200**
12	6/12/2007	760
13	9/11/2007	2,700
14	12/11/2007	830
15	3/10/2008	200
16	10/6/2008	4,000
17	1/21/2009	1,500
18	5/7/2009	380
19	10/20/2009	2,700
20	4/21/2010	170
21	10/6/2010	25
22	6/9/2011	110
23	10/4/2011	850
24	5/10/2012	180
25	10/15/2012	**1**
26	5/23/2013	**1**
27	10/17/2013	**360**
28	6/12/2014	**1**
29	11/3/2014	**1**
30		
Coefficient of Variation:		**1.24**
Mann-Kendall Statistic (S):		**-189**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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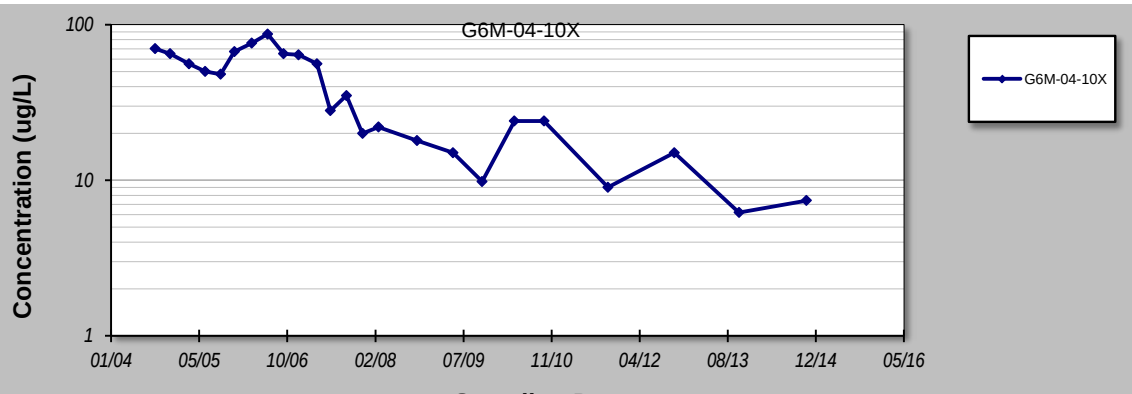
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-10X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/20/2004	70
2	12/14/2004	65
3	3/31/2005	56
4	7/1/2005	50
5	9/27/2005	48
6	12/14/2005	67
7	3/22/2006	76
8	6/20/2006	87
9	9/19/2006	65
10	12/13/2006	64
11	3/28/2007	56
12	6/12/2007	28
13	9/11/2007	35
14	12/11/2007	20
15	3/11/2008	22
16	10/15/2008	18
17	5/7/2009	15
18	10/20/2009	9.8
19	4/21/2010	24
20	10/6/2010	24
21	10/4/2011	9.0
22	10/15/2012	15.0
23	10/17/2013	6.2
24	11/3/2014	7.4
25		
Coefficient of Variation:		**0.65**
Mann-Kendall Statistic (S):		**-192**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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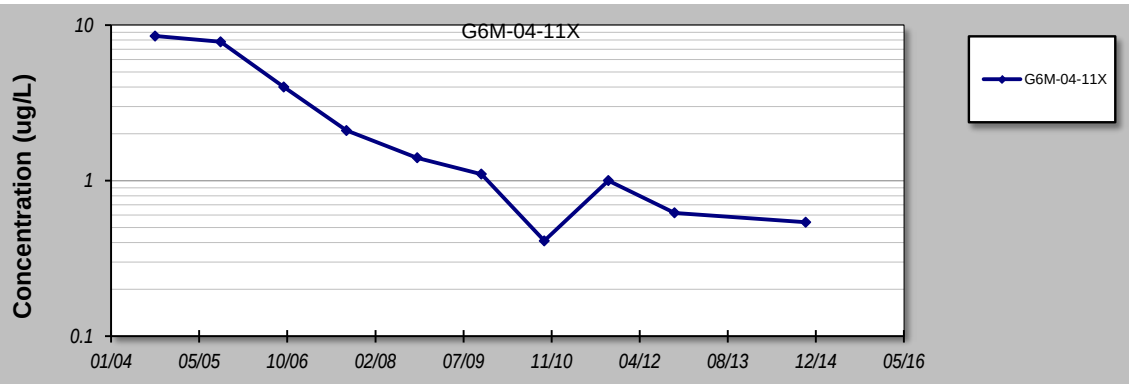
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-11X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/20/2004	8.5
2	9/26/2005	7.8
3	9/20/2006	4
4	9/11/2007	2.1
5	10/17/2008	1.4
6	10/16/2009	1.1
7	10/8/2010	**0.41**
8	10/6/2011	**1**
9	10/16/2012	0.62
10	10/31/2014	0.54
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.11**
Mann-Kendall Statistic (S):		**-39**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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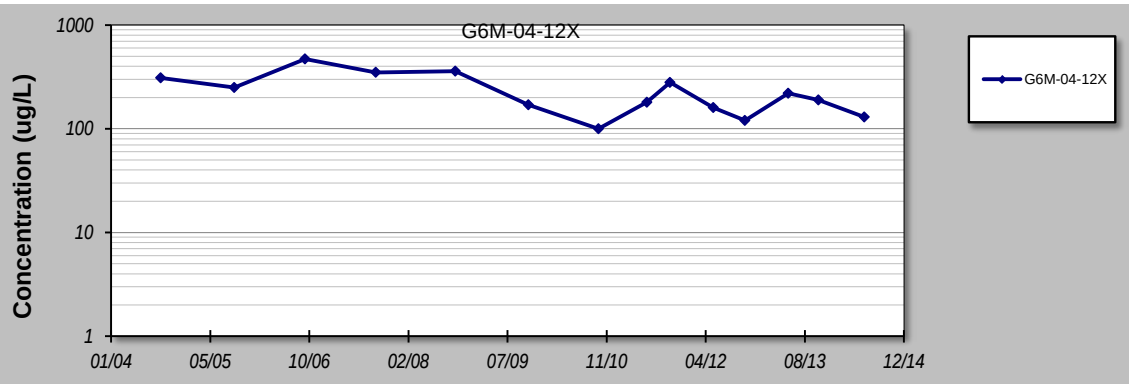
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-12X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/20/2004	310
2	9/26/2005	250
3	9/18/2006	470
4	9/10/2007	350
5	10/16/2008	360
6	10/19/2009	170
7	10/8/2010	100
8	6/9/2011	180
9	10/4/2011	280
10	5/9/2012	160
11	10/16/2012	120
12	5/22/2013	220
13	10/22/2013	190
14	6/10/2014	130
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.46**
Mann-Kendall Statistic (S):		**-37**
Confidence Factor:		**97.6%**
Concentration Trend:		Decreasing



Notes:

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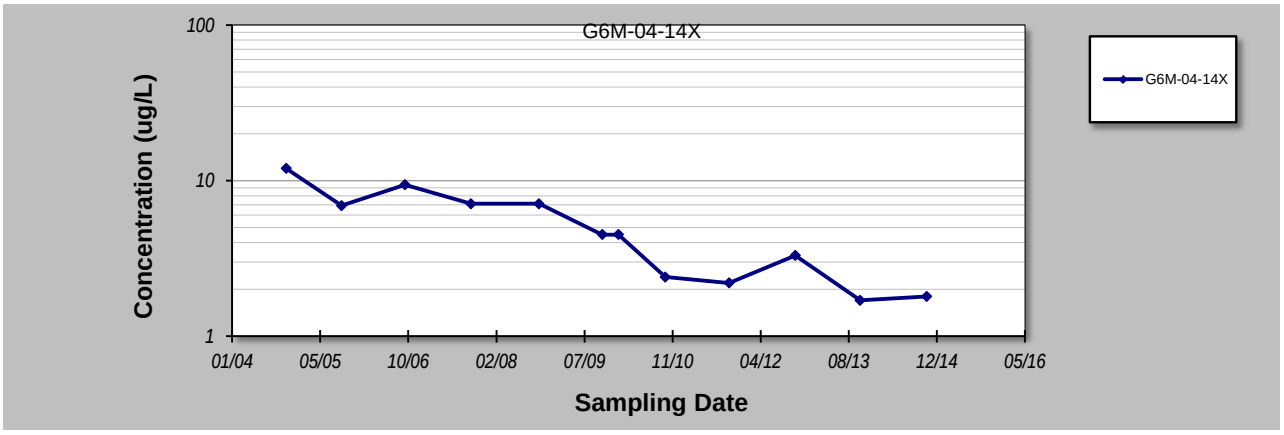
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-14X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	11/16/2004	12
2	9/27/2005	6.9
3	9/21/2006	9.4
4	10/1/2007	7.1
5	10/21/2008	**7.1**
6	10/15/2009	**4.5**
7	1/15/2010	4.5
8	10/8/2010	2.4
9	10/5/2011	2.2
10	10/15/2012	3.3
11	10/18/2013	1.7
12	10/31/2014	1.8
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.63**
Mann-Kendall Statistic (S):		**-52**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



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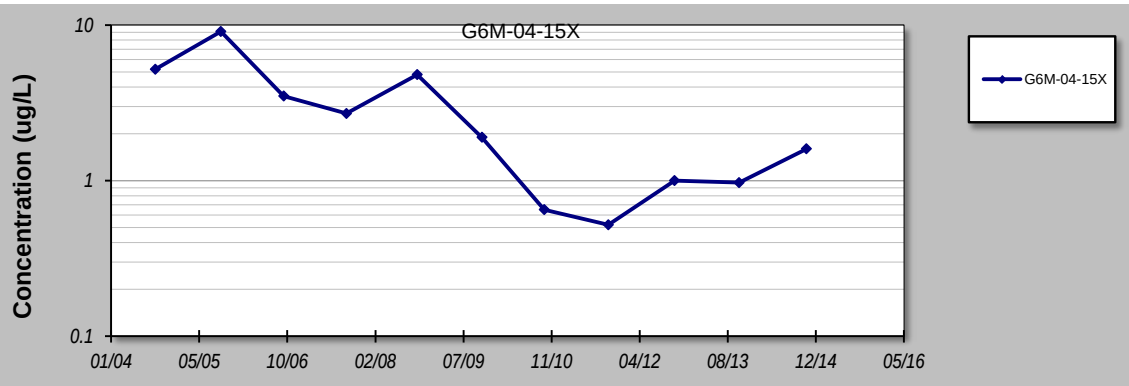
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-15X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/21/2004	5.2
2	9/28/2005	9.1
3	9/20/2006	3.5
4	9/11/2007	2.7
5	10/17/2008	4.8
6	10/19/2009	1.9
7	10/8/2010	0.65
8	10/6/2011	0.52
9	10/16/2012	1.0
10	10/18/2013	0.97
11	11/4/2014	1.60
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.90**
Mann-Kendall Statistic (S):		**-33**
Confidence Factor:		**99.5%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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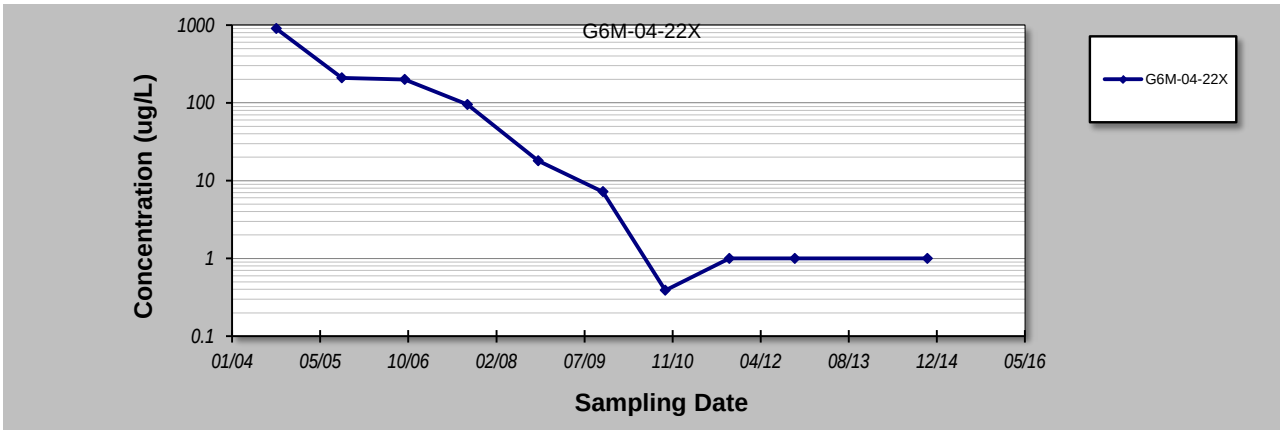
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-22X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/21/2004	900
2	9/28/2005	210
3	9/20/2006	200
4	9/11/2007	95
5	10/17/2008	18
6	10/19/2009	7.2
7	10/8/2010	**0.39**
8	10/6/2011	**1**
9	10/12/2012	**1**
10	10/18/2013	**-**
11	11/4/2014	**1**
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.94**
Mann-Kendall Statistic (S):		**-36**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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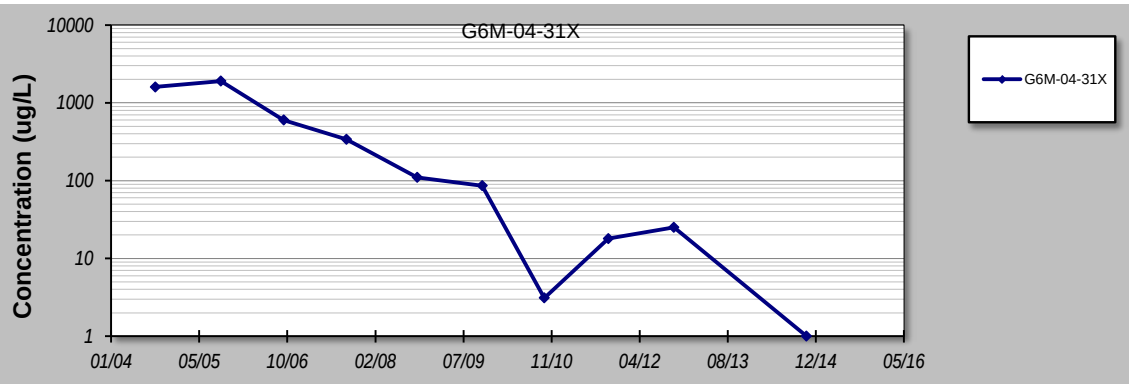
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-31X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	9/21/2004	1,600
2	9/28/2005	1,900
3	9/20/2006	600
4	9/11/2007	340
5	10/17/2008	110
6	10/21/2009	86
7	10/8/2010	3.1
8	10/6/2011	18
9	10/12/2012	25
10	10/18/2013	-
11	11/4/2014	**1**
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.51**
Mann-Kendall Statistic (S):		**-37**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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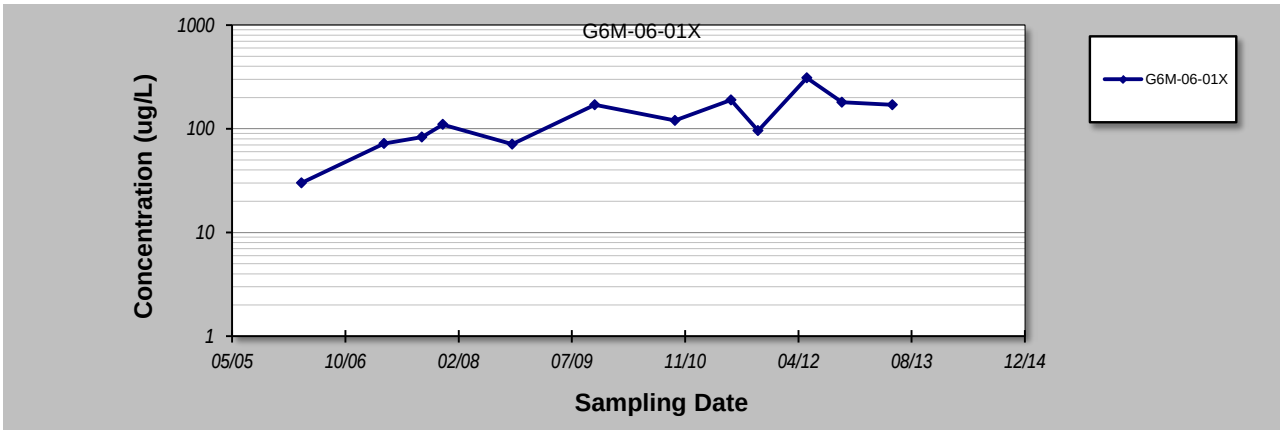
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-06-01X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	3/30/2006	30
2	3/30/2007	72
3	9/13/2007	83
4	12/14/2007	110
5	10/16/2008	71
6	10/15/2009	170
7	10/4/2010	120
8	6/8/2011	190
9	10/6/2011	96
10	5/8/2012	310
11	10/10/2012	180
12	5/21/2013	170
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.56**
Mann-Kendall Statistic (S):		**39**
Confidence Factor:		**99.7%**
Concentration Trend:		Increasing



Notes:

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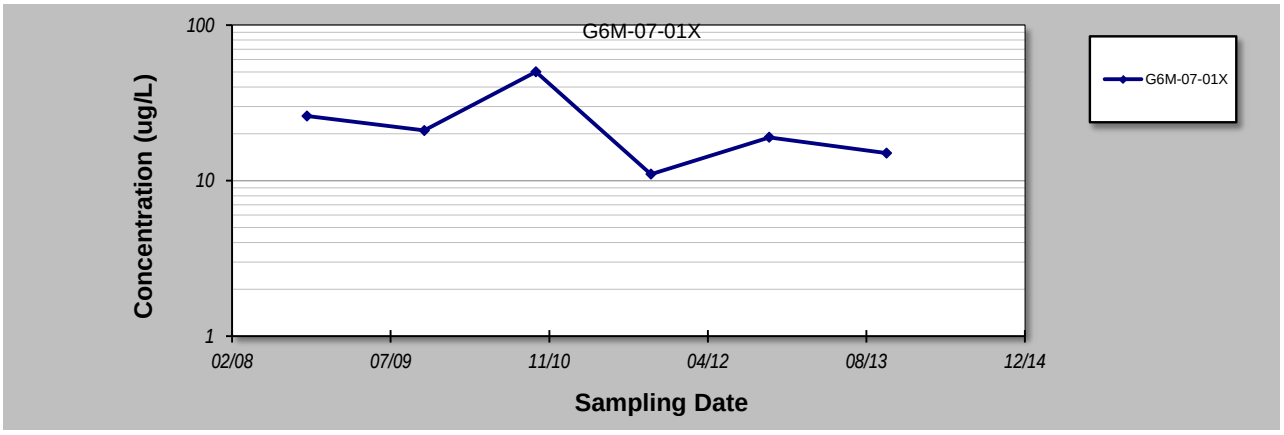
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-07-01X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/15/2008	26
2	10/20/2009	21
3	10/7/2010	50
4	10/5/2011	11
5	10/12/2012	19
6	10/17/2013	15
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.59**
Mann-Kendall Statistic (S):		**-7**
Confidence Factor:		**86.4%**
Concentration Trend:		Stable



Notes:

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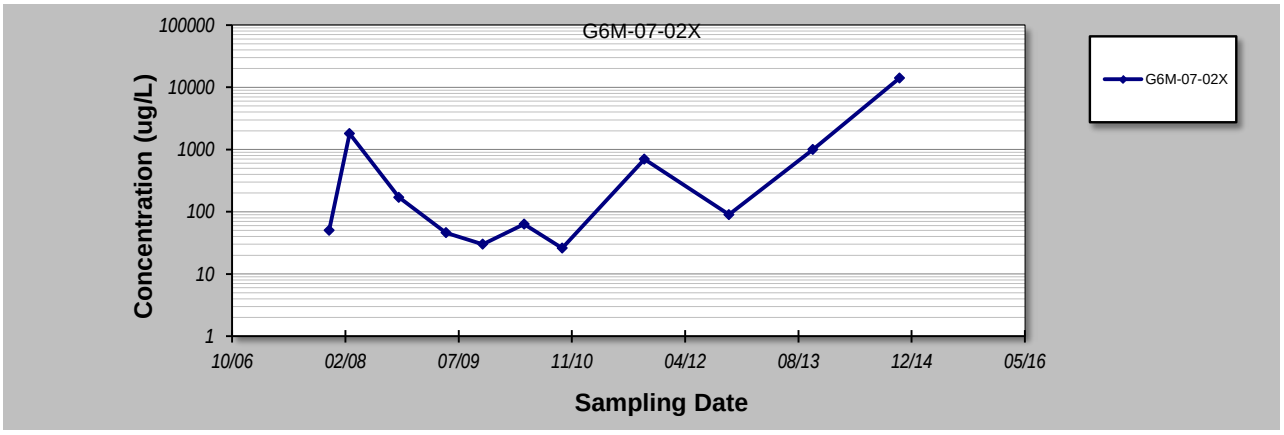
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-07-02X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	12/12/2007	50
2	3/11/2008	1,800
3	10/15/2008	170
4	5/11/2009	46
5	10/20/2009	**30**
6	4/21/2010	63
7	10/6/2010	**26**
8	10/4/2011	700
9	10/11/2012	90
10	10/17/2013	1,000
11	11/3/2014	14,000
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**2.53**
Mann-Kendall Statistic (S):		**13**
Confidence Factor:		**82.1%**
Concentration Trend:		No Trend



Notes:

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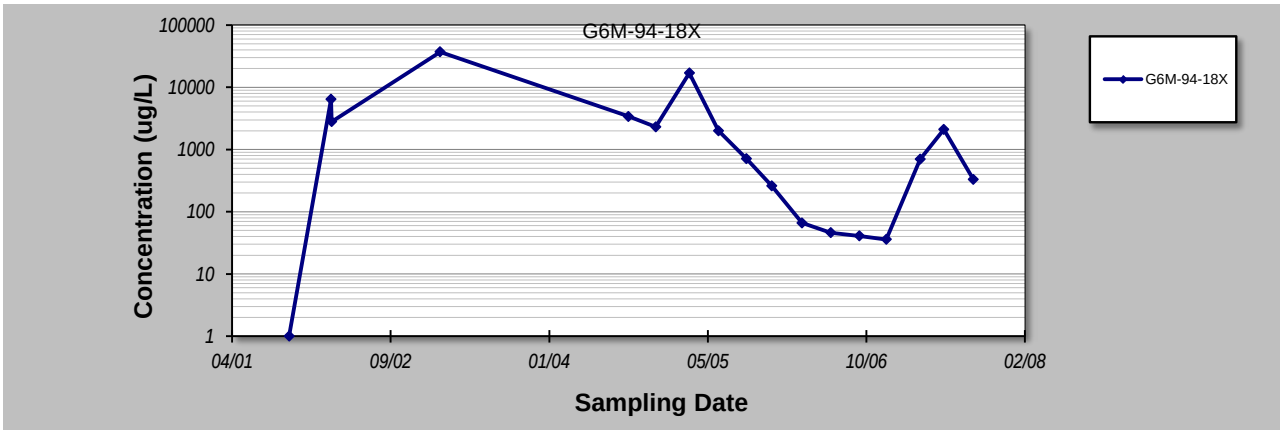
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-94-18X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/16/2001	**1**
2	2/25/2002	6,400
3	2/27/2002	2,800
4	2/4/2003	37,000
5	9/20/2004	3,400
6	12/15/2004	2,300
7	3/31/2005	17,000
8	7/1/2005	2,000
9	9/27/2005	710
10	12/16/2005	260
11	3/21/2006	66
12	6/20/2006	46
13	9/18/2006	41
14	12/12/2006	36
15	3/29/2007	700
16	6/11/2007	2,100
17	9/12/2007	330
18		
19		
20		
Coefficient of Variation:		**2.12**
Mann-Kendall Statistic (S):		**-54**
Confidence Factor:		**98.6%**
Concentration Trend:		Decreasing



Notes:

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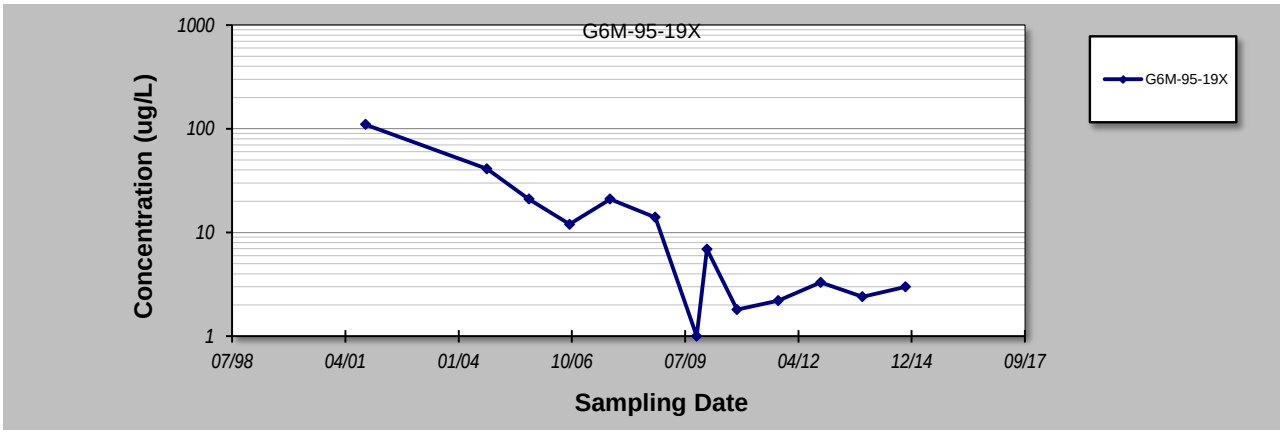
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-95-19X

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/15/2001	110
2	9/20/2004	41
3	9/26/2005	21
4	9/19/2006	12
5	9/12/2007	21
6	10/15/2008	**14**
7	10/16/2009	1
8	1/15/2010	6.9
9	10/7/2010	1.8
10	10/7/2011	2.2
11	10/15/2012	3.3
12	10/18/2013	2.4
13	11/3/2014	3
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.62**
Mann-Kendall Statistic (S):		**-45**
Confidence Factor:		**99.8%**
Concentration Trend:		Decreasing



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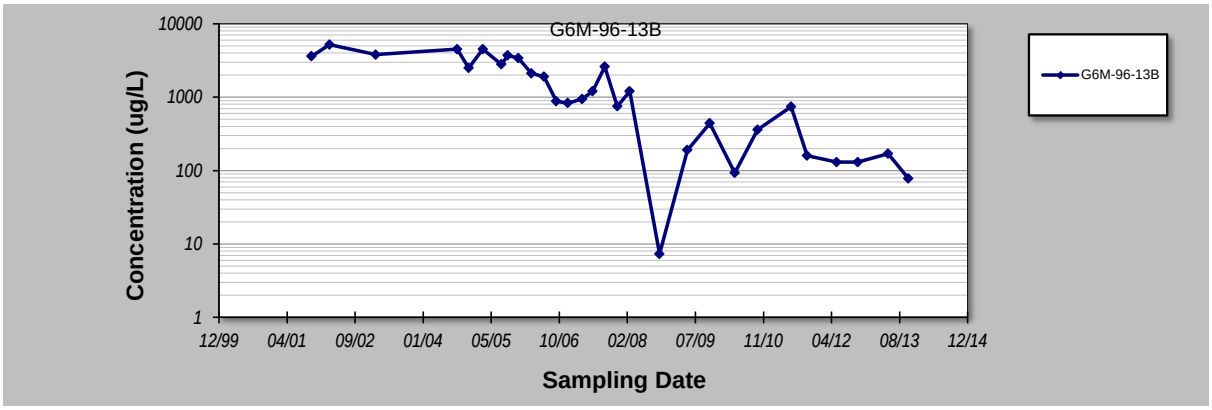
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 10-Jun-15
Facility Name: Devens AOC 50
Conducted By:

Job ID:
Constituent: PCE
Concentration Units: ug/L

Sampling Point ID: G6M-96-13B

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/15/2001	3,600
2	2/25/2002	5,200
3	1/31/2003	3,800
4	9/20/2004	4,500
5	12/13/2004	2,500
6	3/28/2005	4,500
7	8/10/2005	2,800
8	9/26/2005	3,700
9	12/13/2005	3,400
10	3/20/2006	2,100
11	6/20/2006	1,900
12	9/18/2006	880
13	12/11/2006	830
14	3/27/2007	940
15	6/11/2007	1,200
16	9/10/2007	2,600
17	12/11/2007	750
18	3/10/2008	1,200
19	10/15/2008	**7.3**
20	5/7/2009	190
21	10/19/2009	440
22	4/21/2010	93
23	10/6/2010	360
24	6/9/2011	740
25	10/4/2011	160
26	5/9/2012	130
27	10/11/2012	130
28	5/22/2013	170
29	10/17/2013	78
30		
Coefficient of Variation:		0.96
Mann-Kendall Statistic (S):		-297
Confidence Factor:		>99.9%
Concentration Trend:		Decreasing



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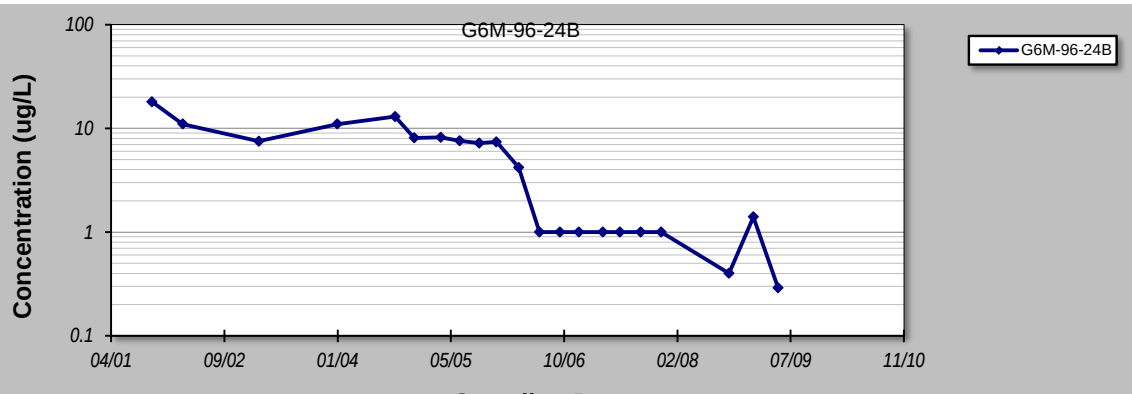
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-96-24B

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/16/2001	18
2	3/1/2002	11
3	1/31/2003	7.5
4	1/12/2004	11
5	9/24/2004	13
6	12/17/2004	8.1
7	4/13/2005	8.2
8	7/6/2005	7.6
9	9/30/2005	7.2
10	12/15/2005	7.4
11	3/23/2006	4.2
12	6/23/2006	**1**
13	9/22/2006	**1**
14	12/14/2006	**1**
15	3/30/2007	**1**
16	6/13/2007	**1**
17	9/13/2007	**1**
18	12/12/2007	**1**
19	10/7/2008	0.4
20	1/22/2009	1.4
21	5/11/2009	0.29
22		
23		
24		
25		
Coefficient of Variation:		**0.95**
Mann-Kendall Statistic (S):		**-154**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



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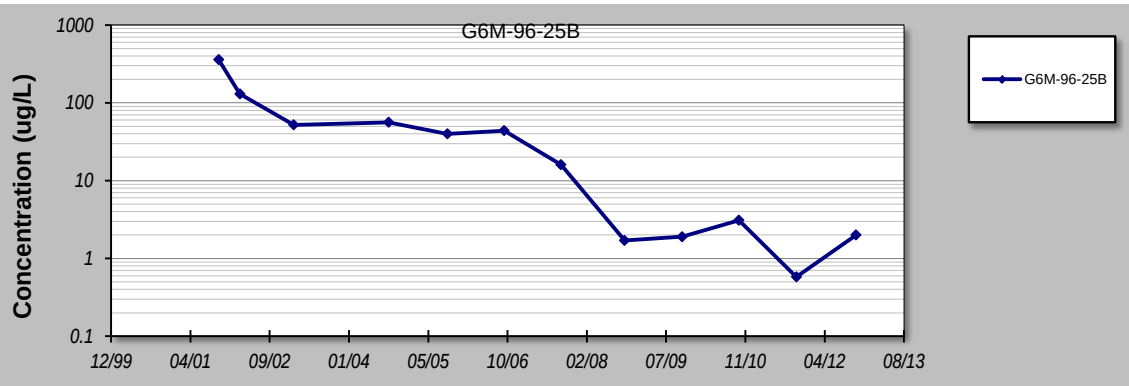
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-96-25B

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/15/2001	360
2	2/25/2002	130
3	2/27/2002	-
4	1/31/2003	52
5	9/20/2004	56
6	9/26/2005	40
7	9/19/2006	44
8	9/11/2007	16
9	10/17/2008	1.7
10	10/16/2009	1.9
11	10/8/2010	3.1
12	10/6/2011	0.58
13	10/16/2012	2.0
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.73**
Mann-Kendall Statistic (S):		**-50**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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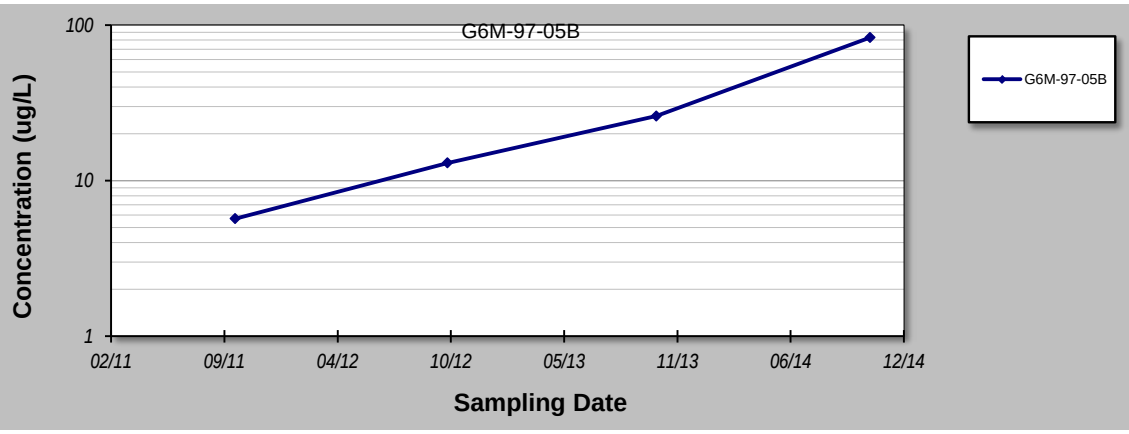
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-97-05B

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/3/2011	5.7
2	10/12/2012	13
3	10/16/2013	26
4	10/28/2014	83
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		1.10
Mann-Kendall Statistic (S):		6
Confidence Factor:		95.8%
Concentration Trend:		Increasing



Notes:

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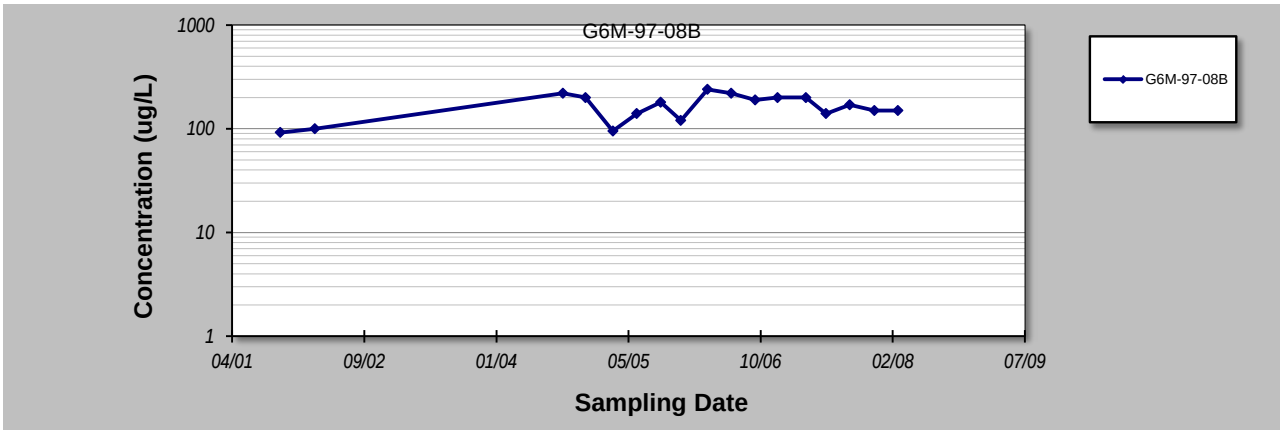
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-97-08B

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/18/2001	92
2	2/26/2002	100
3	9/22/2004	220
4	12/16/2004	200
5	3/30/2005	95
6	6/28/2005	140
7	9/27/2005	180
8	12/12/2005	120
9	3/23/2006	240
10	6/21/2006	220
11	9/19/2006	190
12	12/13/2006	200
13	3/30/2007	200
14	6/14/2007	140
15	9/12/2007	170
16	12/14/2007	**150**
17	3/12/2008	150
18		
19		
20		
Coefficient of Variation:		**0.28**
Mann-Kendall Statistic (S):		**16**
Confidence Factor:		**72.9%**
Concentration Trend:		No Trend



Notes:

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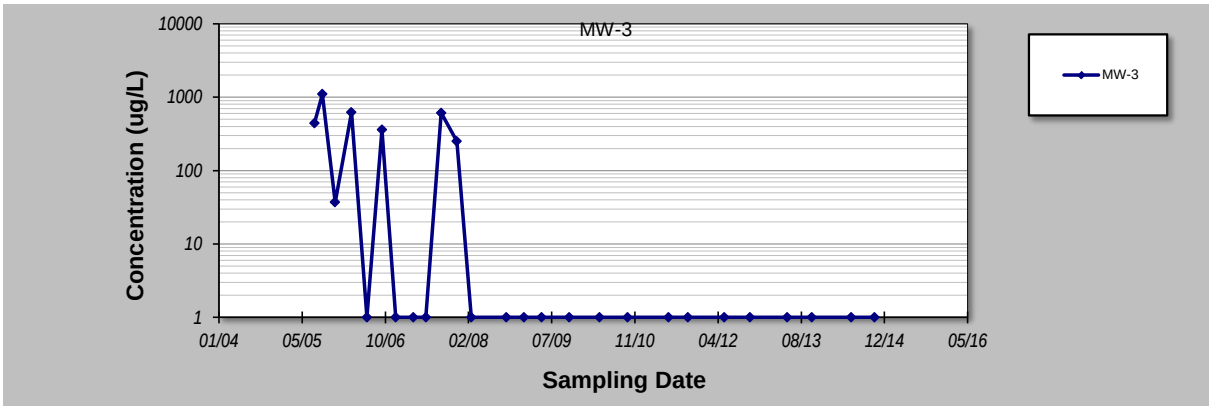
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: MW-3

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	8/10/2005	440
2	9/27/2005	1,100
3	12/12/2005	37
4	3/20/2006	620
5	6/22/2006	**1**
6	9/20/2006	360
7	12/12/2006	**1**
8	3/27/2007	**1**
9	6/11/2007	**1**
10	9/11/2007	610
11	10/12/2007	-
12	12/13/2007	250
13	3/10/2008	**1**
14	10/6/2008	**1**
15	1/21/2009	**1**
16	5/7/2009	**1**
17	10/19/2009	**1**
18	4/20/2010	**1**
19	10/5/2010	**1**
20	6/8/2011	**1**
21	10/3/2011	**1**
22	5/8/2012	**1**
23	10/10/2012	**1**
24	5/21/2013	**1**
25	10/16/2013	**1**
26	6/11/2014	**1**
27	10/29/2014	**1**
28		
29		
30		
Coefficient of Variation:		**2.09**
Mann-Kendall Statistic (S):		**-120**
Confidence Factor:		**99.6%**
Concentration Trend:		Decreasing



Notes:

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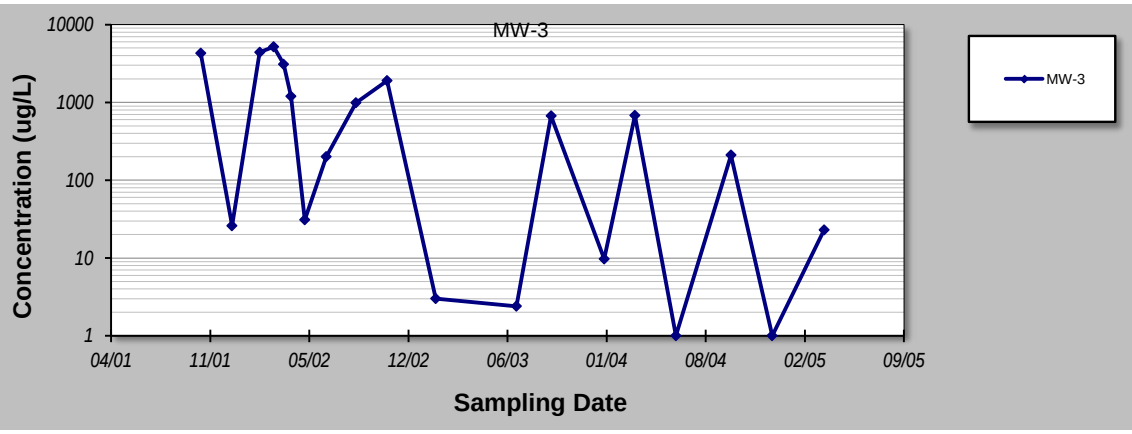
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: MW-3

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	10/17/2001	4,300
2	12/19/2001	26
3	1/3/2002	-
4	1/31/2002	-
5	2/13/2002	4,400
6	3/13/2002	5,200
7	4/2/2002	3,100
8	4/17/2002	1,200
9	5/15/2002	31
10	6/27/2002	**200**
11	7/31/2002	-
12	8/26/2002	990
13	10/28/2002	1,900
14	2/3/2003	3
15	7/16/2003	2.4
16	9/24/2003	670
17	1/9/2004	9.7
18	3/11/2004	680
19	6/2/2004	**1**
20	9/21/2004	210
21	12/13/2004	**1**
22	3/28/2005	**23**
23		
24		
25		
Coefficient of Variation:		**1.43**
Mann-Kendall Statistic (S):		**-82**
Confidence Factor:		**99.8%**
Concentration Trend:		Decreasing



Notes:

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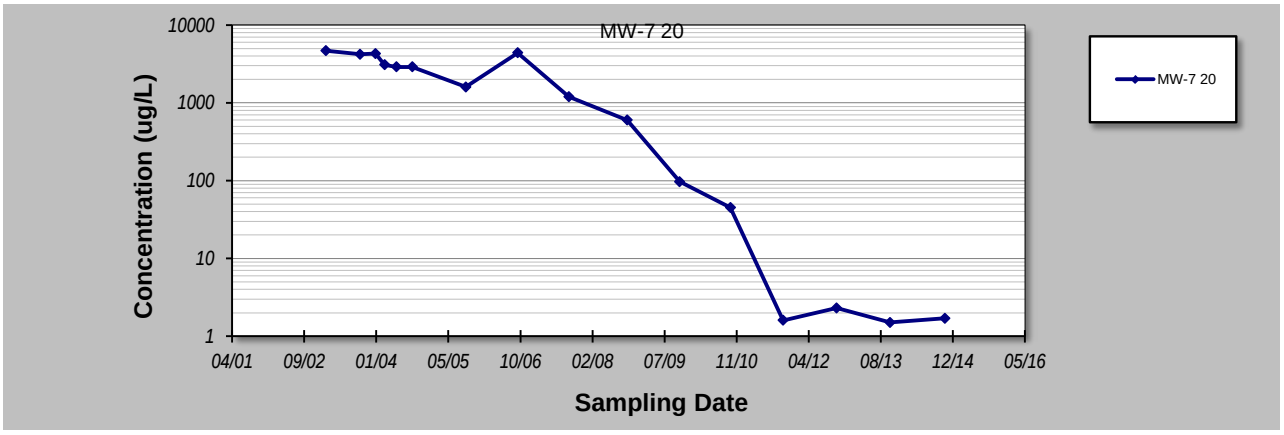
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: MW-7

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	12/14/2002	-
2	1/30/2003	4,700
3	9/24/2003	4,200
4	1/8/2004	4,300
5	3/12/2004	3,100
6	6/3/2004	2,900
7	9/21/2004	2,900
8	9/27/2005	1,600
9	9/22/2006	4,400
10	9/11/2007	1,200
11	10/20/2008	600
12	10/19/2009	97
13	10/6/2010	45
14	10/6/2011	1.6
15	10/12/2012	2.3
16	10/17/2013	1.5
17	11/3/2014	1.7
18		
19		
20		
Coefficient of Variation:		**0.99**
Mann-Kendall Statistic (S):		**-99**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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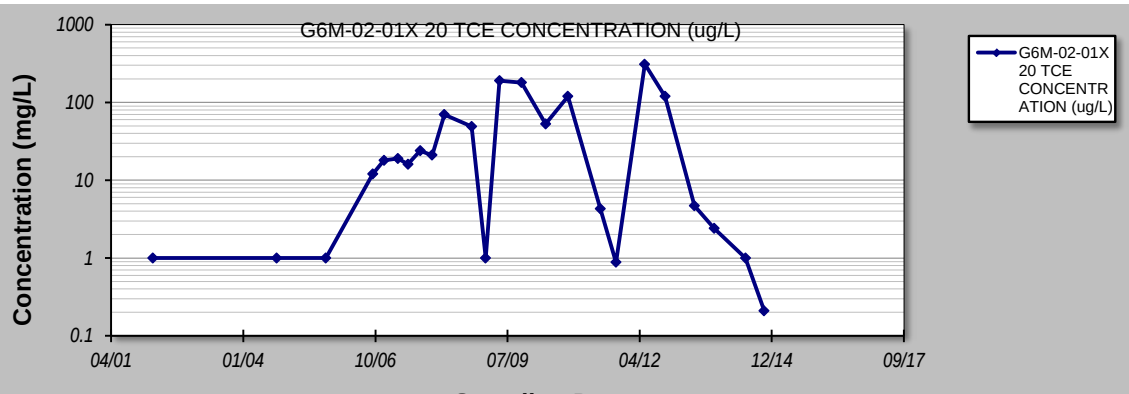
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-01X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	2/28/2002	**1**
2	9/23/2004	**1**
3	9/30/2005	**1**
4	9/20/2006	12
5	12/14/2006	18
6	3/30/2007	19
7	6/14/2007	16
8	9/14/2007	24
9	12/13/2007	**21**
10	3/14/2008	70
11	10/7/2008	49
12	1/21/2009	**1**
13	5/6/2009	190
14	10/20/2009	180
15	4/21/2010	**53**
16	10/6/2010	120
17	6/9/2011	4.3
18	10/5/2011	0.88
19	5/9/2012	310
20	10/10/2012	120
21	5/21/2013	4.7
22	10/17/2013	2.4
23	6/11/2014	**1**
24	10/30/2014	**0.21**
25		
Coefficient of Variation:		**1.56**
Mann-Kendall Statistic (S):		**25**
Confidence Factor:		**72.2%**
Concentration Trend:		No Trend



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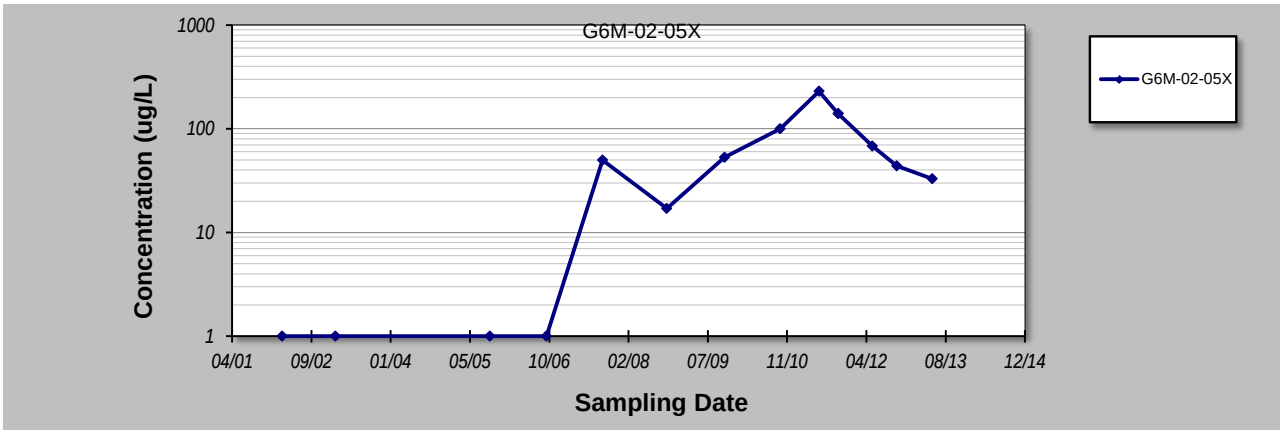
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-05X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	2/28/2002	**1**
2	1/30/2003	**1**
3	9/30/2005	**1**
4	9/22/2006	**1**
5	9/12/2007	50
6	10/20/2008	17
7	10/19/2009	53
8	10/5/2010	100
9	6/8/2011	230
10	10/6/2011	140
11	10/6/2011	140
12	5/9/2012	68
13	10/10/2012	44
14	5/21/2013	**33**
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.08**
Mann-Kendall Statistic (S):		**40**
Confidence Factor:		**98.5%**
Concentration Trend:		Increasing



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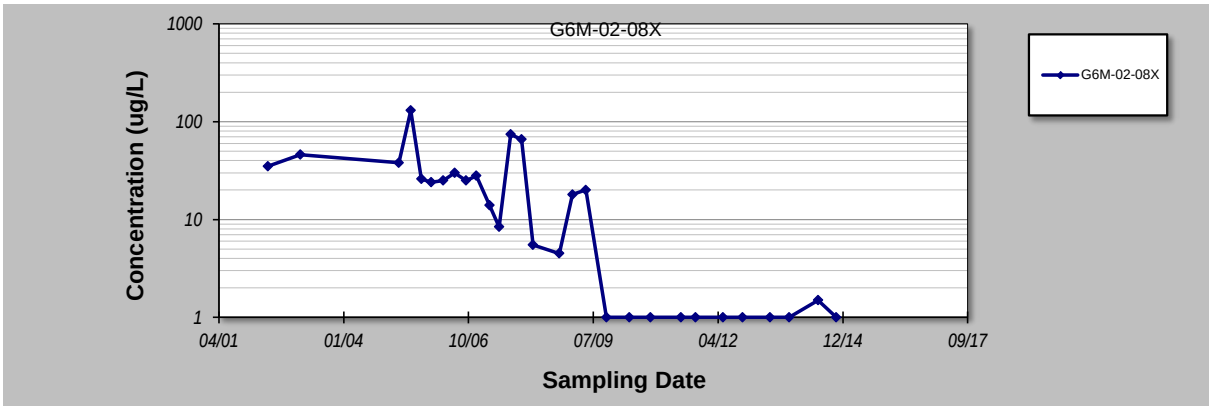
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-08X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	5/17/2002	35
2	1/31/2003	46
3	3/31/2005	**38**
4	7/5/2005	130
5	9/27/2005	26
6	12/16/2005	24
7	3/21/2006	25
8	6/21/2006	30
9	9/20/2006	25
10	12/12/2006	28
11	3/28/2007	14
12	6/13/2007	8.4
13	9/13/2007	74
14	12/10/2007	66
15	3/10/2008	5.5
16	10/6/2008	**4.5**
17	1/21/2009	**18**
18	5/7/2009	**20**
19	10/20/2009	**1**
20	4/21/2010	**1**
21	10/7/2010	**1**
22	6/9/2011	**1**
23	10/4/2011	**1**
24	5/10/2012	**1**
25	10/15/2012	**1**
26	5/23/2013	**1**
27	10/22/2013	**1**
28	6/12/2014	1.5
29	11/3/2014	**1**
30		
Coefficient of Variation:		**1.32**
Mann-Kendall Statistic (S):		**-252**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



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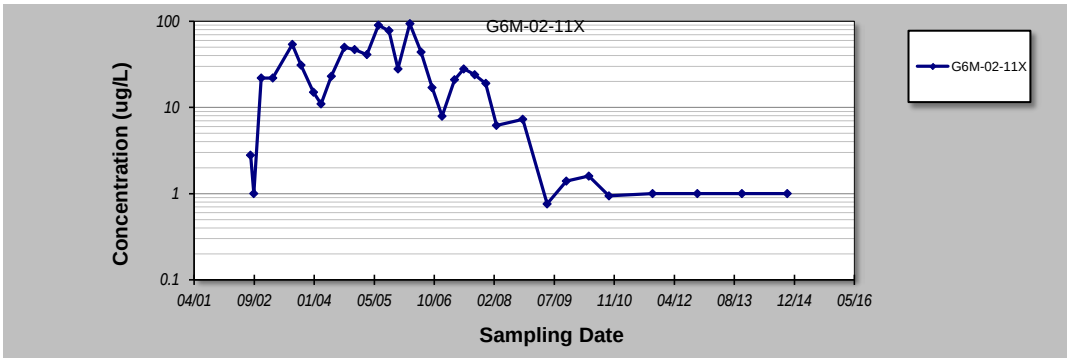
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 11-Jun-15
Facility Name: AOC 50 Devens
Conducted By:

Job ID:
Constituent: TCE
Concentration Units: ug/L

Sampling Point ID: G6M-02-11X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	8/1/2002	2.8
2	8/28/2002	**1**
3	10/29/2002	22
4	2/3/2003	22
5	7/16/2003	54
6	9/26/2003	31
7	1/8/2004	15
8	3/10/2004	11
9	6/4/2004	23
10	9/22/2004	50
11	12/15/2004	47
12	3/28/2005	41
13	7/1/2005	90
14	9/27/2005	78
15	12/12/2005	28
16	3/21/2006	94
17	6/22/2006	44
18	9/22/2006	17
19	12/13/2006	7.9
20	3/27/2007	21
21	6/13/2007	28
22	9/11/2007	24
23	12/13/2007	**19**
24	3/11/2008	6.2
25	10/16/2008	7.3
26	5/7/2009	0.76
27	10/14/2009	1.4
28	4/20/2010	1.6
29	10/5/2010	0.94
30	6/9/2011	-
31	10/3/2011	**1**
32	5/8/2012	-
33	10/10/2012	**1**
34	5/21/2013	-
35	10/16/2013	**1**
36	6/11/2014	-
37	10/29/2014	**1**
38		
39		
40		
Coefficient of Variation:		1.08
Mann-Kendall Statistic (S):		-198
Confidence Factor:		99.9%
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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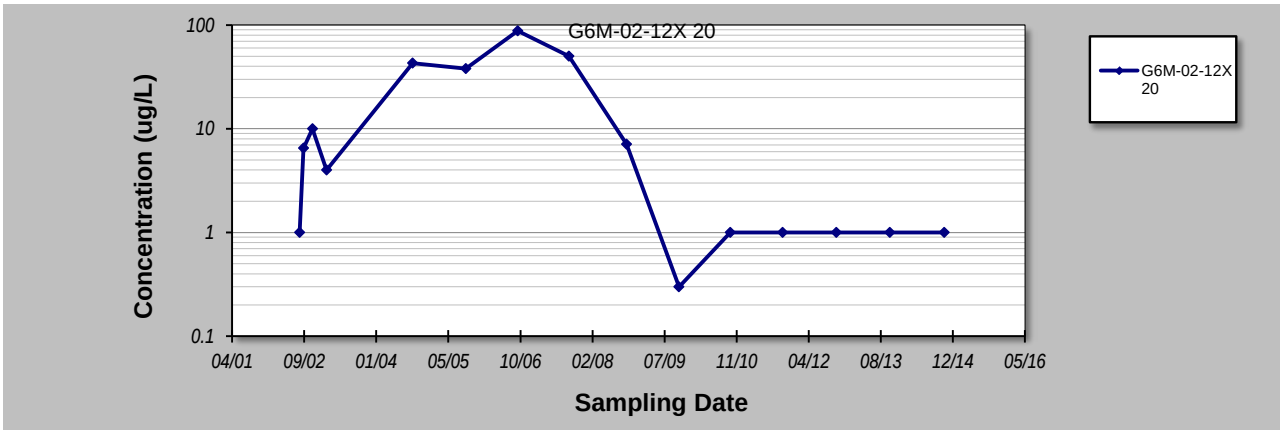
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-12X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	8/1/2002	**1**
2	8/28/2002	6.5
3	10/29/2002	10
4	2/3/2003	4
5	7/14/2003	-
6	9/22/2004	43
7	9/27/2005	38
8	9/21/2006	88
9	9/12/2007	50
10	10/16/2008	7.1
11	10/14/2009	**0.3**
12	10/5/2010	**1**
13	10/4/2011	**1**
14	10/10/2012	**1**
15	10/16/2013	**1**
16	10/29/2014	**1**
17		
18		
19		
20		
Coefficient of Variation:		**1.54**
Mann-Kendall Statistic (S):		**-26**
Confidence Factor:		**89.0%**
Concentration Trend:		No Trend



Notes:

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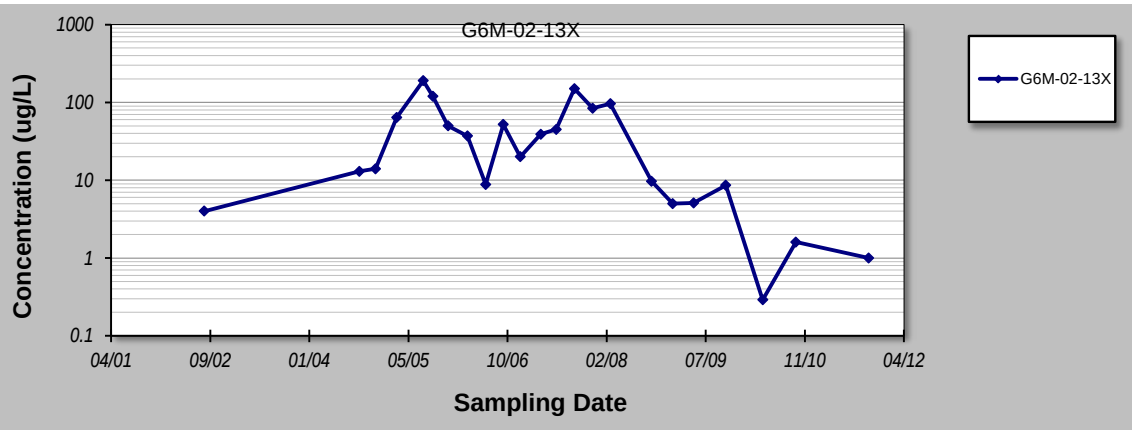
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-13X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	8/2/2002	4
2	9/23/2004	13
3	12/13/2004	14
4	3/30/2005	**64**
5	8/11/2005	190
6	9/29/2005	120
7	12/14/2005	50
8	3/22/2006	**37**
9	6/22/2006	8.8
10	9/18/2006	52
11	12/14/2006	20
12	3/27/2007	39
13	6/13/2007	45
14	9/13/2007	150
15	12/14/2007	**84**
16	3/12/2008	96
17	10/6/2008	9.7
18	1/21/2009	5
19	5/6/2009	5.1
20	10/15/2009	8.6
21	4/20/2010	**0.29**
22	10/4/2010	1.6
23	6/9/2011	-
24	10/6/2011	**1**
25		
Coefficient of Variation:		**1.17**
Mann-Kendall Statistic (S):		**-75**
Confidence Factor:		**97.5%**
Concentration Trend:		Decreasing



Notes:

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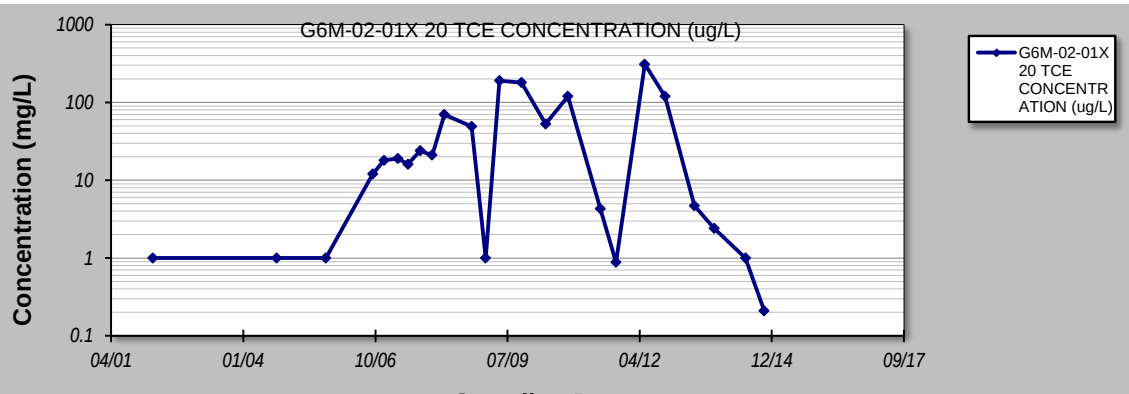
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-02-01X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	2/28/2002	**1**
2	9/23/2004	**1**
3	9/30/2005	**1**
4	9/20/2006	12
5	12/14/2006	18
6	3/30/2007	19
7	6/14/2007	16
8	9/14/2007	24
9	12/13/2007	**21**
10	3/14/2008	70
11	10/7/2008	49
12	1/21/2009	**1**
13	5/6/2009	190
14	10/20/2009	180
15	4/21/2010	**53**
16	10/6/2010	120
17	6/9/2011	4.3
18	10/5/2011	0.88
19	5/9/2012	310
20	10/10/2012	120
21	5/21/2013	4.7
22	10/17/2013	2.4
23	6/11/2014	**1**
24	10/30/2014	**0.21**
25		
Coefficient of Variation:		**1.56**
Mann-Kendall Statistic (S):		**25**
Confidence Factor:		**72.2%**
Concentration Trend:		No Trend



Notes:

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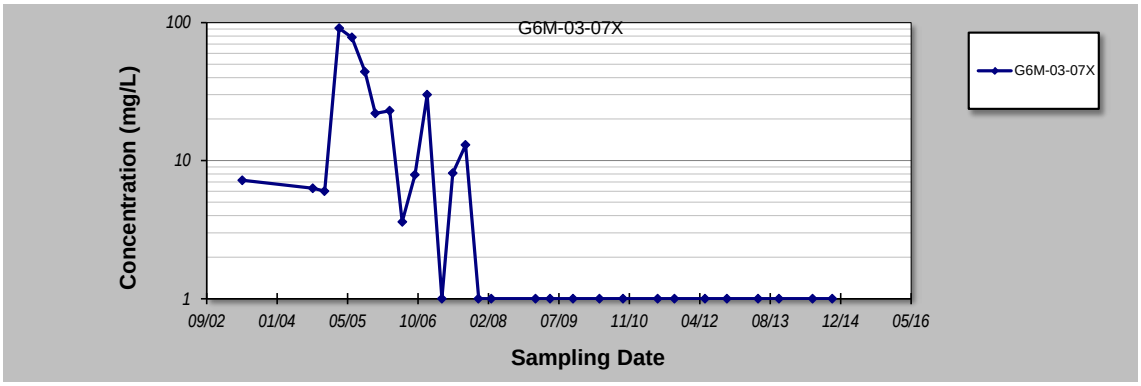
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 11-Jun-15
Facility Name: AOC 50 Devens
Conducted By:

Job ID:
Constituent: TCE
Concentration Units: ug/L

Sampling Point ID: G6M-03-07X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	5/12/2003	7.2
2	9/24/2004	6.3
3	12/16/2004	6
4	3/30/2005	91
5	6/29/2005	78
6	9/29/2005	44
7	12/12/2005	22
8	3/24/2006	23
9	6/21/2006	3.6
10	9/19/2006	7.9
11	12/14/2006	30
12	3/29/2007	1
13	6/14/2007	8.1
14	9/13/2007	13
15	12/14/2007	1
16	3/14/2008	1
17	10/7/2008	2.2J
18	1/22/2009	1
19	5/6/2009	1
20	10/15/2009	1
21	4/21/2010	1
22	10/5/2010	1
23	6/8/2011	1
24	10/5/2011	1
25	5/9/2012	1
26	10/11/2012	1
27	5/21/2013	1
28	10/16/2013	1
29	6/11/2014	1
30	10/30/2014	1
31		
32		
33		
34		
35		
Coefficient of Variation:		1.84
Mann-Kendall Statistic (S):		-206
Confidence Factor:		>99.9%
Concentration Trend:		Decreasing



Notes:

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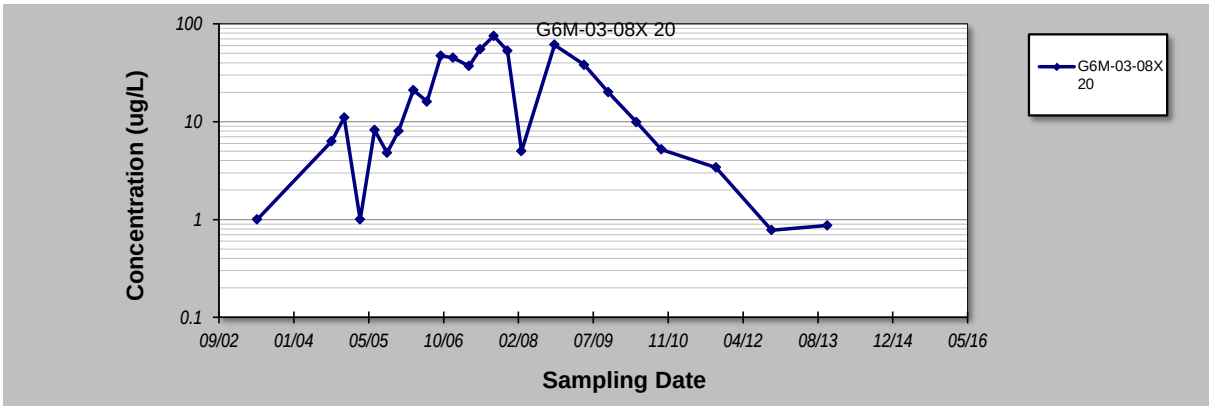
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-03-08X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	5/14/2003	**1**
2	9/22/2004	6.3
3	12/16/2004	11
4	3/31/2005	**1**
5	7/6/2005	8.2
6	9/28/2005	4.8
7	12/14/2005	8
8	3/22/2006	**21**
9	6/21/2006	16
10	9/21/2006	47
11	12/12/2006	45
12	3/29/2007	37
13	6/12/2007	55
14	9/10/2007	75
15	12/11/2007	53
16	3/13/2008	5
17	10/20/2008	61
18	5/6/2009	38
19	10/14/2009	20
20	4/20/2010	**9.9**
21	10/4/2010	5.2
22	6/8/2011	-
23	10/3/2011	3.4
24	5/8/2012	-
25	10/9/2012	0.78
26	5/22/2013	-
27	10/15/2013	0.87
28	6/12/2014	-
29		
30		
Coefficient of Variation:		**1.03**
Mann-Kendall Statistic (S):		**9**
Confidence Factor:		**57.8%**
Concentration Trend:		No Trend



Notes:

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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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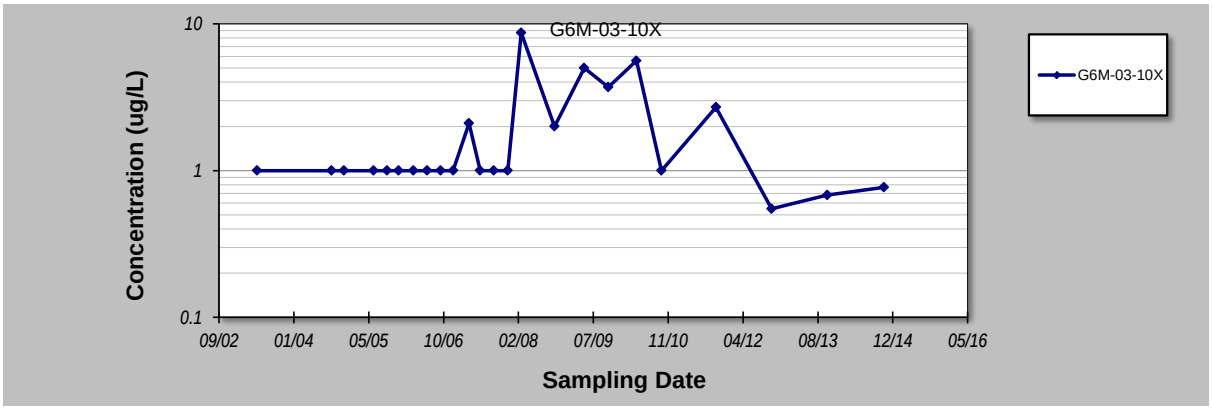
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-03-10X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	5/14/2003	**1**
2	9/22/2004	**1**
3	12/14/2004	**1**
4	3/29/2005	0.98J
5	6/30/2005	**1**
6	9/28/2005	**1**
7	12/13/2005	**1**
8	3/23/2006	**1**
9	6/22/2006	**1**
10	9/20/2006	**1**
11	12/13/2006	**1**
12	3/29/2007	2.1
13	6/11/2007	**1**
14	9/10/2007	**1**
15	12/12/2007	**1**
16	3/11/2008	8.7
17	10/20/2008	2.0
18	5/6/2009	5
19	10/14/2009	3.7
20	4/20/2010	5.6
21	10/4/2010	**1**
22	6/9/2011	-
23	10/3/2011	2.7
24	5/8/2012	-
25	10/9/2012	0.55
26	5/22/2013	-
27	10/15/2013	0.68
28	6/12/2014	-
29	10/29/2014	0.77
30		
Coefficient of Variation:		**1.03**
Mann-Kendall Statistic (S):		**21**
Confidence Factor:		**68.9%**
Concentration Trend:		No Trend



Notes:

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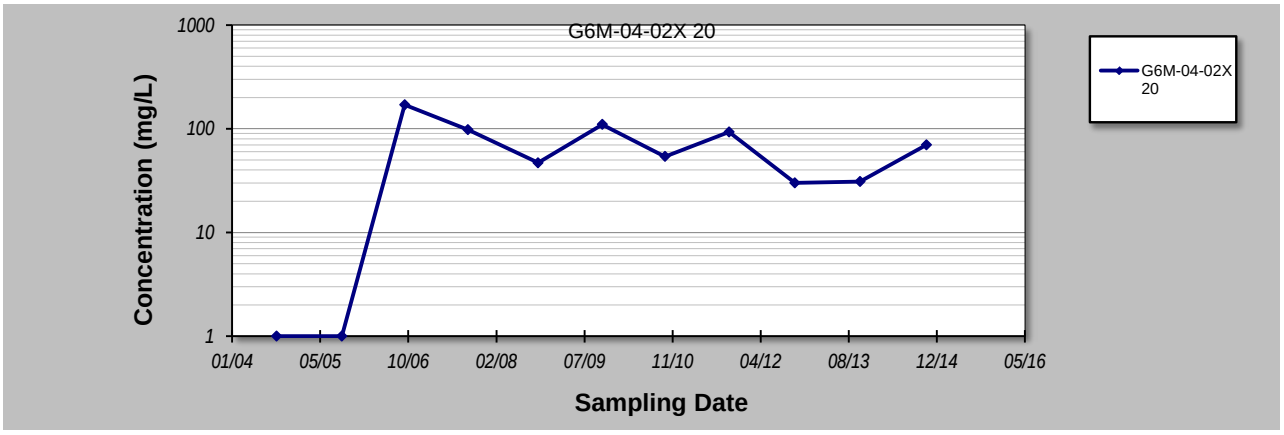
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-02X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/23/2004	**1**
2	9/28/2005	**1**
3	9/20/2006	170
4	9/14/2007	98
5	10/16/2008	47
6	10/15/2009	110
7	10/6/2010	54
8	6/8/2011	-
9	10/5/2011	93
10	5/8/2012	-
11	10/12/2012	30
12	5/21/2013	-
13	10/17/2013	31
14	6/11/2014	-
15	10/30/2014	70
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.79**
Mann-Kendall Statistic (S):		**2**
Confidence Factor:		**53.0%**
Concentration Trend:		No Trend



Notes:

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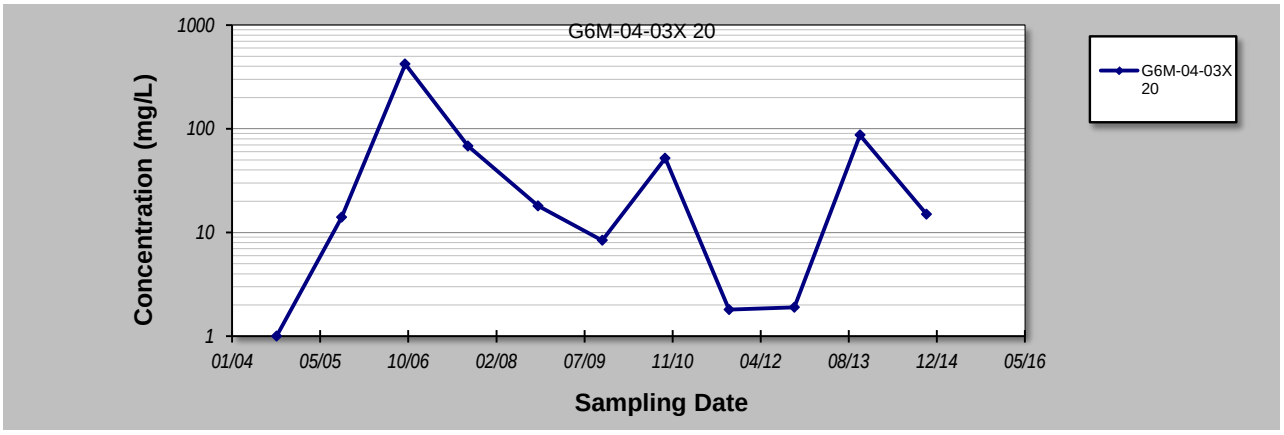
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	11-Jun-15	Job ID:	
Facility Name:	AOC 50 Devens	Constituent:	TCE
Conducted By:		Concentration Units:	ug/L

Sampling Point ID: G6M-04-03X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/23/2004	1
2	9/27/2005	14
3	9/22/2006	420
4	9/14/2007	68
5	10/16/2008	18
6	10/15/2009	8.4
7	10/7/2010	52
8	10/5/2011	1.8
9	10/10/2012	1.9
10	10/17/2013	87
11	10/30/2014	15
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		1.96
Mann-Kendall Statistic (S):		1
Confidence Factor:		50.0%
Concentration Trend:		No Trend



Notes:

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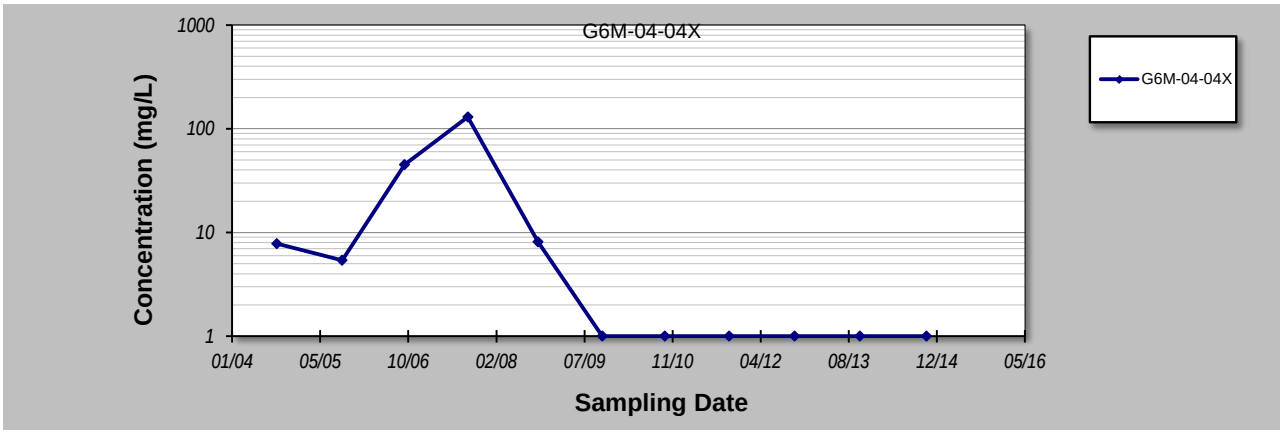
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-04X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/24/2004	7.8
2	9/29/2005	5.4
3	9/19/2006	45
4	9/13/2007	130
5	10/16/2008	8.1
6	10/15/2009	**1**
7	10/5/2010	**1**
8	10/5/2011	**1**
9	10/11/2012	**1**
10	10/16/2013	**1**
11	10/30/2014	**1**
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**2.13**
Mann-Kendall Statistic (S):		**-26**
Confidence Factor:		**97.5%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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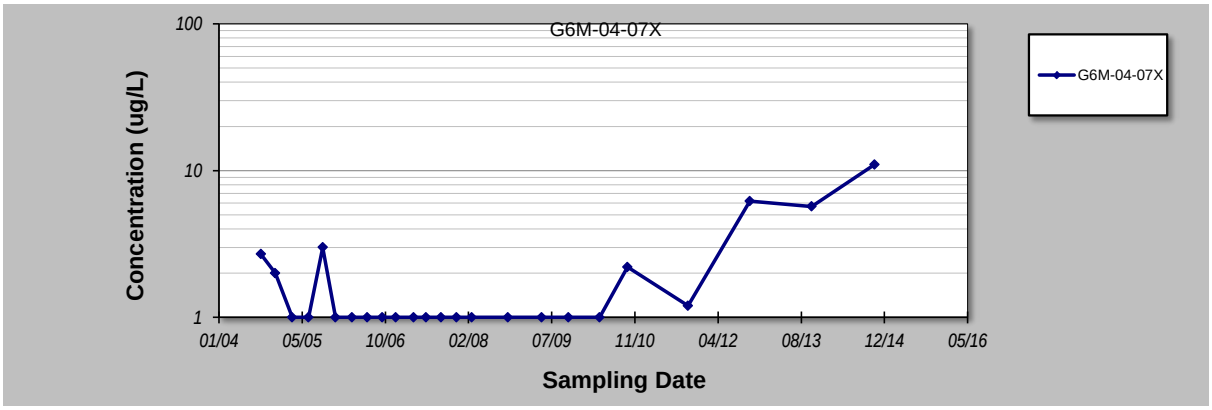
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-07X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/22/2004	2.7
2	12/17/2004	2
3	3/29/2005	**1**
4	7/5/2005	**1**
5	9/29/2005	3
6	12/14/2005	**1**
7	3/23/2006	**1**
8	6/23/2006	**1**
9	9/21/2006	**1**
10	12/11/2006	**1**
11	3/29/2007	**1**
12	6/12/2007	**1**
13	9/10/2007	**1**
14	12/12/2007	**1**
15	3/13/2008	**1**
16	10/16/2008	**1**
17	5/6/2009	**1**
18	10/14/2009	**1**
19	4/20/2010	**1**
20	10/4/2010	2.2
21	6/8/2011	-
22	10/3/2011	1.2
23	5/8/2012	-
24	10/9/2012	6.2
25	5/22/2013	-
26	10/15/2013	5.7
27	6/10/2014	-
28	10/28/2014	11
29		
30		
Coefficient of Variation:		**1.14**
Mann-Kendall Statistic (S):		**48**
Confidence Factor:		**87.7%**
Concentration Trend:		No Trend



Notes:

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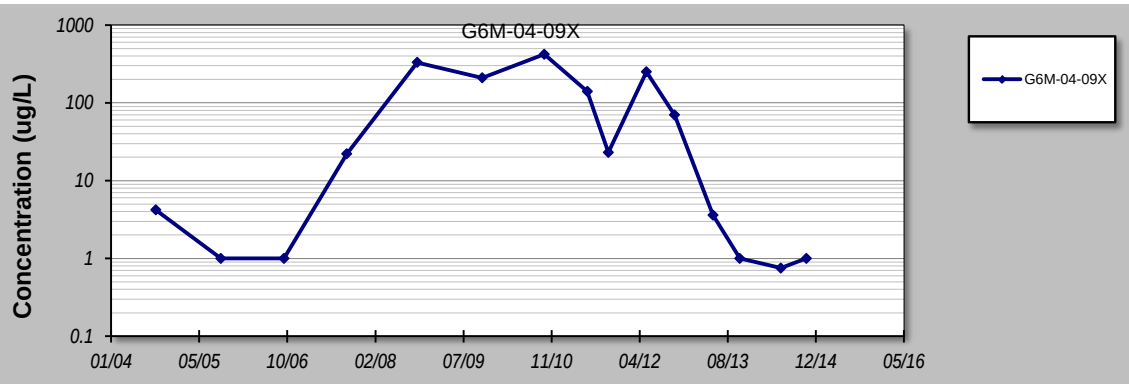
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-09X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/24/2004	4.2
2	9/28/2005	**1**
3	9/21/2006	**1**
4	9/12/2007	22
5	10/17/2008	330
6	10/21/2009	210
7	10/8/2010	420
8	6/9/2011	140
9	10/7/2011	23
10	5/9/2012	250
11	10/16/2012	70
12	5/22/2013	3.6
13	10/22/2013	**1**
14	6/12/2014	0.75
15	11/3/2014	**1**
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.41**
Mann-Kendall Statistic (S):		**-19**
Confidence Factor:		**81.0%**
Concentration Trend:		No Trend



Notes:

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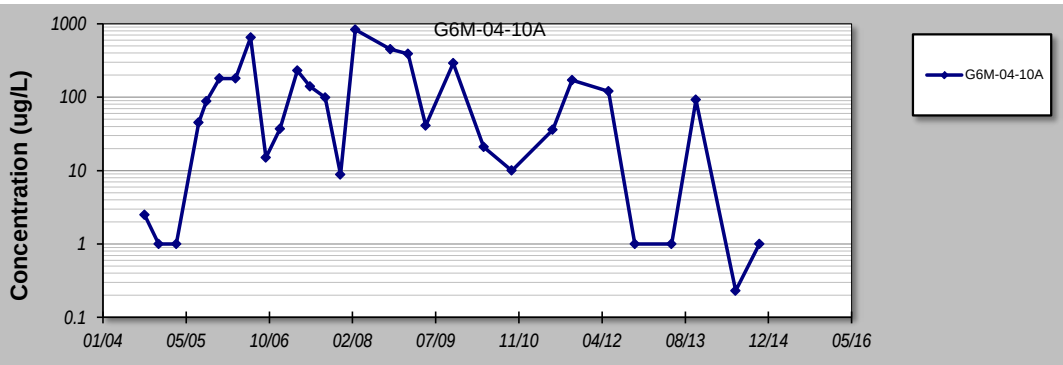
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 10-Jun-15
Facility Name: Devens AOC 50
Conducted By:

Job ID:
Constituent: TCE
Concentration Units: ug/L

Sampling Point ID: G6M-04-10A

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/20/2004	2.5
2	12/14/2004	**1**
3	3/30/2005	**1**
4	8/11/2005	45
5	9/27/2005	88
6	12/14/2005	180
7	3/21/2006	180
8	6/20/2006	650
9	9/19/2006	15
10	12/13/2006	37
11	3/28/2007	**230**
12	6/12/2007	140
13	9/11/2007	**99**
14	12/11/2007	8.8
15	3/10/2008	830
16	10/6/2008	450
17	1/21/2009	390
18	5/7/2009	41
19	10/20/2009	290
20	4/21/2010	21
21	10/6/2010	**10**
22	6/9/2011	36
23	10/4/2011	170
24	5/10/2012	120
25	10/15/2012	**1**
26	5/23/2013	**1**
27	10/17/2013	**92**
28	6/12/2014	**0.23**
29	11/3/2014	**1**
30		
Coefficient of Variation:		**1.44**
Mann-Kendall Statistic (S):		**-45**
Confidence Factor:		**79.4%**
Concentration Trend:		No Trend



Notes:

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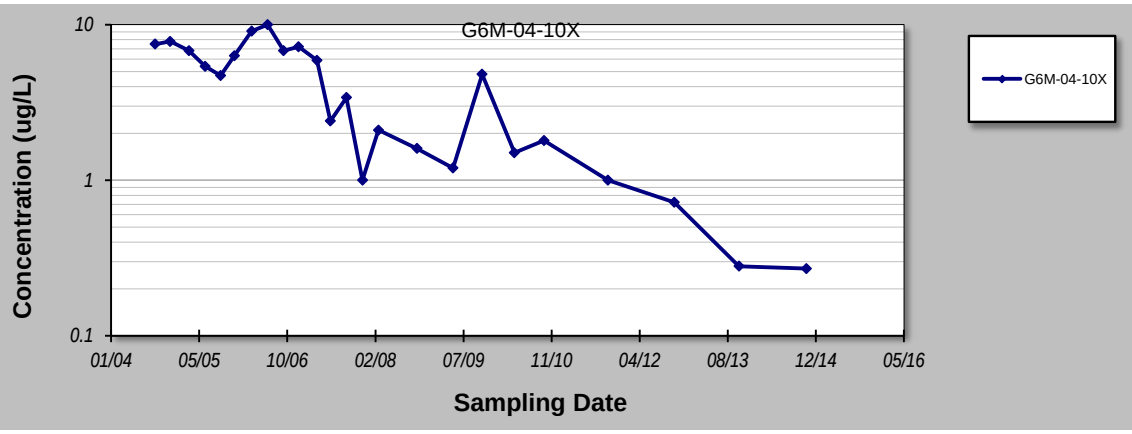
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-10X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/20/2004	7.5
2	12/14/2004	7.8
3	3/31/2005	6.8
4	7/1/2005	5.4
5	9/27/2005	4.7
6	12/14/2005	6.3
7	3/22/2006	**9.1**
8	6/20/2006	10
9	9/19/2006	6.8
10	12/13/2006	7.2
11	3/28/2007	5.9
12	6/12/2007	2.4
13	9/11/2007	3.4
14	12/11/2007	**1**
15	3/11/2008	2.1
16	10/15/2008	1.6
17	5/7/2009	1.2
18	10/20/2009	4.8
19	4/21/2010	1.5
20	10/6/2010	1.8
21	10/4/2011	**1**
22	10/15/2012	0.72
23	10/17/2013	**0.28**
24	11/3/2014	**0.27**
25		
Coefficient of Variation:		**0.73**
Mann-Kendall Statistic (S):		**-188**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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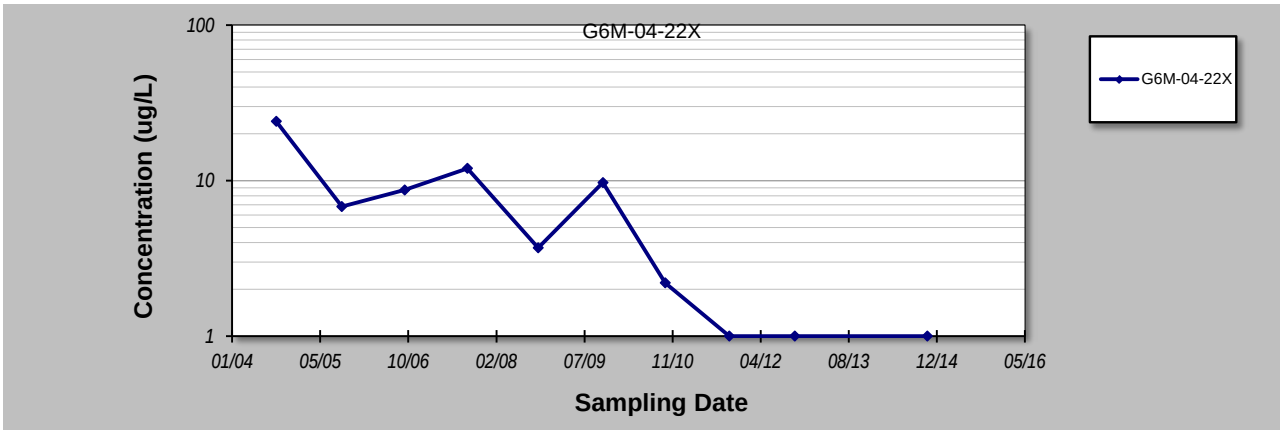
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-22X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/21/2004	24
2	9/28/2005	6.8
3	9/20/2006	8.7
4	9/11/2007	12
5	10/17/2008	3.7
6	10/19/2009	9.7
7	10/8/2010	2.2
8	10/6/2011	**1**
9	10/12/2012	**1**
10	10/18/2013	-
11	11/4/2014	**1**
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.03**
Mann-Kendall Statistic (S):		**-30**
Confidence Factor:		**99.7%**
Concentration Trend:		Decreasing



Notes:

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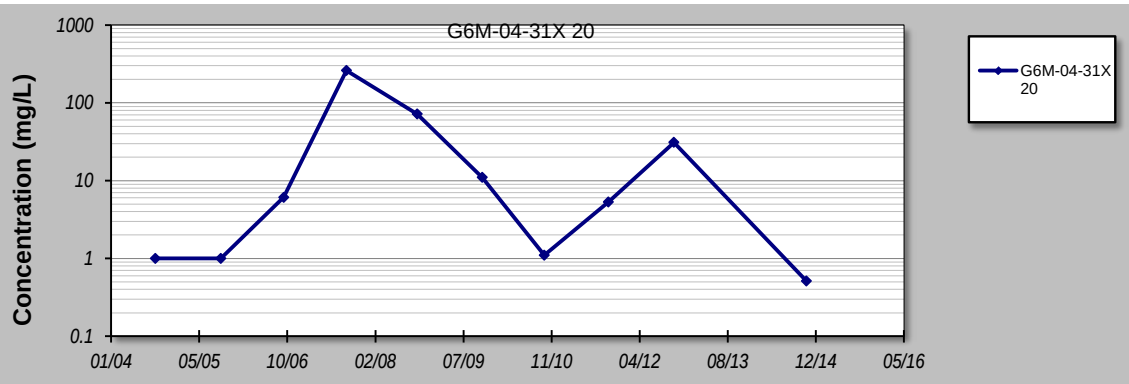
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-04-31X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	9/21/2004	**1**
2	9/28/2005	**1**
3	9/20/2006	6.1
4	9/11/2007	260
5	10/17/2008	72
6	10/21/2009	11
7	10/8/2010	1.1
8	10/6/2011	5.3
9	10/12/2012	31
10	10/18/2013	-
11	11/4/2014	0.51
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**2.08**
Mann-Kendall Statistic (S):		**0**
Confidence Factor:		**45.6%**
Concentration Trend:		No Trend



Notes:

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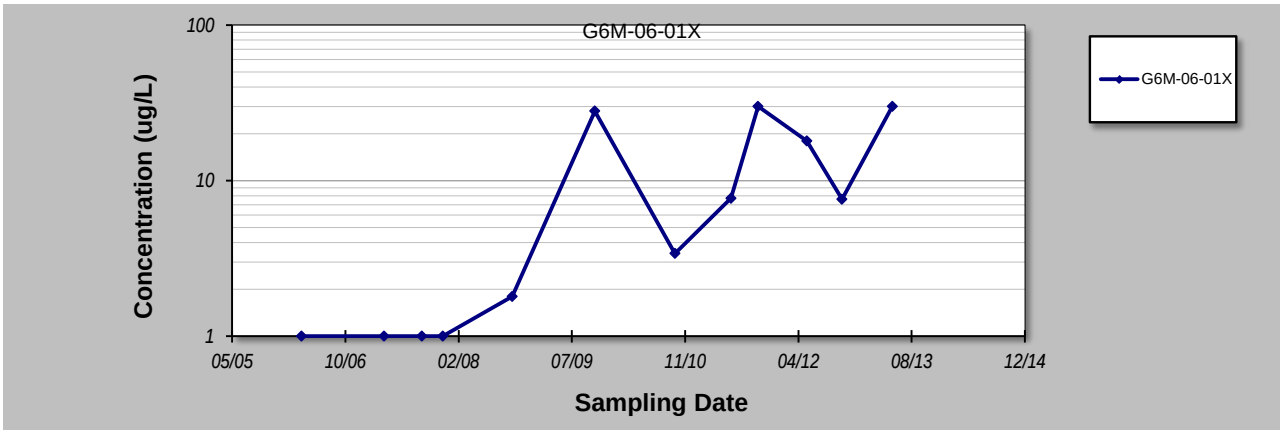
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-06-01X

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	3/30/2006	**1**
2	3/30/2007	**1**
3	9/13/2007	**1**
4	12/14/2007	**1**
5	10/16/2008	1.8
6	10/15/2009	28
7	10/4/2010	**3.4**
8	6/8/2011	7.7
9	10/6/2011	30
10	5/8/2012	18
11	10/10/2012	7.6
12	5/21/2013	30
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**1.12**
Mann-Kendall Statistic (S):		**43**
Confidence Factor:		**99.9%**
Concentration Trend:		Increasing



Notes:

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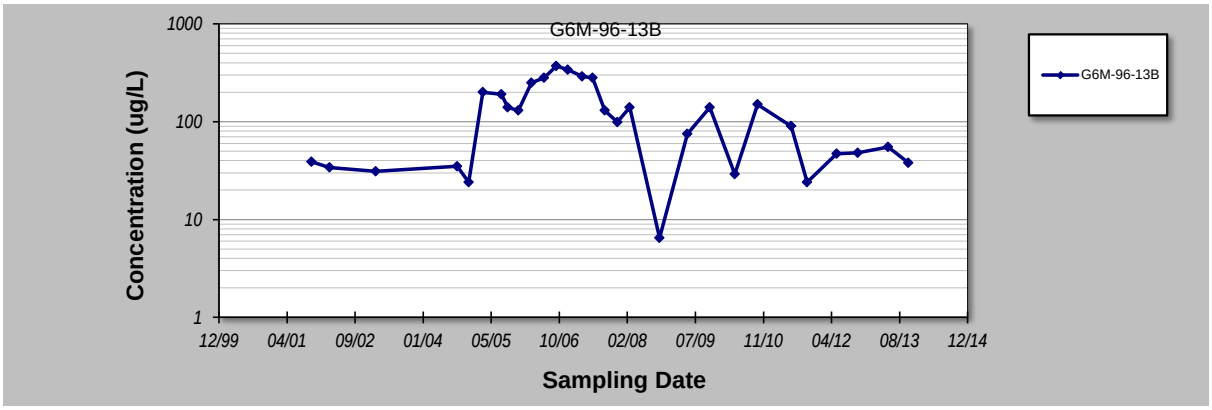
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **10-Jun-15**
Facility Name: **Devens AOC 50**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-96-13B

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	10/15/2001	39
2	2/25/2002	34
3	1/31/2003	31
4	9/20/2004	35
5	12/13/2004	24
6	3/28/2005	**200**
7	8/10/2005	190
8	9/26/2005	140
9	12/13/2005	130
10	3/20/2006	250
11	6/20/2006	280
12	9/18/2006	370
13	12/11/2006	340
14	3/27/2007	290
15	6/11/2007	280
16	9/10/2007	**130**
17	12/11/2007	99
18	3/10/2008	140
19	10/15/2008	**6.5**
20	5/7/2009	75
21	10/19/2009	140
22	4/21/2010	29
23	10/6/2010	150
24	6/9/2011	90
25	10/4/2011	24
26	5/9/2012	47
27	10/11/2012	48
28	5/22/2013	55
29	10/17/2013	38
30		
Coefficient of Variation:		0.83
Mann-Kendall Statistic (S):		-46
Confidence Factor:		79.9%
Concentration Trend:		Stable



Notes:

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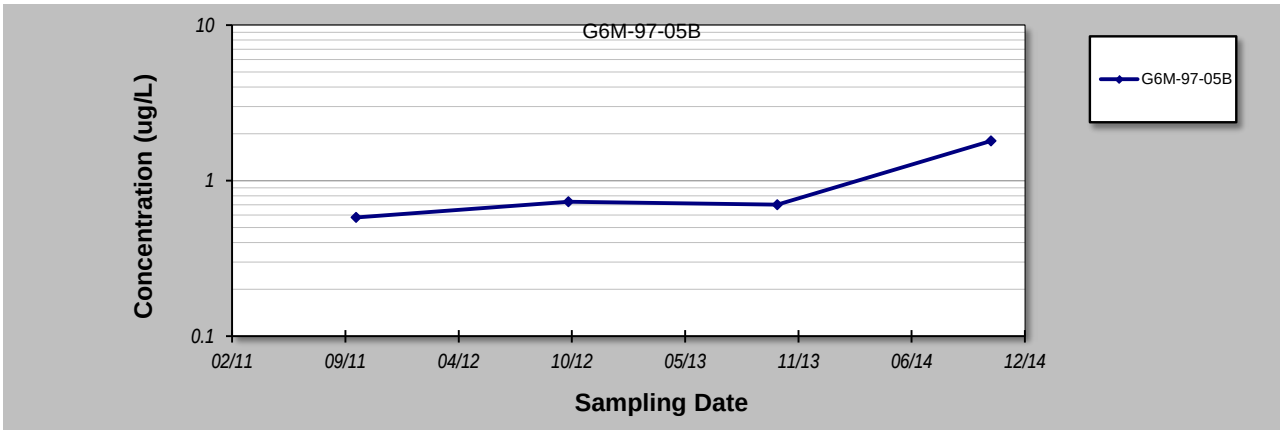
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-97-05B

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	10/3/2011	0.58
2	10/12/2012	0.73
3	10/16/2013	0.70
4	10/28/2014	1.80
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		**0.60**
Mann-Kendall Statistic (S):		**4**
Confidence Factor:		**83.3%**
Concentration Trend:		No Trend



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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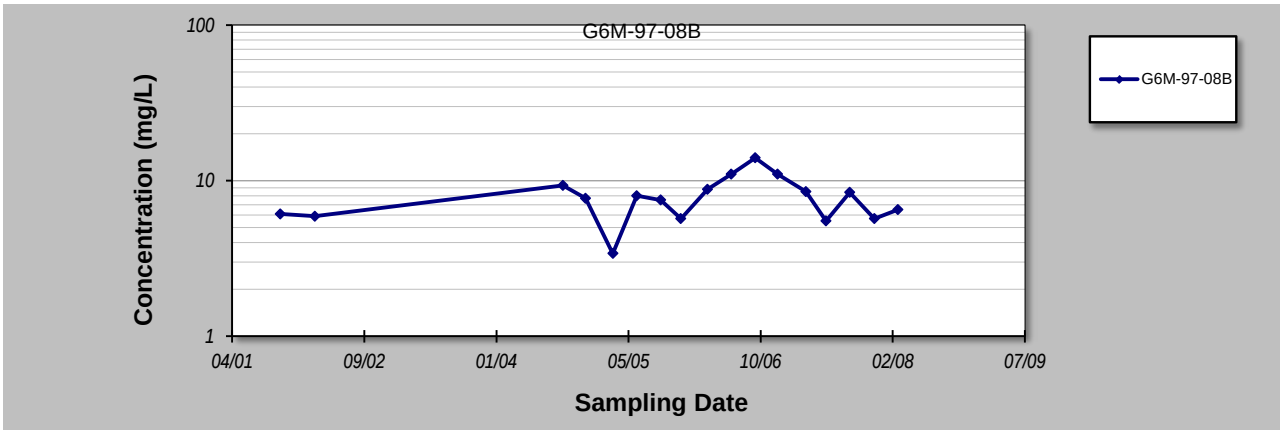
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: G6M-97-08B

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	10/18/2001	6.1
2	2/26/2002	5.9
3	9/22/2004	9.3
4	12/16/2004	7.7
5	3/30/2005	**3.4**
6	6/28/2005	8
7	9/27/2005	7.5
8	12/12/2005	5.7
9	3/23/2006	8.8
10	6/21/2006	11
11	9/19/2006	14
12	12/13/2006	11
13	3/30/2007	8.5
14	6/14/2007	5.5
15	9/12/2007	8.4
16	12/14/2007	**5.7**
17	3/12/2008	6.5
18		
19		
20		
Coefficient of Variation:		**0.33**
Mann-Kendall Statistic (S):		**8**
Confidence Factor:		**61.2%**
Concentration Trend:		No Trend



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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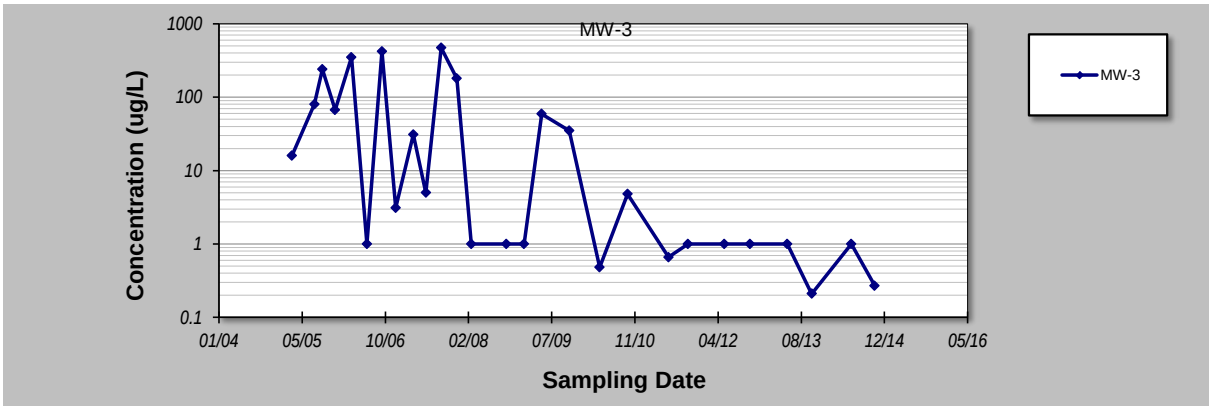
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: MW-3

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	3/28/2005	**16**
2	8/10/2005	80
3	9/27/2005	240
4	12/12/2005	67
5	3/20/2006	350
6	6/22/2006	**1**
7	9/20/2006	420
8	12/12/2006	3.1
9	3/27/2007	31
10	6/11/2007	5
11	9/11/2007	470
12	10/12/2007	-
13	12/13/2007	180
14	3/10/2008	**1**
15	10/6/2008	**1**
16	1/21/2009	**1**
17	5/7/2009	59
18	10/19/2009	35
19	4/20/2010	**0.48**
20	10/5/2010	4.8
21	6/8/2011	0.66
22	10/3/2011	**1**
23	5/8/2012	**1**
24	10/10/2012	**1**
25	5/21/2013	**1**
26	10/16/2013	**0.21**
27	6/11/2014	**1**
28	10/29/2014	**0.27**
29		
30		
Coefficient of Variation:		**1.87**
Mann-Kendall Statistic (S):		**-171**
Confidence Factor:		**>99.9%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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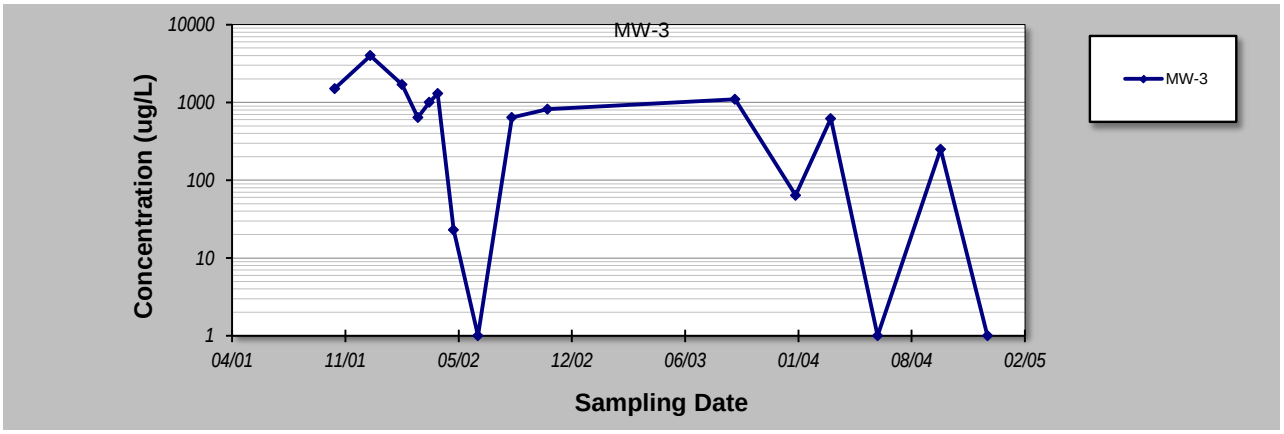
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: MW-3

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	10/17/2001	1,500
2	12/19/2001	4,000
3	1/3/2002	-
4	1/31/2002	-
5	2/13/2002	1,700
6	3/13/2002	640
7	4/2/2002	1,000
8	4/17/2002	1,300
9	5/15/2002	23
10	6/27/2002	**1**
11	7/31/2002	-
12	8/26/2002	640
13	10/28/2002	820
14	2/3/2003	2U
15	7/16/2003	2U
16	9/24/2003	1,100
17	1/9/2004	64
18	3/11/2004	620
19	6/2/2004	**1**
20	9/21/2004	250
21	12/13/2004	**1**
22		
23		
24		
25		
Coefficient of Variation:		**1.18**
Mann-Kendall Statistic (S):		**-64**
Confidence Factor:		**99.8%**
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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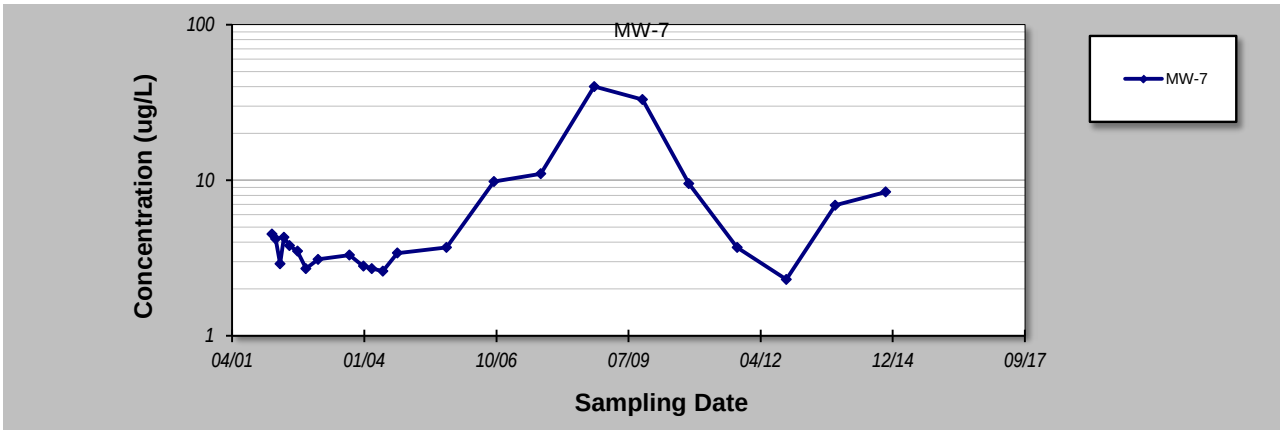
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **11-Jun-15**
Facility Name: **AOC 50 Devens**
Conducted By:

Job ID:
Constituent: **TCE**
Concentration Units: **ug/L**

Sampling Point ID: MW-7

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	2/14/2002	4.5
2	3/14/2002	4.2
3	4/17/2002	2.9
4	5/16/2002	4.3
5	6/27/2002	**3.8**
6	8/27/2002	3.5
7	10/30/2002	2.7
8	12/14/2002	-
9	1/30/2003	3.1
10	9/24/2003	3.3
11	1/8/2004	2.8
12	3/12/2004	2.7
13	6/3/2004	2.6
14	9/21/2004	3.4
15	9/27/2005	3.7
16	9/22/2006	9.8
17	9/11/2007	11
18	10/20/2008	40
19	10/19/2009	33
20	10/6/2010	9.5
21	10/6/2011	3.7
22	10/12/2012	2.3
23	10/17/2013	6.9
24	11/3/2014	8.4
25		
Coefficient of Variation:		**1.28**
Mann-Kendall Statistic (S):		**35**
Confidence Factor:		**81.3%**
Concentration Trend:		No Trend



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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APPENDIX K – Building 3713 Fuel Oil Spill Site

K.1 Building 3713

Fuel Oil Spill Site

Figures

Figure 10.1
Site Layout
Area of Contamination 57 - Area 2



Legend

- Monitoring Well
- Well Point
- Piezometer - Abandoned
- Piezometer - Presumed Destroyed
- Staff Gauge
- Former Surface Water Sample Location
- Sump
- 57M-03-06X — Well/Piezometer/Sump/Sample Location Identification
- Final Excavation Limit (2003)
- Continued Excavation Limit (2002)
- Former Fort Devens Boundary
- Flagged Wetland Limits
- Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on Fall 2003 to Spring 2011 analytical data)
- Containment Dam
- Area of Contamination (AOC)

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five Year Review
AOC 57 - Area 2

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 30 60
Feet

Date: 04/14/2015

Figure 10.1

H&S

Figure 10.2
Site Layout
Area of Contamination 57 - Area 3



Legend

- LTM Sample Well
- LTM Well - Gauge Only
- Well Point - Gauge Only
- LTM Piezometer
- Former Surface Water Sample Location
- ⊕ Monitoring Well - Abandoned (2012)
- ⊠ Monitoring Well - Destroyed
- 57M-95-03X — Well/Piezometer/Sample Location Identification
- Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on Fall 2003 to Spring 2011 analytical data)
- Area of Contamination (AOC)/ 1999 Excavation Area
- Alternate III-2a Estimated Soil Excavation Area (approximate location)

Notes:
Well 57M-96-09X buried by construction.

LTM = Long-term monitoring

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five Year Review
AOC 57 - Area 3

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

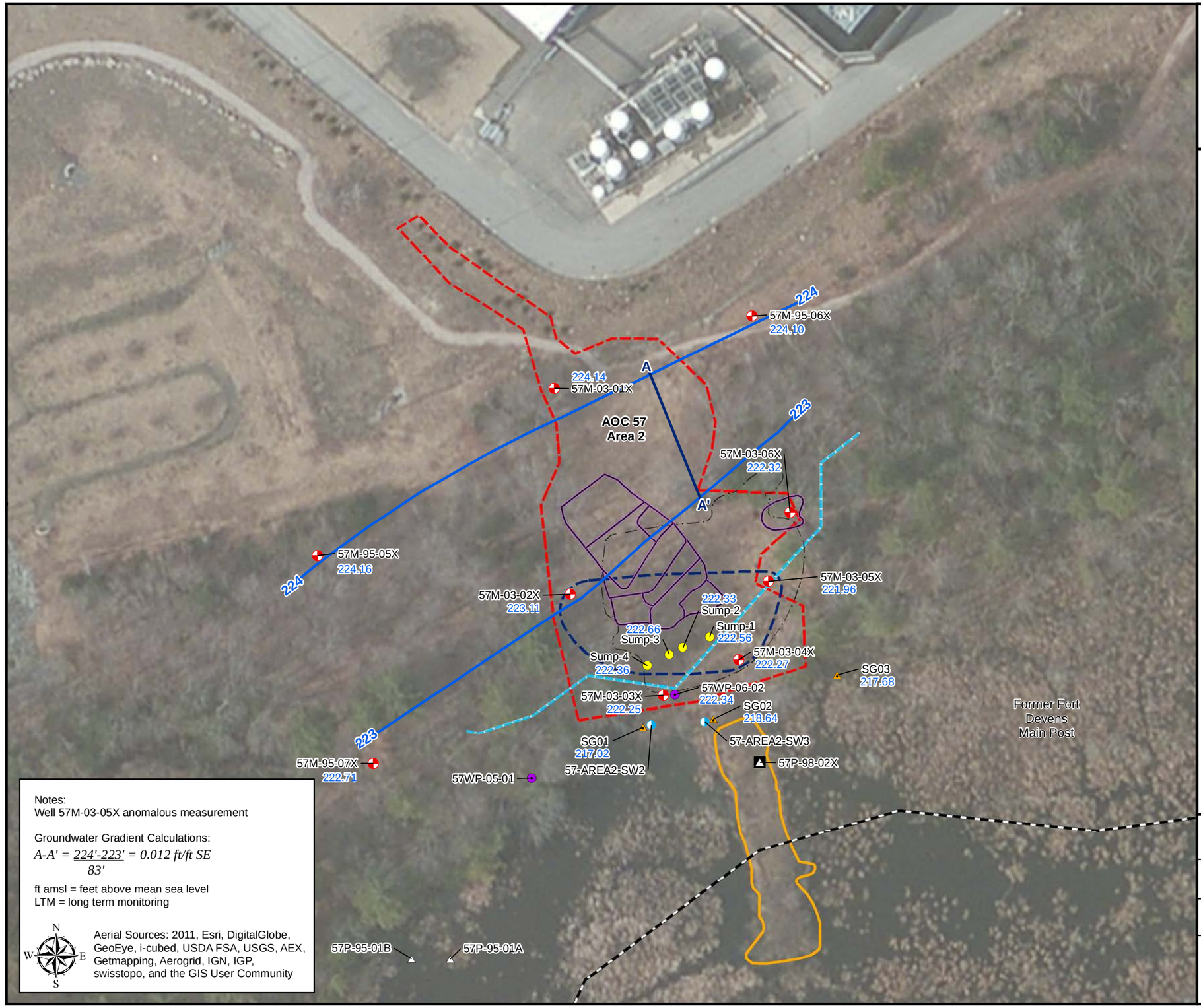
0 30 60
Feet

Date: 04/14/2015

Figure 10.2

H&S

Figure 10.3
Interpretive Water Table Elevation
Area of Contamination 57 - Area 2
June 2013



Notes:
Well 57M-03-05X anomalous measurement

Groundwater Gradient Calculations:

$$A\text{-}A' = \frac{224'\text{-}223'}{83'} = 0.012 \text{ ft/ft SE}$$

ft amsl = feet above mean sea level
LTM = long term monitoring

N W E S

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- Monitoring Well
- Well Point
- Piezometer - Abandoned
- Piezometer - Presumed Destroyed
- Staff Gauge
- Former Surface Water Sample Location
- Sump
- 57M-03-06X — Well/Piezometer/Sump/Sample Location Identification
- 222.32 — Groundwater Elevation (ft amsl)
- 224 — Groundwater Elevation Contour (ft amsl) (contour interval = 1 ft)
- A—A' — Groundwater Gradient Calculation Location
- Final Excavation Limit (2003)
- Conti Excavation Limit (2002)
- Former Fort Devens Boundary
- Flagged Wetland Limits
- Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on Fall 2003 to Spring 2011 analytical data)
- Containment Dam
- Area of Contamination (AOC)

References:
HGL. LTMMP 2012.

2015 Five Year Review
AOC 57 - Area 2

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

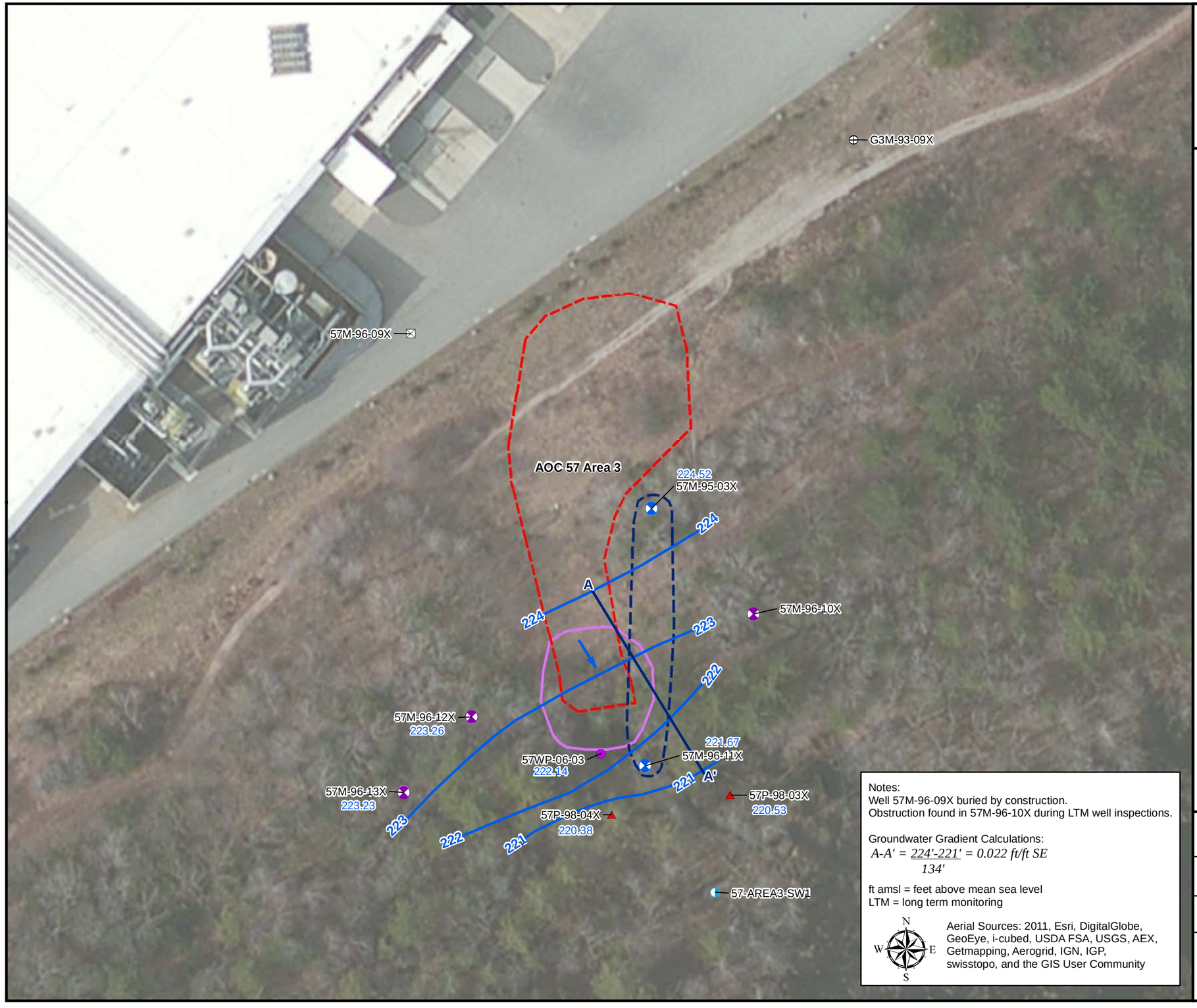
0 30 60
Feet

Date: 04/14/2015

Figure 10.3

H&S

Figure 10.4
Interpretive Water Table Elevation
Area of Contamination 57 - Area 3
June 2013



Notes:
Well 57M-96-09X buried by construction.
Obstruction found in 57M-96-10X during LTM well inspections.

Groundwater Gradient Calculations:

$$A\text{-}A' = \frac{224' - 221'}{134'} = 0.022\ ft/ft\ SE$$

ft amsl = feet above mean sea level
LTM = long term monitoring

N
W E
S

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- LTM Sample Well
- LTM Well - Gauge Only
- Well Point - Gauge Only
- LTM Piezometer
- Former Surface Water Sample Location
- ⊕ Monitoring Well - Abandoned (2012)
- ☒ Monitoring Well - Destroyed
- 57M-95-03X — Well/Piezometer/Sample Location Identification
- 223.26 — Groundwater Elevation (ft amsl)
- 222 — Groundwater Elevation Contour (ft amsl) (contour interval = 1 ft)
- Groundwater Flow Direction
- A — A' Groundwater Gradient Calculation Location
- Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on Fall 2003 to Spring 2011 analytical data)
- Area of Contamination (AOC)/ 1999 Excavation Area
- Alternate III-2a Estimated Soil Excavation Area (approximate location)

2015 Five Year Review
AOC 57 - Area 3

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

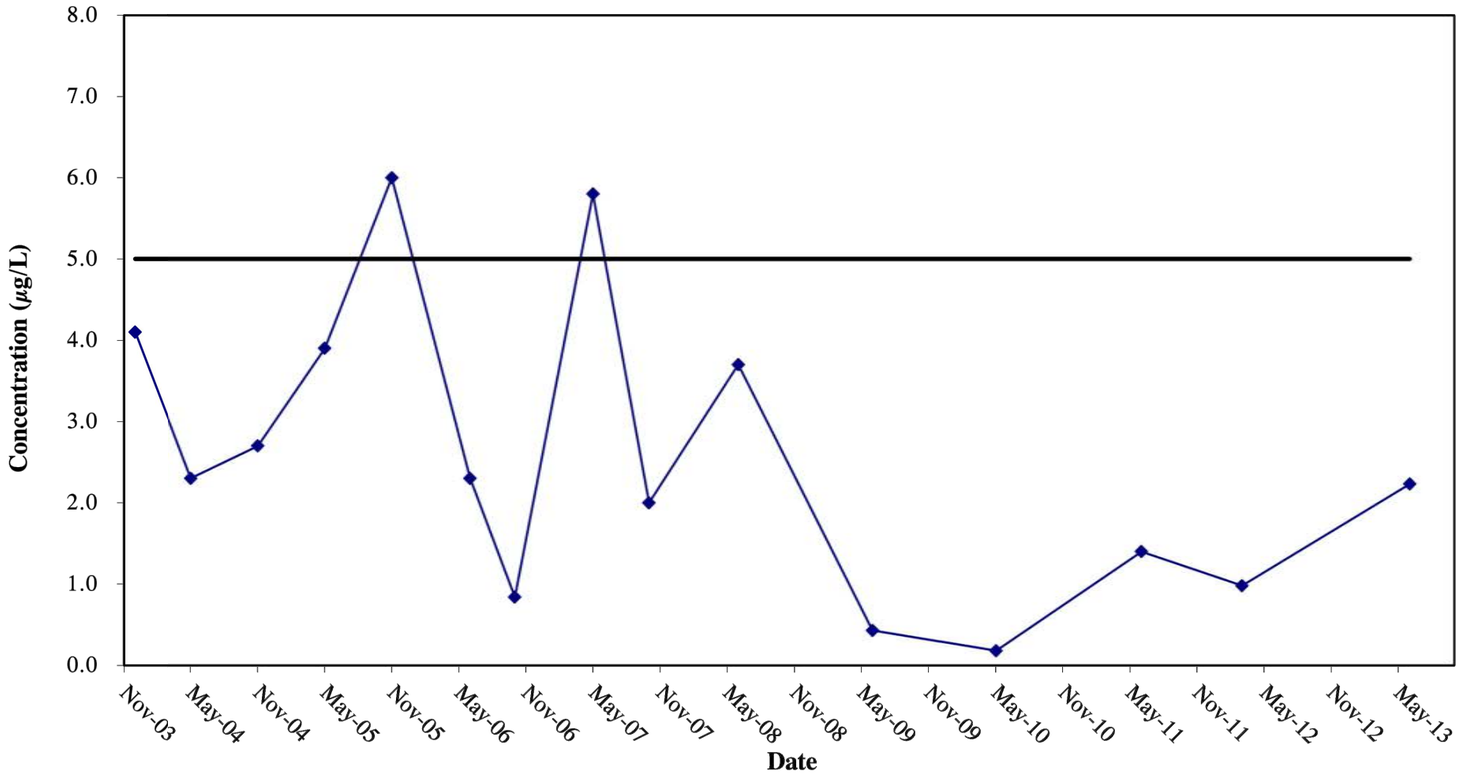
0 30 60
Feet

Date: 04/14/2015

Figure 10.4

H&S

Figure 10.5
Long-Term Trends
Tetrachloroethene
Area of Contamination 57 - Area 2



The "0" values represented on the graph are non-detects due to the MDL data not being available.

2015 Five Year Review
AOC 57

Former Fort Devens Army Installation and Sudbury Annex
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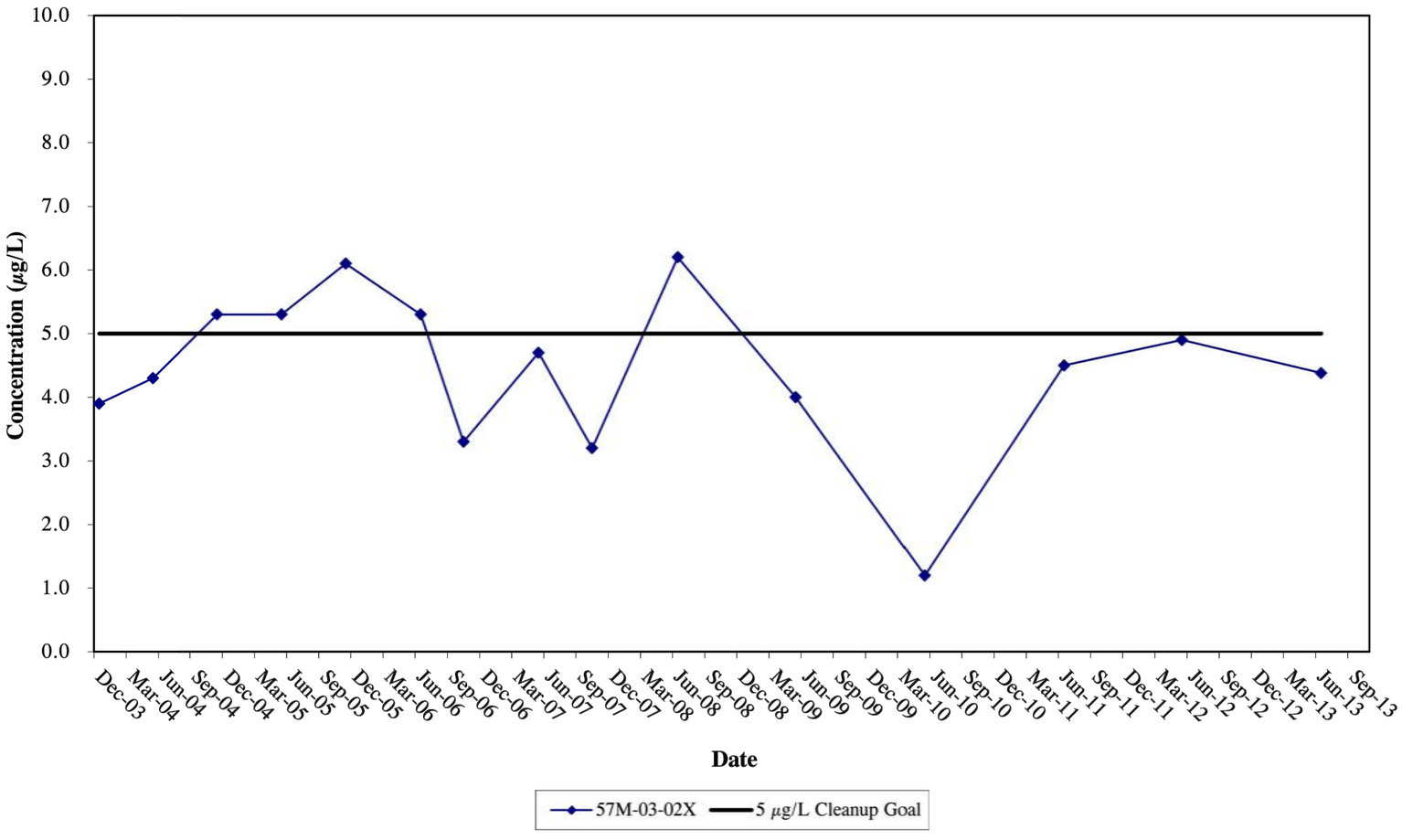
Date:	Figure
04/14/2015	10.5

Figure 10.6
Long-Term Trends
Trichloroethene
Area of Contamination 57 - Area 2



2015 Five Year Review
AOC 57

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental, Inc.
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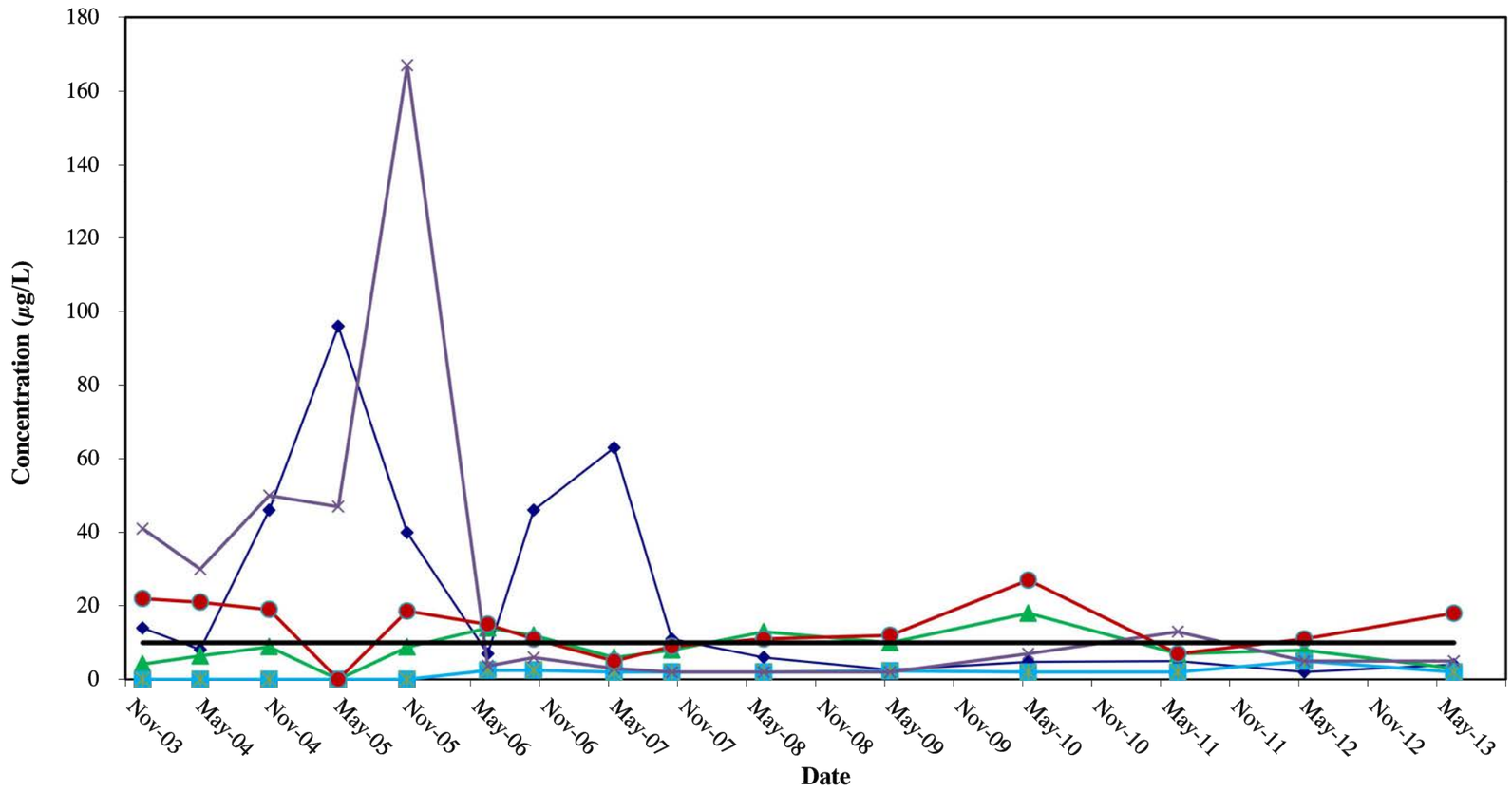
Date:	Figure
04/14/2015	10.6

Figure 10.7
Long-Term Trends
Arsenic
Area of Contamination 57 - Area 2



The "0" values represented on the graph are non-detects due to the MDL data not being available.

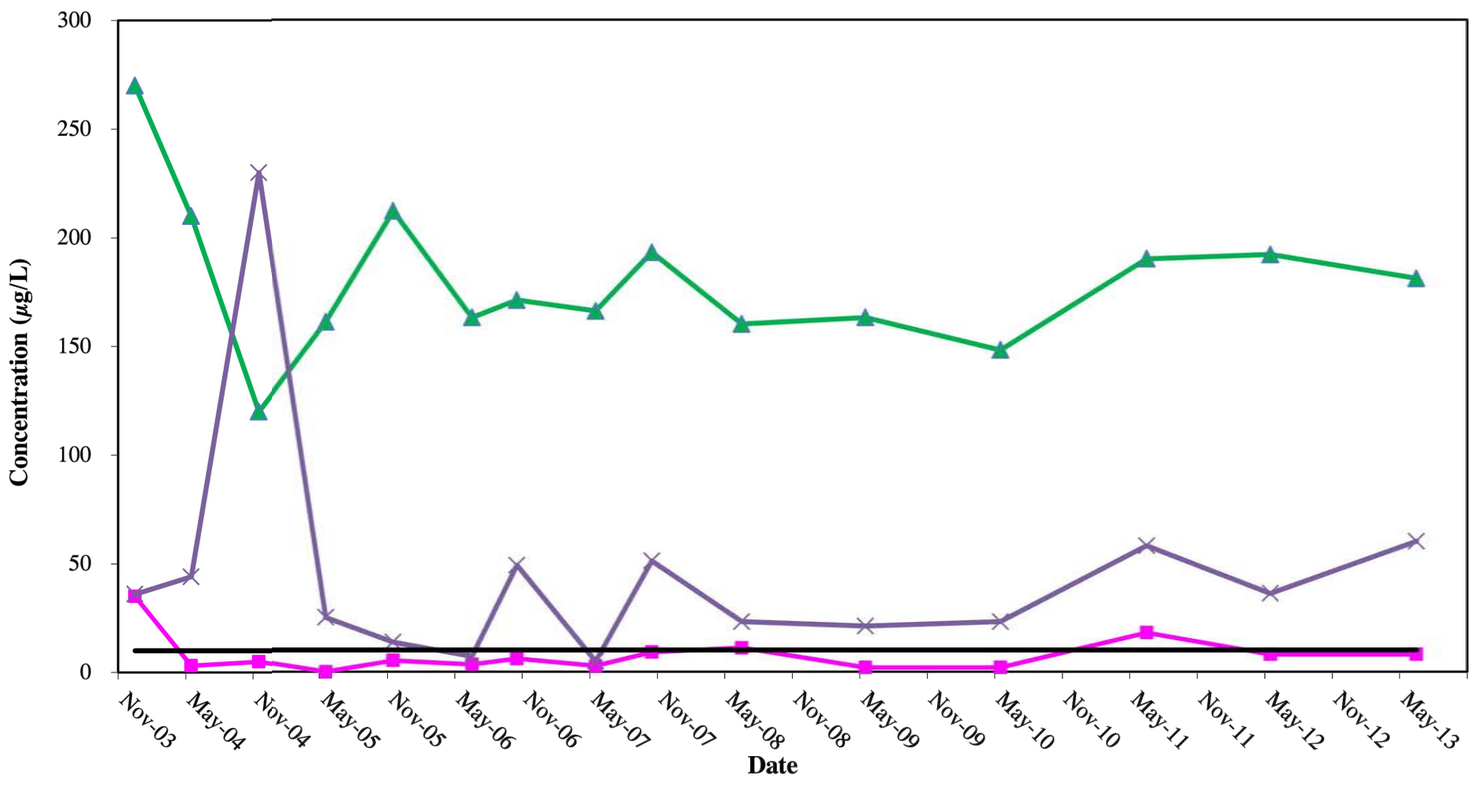
2015 Five Review Review
AOC 57

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental, Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

Date:	Figure
04/14/2015	10.7

Figure 10.8
Long-Term Trends
Arsenic
Area of Contamination 57 - Area 3



The "0" values represented on the graph are non-detects due to the MDL data not being available.

2015 Five Year Review
AOC 57

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

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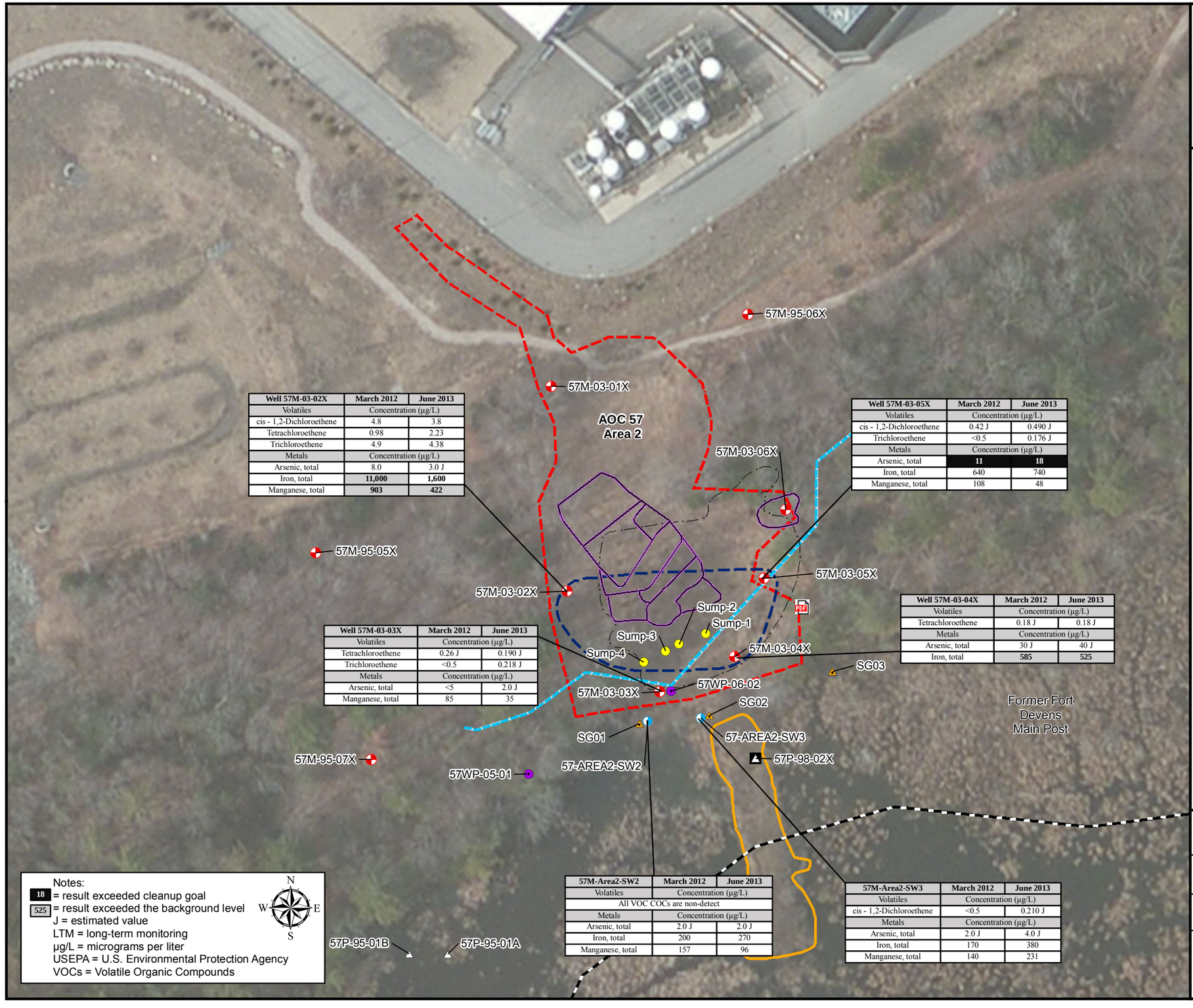
160 East Main Street, Suite 2F, Westborough, MA 01581

Date:	Figure
04/14/2015	10.8

Figure 10.9
VOCs and Metals Concentrations in Groundwater and Surface Water
Area of Contamination 57 - Area 2
May 2012 and June 2013



Well 57M-03-02X	March 2012	June 2013
Volatiles	Concentration (µg/L)	
cis - 1,2-Dichloroethene	4.8	3.8
Tetrachloroethene	0.98	2.23
Trichloroethene	4.9	4.38
Metals	Concentration (µg/L)	
Arsenic, total	8.0	3.0 J
Iron, total	**11,000**	**1,600**
Manganese, total	**903**	**422**

Well 57M-03-05X	March 2012	June 2013
Volatiles	Concentration (µg/L)	
cis - 1,2-Dichloroethene	0.42 J	0.490 J
Trichloroethene	<0.5	0.176 J
Metals	Concentration (µg/L)	
Arsenic, total	**11**	**18**
Iron, total	640	740
Manganese, total	108	48

Well 57M-03-03X	March 2012	June 2013
Volatiles	Concentration (µg/L)	
Tetrachloroethene	0.26 J	0.190 J
Trichloroethene	<0.5	0.218 J
Metals	Concentration (µg/L)	
Arsenic, total	<5	2.0 J
Manganese, total	85	35

Well 57M-03-04X	March 2012	June 2013
Volatiles	Concentration (µg/L)	
Tetrachloroethene	0.18 J	0.18 J
Metals	Concentration (µg/L)	
Arsenic, total	30 J	40 J
Iron, total	**585**	**525**

57M-Area2-SW2	March 2012	June 2013
Volatiles	Concentration (µg/L)	
All VOC COCs are non-detect		
Metals	Concentration (µg/L)	
Arsenic, total	2.0 J	2.0 J
Iron, total	200	270
Manganese, total	157	96

57M-Area2-SW3	March 2012	June 2013
Volatiles	Concentration (µg/L)	
cis - 1,2-Dichloroethene	<0.5	0.210 J
Metals	Concentration (µg/L)	
Arsenic, total	2.0 J	4.0 J
Iron, total	170	380
Manganese, total	140	231

Notes:
18 = result exceeded cleanup goal
525 = result exceeded the background level
J = estimated value
LTM = long-term monitoring
µg/L = micrograms per liter
USEPA = U.S. Environmental Protection Agency
VOCs = Volatile Organic Compounds

N W E S

Legend

- Monitoring Well
- Well Point
- Piezometer - Abandoned
- Piezometer - Presumed Destroyed
- Staff Gauge
- Former Surface Water Sample Location
- Sump
- 57M-03-06X — Well/Piezometer/Sump/Sample Location Identification
- Final Excavation Limit (2003)
- Conti Excavation Limit (2002)
- Former Fort Devens Boundary
- Flagged Wetland Limits
- Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on Fall 2003 to Spring 2011 analytical data)
- Containment Dam
- Area of Contamination (AOC)

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five Year Review
AOC 57 Area 2

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

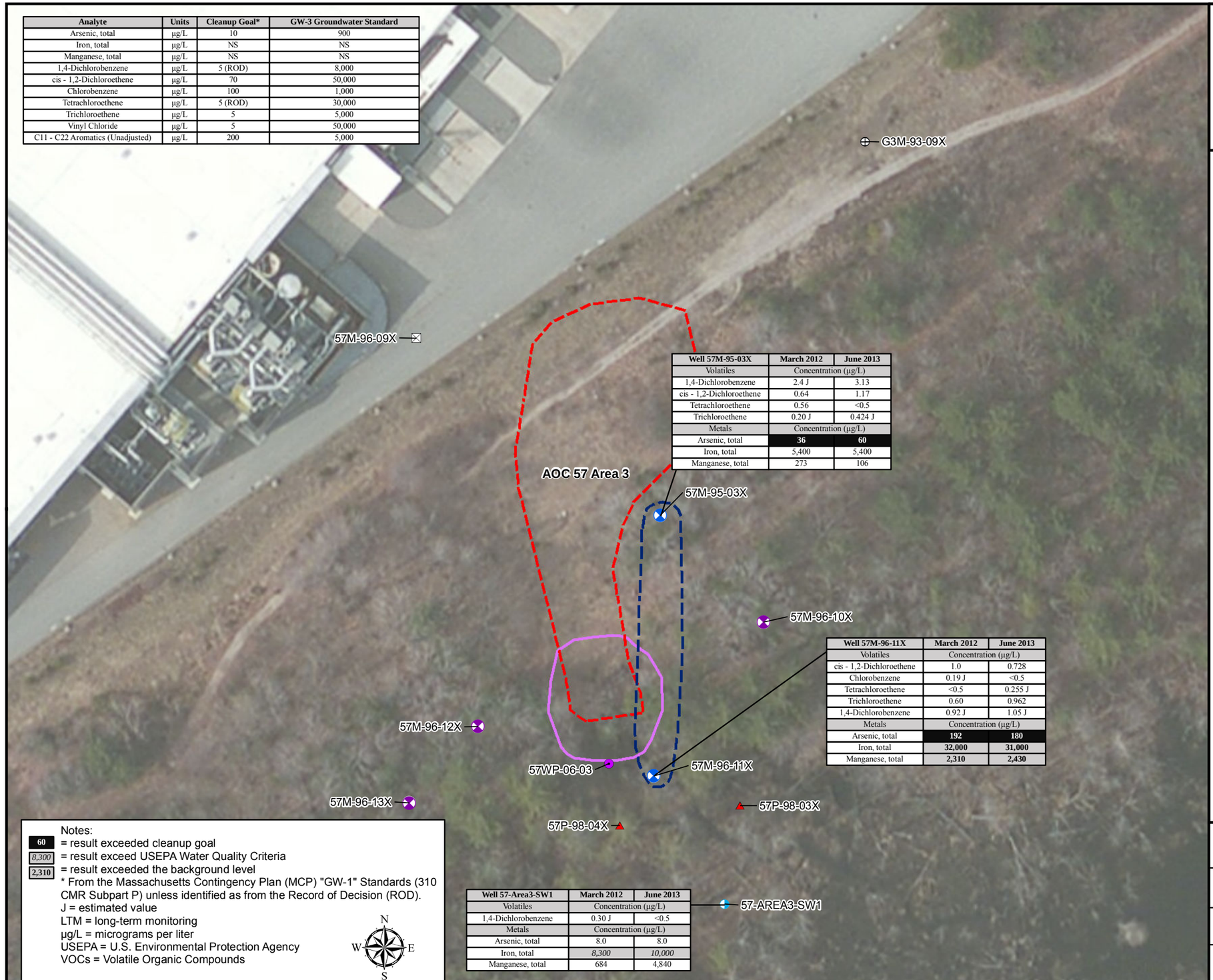
0 30 60
Feet

Date: 04/14/2015

Figure 10.9

Figure 10.10
VOCs and Metals Concentrations in Groundwater and Surface Water
Area of Contamination 57 - Area 3
May 2012 and June 2013

Analyte	Units	Cleanup Goal*	GW-3 Groundwater Standard
Arsenic, total	µg/L	10	900
Iron, total	µg/L	NS	NS
Manganese, total	µg/L	NS	NS
1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000
cis - 1,2-Dichloroethene	µg/L	70	50,000
Chlorobenzene	µg/L	100	1,000
Tetrachloroethene	µg/L	5 (ROD)	30,000
Trichloroethene	µg/L	5	5,000
Vinyl Chloride	µg/L	5	50,000
C11 - C22 Aromatics (Unadjusted)	µg/L	200	5,000



Well 57M-95-03X	March 2012	June 2013
Volatiles	Concentration (µg/L)	
1,4-Dichlorobenzene	2.4 J	3.13
cis - 1,2-Dichloroethene	0.64	1.17
Tetrachloroethene	0.56	<0.5
Trichloroethene	0.20 J	0.424 J
Metals	Concentration (µg/L)	
Arsenic, total	**36**	**60**
Iron, total	5,400	5,400
Manganese, total	273	106

Well 57M-96-11X	March 2012	June 2013
Volatiles	Concentration (µg/L)	
cis - 1,2-Dichloroethene	1.0	0.728
Chlorobenzene	0.19 J	<0.5
Tetrachloroethene	<0.5	0.255 J
Trichloroethene	0.60	0.962
1,4-Dichlorobenzene	0.92 J	1.05 J
Metals	Concentration (µg/L)	
Arsenic, total	**192**	**180**
Iron, total	**32,000**	**31,000**
Manganese, total	**2,310**	**2,430**

Well 57-Area3-SW1	March 2012	June 2013
Volatiles	Concentration (µg/L)	
1,4-Dichlorobenzene	0.30 J	<0.5
Metals	Concentration (µg/L)	
Arsenic, total	8.0	8.0
Iron, total	*8,300*	*10,000*
Manganese, total	684	4,840

Notes:
60 = result exceeded cleanup goal
8,300 = result exceed USEPA Water Quality Criteria
2,310 = result exceeded the background level
* From the Massachusetts Contingency Plan (MCP) "GW-1" Standards (310 CMR Subpart P) unless identified as from the Record of Decision (ROD).
J = estimated value
LTM = long-term monitoring
µg/L = micrograms per liter
USEPA = U.S. Environmental Protection Agency
VOCs = Volatile Organic Compounds

N W E S

Legend

- LTM Sample Well
- LTM Well - Gauge Only
- Well Point - Gauge Only
- LTM Piezometer
- Former Surface Water Sample Location
- Monitoring Well - Abandoned (2012)
- Monitoring Well - Destroyed
- 57M-95-03X — Well/Piezometer/Sample Location Identification
- Approximate Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (based on Fall 2003 to Spring 2011 analytical data)
- Area of Contamination (AOC)/ 1999 Excavation Area
- Alternate III-2a Estimated Soil Excavation Area (approximate location)

References:
HGL. LTMMP 2012.

Aerial Sources: 2011, Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2015 Five Year Review
AOC 57 Area 3

Former Fort Devens Army Installation and Sudbury Annex
Devens, Massachusetts

H & S Environmental , Inc.
160 East Main Street, Suite 2F, Westborough, MA 01581

0 30 60 Feet

Date: 04/14/2015

Figure 10.10

H&S

K.2 Building 3713

Fuel Oil Spill Site

Tables

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2010

						AREA 2									
Groundwater Analytical Results	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-03-02X**	**Qual**	**57M-03-02X Duplicate**	**Qual**	**57M-03-03X**	**Qual**	**57M-03-04X**	**Qual**	**57M-03-05X**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	**18**		NA		5	U	7		**27**	
	Iron, Total	µg/L	NS	NS	9,100	**37,000**		NA		50	U	230		1,200	
	Manganese, Total	µg/L	NS	NS	291	**2,450**		NA		47		**3,210**		221	
VOCs (8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.5	U	NA		2.5	U	0.25	J	2.5	U
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	13.0		NA		0.50	U	0.38	J	0.76	
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	NA		0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.50	U	NA		0.86		0.37	J	0.50	U
	Trichloroethene	µg/L	5	5,000	NS	1.2		NA		0.50	U	0.31	J	0.21	J
	Vinyl Chloride	µg/L	2	50,000	NS	1.0	U	NA		1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	100	U	100	U	100	U	100	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	NS	11.9		NA		11.5		13.5		14.6	
	Temperature, final	°C	NS	NS	NS	11.3		NA		11.1		12.4		12.5	
	ORP	mV	NS	NS	NS	-261.1		NA		-67.2		-163.5		-109.5	
	pH	standard units	NS	NS	NS	6.46		NA		5.57		6.2		5.72	
	Specific Conductance	µS/cm	NS	NS	NS	191		NA		450		658		328	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.26		NA		1.31		0.28		0.30	
	Turbidity	NTU	NS	NS	NS	4.42		NA		3.8		4.1		4.34	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] GW-3 standard effective June 26, 2009

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2010

						AREA 3					
Groundwater Analytical Results	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-95-03X**	**Qual**	**57M-96-11X**	**Qual**	**57M-96-11X Duplicate**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	**23**		**148**		**146**	
	Iron, Total	µg/L	NS	NS	9,100	2,400		**28,000**		**28,000**	
	Manganese, Total	µg/L	NS	NS	291	155		**2,100**		**2,090**	
VOCs (8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	1.4	J	2.1	J	2.0	J
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	0.67		1.7		1.7	
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.40	J	0.52		0.53	
	Trichloroethene	µg/L	5	5,000	NS	0.50	U	1.6		1.6	
	Vinyl Chloride	µg/L	2	50,000	NS	1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	NA		NA		NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	10.22		13.05		NA	
	Temperature, final	°C	NS	NS	NS	9.77		11.74		NA	
	ORP	mV	NS	NS	NS	-282.4		-268.1		NA	
	pH	standard units	NS	NS	NS	6.7		6.91		NA	
	Specific Conductance	µS/cm	NS	NS	NS	209		167		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.42		0.28		NA	
	Turbidity	NTU	NS	NS	NS	4.85		1.88		NA	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] GW-3 standard effective June 26, 2009

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2011

						AREA 2									
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-03-02X**	**Qual**	**57M-03-02X Duplicate**	**Qual**	**57M-03-03X**	**Qual**	**57M-03-04X**	**Qual**	**57M-03-05X**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	7		NA		5	U	**13**		7	
	Iron, Total	µg/L	NS	NS	9,100	**10,000**		NA		140	U	620		440	
	Manganese, Total	µg/L	NS	NS	291	**2,840**		NA		129		**2,230**		177	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.5	U	NA		2.5	U	2.5	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	7.3		NA		0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	NA		0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	1.4		NA		0.84		0.50	U	0.50	U
	Trichloroethene	µg/L	5	5,000	NS	4.5		NA		0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	0.59	J	NA		1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	100	UJ	100	UJ	100	UJ	100	UJ	100	UJ
Field Parameter	Temperature, initial	°C	NS	NS	NS	14.0		NA		12.3		13.94		15.17	
	Temperature, final	°C	NS	NS	NS	14.2		NA		13.8		13.98		15.02	
	ORP	mV	NS	NS	NS	157.8		NA		297.6		304.0		312.7	
	pH	standard units	NS	NS	NS	5.26		NA		5.13		4.93		2.77	
	Specific Conductance	µS/cm	NS	NS	NS	117		NA		1,060		303.2		308	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.46		NA		2.82		5.08		4.07	
	Turbidity	NTU	NS	NS	NS	2.58		NA		4.4		3.38		1.78	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this sec

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2011

						AREA 3					
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-95-03X**	**Qual**	**57M-96-11X**	**Qual**	**57M-96-11X Duplicate**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	**58**		**190**		**184**	
	Iron, Total	µg/L	NS	NS	9,100	6,100		**31,000**		**30,000**	
	Manganese, Total	µg/L	NS	NS	291	153		**2,190**		**2,190**	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	**5.1**		2.3	J	2.3	J
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	1.1		1.6		1.5	
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	1.0		0.36	J	0.37	J
	Trichloroethene	µg/L	5	5,000	NS	0.33	J	1.4		1.4	
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	NA		NA		NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	12.93		14.53		NA	
	Temperature, final	°C	NS	NS	NS	11.62		13.41		NA	
	ORP	mV	NS	NS	NS	-72		-3.5		NA	
	pH	standard units	NS	NS	NS	6.18		5.92		NA	
	Specific Conductance	µS/cm	NS	NS	NS	389		150		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.53		0.32		NA	
	Turbidity	NTU	NS	NS	NS	0		0		NA	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this sec

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2012

						AREA 2									
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-03-02X**	**Qual**	**57M-03-02X Duplicate**	**Qual**	**57M-03-03X**	**Qual**	**57M-03-04X**	**Qual**	**57M-03-05X**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	8		NA		5.0	U	5.0	U	**11**	
	Iron, Total	µg/L	NS	NS	9,100	**11,000**				170		30	J	640	
	Manganese, Total	µg/L	NS	NS	291	**903**				85		**585**		108	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.5	U	NA		2.5	U	2.5	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	4.8				0.50	U	0.50	U	0.42	J
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U			0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.98				0.26	J	0.18	J	0.50	U
	Trichloroethene	µg/L	5	5,000	NS	4.9				0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	1.0	U			1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	100	U	100	U	100	U	100	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	NS	10.93		NA		11.79		12.58		11.16	
	Temperature, final	°C	NS	NS	NS	11.12				11.65		12.62		10.97	
	ORP	mV	NS	NS	NS	26.9				124.6		118.5		169.2	
	pH	standard units	NS	NS	NS	5.85				5.74		5.81		5.66	
	Specific Conductance	µS/cm	NS	NS	NS	155				1,115		1,008		539	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.51				5.44		3.42		1.31	
	Turbidity	NTU	NS	NS	NS	3.14				1.39		0.83		4.33	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2012

						AREA 3					
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-95-03X**	**Qual**	**57M-96-11X**	**Qual**	**57M-96-11X Duplicate**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	**36**		**192**		**166**	
	Iron, Total	µg/L	NS	NS	9,100	5,400		**32,000**		**29,000**	
	Manganese, Total	µg/L	NS	NS	291	273		**2,310**		**2,330**	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.4	J	0.92	J	0.39	J
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	0.64		1.0		0.83	J
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	0.19	J	0.50	UJ
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.56		0.50	U	0.50	UJ
	Trichloroethene	µg/L	5	5,000	NS	0.20	J	0.60		0.30	J
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	1.0	U	1.0	U	1.0	UJ
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	NA		NA		NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	9.75		11.61		NA	
	Temperature, final	°C	NS	NS	NS	9.48		11.72			
	ORP	mV	NS	NS	NS	-42.6		-79.8			
	pH	standard units	NS	NS	NS	6.42		6.37			
	Specific Conductance	µS/cm	NS	NS	NS	487		165			
	Dissolved Oxygen	mg/L	NS	NS	NS	0.21		0.22			
	Turbidity	NTU	NS	NS	NS	1.65		1.87			

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2013

						AREA 2									
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-03-02X**	**Q**	**57M-03-02X Duplicate**	**Q**	**57M-03-03X**	**Q**	**57M-03-04X**	**Q**	**57M-03-05X**	**Q**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	3.0	J	NA		2.0	J	5.0	U	**18**	
	Iron, Total	µg/L	NS	NS	9,100	1,600				50	U	40	J	740	
	Manganese, Total	µg/L	NS	NS	291	**422**				35		**525**		48	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.5	U	NA		2.5	U	2.5	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	3.77				0.50	U	0.50	U	0.490	J
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U			0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	2.23				0.190	J	0.50	U	0.50	U
	Trichloroethene	µg/L	5	5,000	NS	4.38				0.218	J	0.50	U	0.176	J
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	1.0	U			1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	100	U	100	U	100	U	100	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	NS	13.42		NA		11.27		11.09		11.93	
	Temperature, final	°C	NS	NS	NS	13.11				11.18		11.00		11.89	
	ORP	mV	NS	NS	NS	150.8				322.1		245.4		177.2	
	pH	standard units	NS	NS	NS	5.07				5.32		5.87		5.37	
	Specific Conductance	µS/cm	NS	NS	NS	42				467		621		218	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.85				2.28		4.04		0.78	
	Turbidity	NTU	NS	NS	NS	2.75				0.59		0.63		3.12	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.9
Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2013

						AREA 3					
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-95-03X**	**Q**	**57M-96-11X**	**Q**	**57M-96-11X Duplicate**	**Q**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	**60**		**181**		**172**	
	Iron, Total	µg/L	NS	NS	9,100	5,400		**31,000**		**31,000**	
	Manganese, Total	µg/L	NS	NS	291	106		**2,430**		**2,160**	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	3.13		1.05	J	1.04	J
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	1.17		0.728		0.709	
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.50	U	0.255	J	0.262	J
	Trichloroethene	µg/L	5	5,000	NS	0.424	J	0.962		0.928	
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	NA		NA		NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	11.54		10.72			
	Temperature, final	°C	NS	NS	NS	10.3		10.36			
	ORP	mV	NS	NS	NS	-64.2		-90.4			
	pH	standard units	NS	NS	NS	6.5		6.58		NA	
	Specific Conductance	µS/cm	NS	NS	NS	310		155			
	Dissolved Oxygen	mg/L	NS	NS	NS	0.68		0.38			
	Turbidity	NTU	NS	NS	NS	1.97		44.70			

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.2
Groundwater Analytical Results
Area of Concern 57 - Areas 2 and 3
June 2014

						AREA 2							
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-03-02X**	**Q**	**57M-03-03X**	**Q**	**57M-03-04X**	**Q**	**57M-03-05X**	**Q**
Metals (SW6010C)	Arsenic, Total	µg/L	10	900	10.5	5.0	U	5.0		5.0	U	15	
	Iron, Total	µg/L	NS	NS	9,100	3,000		50		20	J	750	
	Manganese, Total	µg/L	NS	NS	291	476		30		165		43	
VOCs (SW8260C)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.5	U	2.5	U	2.5	U	2.5	U
	cis-1,2-Dichloroethene	µg/L	70	50,000	NS	4.11		0.5	U	0.5	U	0.5	U
	Chlorobenzene	µg/L	100	1,000	NS	0.5	U	0.5	U	0.5	U	0.5	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	1.18		0.5	U	0.5	U	0.5	U
	Trichloroethene	µg/L	5	5,000	NS	4.19	J	0.5	U	1.0	U	1.0	U
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	0.763	J	1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	100	U	100	U	100	U	100	U
Field Parameters	Temperature, Initial	°Celcius	NS	NS	NS	13.16		12.53		11.98		15.79	
	Temperature, Final	°Celcius	NS	NS	NS	13.38		10.83		11.49		14.63	
	ORP	mV	NS	NS	NS	150.6		193.7		188.6		208.7	
	pH	Std Units	NS	NS	NS	5.47		6.04		5.36		5.53	
	Specific Conductance	µS/cm	NS	NS	NS	110		384.0		376		178	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.41		1.54		1.77		0.34	
	Turbidity	NTU	NS	NS	NS	17.5		4.77		0.96		5.98	

Notes:

0.333 = Cleanup goal exceedance

0.716 = Detected result above GW-3 Standard and/or Background

NS - No standard

NA - Not analyzed

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on April 2014

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.2
Groundwater Analytical Results
Area of Concern 57 - Areas 2 and 3
June 2014

						AREA 3					
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-95-03X**	**Q**	**57M-96-11X**	**Q**	**57M-DUP2 (57M-96-11X Duplicate)**	**Q**
Metals (SW6010C)	Arsenic, Total	µg/L	10	900	10.5	60		160		155	
	Iron, Total	µg/L	NS	NS	9,100	5,400		30,000		28,000	
	Manganese, Total	µg/L	NS	NS	291	106		2,790		2,640	
VOCs (SW8260C)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	3.27		1.22		1.26	J
	cis-1,2-Dichloroethene	µg/L	70	50,000	NS	0.85		0.67		0.704	
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	0.20		0.23	J
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.50	U	0.26		0.262	J
	Trichloroethene	µg/L	5	5,000	NS	0.424	J	0.80		0.809	2.9
	Vinyl Chloride	µg/L	2 (ROD)	50,000	NS	1.0	U	1.0		1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	100	U	100	U	100	U
Field Parameters	Temperature, Initial	°Celcius	NS	NS	NS	10.75		10.96		40	
	Temperature, Final	°Celcius	NS	NS	NS	11.42		11.2		3	
	ORP	mV	NS	NS	NS	-57.3		-32.3		2.5	
	pH	Std Units	NS	NS	NS	6.72		6.52		2.5	
	Specific Conductance	µS/cm	NS	NS	NS	293.0		212.0		0.5	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.69		0.95		0.376	
	Turbidity	NTU	NS	NS	NS	10.88		13.6		5	

Notes:

0.333 = Cleanup goal exceedance

0.716 = Detected result above GW-3 Standard and/or Background

NS - No standard

NA - Not analyzed

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] The GW-3 standard was effective on April 2014

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 10.10
Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2010

Method	Analyte	Units	USEPA Water Quality Criteria *	57-AREA2-SW2	Qual	57-AREA2-SW2 Duplicate	Qual	57-AREA2-SW3	Qual	57-AREA3-SW1	Qual
Metals (SW6010B)	Arsenic, Dissolved	µg/L	150	2.4	J	5	U	4.8	J	5.0	U
	Iron, Dissolved	µg/L	1,000	**1,400**		**1,500**		150		240	
	Manganese, Dissolved	µg/L	NS	79		71		119		446	
VOCs (8260B)	1,4-Dichlorobenzene	µg/L	NS	2.5	U	2.5	U	2.5	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	NS	0.25	J	0.26	J	0.50	U	0.50	U
	Trichloroethene	µg/L	NS	0.50	U	0.50	U	0.17	J	0.50	U
	Vinyl Chloride	µg/L	NS	1.0	U	1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	NS	100	U	100	U	100	U	NA	
Field Parameters	Temperature, initial	°C	NS	NA		NA		NA		NA	
	Temperature, final	°C	NS	16.01		NA		22.04		19.81	
	ORP[1]	mV	NS	-132.5		NA		-114.90		-153.7	
	pH	standard units	NS	6.25		NA		6.50		6.67	
	Specific Conductance	µS/cm	NS	369		NA		469		131	
	Dissolved Oxygen	mg/L	NS	3.25		NA		8.89		2.58	
	Turbidity	NTU	NS	NA		NA		NA		NA	

Notes:
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.
* = Criterion Continuous Concentration
Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.
For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.
[1] The ORP value was not corrected to SHE.

Table 10.10
Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2011

Method	Analyte	Units	USEPA Water Quality Criteria *	57-AREA2-SW2	Qual	57-AREA2-SW2 Duplicate	Qual	57-AREA2-SW3	Qual	57-AREA3-SW1	Qual
Metals (SW6010B)	Arsenic, Dissolved	µg/L	150	3.0	J	5.0	U	5.0		18	
	Iron, Dissolved	µg/L	1,000	360	J	390		150		**20,000**	
	Manganese, Dissolved	µg/L	NS	109		112		115		2,430	
VOCs (8260B)	1,4-Dichlorobenzene	µg/L	NS	2.5	U	2.5	U	2.5	U	0.33	J
	cis -1,2-Dichloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.22	J
	Chlorobenzene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Trichloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	NS	1.0	U	1.0	U	1.0	U	0.50	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	NS	100	U	100	UJ	100	U	NA	
Field Parameters	Temperature, initial	°C	NS	NA		NA		NA		NA	
	Temperature, final	°C	NS	15.99		NA		24.30		21.19	
	ORP[1]	mV	NS	178.1		NA		127.50		-34	
	pH	standard units	NS	5.70		NA		6.40		6.53	
	Specific Conductance	µS/cm	NS	843		NA		377		228	
	Dissolved Oxygen	mg/L	NS	5.53		NA		7.09		2.7	
	Turbidity	NTU	NS	NA		NA		NA		NA	

Notes:
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.
* = Criterion Continuous Concentration
Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.
For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.
[1] The ORP value was not corrected to SHE.

Table 10.10
Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2012

Method	Analyte	Units	USEPA Water Quality Criteria *	57-AREA2-SW2	Qual	57-AREA2-SW2 Duplicate	Qual	57-AREA2-SW3	Qual	57-AREA3-SW1	Qual
Metals (SW6010B)	Arsenic, Dissolved	µg/L	150	2.0	J	5.0		2	J	8	
	Iron, Dissolved	µg/L	1,000	200		190		170		***8,300***	
	Manganese, Dissolved	µg/L	NS	157		148		140		684	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	NS	2.50	UJ	2.5	UJ	2.5	UJ	2.50	UJ
	cis -1,2-Dichloroethene	µg/L	NS	0.50	UJ	0.20	J	0.50	UJ	0.30	J
	Chlorobenzene	µg/L	NS	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ
	Tetrachloroethene	µg/L	NS	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ
	Trichloroethene	µg/L	NS	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ
	Vinyl Chloride	µg/L	NS	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	NS	100	U	100	U	100	U	NA	
Field Parameters	Temperature, initial	°C	NS	NA		NA		NA		NA	
	Temperature, final	°C	NS	17.68				16.83		16.23	
	ORP[1]	mV	NS	24.4				-79.70		-77.5	
	pH	standard units	NS	7.42				6.47		6.27	
	Specific Conductance	µS/cm	NS	277				435		172	
	Dissolved Oxygen	mg/L	NS	8.17				8.17		1.39	
	Turbidity	NTU	NS	1.54				2.13		NA	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

* = Criterion Continuous Concentration

Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.

For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.

[1] The ORP value was not corrected to SHE.

Table 10.10
Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2013

Method	Analyte	Units	USEPA Water Quality Criteria *	57-AREA2-SW2	Q	57-AREA2-SW2 Duplicate	Q	57-AREA2-SW3	Q	57-AREA3-SW1	Q
Metals (SW6010B)	Arsenic, Dissolved	µg/L	150	2.0	J	5.0		4	J	8	
	Iron, Dissolved	µg/L	1,000	270		290		380		***10,000***	
	Manganese, Dissolved	µg/L	NS	96		89		231		4,840	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	NS	2.50	U	2.5	U	2.5	U	2.50	U
	cis -1,2-Dichloroethene	µg/L	NS	0.50	U	0.50	U	0.210	J	0.50	U
	Chlorobenzene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Trichloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	NS	1.0	U	1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	NS	100	U	100	U	100	U	NA	
Field Parameters	Temperature, initial	°C	NS	NA		NA		NA		NA	
	Temperature, final	°C	NS	15.60				15.80		14.65	
	ORP[1]	mV	NS	256.7				191.20		-56.9	
	pH	standard units	NS	6.95		NA		6.74		6.72	
	Specific Conductance	µS/cm	NS	303				286		286	
	Dissolved Oxygen	mg/L	NS	9.31				6.48		2.96	
	Turbidity	NTU	NS	NA				NA		NA	

Notes:
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.
* = Criterion Continuous Concentration
Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.
For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.

[1] The ORP value was not corrected to SHE.

Table 10.3a
Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2014

Method	Analyte	Units	USEPA Water Quality Criteria *	57-AREA2-SW2	Q	57-AREA2-SW2 Duplicate	Q	57-AREA2-SW3	Q	57-AREA3-SW1	Q
Metals (SW6010B)	Arsenic, Dissolved	µg/L	150	17	J	13	J	6	B	15	U
	Iron, Dissolved	µg/L	1,000	***3,300***		***2,700***		120		***10,000***	
	Manganese, Dissolved	µg/L	NS	91		87		83		2,380	
VOCs (SW8260B)	1,4-Dichlorobenzene	µg/L	NS	2.50	U	2.50	U	2.5	U	0.396	J
	cis -1,2-Dichloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Chlorobenzene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.226	J
	Tetrachloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Trichloroethene	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U
	Vinyl Chloride	µg/L	NS	1.0	U	1.0	U	1.0	U	1.0	U
EPH (EPH-04-1.1)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	NS	100	U	100	U	100	U	NA	
Field Parameters	Temperature, initial	°C	NS	NA		NA		NA		NA	
	Temperature, final	°C	NS	24.72				28.25		19.48	
	ORP[1]	mV	NS	67.7				104.00		-0.5	
	pH	standard units	NS	6.66				6.67		6.96	
	Specific Conductance	µS/cm	NS	920				501		278	
	Dissolved Oxygen	mg/L	NS	0.06				7.45		1.09	
	Turbidity	NTU	NS	6.95				4.81		34.3	

Notes:

0.716 Detected results above USEPA Water Quality Criteria

NS - No standard

NA - Not analyzed

* Results for contaminants of concern that are not present in this table were non-detect

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

* = Criterion Continuous Concentration

Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.

For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.

[1] The ORP value was not corrected to SHE.

Table 10.3b
Historic DO and ORP Concentrations
Area of Contamination 57 - Area 2

Well Number	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007	Spring 2008	Spring 2009	Spring 2010	Spring 2011	Spring 2012	Spring 2013	Spring 2014
Dissolved Oxygen (mg/L)													
57M-03-02X	3.11	0.3	0.26	0.42	0.31	0.45	0.83	0.21	0.26	0.46	0.51	0.85	0.41
57M-03-03X	0.44	-1.13	0.63	0.4	1.38	0.74	1.1	6.1	1.31	2.82	5.44	2.28	1.54
57M-03-04X	-0.2 *	-0.45 *	1.85	0.3	0.49	0.44	0.34	1.49	0.28	5.08	3.42	4.04	1.77
57M-03-05X	0.21	-0.19 *	0.7	0.19	0.33	0.18	0.25	0.37	0.3	4.07	1.31	0.78	0.34
57-AREA 2-SW-2	NA	NA	7.28	3.36	12.8	11.17	6.12	7.92	3.25	5.53	8.17	9.31	7.45
57-AREA 2-SW-3	NA	NA	6.22	9.56	8.15	11.83	8.26	7.55	8.89	7.09	8.17	6.48	1.09
ORP (mv)													
57M-03-02X	137.3	-42.8	-81.1	19.8	-108.5	-4.8	.29.1	142	-261.1	157.8	26.9	150.8	150.6
57M-03-03X	207	297.4	35.1	258.7	217.9	115.9	119.6	518	-67.2	297.6	124.6	322.1	193.7
57M-03-04X	107	303.2	241.5	158.2	-81.5	64.6	145.5	309	-163.5	304	118.5	245.4	188.6
57M-03-05X	-104.2	-114	-30.2	51.7	-10	-90.6	35.8	252	-109.5	312.7	169.2	177.2	208.7
57-AREA 2-SW-2	NA	NA	70.5	149.8	114.7	3.7	102.9	334	-132.5	178.1	24.4	256.7	104
57-AREA 2-SW-3	NA	NA	2.2	33.1	101.9	-1.1	105.9	290	-114.9	127.5	-79.7	191.2	-0.5

Notes:

NA- Not Applicable

* - Meter Malfuction suspected due to erroneous error.

Table 10.4
Exceedances Over Time
Area of Contamination 57
2003 to 2014

GROUNDWATER																
Well Number	**Fall 2003**	**Spring 2004**	**Fall 2004**	**Spring 2005**	**Fall 2005**	**Spring 2006**	**Fall 2006**	**Spring 2007**	**Fall 2007**	**Spring 2008**	**Spring 2009**	**Spring 2010**	**Spring 2011**	**Spring 2012**	**Spring 2013**	**Spring 2014**
Arsenic - 10 µg/L Cleanup Goal																
57M-03-02X (AREA 2)	(4.2)	(6.4)	(8.9)	ND	(8.8)	14	13	(6)	(8)	13	10	18	(7)	(8)	(3 J)	ND
57M-03-04X (AREA 2)	41	30	50	47	167	(3.7)	(6)	(3)	ND	ND	ND	(7)	13	ND	ND	ND
57M-03-05X (AREA 2)	22	21	19	ND	18.6	15	11	(5)	(9)	11	12	27	(7)	11	18	15
SUMP-1 (AREA 2)	NC	55	(7.8)	ND	36.1	25	(9.0)	(4.1)	(7)	NC	NC	NC	NC	NC	NC	NC
SUMP-2 (AREA 2)	NC	28	24	ND	36.2	38	17	(3.2)	28	NC	NC	NC	NC	NC	NC	NC
SUMP-3 (AREA 2)	NC	22	25	ND	16.8	21	20	(4.7)	14	NC	NC	NC	NC	NC	NC	NC
SUMP-4 (AREA 2)	NC	21	62	ND	24.8	23	37	ND	62	NC	NC	NC	NC	NC	NC	NC
57M-95-03X (AREA 3)	36	44	230	25	13.6	(7)	49	(4.8)	51	23	21	23	58	36	60	60
57M-96-11X (AREA 3)	270	240	120	161	215	163	171	166	193	160	163	148	190	192	181	160
Trichloroethene - 5 µg/L Cleanup Goal																
57M-03-02X (AREA 2)	(3.9)	(4.3)	5.3	5.3	6.1	5.3	(3.3)	(4.7)	(3.2)	6.2	(4.0)	(1.2)	(4.5)	(4.9)	(4.38)	(4.19 J)
Tetrachloroethene - 5 µg/L Cleanup Goal																
57M-03-02X (AREA 2)	(4.1)	(2.3)	(2.7)	(3.9)	6.0	(2.3)	(0.84)	5.8	(1.5)	(3.7)	(0.43 J)	ND	(1.4)	(0.98)	(2.23)	(1.18)
C_{11}-C_{22} Aromatics - 200 µg/L Cleanup Goal																
SUMP-2 (AREA 2)	NC	ND	ND	ND	251	ND	ND	ND	ND	NC	NC	NC	NC	NC	NC	NC
1,4-Dichlorobenzene - 5 µg/L Cleanup Goal																
57M-95-03X (AREA 3)	(1.4)	(2.2)	13	(0.5)	(0.8)	(1.4)	(4.5)	(1.4)	13	(0.9)	(2.4 J)	(1.4 J)	5.1	(2.4 J)	(3.13)	(3.27)
57M-96-11X (AREA 3)	(3.4)	(3.8)	(2.4)	(3.3)	(1.4)	(3.7)	(2.4)	(4.4)	(1.6)	5.1	7.5	(2.1 J)	(2.3 J)	(0.92 J)	(1.05 J)	(1.22)
SURFACE WATER																
Well Number	**Fall 2003**	**Spring 2004**	**Fall 2004**	**Spring 2005**	**Fall 2005**	**Spring 2006**	**Fall 2006**	**Spring 2007**	**Fall 2007**	**Spring 2008**	**Spring 2009**	**Spring 2010**	**Spring 2011**	**Spring 2012**	**Spring 2013**	**Spring 2014**
Arsenic - 150 µg/L Water Quality Criteria																
57-AREA 2-SW-3 (AREA 2)	(14)	(8.1)	(46)	(96)	(39.9)	(7)	(46)	(63)	(11)	(6)	(2.6 J)	(4.8 J)	(5)	(2.0 J)	(4.0 J)	(6 B)
Iron - 1,000 µg/L Water Quality Criteria																
57-AREA 2-SW-2 (AREA 2)	NC	NC	NC	NC	NC	1,100	(480)	3,900	1,200	2,600	(770)	1,400	(360 J)	(200)	(270)	3,300
57-AREA 2-SW-3 (AREA 2)	NC	NC	NC	NC	NC	(740)	8,300	4,500	1,100	1,500	7600	(150)	(150)	(170)	(380)	(120)
57-AREA 3-SW-1 (AREA 3)	NC	NC	NC	NC	NC	(600)	4,500	(520)	7,100	6,800	2500	(240)	20,000	8,300	10,000	10,000
Lead - 2.5 µg/L Water Quality Criteria																
57-AREA 2-SW-2 (AREA 2)	ND	ND	ND	ND	ND	(1.8)	(1.9)	12	ND	NC	NC	NC	NC	NC	NC	NC
57-AREA 2-SW-3 (AREA 2)	2.6	ND	ND	5.2	3.3	2.8	ND	12	ND	NC	NC	NC	NC	NC	NC	NC
57-AREA 3-SW-1 (AREA 3)	34	ND	(0.81)	3.4	ND	(2.3)	ND	(1.8)	14	NC	NC	NC	NC	NC	NC	NC

Notes:

Number in parentheses denotes that the concentration is below the cleanup goal.

The unadjusted result was used beginning with the Spring 2006 sampling event.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

K.3 Building 3713

Fuel Oil Spill Site

Site Inspection

Annual Land Use Checklist & Interview Forms

The checklist and interview form will be completed annually and submitted with the annual long-term monitoring report. The checklist will also be used to assist in compiling information for the five-year review.

I. Site Information		
Site Name:	Fort Devens AOC 57	**Name:** Elizabeth Anderson **Affiliation:** H&S Environmental, Inc. **Date:** 05/31/2015
Location:	Ayer, MA	**Weather:** Sun/Humid/Partly Cloudy, 78°
Remedy Includes: Long-Term Monitoring Institutional Controls Wetlands Protection Source Removal via excavation and off site disposal/treatment		
Inspectors:	Elizabeth Anderson	
Site Map Attached:	NA	

II Documentation & Records		
Item	**Check One**	**Comments**
Any related notices filed with Devens Enterprise Commission?	Yes ☐ No ☒	
Any related Department of Public Works permits found?	Yes ☐ No ☒	
Any related zoning permits or variances found?	Yes ☐ No ☒	
Any related Conservation Commission findings, proposals or notices of intent found?	Yes ☐ No ☒	

III Physical On-site Inspection		
Item	**Check One**	**Comments**
Any evidence of new construction or excavation present in the area of the remedy?	Yes ☐ No ☒	No construction activities noted. Sites are in good condition.
Is there evidence of damage to the remedy?	Yes ☐ No ☒	
Any groundwater extraction wells present?	Yes ☐ No ☐	
Is there sufficient access to the site for monitoring?	Yes ☒ No ☐	No issues, Nypro is new building tenant.
Any signs of increased exposure potential?	Yes ☐ No ☒	

IV Interview		
Name of Interviewer:	Elizabeth Anderson	
Name of Interviewee:	N/A - previously conducted	
Date:		
Position: Owner ☐ Manager ☐ Other: Please Specify [x]		
Location: Site ☐ Office ☐ Phone: [X] Telephone #		
Item	**Check One**	**Comments**
Are there any extraction wells at the property?	Yes ☐ No [X]	No extraction wells are on site.
Are there any proposed plans for property sale, future development, construction or demolition activities at the property?	Yes ☐ No [X]	No specific construction plans are known.
Are there any issues with site access for monitoring?	Yes ☐ No [X]	Site activities are to be scheduled with building maintenance.

Annual Certification

Name: Elizabeth Anderson

Affiliation: H&S Environmental, Inc.

Signature: _____

Date: _____



Open area adjacent to Nypro



Monitoring well location just into tree line



Monitoring well behind Nypro



Monitoring well behind Nypro

K.4 Building 3713

Fuel Oil Spill Site

ARARs

TABLE 14
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Floodplains	Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]	Applicable	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Contaminated soil removal will be designed to minimize alternation/destruction of the floodplain area. If this alternative is chosen, floodplains affected by Remedial Investigation will be restored to original elevations.
	Wetlands	Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Applicable	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Contaminated soil removal will be designed to minimize alternative/destruction of the wetlands. If this alternative is chosen, the wetlands will be restored.
	Wetlands, Aquatic Ecosystem	Clean Water Act, Dredge or Fill Requirements Section 404 [40 CFR Part 230]	Relevant and Appropriate	Section 404 of the CWA regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a	The removal of soil will be designed for eventual restoration. A Massachusetts PGP (granted by USACE) is typically required prior to excavating/restoring

TABLE 14 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				discharge of fill materials. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under CWA Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands.	any sediment. The substantive portions of the permit would potentially be required.
	Surface Waters, Endangered Species, Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et seq.]	Relevant and Appropriate	Actions that affect species/habitat require consultation with USDOI, USFWS, NMFS, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these	To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The USFWS, will be kept informed of proposed Remedial Investigations.

TABLE 14 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				requirements apply to all response activities under the NCP.	
	Endangered Species	Endangered Species Act [50 CFR Parts 17.11-17.12]	Relevant and Appropriate	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	According to the RI report, no endangered federally-listed species have been identified within one mile of the AOC 57. However, protection of endangered species and their habitat will be considered as part of the design and excavation activities.
	Atlantic Flyway, Wetlands, Surface Waters	Migratory Bird Treaty Act [16 USC 703 et seq.]	Relevant and Appropriate	The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial Investigations will be performed to protect migratory birds, their nests, and eggs.
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Regulations [310 CMR 10.00]	Applicable	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A NOI must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000	All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.

TABLE 14 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	
	Endangered Species	Massachusetts Endangered Species Regulations [321 CMR 8.00]	Applicable	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Hearing Program.	The RI report identified several state-listed rare, threatened, or endangered species occurring within one mile of AOC 57. The protection of state listed endangered species will be considered during the design and implementation of this alternative.

Notes:

AOC = Area of contamination
ARAR = Area of Contamination
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
USDOI = U.S. Department of the Interior
USFWS = U.S. Fish and Wildlife Service
NCP = National Contingency Plan
NMFS = National Maine Fisheries Service
NOI = Notice of Intent
PGP = Programatic General Permit
RI = Remedial Investigation
USACE = U.S. Army Corps of Engineers
USEPA = U.S. Environmental Protection Agency
USC = United Sees Code

TABLE 15
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs and MCLGs [40 CFR Parts 141.60 - 141.63 and 141.50 - 141.52]	Relevant and Appropriate	The National Primary Drinking Water Regulations establish MCLs and MCLGs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.	The MCLs for arsenic and PCE will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or migration; therefore attainment of groundwater ARARs would eventually be confirmed at the two locations (57M-95-04A and 57P-98-02X), where MCL exceedances were detected.
State	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Relevant and Appropriate	These standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I, fresh groundwaters designated as a source of potable water supply.	314 CMR 6.00 would be met by achieving MMCLs for arsenic and PCE. The MMCLs for arsenic and PCE will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or migration; therefore attainment of groundwater MMCLs would eventually be confirmed at the two locations (57M-95-04A and 57P-98-02X).
	Groundwater	Massachusetts Drinking	Relevant and	These regulations list MMCLs which	As previously stated, Devens

TABLE 15 (continued)
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
		Water Regulations [310 CMR 22.00]	Appropriate	apply to drinking water distributed through a public water system.	Groundwater is classified as Class I, and designated as a source of potable water supply. AOC 57 is currently not within a Zone I or II/Interim Wellhead Protection Area. An AUL would be established at Area 2 until the environmental monitoring program indicates that MMCLs have been achieved for at least three years.

Notes:

AOC = Area of contamination
ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level
PCE = Tetrachloroethylene

TABLE 16
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Control of surface water runoff, Direct discharge to surface water	Clean Water Act NPDES Permit Program [40 CFR 122, 125]	Relevant and Appropriate	The NPDES permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to water of the United States.	Construction activities will be controlled to meet USEPA discharge requirements. Water collected from dewatering and stockpile activities will be collected and treated offsite or discharged to the Devens WWTP. Any on-site runoff discharges (though none expected) will meet the substantive requirements of these regulations.
	Discharge to Devens Treatment Plant	CWA, General Pretreatment Program (40 CFR Part 403)	Applicable	Discharge of nondomestic wastewater to WWTP must comply with the general prohibitions of this regulation, as well as categorical standards, and local pretreatment standards.	Discharge to Devens WWTP would be sampled to evaluate compliance with pre-treatment standards.
	Groundwater	USEPA OWSER Publication 9345.3-03FS, January 1992	To Be Considered	Management of IDW must ensure protection of human health and the environment.	IDW produced from well sampling will comply with ARARs.
	RCRA-Identification and Listing of Hazardous Wastes	Toxicity Characteristics (40 CFR 261.24)	Applicable	Defines those wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 124 and 264.	Soil/sediment analytical results will be evaluated against the criteria and definitions of hazardous waste. The criteria and definition of hazardous waste will be referred to and utilized in development of the Remedial

TABLE 16 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
					Investigation.
	Disposal of soil that contains hazardous waste	RCRA, Land Disposal Restrictions (40 CFR 268)	Applicable	Land disposal of RCRA hazardous wastes without specified treatment is restricted. LDRs require that such wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	Waste materials from Area 2 will be evaluated to determine whether the waste is subject to LDRs. If so, the materials will be treated in accordance with LDRs prior to disposal at an off-base facility.
	Management of PCB-contaminated soil	TSCA (40 CFR Part 761 Subpart G) PCB Spill Cleanup Policy	To be considered	This policy governs the cleanup of PCB spills occurring after May 4, 1987. Because this policy is not a regulation and only applies to recent spills (reported within 24 hours of occurrence), these requirements are not applicable, but will be considered.	This policy would only be considered during the development of Remedial Investigation for areas with expected detected PCBs at concentrations greater than or equal to 50 ppm. The highest concentration of PCBs in soil was detected during the RI at 12 ppm.
	Management of PCB-contaminated soil	TSCA (40 CFR Part 761 Subpart D) Storage and Disposal	Relevant and Appropriate	This regulation governs the storage and final disposal of PCBs. The regulation also specifies procedures to be followed in decontaminating containers and moveable equipment used in storage areas. Section 761.61 pertains to PCB remediation wastes and provides self-implementing on-site cleanup and disposal requirements. Per Section 761.61, the self-implementing cleanup provisions are not binding for cleanups	Section 761.61 cleanup levels for low and high occupancy areas are # 1 ppm, respectively. RI calculated RBCs for Aroclor – 1260 are more conservative and will be used as PRGs at AOC 57. Off-site storage, disposal and decontamination requirements specified in this regulation will be applied for soil or sediment containing PCBs.

TABLE 16 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				conducted under CERCLA.	
State	Hazardous Waste	Hazardous Waste Management Systems; (RCRA 40 CFR 260)	Relevant and Appropriate	USEPA procedures for making information available to the public; rules for claims of business confidentially.	Does not address cleanup requirements. However, these procedures will be followed when dealing with hazardous waste.
	Hazardous Waste	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (RCRA 40 CFR 264)	Relevant and Appropriate	Define requirements for RCRA facility operations and management including impoundments, waste piles, land treatment, landfills, incinerators, storage, closure and post closure.	Operations, management and safety requirements in effect for all portions of remedial process, if hazardous waste is being handled.
	Hazardous Waste	RCRA 40 CFR Part 262, Standards Applicable to Generators of Hazardous Waste	Relevant and Appropriate	These regulations establish standards for generators of hazardous waste. RCRA Subtitle C established standards applicable to treatment, storage, and disposal of hazardous waste and closure of hazardous waste facilities.	Sediments will be tested to determine whether they contain characteristic hazardous waste. If so, management of the hazardous waste would comply with substantive requirements of these regulations.
	Hazardous Waste	Massachusetts Hazardous Waste Management Rules; 310 CMR 30.000	Relevant and Appropriate	These rules set forth Massachusetts definitions and criteria for establishing whether waste materials are hazardous and subject to associated hazardous waste regulations.	These regulations supplement RCRA requirements. Those criteria and definitions more stringent than RCRA take precedence over federal requirements.
	Activities that potentially affect surface water quality	Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]	Relevant and Appropriate	A Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00 for dredging-related	Excavation and filling activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to

TABLE 16 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				activities in waters (including wetlands) within the Commonwealth which require federal licenses or permits and which are subject to state water quality certification.	attain and maintain Massachusetts Water Quality Standards in affected waters.
	Activities that affect ambient air quality	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Applicable	These regulations pertain to the prevention of emissions in excess of Massachusetts ambient air quality standards.	Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).

Notes:

ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
IDW = Investigation derived waste
LDR = Land Disposal Restrictions
NPDES = National Pollutant Discharge Elimination System
RCBs = Risk-based concentrations
RCRA = Resource Conservation and Recovery Act
RI = Remedial Investigation
TSCA = Toxic Substances Control Act
PCB = Polychlorinated biphenyls
PRGs = preliminary remediation goals
USEPA = U.S. Environmental Protection Agency
WWTP = Wastewater Treatment Plant

TABLE 17
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Floodplains	Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]	Applicable	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Contaminated soil removal will be designed to minimize alteration/destruction of the floodplain area. If this alternative is chosen, floodplains affected by Remedial Investigation will be restored to original elevations.
	Wetlands	Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Applicable	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Contaminated soil removal will be designed to minimize alteration/destruction of the wetlands. If this alternative is chosen, the wetlands will be restored.
	Wetlands, Aquatic Ecosystem	Clean Water Act, Dredge or Fill Requirements Section 404	Relevant and Appropriate	Section 404 of the Clean Water Act (CWA) regulates the discharge of dredged or fill materials to U.S.	The removal of soil will be designed for eventual restoration. A Massachusetts PGP (granted by USACE) is typically

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
		[40 CFR Part 230]		waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under CWA Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands.	required prior to excavating/ restoring any sediment. The substantive portions of the permit would potentially be required.
	Surface Waters, Endangered Species, Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et seq.]	Relevant and Appropriate	Actions that affect species/habitat require consultation with USDOI, USFWS, NMFS, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources.	To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The USFWS, acting as a review agency for the USEPA, will be kept informed of proposed Remedial Investigations.

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the NCP.	
	Endangered Species	Endangered Species Act [50 CFR Parts 17.11-17.12]	Relevant and Appropriate	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	According to the RI report, no endangered federally-listed species have been identified within one mile of the AOC 57. However, protection of endangered species and their habitat will be considered as part of the design and excavation activities.
	Atlantic Flyway, Wetlands, Surface Waters	Migratory Bird Treaty Act [16 USC 703 et seq.]	Relevant and Appropriate	The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial Investigations will be performed to protect migratory birds, their nests, and eggs.
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Regulations [310 CMR 10.00]	Applicable	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year flood plain). A NOI must be filed with the municipal conservation commission and a Final Order of	All work to be performed within wetlands and the 100-foot buffer zone will be in accordance with the substantive requirements of these regulations.

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100-foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	
	Endangered Species	Massachusetts Endangered Species Regulations [321 CMR 8.00]	Applicable	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	The RI report identified several state-listed rare, threatened, or endangered species occurring within one mile of AOC 57. The protection of state listed endangered species will be considered during the design and implementation of this alternative.

Notes:

AOC = Area of contamination
ARAR = Area of Contamination
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
USDOI = U.S. Department of the Interior
USFWS = U.S. Fish and Wildlife Service
NCP = National Contingency Plan
NMFS = National Maine Fisheries Service

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

NOI	=	Notice of Intent
PGP	=	Programatic General Permit
RI	=	Remedial Investigation
USACE	=	U.S. Army Corps of Engineers
USEPA	=	U.S. Environmental Protection Agency
USC	=	United States Code

TABLE 18
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVES III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs and MCLGs [40 CFR Parts 141.60 - 141.63 and 141.50 - 141.52]	Relevant and Appropriate	The National Primary Drinking Water Regulations establish Maximum Containment Levels (MCLs) and Maximum Containment Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.	The MCLs for arsenic, cadmium, tetrachloroethene (PCE), and 1,4-dichlorobenzene will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or migration; therefore attainment of groundwater ARARs would eventually be confirmed at the two locations (57M-95-03X and 57M-96-11X), where MCL exceedances were detected.
State	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Relevant and Appropriate	These standards designate and assign uses for which groundwaters of the commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated users. Groundwater at Fort Devens is classified as Class I, fresh groundwaters designated as a	314 CMR 6.00 would be met by achieving MMCLs for arsenic, cadmium, PCE, and 1,4-dichlorobenzene. The MMCLs will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or

TABLE 18 (continued)
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVES III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				source of potable water supply.	migration; therefore attainment of groundwater MMCLs would eventually be confirmed at the two locations (57M-95-03X and 57M-96-11X).
	Groundwater	Massachusetts Drinking Water Regulations [310 CMR 22.00]	Relevant and Appropriate	These regulations list Massachusetts MCLs applicable to drinking water distributed through a public water system.	As previously stated, Devens groundwater is classified as Class 1, and designated as a source of potable water supply. AOC 57 is currently not within a Zone I or II/Interim Wellhead Protection Area. An AUL would be established at Area 3 until the environmental monitoring program indicates that MMCLs have been achieved for at least three years.

Notes:

AOCs = Area of Contamination
ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level

TABLE 19
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVES III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Control of surface water runoff, Direct discharge to surface water	Clean Water Act NPDES Permit Program [40 CFR 122,125]	Relevant and Appropriate	The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.	Construction activities will be controlled to meet USEPA discharge requirements. Water collected from dewatering and stockpile activities will be collected and treated offsite or discharged to Devens WWTP. Any on-site runoff discharges (through none expected) will meet the substantive requirements of these regulations.
	Discharge to Devens Treatment Plant	CWA, General Pretreatment Program (40 CFR Part 403)	Applicable	Discharge of nondomestic wastewater to WWTP must comply with the general prohibitions of this regulation, as well as categorical standards, and local pretreatment standards.	Discharge to Devens WWTP would be sampled to evaluate compliance with pre-treatment standards.
	Groundwater	USEPA OSWER Publication 9345.3-03FS, January 1992	To Be Considered	Management of IDW must ensure protection of human health and the environment.	IDW produced from well sampling will comply with ARARs.
	RCRA – Identification and Listing of Hazardous Wastes	Toxicity Characteristics (40 CFR 261.24)	Applicable	Defines those wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 124 and 264.	Soil/sediment analytical results will be evaluated against the criteria and definitions of hazardous waste. The criteria and definition of hazardous waste will be referred to and utilized in development of the remedial action.
	Disposal of soil	RCRA, Land Disposal	Applicable	Land disposal of RCRA hazardous	Waste materials from Area 3 will be

TABLE 19 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVES III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	that contains hazardous waste	Restrictions (40 CFR 268)		wastes without specified treatment is restricted. LDRs require that such wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	evaluated to determine whether the waste is subject to LDRs. If so, the materials will not be disposed of on base but will be treated in accordance with LDRs prior to disposal at an off-base facility.
	Hazardous Waste	Hazardous Waste Management Systems; (RCRA 40 CFR 260)	Relevant and Appropriate	USEPA procedures for making information available to the public; rules for claims of business confidentially.	Does not address cleanup requirements. However, these procedures will be followed when dealing with hazardous waste.
	Hazardous Waste	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (RCRA 40 CFR 264)	Relevant and Appropriate	Define requirements for RCRA facility operations and management including impoundments, wastepiles, land treatment, landfills, incinerators, storage, closure and post closure.	Operation, management and safety requirements in effect for all portions of remedial process, if hazardous waste is being handled.
	Hazardous Waste	RCRA 40 CFR Part 262, Standards Applicable to Generators of Hazardous Waste	Relevant and Appropriate	RCRA Subtitle C established standards applicable to treatment, storage and disposal of hazardous waste and closure of hazardous waste facilities.	Sediments will be tested to determine whether they contain characteristic hazardous waste. If so, treatment on-site would comply with substantive requirements of these regulations.
State	Hazardous Waste	Massachusetts Hazardous Waste Management Rules; 310 CMR 30.000	Relevant and Appropriate	These rules set forth Massachusetts definitions and criteria for establishing whether waste materials are hazardous and subject to associated hazardous waste regulations.	These regulations supplement RCRA requirements. Those criteria and definitions more stringent than RCRA take precedence over federal requirements.

TABLE 19 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVES III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Activities that potentially affect surface water quality	Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]	Relevant and Appropriate	A Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00 for dredging-related activities in waters (including wetlands) within the Commonwealth which require federal licenses or permits and which are subject to state water quality certification.	Excavation and filling activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.
	Activities that affect ambient air quality	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Applicable	These regulation pertain to the prevention of emissions in excess of Massachusetts ambient air quality standards.	Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).

Notes:

ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
IDW = Investigation-derived waste
LDR = Land Disposal Restrictions
NPDES = National Pollutant Discharge Elimination System
PCB = Polychlorinated biphenyls
PRGs = preliminary remediation goals

TABLE 19 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVES III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

RBCs	=	Risk-based concentrations
RCRA	=	Resource Conservation and Recovery Act
RI	=	Remedial Investigation
TSCA	=	Toxic Substances Control Act
USEPA	=	U.S. Environmental Protection Agency
WWTP	=	Wastewater Treatment Plant

K.5 Building 3713

Fuel Oil Spill Site

Statistical

Analysis

K.6 OU#9 AOC 57

Statistical Analysis

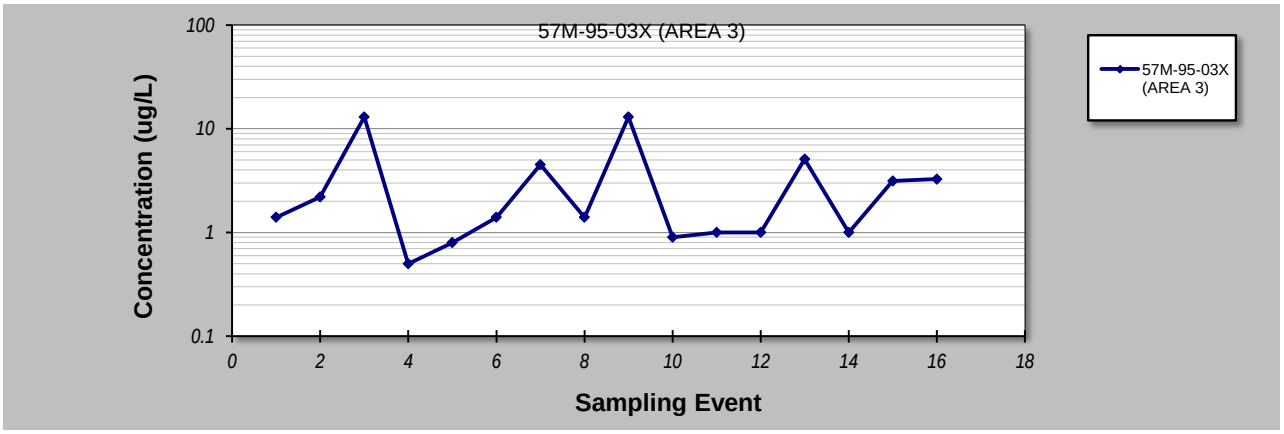
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 1-Jul-15
Facility Name: AOC 57 Devens
Conducted By: J. Fitzgerald

Job ID:
Constituent: 1,4 Dichlorobenzene
Concentration Units: ug/L

Sampling Point ID: 57M-95-03X (AREA 3)

Sampling Event	Sampling Date	57M-95-03X (AREA 3) CONCENTRATION (ug/L)
1	Fall 2003	1.4
2	Spring 2004	2.2
3	Fall 2004	13
4	Spring 2005	0.5
5	Fall 2005	0.8
6	Spring 2006	1.4
7	Fall 2006	4.5
8	Spring 2007	1.4
9	Fall 2007	13
10	Spring 2008	0.9
11	Spring 2009	1
12	Spring 2010	1
13	Spring 2011	5.1
14	Spring 2012	1
15	Spring 2013	3.13
16	Spring 2014	3.27
17		
18		
19		
20		
Coefficient of Variation:		1.20
Mann-Kendall Statistic (S):		11
Confidence Factor:		67.1%
Concentration Trend:		No Trend



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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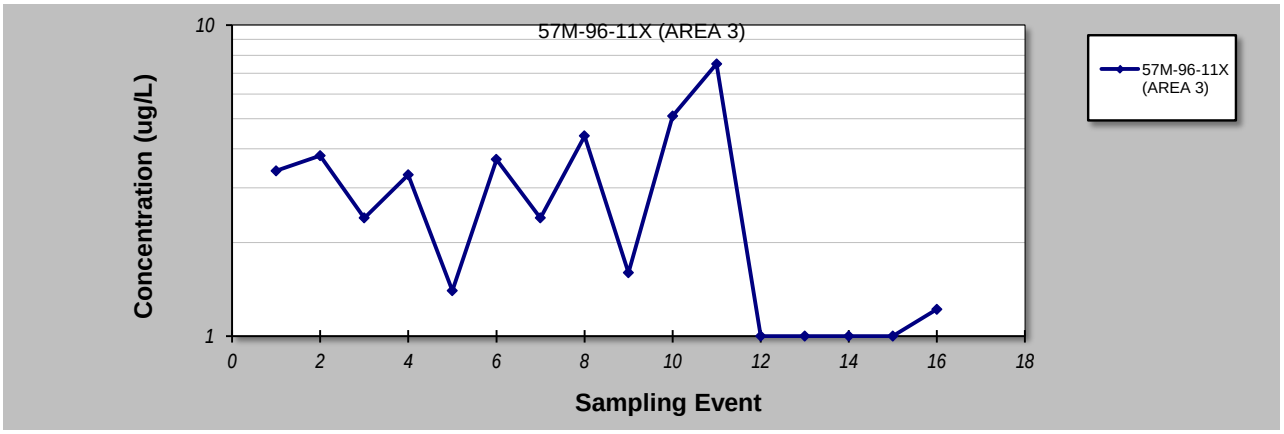
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **1-Jul-15**
Facility Name: **AOC 57 Devens**
Conducted By: **J. Fitzgerald**

Job ID:
Constituent: **1,4 Dichlorobenzene**
Concentration Units: **ug/L**

Sampling Point ID: 57M-96-11X (AREA

Sampling Event	Sampling Date	1,4 DICHLOROBENZENE CONCENTRATION (ug/L)
1	Fall 2003	3.4
2	Spring 2004	3.8
3	Fall 2004	2.4
4	Spring 2005	3.3
5	Fall 2005	1.4
6	Spring 2006	3.7
7	Fall 2006	2.4
8	Spring 2007	4.4
9	Fall 2007	1.6
10	Spring 2008	5.1
11	Spring 2009	7.5
12	Spring 2010	1
13	Spring 2011	1
14	Spring 2012	1
15	Spring 2013	1
16	Spring 2014	1.22
17		
18		
19		
20		
Coefficient of Variation:		0.67
Mann-Kendall Statistic (S):		-37
Confidence Factor:		94.7%
Concentration Trend:		Prob. Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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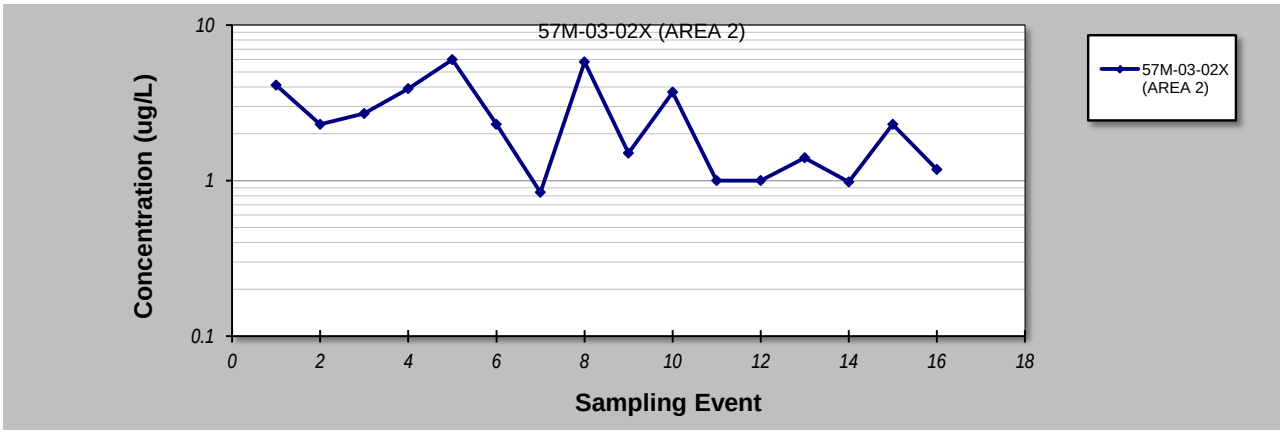
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **1-Jul-15**
Facility Name: **AOC 57 Devens**
Conducted By: **J. Fitzgerald**

Job ID:
Constituent: **PCE**
Concentration Units: **ug/L**

Sampling Point ID: 57M-03-02X (AREA 2)

Sampling Event	Sampling Date	PCE CONCENTRATION (ug/L)
1	Fall 2003	4.1
2	Spring 2004	2.3
3	Fall 2004	2.7
4	Spring 2005	3.9
5	Fall 2005	6.0
6	Spring 2006	2.3
7	Fall 2006	0.84
8	Spring 2007	5.8
9	Fall 2007	1.5
10	Spring 2008	3.7
11	Spring 2009	1
12	Spring 2010	1
13	Spring 2011	1.4
14	Spring 2012	0.98
15	Spring 2013	2.30
16	Spring 2014	1.18
17		
18		
19		
20		
Coefficient of Variation:		0.66
Mann-Kendall Statistic (S):		-46
Confidence Factor:		97.9%
Concentration Trend:		Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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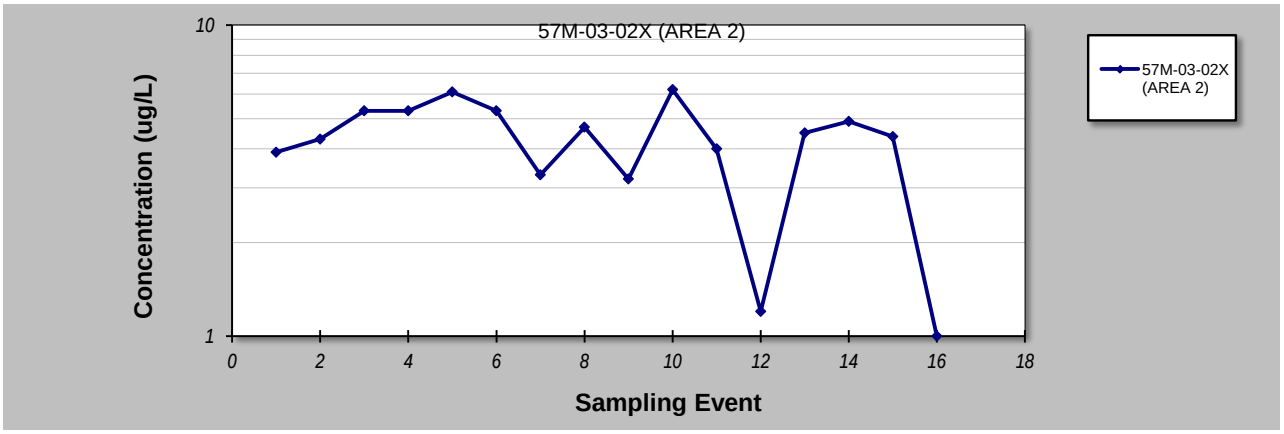
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 1-Jul-15
Facility Name: AOC 57 Devens
Conducted By: J. Fitzgerald

Job ID:
Constituent: TCE
Concentration Units: ug/L

Sampling Point ID: 57M-03-02X (AREA 2)

Sampling Event	Sampling Date	TCE CONCENTRATION (ug/L)
1	Fall 2003	3.9
2	Spring 2004	4.3
3	Fall 2004	5.3
4	Spring 2005	5.3
5	Fall 2005	6.1
6	Spring 2006	5.3
7	Fall 2006	3.3
8	Spring 2007	4.7
9	Fall 2007	3.2
10	Spring 2008	6.2
11	Spring 2009	4.0
12	Spring 2010	1.2
13	Spring 2011	4.5
14	Spring 2012	4.9
15	Spring 2013	4.38
16	Spring 2014	1
17		
18		
19		
20		
Coefficient of Variation:		0.35
Mann-Kendall Statistic (S):		-25
Confidence Factor:		85.7%
Concentration Trend:		Stable



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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APPENDIX L – Response to Comments

RESPONSE TO COMMENTS – EPA Review of the *2015 Five-Year Review Report for Former Fort Devens Army Installation.*
H&S Environmental, Inc.
Received 9 September 9, 2015

EPA COMMENTS ON THE
DRAFT 2015 FIVE YEAR REVIEW REPORT
FORMER FORT DEVENS ARMY INSTALLATION
JULY 2015

GENERAL COMMENTS

1. The document should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". Specifically, the Table of Contents (and each subsequent, AOC-specific section) should include each of the following elements:

I. Introduction
II. Site Chronology
III. Background
Physical Characteristics
Land and Resource Use
History of Contamination
Initial Response
Basis for Taking Action
IV. Remedial Actions
Remedy Selection
Remedy Implementation
System Operations/Operation and Maintenance (O&M)
V. Progress Since the Last Five-Year Review
VI. Five-Year Review Process
Administrative Components
Community Involvement
Document Review
Data Review
Site Inspection
Interviews
VII. Technical Assessment
Question A: Is the remedy functioning as intended by the decision documents?
- remedial action performance and monitoring results
- system operations/O&M
- costs of system operations/O&M
- opportunities for optimization
- early indicators of potential remedy problems
- implementation of institutional controls and other measures

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid
- changes in exposure pathways
- changes in land use

- new contaminants and/or contaminant sources
- remedy byproducts
- changes in standards, newly promulgated standards, and TBCs
- changes in toxicity and other contaminant characteristics
- expected progress towards meeting RAOs
- risk recalculation/assessment (as applicable)

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

- ecological risks
- natural disaster impacts
- any other information that could call into question the protectiveness of the remedy

Technical Assessment Summary

- summary of findings and conclusions related to Questions A, B, and C

VIII. Issues
IX. Recommendations and Follow-up Actions
X. Protectiveness Statement(s)
XI. Next Review

Tables
Table 1 - Chronology of Site Events
Table 2 - Annual System Operations/O&M Costs
Table 3 - Quarterly Comparison of Groundwater Concentrations
Table 4 - Issues
Table 5 - Recommendations and Follow-Up Actions

Attachments
Attachment 1 - Site Location Map
Attachment 2 - Site Plan
Attachment 3 - List of Documents Reviewed
Attachment 4 - Applicable or Relevant and Appropriate Requirements (ARARs)

Please modify the document to ensure that it includes all of the required elements outlined above.

Response. All information listed above is presented within the text report for each AOC. However, the formatting will be reviewed for consistency with EPA's 2001 guidance.

2. Executive Summary - The statements regarding remedy protectiveness at the end of each are insufficient for purposes of supporting such claims and must be expanded to include the identification of contaminants of concern and specifics related to how risks, current and/or potential, are being addressed by the selected remedy (i.e., ICs, LUCs, LTM, FYRs, etc.).

Response. All protectiveness statements have been reviewed and present sufficient discussions for purposes of supporting respective claims. Text has been revised where deemed necessary to support specific statements.

3. Please precede all references to "Fort Devens" with "former" (or change to refer to "Devens" (consistent with the 2010 FYR).

Response. A global find/replace was done.

PAGE-SPECIFIC COMMENTS

1. Page E-ii, Shepley's Hill (AOCs, 4, 5, and 18), ¶ 3 – Please insert "(2010)" between "previous" and "five-year review" in the first sentence.

Response. The text has been updated as indicated.

2. Page E-ii, Shepley's Hill (AOCs, 4, 5, and 18), ¶ 4 – Please amend the second sentence to more accurately reflect the stated conclusions of the referenced report (Pages 58-60, Section 10.0 "Findings and Conclusions"). Specifically, the third bullet on page 59 states that, "The primary source of arsenic in groundwater appears to be aquifer sands rich in amorphous iron hydroxide solids, usually coated on sand grains as documented through microscopy. Other sources of arsenic may include landfill waste, peat, and bedrock/till." The next sub-bullet states, "Arsenic solubility is controlled by desorption from the iron solids and by reductive dissolution of the iron (III) solids created by biodegradation of peat and waste." While the Army has long argued that naturally occurring peat deposits in the subsurface, within the landfill footprint, are the primary source of the reducing conditions responsible for mobilizing arsenic, the landfill is known to have been an additional source of organic carbon, and the relative contributions of carbon from landfill waste and peat deposits and any discussion about "the dominant SHL Groundwater Conceptual Site Model" must acknowledge this an a critical component. Since landfill waste is contributing arsenic to site groundwater, it must be assumed that the landfill is contributing to the reducing conditions that mobilize arsenic to site groundwater.

   In addition, please delete the statement that the report concluded that "the restoration potential to achieve groundwater MCLs is LOW". EPA could not find similar text (or data to support this statement) in the August 2011 Report.

Response. The second sentence in Paragraph 4 will be replaced with the following:

The Report concluded that the primary source of arsenic in groundwater appears to be aquifer sands rich in amorphous iron hydroxide solids with other sources of arsenic including landfill waste, peat, and bedrock/till. Arsenic solubility is controlled by desorption from the iron solids and by reductive dissolution of the iron (III) solids created by biodegradation of landfill waste and peat within the landfill and the NIA. The time to return the aquifer to "pre-landfill" conditions was estimated at 270 years. Based on this information, the Army has concluded that the dominant SHL Groundwater Conceptual Site Model is reductive dissolution of naturally occurring Arsenic and that the restoration potential to achieve groundwater MCLs is LOW.

3. Page E-iii, Shepley's Hill (AOCs, 4, 5, and 18), ¶ 2 – As discussed in EPA's comments on the 2013, Draft SHL LTMMP Update Report", while the addition of the barrier wall along the eastern portion of the landfill and the institution of LUCs restricting groundwater use in the NIA help short-term achievement of RAOs, the existing groundwater extraction / arsenic treatment plant for the SHL is insufficient for purposes of

ensuring the long-term protection of human health and the environment. Therefore, this paragraph is inaccurate and must be amended to reflect the fact that while the existing remedy is currently protective of human health and the environment, the completion of follow-up actions, as set forth in the 2015 Five-Year Review (FYR) Report, will help insure the long-term protectiveness of the remedy, as required by the 1995 ROD. In addition, EPA recommends that the following discussion (based largely on text contained in the 2010 Five-Year Review Report) be inserted in place of the deleted text:

"While recent studies of the treatment system's hydraulic capture zone have shown that a majority of arsenic mass migrating northward from the landfill is being contained by the current extraction well field, there is a small portion of high arsenic concentration groundwater that appears to be bypassing the system untreated. While the current remedy at SHL is considered protective in the short-term, because there is no evidence of current exposure, a long-term remediation strategy must be developed to effectively meet the RAO set forth in the 1995 ROD. The Army plans to release a revised, draft FFS and draft ROD amendment in 2016 to enhance the existing remedy and insure long-term protectiveness."

Response. The second paragraph on page E-iii will be replaced with the following:

The SHL Annual Reports (2011 – 2014) evaluate the contingency pump & treat remedy performance as per *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems* (USEPA, 2008) and have concluded that the system is effectively controlling the migration of arsenic impacted groundwater at the north end of SHL. Despite apparent minor seasonal fluctuations and brief system operational shutdowns, the extraction wells are effective in maintaining a capture zone across the toe of the landfill as designed. However, due to site conditions specified in the CSM, the current SHL remedy (i.e., extraction and treatment of arsenic contaminated groundwater) is unlikely to achieve the groundwater cleanup levels within a reasonable timeframe as set forth in the 1995 SHL ROD.

4. Page E-iii, Devens Consolidation Landfill (DCL) and Contributor Sites, ¶ 3 – The current discussion needs to be expanded to include (1) more details on the history of the "contributor sites" (i.e. AOC 9, 11, and 40 and SA 13), (2) a more thorough explanation as to why these sites were included in the 2010 FYR, and (3) specifics as to why they should be removed from the FYR process (the 2010 FYR Report states that FYRs are not required for AOC 41 and SA12, but makes no reference to the other contributor sites).

Response. The last four paragraphs of DCL ES (pg E-iii) will be revised to include the following:

The USEPA approved the ROD for landfill remediation of the first six areas in July 1999. The selected remedies included provisions for either on-site or off-site disposal options. The approved remedial alternative documented in the 1999 ROD called for limited removal at SA12 and AOC41 and full excavation of AOCs 9, 11, 40 and SA13. The on-site landfill construction alternative was selected as the preferred alternative. Construction of the DCL commenced in September 2000 and was completed in November 2002. The Remedial Action Closure Report, prepared by Shaw Environmental (formerly Stone & Webster, Inc. [SWETS]) in September 2003, was accepted by EPA and DEP, certifying that the DCL was constructed and capped in accordance with the ROD, and met

the performance standards and/or response objectives in the ROD.

Construction activities at the associated contribution sites (AOC 9 AOC 40, and SA 13) are complete and remedial action objectives (RAOs), as defined by the ROD, have been achieved. Long-term protectiveness of the remedial action will be verified by continued operation and maintenance (O&M) and long term groundwater monitoring (LTM) at the DCL. Current O&M and LTM data indicate that the remedy is functioning as required.

Operations and Maintenance (O&M) at the DCL includes monthly inspections of the landfill system, annual leachate sampling, semi-annual groundwater sampling and well gauging. LTM samples are collected and submitted for VPH, EPH, pesticides and metals analyses. DCL leachate effluent samples are collected annually and submitted for analyses per the discharge permit No.17.

The remedy in place at the DCL is functioning as intended and continues to be protective of human health and the environment. Exposure pathways from the contributor sites have been removed.

Under the CERCLA Five Year guidance, the DCL contributor sites (AOC 9, AOC 40 and SA13) meet the ROD remediation goals for unlimited use/unrestricted exposure (UU/UE). As a result a technical assessment is not required. It is recommended the DCL contributor sites AOC 9, 40 and SA 13be removed from the five year review process.

5. Page E-iv, SPIA, ¶ 2 – Please delete the current text and replace it with the following: "A ROD for the four AOCs (collectively referred to as the "SPIA monitored area". The ROD documented the "No Action" remedy for the SPIA monitoring area groundwater, surface water, soil and sediment and included the following components: groundwater monitoring for potential contaminant migration out of the SPIA monitored area, groundwater monitoring at the individual AOCs, sampling of Well D-1 (classified as a transient non-community supply well), developing a LTMP and Integrated Natural Resources Management Plan (INRMP), restricting development of new drinking water sources within the SPIA monitored area, and submitting annual reports."

Response. The second paragraph will be deleted and replaced with the following text:

A ROD for the four AOCs (AOCs 25, 26, 27, and 41), collectively referred to as the SPIA monitored area, was issued in July 1996. The ROD documented the "No Action" remedy for the SPIA monitored area groundwater, surface water, soil, and sediment. The following components were included as part of the selected No Action Remedy: groundwater monitoring for potential contaminant migration out of the SPIA monitored area, groundwater monitoring at the individual AOCs, sampling of Well D-1 (classified as a transient non-community supply well), developing a LTMP and Integrated Natural Resources Management Plan (INRMP), restricting development of new drinking water sources within the SPIA monitored area, and submitting annual reports.

6. Page E-iv, Barnum Road Maintenance Yards (AOCs 44 and 52), ¶ 1 – Typo. Please change "comprises" to "comprise".

Response. The correction will be made.

7. Page E-iv, Barnum Road Maintenance Yards (AOCs 44 and 52), ¶ 1 – The second to last sentence states that, "The remedial action at AOCs 44 and 52 is considered complete." Please provide a date for the "Final Remedial Action Completion Report" for these AOCs. If one does not exist, then the remedial action should not be "considered complete". Please provide justification for this finding. In addition, further discussion is warranted in support of the protectiveness statement in the subsequent paragraph.

Response.

1) **The following sentence will be inserted before** , "The remedial action at AOCs 44 and 52 is considered complete." ***The Remedial Action Completion Report for AOCs 44 and 52 was issued in June 1996 (Weston, 1996).***

2) **The following paragraph will replace the last paragraph of this section:**

The remedy at AOCs 44 and 52 is protective of human health and the environment and exposure pathways that could result in unacceptable risk are being controlled. The asphalt batching of contaminated soils conducted in 1995 and 1996 remains effective at immobilizing the petroleum related contaminants and has met the objectives of the remedial action. The cover over the untreated subsurface soils remains in place and recent on-site construction activities have complied with the provisions of the ROD concerning construction activity soil management practices. Previous groundwater monitoring has confirmed that migration of surface soil contaminants to the aquifer following the historic releases at the site, or because of remedial activities, has not occurred.

10 Page E-iv, Barnum Road Maintenance Yards (AOCs 44 and 52), Protectivenss Statement- An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that the LTMP should be amended to include sampling for 1,4 - dioxane since chlorinated VOCs have been detected in site groundwater. Such analysis is recommended for any site with chlorinated VOCs. (See comment

Response. The compound, 1,4-dioxane, is not included in the ROD for AOCs 44/52. The recommendation for the addition of 1,4-dioxane to the LTM at Barnum Road will be taken into consideration during the next LTMMP review period.

11 Page E-v, DRMO Yards (AOCs 32 and 43A) – Please amend this section to include a brief discussion of former and existing (if any) sources of contamination and current contaminant concentrations in groundwater (i.e. are contaminant concentration above cleanup goals?). As currently written, it is insufficient for purposes of supporting the protectiveness statement in the subsequent paragraph.

Response. The following text will be inserted before the last paragraph of this section:

The excavation and off-site disposal of contaminated soils have been effective at removing any contaminant source soils and has met the objectives of the remedial actions. Analysis of groundwater data to date has indicated that off-site migration is not occurring. While a slight rebound was observed in 32M-01-18XBR

during the 2014 LTM event, the current groundwater analytical data for well 32M-01-18XBR indicates significantly diminished COC concentrations as a result of the February 2009 persulfate injection event.

12 Page E-v, Historic Gas Stations (AOC 43G and 43J) – Please include a brief description of the events that occurred between issuance of the ROD (2006) and release of the 2015 FYR to support the remedy protectiveness claim in the last paragraph. (Please see Page ES-6 in 2010 FYR Report.)

Response. Modifications to the text to include events prior to the current five year review were not included in the executive summary.

13 Page E-vi, Former Elementary School (AOC 69W) – Please include a brief description of the events that occurred between issuance of the ROD (1999) and release of the 2015 FYR to support the remedy protectiveness claim in the last paragraph of the section . (Please see Page ES-10 in 2010 FYR Report.)

Response. Modifications to the text to include events prior to the current five year review were not included in the executive summary.

14 Page E-vi, Former Moore Army Airfield (AOC 50), ¶ 4 – Please insert the following text prior to the last sentence, "**Human health is current not at risk because groundwater at the site is not a potable water source nor is it planned to be used as a potable water source. However,"**.

Response. The suggested text will be inserted as indicated.

15 Page E-vi, Former Building 3713 Fuel Oil Spill Site (AOC 57) – Please insert the following text as the second paragraph, "**Data obtained and observations made at Area 2 between 2002 and 2003, during the soil excavation activities and subsequent investigations prompted the submittal of an ESD in March 2004. The ESD expanded ROD mandated long-term monitoring (LTM) activities to include extractable petroleum hydrocarbons (EPH) C_{11}- C_{22} aromatics and polychlorinated biphenyls (PCBs) as contaminants of concern (COC) for Area 2 groundwater, include EPH as a COC for Area 2 soil, monitor for the presence of petroleum waste at Area 2, and increase the soil volume and associated cost for Area 2 soil removal activities."**

Response. The suggested text will be inserted as indicated.

16 Page E-vi, Former Building 3713 Fuel Oil Spill Site (AOC 57) - Please insert a brief description of the events that occurred between issuance of the ESD (2004) and release of the 2015 FYR (after the above paragraph) to support the remedy protectiveness claim in the last paragraph of the section . (Please see Page ES-5 – ES-6 in the 2010 FYR Report.)

Response. Modifications to the text to include events prior to the current five year review were not included in the executive summary.

17 Page E-viii, Five-Year Review Summary Form, Site Status - Please change the "Yes" to "No" for "Has the site achieved construction completion?" A "construction completion" site is an NPL site where physical construction of all cleanup activities is complete (final cleanup goals may or may not have been achieved at this time), all immediate threats have been addressed, and all long-term threats are under control. The Former Fort Devens Army Installation cannot achieve "construction complete" until a final long-term remediation strategy (to control long-term threats) is designed, implemented and deemed OPS at the SHL operable unit.

Response. The form has been revised to NO.

18 Page E-viii, Five-Year Review Summary Form, Review Status, Review Period – Please change start of preview period from "February 2015" to "January 2015" (the FYR began when the FYR process was presented to the public (i.e. January 15, 2015, Devens' RAB meeting)).

Response. The text has been changed as indicated. February to January

19 Page E-viii, Five-Year Review Summary Form, Review Status, Review Number – Please change "1" to "4" (this is the fourth, Five-Year Review for the former Fort Devens Army Installation).

Response. The text has been updated as indicated.

20 Page E-ix, Five-Year Review Summary Form (continued) - The "Protectiveness Statement(s)" section must be preceded by an "Issues/Recommendations" section (see attached "Updated Five-Year Review Summary Form, December 9, 2011"). The "Issues/Recommendations" table can be copied and pasted as many times as necessary to document all issues/recommendations identified in the FYR Report.

Response. No Issues/Recommendations were determined for any of the AOCs reviewed. Technical recommendations are included in each sections discussion. As a result the Issues/Recommendations form was deleted.

21 Page E-ix, Protectiveness Summary, SHL, Protectiveness Statement – Please delete the current text and replace it with, "The SHL remedy is considered protective of human health and the environment in the short-term, because there is no evidence of current exposure. However, in order for the remedy to remain protective in the long-term, the Recommendations and Follow-Up Actions identified in Section 2.9 must be successfully resolved." (see comment 66 below)

Response. The existing text will be deleted and replaced with the following:

The remedy is considered to be protective of human health and the environment in the short-term. Short-term protectiveness is achieved because:

- *There is no current exposure of Site related waste to humans or the environment at levels that would represent a health concern.*
- *The landfill cover system prevents exposure to the waste material and contaminants within the landfill.*
- *The public water line has eliminated ground water sue with the area impacted by the landfill.*
- *The land use restriction prevents any use of the land that would result in an exposure to hazardous substances, pollutants or contaminants.*

Long term protectiveness will be accomplished through performance of operation, maintenance and monitoring activities along with the eventual restoration of the groundwater. A reduction in the cleanup level for arsenic will be necessary prior to the certification that long-term protectiveness has been achieved.

22 Page E-ix, Protectiveness Summary, SPIA, Protectiveness Statement – Although it doesn't affect the short-term protectiveness of the remedy, EPA's recent request for supplemental information may necessitate enhancement of the site's LTM program to ensure long-term protectiveness. In addition, the LTMP should be amended to include sampling for 1,4- dioxane since chlorinated VOCs have been detected in site groundwater. Such analysis is recommended for any site with chlorinated VOCs.

Response. The compound, 1,4-dioxane, is not include in the ROD for SPIA. The recommendation for the addition of 1,4-dioxane to the LTM will be taken into consideration during the next LTMMP review period. The text will remain unchanged.

23 Page E-x, Protectiveness Summary, Former Moore Army Airfield (AOC 50), Protectiveness Statement – Although it doesn't affect the short-term protectiveness of the remedy, supplemental ERD Injections (with pre- and post- monitoring) should be performed in targeted areas with TCE concentrations above remedial goals.

Response. Supplemental ERD injections are evaluated in the Annual Reports.

24 Page 1-3, Section 1.4 – Please amend the text to reflect that this is the "fourth" comprehensive Five-Year Review (FYR) that has been performed for the Former Fort Devens; the "third" FYR for AOC 50, AOC 57, and the DCL and the "fifth" FYR for SHL. (Please see section 1.4 of the 2010 FYR Report.)

Response. The text will be updated reflect the correct numbers.

SECTION 2 –SHEPLEY'S HILL LANDFILL (AOCS 4, 5, AND 18)

25 Page 2-1, Section 2.0 – As discussed in GC 1 above, this entire section (and all subsequent sections) should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". Specifically, the discussion should be reformatted to include the following subsections:

2.1 - Introduction
2.2 - Site Chronology
2.3 - Background
2.3.1 Physical Characteristics
2.3.2 Land and Resource Use

2.3.3 History of Contamination
2.3.4 Initial Response
2.3.5 Basis for Taking Action

2.4 - Remedial Actions

2.4.1 Remedy Selection
2.4.2 Remedy Implementation
2.4.3 System Operations/Operation and Maintenance (O&M)

2.5 - Progress Since the Last Five-Year Review

2.6 - Five-Year Review Process

2.6.1 Administrative Components
2.6.2 Community Involvement
2.6.3 Document Review
2.6.4 Data Review
2.6.5 Site Inspection
2.6.6 Interviews

2.7 - Technical Assessment

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

2.8 - Issues

2.9 - Recommendations and Follow-up Actions

2.10 - Protectiveness Statement(s)

2.11 - Next Review

Tables (should be inserted into each subsection as noted)

Table 1 - Chronology of Site Events (2.2)
Table 2 - Annual System Operations/O&M Costs (2.4.3)
Table 3 - Quarterly Comparison of Groundwater Concentrations (2.6.4)
Table 4 - Issues (3.8)
Table 5 - Recommendations and Follow-Up Actions (2.9)

Response. All information listed above is presented within the text report for each AOC. However, the formatting will be reviewed for consistency with EPA's 2001 guidance.

26 Page 2-1, Section 2.1 – Please change "fourth, five-year review" to "**fifth**, five-year review" in the first sentence.

Response. The text has been updated as suggested.

27 Pages 2-1 and 2-2, Table 2-1 – Please explain "September 2000*" (which refers to a footnote at the end of the table). The requirement to conduct FYRs has always applied to sites with remedial decisions only (to ensure that remedies, where hazardous substances are left on-site, remain protective over the long-term. Please explain the statement (in the footnote) that "In 2000, FYRs were required for all sites *undergoing investigations* or remediation…"

Response. *Footnote was included to explain the second FYR at SHL occurring only 2 years after the first. The footnote will be revised to read:* ***In 2000, FYRs were required for all sites on Ft Devens with remedial decisions regardless of the time since the previous FYR to consolidate all future reviews into the same year.***

28 Page 2-2, Section 2.3, ¶ 2 – Please insert the following text after the first sentence, "**Evidence from test pits within the landfill suggests earlier usage, possibly as early as the mid-nineteenth century."**

Response. The text has been updated as suggested.

29 Page 2-3, Section 2.3.1 – Please insert the following text at the end of the second paragraph, "A portion of the waste was buried below the water table."

Response. *The referenced paragraph refers to the geologic setting related to arsenic background. The last sentence in the second paragraph of Section 2.3 describes the waste in the landfill and states "…*about 11%, or 160,000 cubic yards situated below the water table (Sovereign, 2011)." The text will remain unchanged.

30 Page 2-3, Section 2.3.2 – Please insert a new section immediately following the previously inserted sentence entitled, "2.3.3 History of Contamination" (and change all subsequent section numbers accordingly). Please ensure that all of the information contained in Section 3.2.2 of the 2010 FYR is reflected in this discussion.

Response. *A new section heading "2.3.3 History of Contamination" will be inserted after the second paragraph in Section 2.3.2. The text presented a summary discussion of the history of contamination.* **The text will remain unchanged.**

31 Page 2-3, (new) Section 2.3.3 – For consistency with previous FYR Reports, please replace the current AOC 5 description with the following: "**AOC 5, typically referred to as "Sanitary Landfill No. 1" was closed in five phases between 1987 and 1992-93 in accordance with Massachusetts Regulations 310 CMR 19.000. The MassDEP approved the closure plan in 1985. Details regarding landfill closure and related requirements are provided in Section 2.3.4."**

Response. The text has been updated as suggested.

32 Page 2-4, (new) Section 2.3.5 – As outlined in comment 23 above, please amend the title of this section to "**Basis for Taking Action**" and include a summary of post-closure soil, sediment, surface water, and groundwater conditions at and in the immediate vicinity of the landfill and identify the current and potential human health and ecological risks that necessitated the issuance of the 1995 ROD (see Section 3.2.4 in the 2010 FYR).

Response. The text has been updated to include the following:

Basis for Taking Action

Between 1991 and 1993, the Army performed a RI and supplemental RI at SHL. The RI and RI Addendum reports identified potential human exposure to arsenic in groundwater as the primary risk at SHL. The RI Addendum Report also identified potential ecological risks to aquatic and semi-aquatic receptors from exposure to Plow Shop Pond surface water and sediments.

33 Page 2-6, Table 2.2, Note 3 – Please delete the second sentence (reference to the "original calculated background concentration of 291" is irrelevant for purposes of the FYR.

Response. The text has been deleted as suggested.

34 Page 2-7, Section 2.3.5.1 –The current format is unacceptable. Specifically, subsections 2.3.5.1 – 2.3.5.12 should be incorporated into Section 2.4.2 (and include specific details related to the ROD requirement, subsequent design and implementation, and status of each of the key components of the SHL remedy listed in the current section (i.e., landfill closure to issuance of the 2013 ESD for ICs)) Please refer to Section 3.3.2 of the 2010 FYR.

Response. The section has been moved and reformatted as requested.

35 Page 2-9, Long-Term Groundwater Monitoring – As outlined in comment 23 above, please delete the current text and insert text from the two paragraphs in the 2010 FYR (page 3-8). Since this discussion should be focused specifically on SHL-related LTMMP activities, the following should be inserted as a new, third paragraph, ""A revised LTMMP is under review and will be implemented upon successful resolution of EPA and MassDEP comments." Since the SHL LTMMP Update has not yet been finalized, it is inappropriate to suggest that it has already been modified and for implementation sometime this year.

Response. The text has been updated to include the following:
The ROD required development of a long-term groundwater monitoring plan at SHL to evaluate remedy performance and assess future environmental effects. The revised LTMMP (Sovereign, 2015), includes evaluations of remedy performance. The ROD called for semiannual groundwater monitoring for a minimum of 30 years.

The groundwater monitoring program includes a total of 46 monitoring wells. Hydraulic monitoring is conducted at all 46 monitoring wells. Water quality sampling (including analysis for arsenic) is conducted at 46 monitoring wells in the fall (October) and 9 of those 46 wells are sampled in the spring (April), and every five years 7 additional wells are included in the sampling program. The analytical parameters are appropriately limited to field parameters, selected inorganic parameters, and seven metals (including arsenic, iron, and manganese).

36 Page 2-10, (new) Section 2.4.3 – As outlined in comment 23 above, please insert a section entitled, "2.4.3 - System Operations/Operation and Maintenance (O&M)" and discuss system operations and O&M activities since the last five year review. In addition, a summary of annual operations and O&M costs should be presented as "Table 2 - Annual System Operations/O&M Costs".

Response. Section 2.4.3 was renamed System Operations/Operation and Maintenance (O&M). The section discusses system O&M activity during the five year review period. Operational costs were not included.

37 Page 2-11, Section 2.4 Five Year Reviews – This discussion is just a continuation of the remedial components specified in the ROD. As such, please revise the header to "2.3.7 – Five Year Reviews".

Response. The headers will be reviewed and revised accordingly. See comment #25.

38 Page 2-11, Section 2.4.1 – This discussion should be incorporated into "2.6.4 Data Review". Also, the discussion of sampling results should address each of the COCs identified in Table 2.2. In addition, although data summaries are provided in Appendix C, please incorporate a table entitled, "Quarterly Comparison of Groundwater Concentrations" into this subsection.

Response. The headers will be reviewed and revised accordingly. See comment #25.

39 Page 2-12, Section 2.4.1 - Please amend the last bullet on the page to read, "**A revised LTMMP is under review and will be implemented upon successful resolution of EPA and MassDEP comments.**" Since the SHL LTMMP has not yet been finalized, it is inappropriate to state that it has been "updated" and will be implemented this year.

Response. While the Army will continue to work with EPA to resolve any remaining issues related to the draft final LTMMP; however, the plan as it relates to groundwater monitoring wells, sampling frequency and analysis is currently being implemented.

40 Page 2-13, Section 2.4.1 – Please amend first bullet to read, "The revised draft find LTMMP proposed groundwater sampling semi-annually…." Since the SHL LTMMP has not yet been finalized, it is inappropriate to state that it "stipulated" any changes to the current (December 2009) LTMMP.

Response. . See response to comment no. 39.

41 Page 2-15, Section 2.4.3 – Please delete the text after, "…in a reasonable amount of time" in the first bullet. The remedy is not "considered technically infeasible with respect to meeting long-term remedial objectives".

Response. The last bullet will be deleted.

42 Page 2-17, Section 2.4.3 – Please insert the following text as the last bullet in this section, "While the ATP remains effective at treating extracted groundwater to concentrations required for discharge to the Devens POTW, the current SHL remedy (i.e., extraction and treatment of arsenic contaminated groundwater appears inadequate for purposes of achieving the RAOs and cleanup levels set forth in the 1995 SHL ROD". (Please see Army's 12/31/14 response to EPA's 09/29/14 comments on the October 2013 draft LTMMP.)

Response. The text has been updated to include the following:

With respect to the hydraulic capture zone analysis, the lines of evidence evaluated as per *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems* (USEPA, 2008) indicate the ATP effectively controls the migration of impacted groundwater at the north end of SHL. Despite apparent minor seasonal fluctuations and brief system operational shutdowns, the extraction wells are effective in maintaining a capture zone across the toe of the landfill as designed. However, due to site conditions specified in the CSM, the current SHL remedy (i.e., extraction and treatment of arsenic contaminated groundwater) is unlikely to achieve the groundwater cleanup levels within a reasonable timeframe as set forth in the 1995 SHL ROD.

43 Page 2-17, Section 2.5, Tables 2.3 and 2.4 – Please amend the tables to present only the Protectiveness Statement and recommendations in Section 3.8 of the 2010 FYR and the follow-up actions taken to address/resolve those items.

For example, the first "Issue" identified in Section 3..7 of the 2010 FYR was "ICs prohibiting the use of groundwater as drinking water in the Impact Area are not explicitly stated in the ROD". The "Recommendations and Follow-Up Actions" in Section 3.8 stated that "The Army will prepare a ROD ESD or a ROD Amendment that will formally specify the ICs that prohibit the use of groundwater within the Impacted Area" and includes several IC-specific items that must be incorporated into the amended remedy to ensure long-term protectiveness. The 2015 FYR should identify the issue and recommendations/follow-up and describe the actions taken to address each item. Table 2.4 is inadequate in that it fails to present a thorough and detailed description and evaluation of the implemented actions, including whether they achieved the intended purpose, and the status of any other prior issues. (Please refer to section 3.4 in the 2010 FYR which provides an acceptable assessment of the progress made since the last (2005) FYR.)

Response. Table 2.3 and 2.4 list the protectiveness statement and the issues determined in the previous five year review.

44 Page 2-17, Section 2.5 – The 2015 FYR fails to (1) accurately identify the issue as specified in the 2010 FYR (see pages 3-31 and 3-32) and (2) adequately describe the follow-up actions taken to respond to the recommendation in the 2010 FYR which was to "develop a remedial alternative that will effectively meet RAOS and cleanup goals established as part of an updated remedy that specifically addresses the current site conditions". While progress was being made with regards to the development of a site-specific background arsenic concentration and a long-term remediation strategy to address this issue, recent discussions seem to suggest that the Army is now reluctant to move forward in completing either of these tasks until agreement can be reached on a revised CSM.

Response. Section 2.5 identifies the previous issues from the 2010 five year report. See Army response to EPA comments on the draft final LTMMP Update

45 Page 2-21, Section 2.5.2 – Please delete the sentence "The downgradient extent of dissolved arsenic to the north-northwest of the landfill is controlled by changing redox chemistry that attenuates dissolved arsenic concentrations when reduced groundwater mixes with the oxygenated conditions of Nonacoicus Brook." This statement does not account for the potential situation that arsenic concentrations show a statistically significant decline in the absence of statistically significant changes in "geochemical parameters" that might be used as indicators of redox conditions. While the Army's CSM presumes that dissolution of previously attenuated arsenic is a significant source of currently elevated concentrations, as well as increasing concentrations that have been observed for a limited number of monitoring wells in the portion of the aquifer between the extraction wells and Sculley Road, the EPA/ORD CSM presumes that the primary source of elevated/increasing concentrations is attributed to transport of the landfill-derived plume prior to installation of the extraction system in 2006 and plume movement in response to changing flow gradients from operation of the ATP. In light of the significant differences between the Army's and EPA's CSM, it is inappropriate to include these types of statements/opinions.

Response. The suggested text has been deleted and replaced with the following:

The results of the investigation indicated decreasing arsenic concentrations in groundwater profile and monitoring wells approaching the Nonacoicus Brook. Along with the existing data, the findings indicate the presence of a zone of arsenic attenuation adjacent to the brook that limits discharge of appreciable concentrations from discharging to the Brook.

46 Page 2-22, Section 2.6.3 – Please amend this subsection (and all subsequent "Document Review" subsections) to identify (i.e. list) each of the documents evaluated for the FYR (please refer to section 3.5.2 in the 2010 FYR).

Response. The document list for respective AOCs will be included as an attachment with the text revisions per the 2001 EPA guidance TOC.

47 Page 2-22, Section 2.6.4 – Please amend this subsection (and all subsequent "Date Review" subsections) to be a narrative discussion of data collected since the last FYR. (Please see Section 3.5.3 in the 2010 FYR). In addition, please omit Army comparisons of sampling results and ORP values, which are irrelevant for purposes of presenting results of annual groundwater sampling events and associated trends in COC concentrations at key monitoring locations.

Response. The data review included reviews of data from 2010 through 2015 as stated in the first sentence of Section 2.6.4. The text will be reviewed for clarification. No further changes will be made to the data review discussion.

48 Page 2-24, Section 2.6.4.2 – Please insert a brief description of the ATP optimization/upgrades that were completed by the Army to increase the average effective pumping rate of the system to 50 gpm. (see last paragraph on page 2-26).

Response. The text has been updated to include the following after the third sentence in the paragraph:

Several upgrades to the ATP were implemented in in 2014. These upgrades were primarily related to increasing the average effective flow rate of the system. Upgrades and changes included two additional modules to the skid (filtration from 8 to 10 units) and upsized the effluent pump, storage tanks and other related components to increase maximum flow rate.

49 Page 2-22, Section 2.6.4 – Please insert the following text at the end of the paragraph, "Unfortunately, current data suggests that the current ATP appears inadequate for purposes of achieving the RAOs and cleanup levels set forth in the 1995 SHL ROD. A more comprehensive, long-term remediation strategy should be developed to resolve this issue."

Response. The text was reviewed for clarification. The text will remain unchanged.

50 Page 2-24, Section 2.6.4.3 – Per EPA's request (in comments on the Army's 12/31/14 RTC package and Draft Final LTMMP), please amend this section to include an arsenic trend analysis. Given the current rate of groundwater flow projected in the NIA, along with recent upgrades to the extraction system, a trend analysis (inclusive of additional wells within the "Nearfield Area") be performed as part of the 2015 FYR.

Response. The last three sentences of the first paragraph of Section 2.6.4.3 will be deleted and replaced with the following:

Long-term groundwater monitoring data from wells located within the landfill foot print and adjacent to the bedrock slope (SHM-10-12, SHM-10-14, SHM-10-15), and likely recharge area of Shepley's Hill, indicate that arsenic concentrations remain elevated, in the range of 3 to 6 mg/L. Monitoring wells in the NIA located along the slope of Shepley's Hill also exhibit high arsenic concentrations (greater than 1 mg/L) suggesting that groundwater originating from Shepley's Hill may be a significant source of arsenic within the footprint of the landfill as well as downgradient from the landfill in the vicinity of SHM-05-41C and SHM-10-16. Another area of significant arsenic impact to groundwater is observed in the vicinity of SHM-05-40X and SHM- 13-06. These wells monitor an area of the overburden that is located downgradient from the north toe of Shepley's Hill bedrock and is shallower than, and west of, the deeper plume migrating from the landfill within the bedrock valley (see Figure 2). In 2001, arsenic at similar concentrations was observed in this area in profile wells SHX-01-10X and SHX-01-09X, suggesting that a separate arsenic source that is unrelated to the deep plume migrating from the landfill may be present within the NIA.

Also, please delete the second paragraph; it is based solely on Army opinion and does not consider EPA's interpretation of the data. The purpose of this discussion is to present results only. The Army's interpretation of those results should be omitted.

Response. Comment noted. No changes will be made to the text.

51 Page 2-25, Section 2.6.4.6 – Please delete the second paragraph. It is misleading and not supported by data collected from the NIA.

Response. The paragraph was revised to the following:

As described above, additional investigations were conducted in late 2013 and early 2014 to further assess discharge to Nonacoicus Brook. Vertical profiling and groundwater monitoring indicate arsenic precipitation prior to discharge to the brook. Further, the CSM for the site indicates that the northern extent of dissolved arsenic at the brook is due to precipitation/attenuation of arsenic as groundwater discharges to the oxygenated zone of the brook and associated wetlands.

52 Page 2.27, Section 2.7 – Please amend the section to follow the format in the 2010 FYR. Specifically, this section should identify each of the three "Technical Assessment" questions and a statement regarding the remedy's ability to successfully respond to each (separate subsections are unnecessary and inconsistent with the FYR format outlined in GC1 above).

Response. The overall format numbering will be reviewed for consistency with the 2001 guidance.

53 Page 2.27, Section 2.7, Question A- Please change "Yes" to "Partially". While the ATP is functioning as intended (i.e., designed), it is insufficient for purposes of achieving the RAOs of the ROD.

Response. The text has been updated to include the following:

Yes. The contingency groundwater extraction remedy, landfill cap, and supplemental barrier wall when considered in the context of the ICs that prohibit use of groundwater as drinking water in the NIA, generally achieves the RAOs stated in the ROD. However, due to site conditions specified in the CSM, the ATP while operating as designed and intended, is unlikely to achieve cleanup levels within a reasonable timeframe as specified in the ROD.

54 Page 2-27, Section 2.7, Question A – Please delete the second paragraph of the current section 2.7.1. There is insufficient evidence (i.e., lack of monitoring points) to make such a determination. In addition, for reasons previously discussed, "available data" does not "support likely capture of the arsenic plume emanating from the landfill." (Please refer to Section 3.6 of the 2010 FYR, which reflects an adequate response to this question.) This language seems to follow statements in the draft 2014 SHL Annual Report that incorrectly imply that all contaminated groundwater emitting from the landfill is captured by the extraction system, and elevated arsenic concentrations downgradient of the extraction system (i.e., near- and far-field of the North Impact Area) originate from in-place sources of arsenic that are responding to "other geochemical conditions" within the North Impact Area aquifer. These statements are based on Army opinion that arsenic concentrations on the order of thousands of micrograms per liter observed downgradient of the ATP extraction wells are not related to historical migration of the SHL contaminant plume prior to installation of the interim remedy, which is contrary to EPA's interpretation of available data which shows that if an active release of arsenic from aquifer solids was occurring in the North Impact Area, then trends in arsenic concentrations would not

respond to the effort to contain the landfill plume with installation and operation of the ATP extraction wells.

Response. The paragraphs were revised to:
Although the remedy is operating as intended, dissolved arsenic concentrations downgradient of the ATP extraction wells remain elevated and stable in many locations. Review of historical and recently collected data continues to indicate that the site conditions specified by the CSM are contributing to the downgradient concentrations. The data indicates that ATP operation appears to have less influence on concentrations downgradient of the extraction wells even though available data support hydraulic capture of the arsenic impacted groundwater emanating from the landfill.

Further analysis is being conducted using groundwater flow models and site data analysis to refine ATP influence on the downgradient dissolved arsenic concentrations and the geochemical conditions of the aquifer and site.

55 Pages 2-27 and 2-28 – For reasons previously discussed, please delete subsections 2.7.1 – 2.7.5. (Please refer to Section 3.6 of the 2010 FYR, which reflects an adequate response to this question.)

Response. These sections were not deleted. The sections review the O&M activities using similar headings as the previous five year review.

56 Page 2-28, Question B – Please amend the discussion to include each of the elements to be considered in responding to this question (i.e., changes in standards, changes in exposure pathways, changes in exposure assumptions, changes in toxicology and other contaminant characteristics and change in risk assessment methodology). Please refer to Section 3.6 of the 2010 FYR, which reflects an adequate response to this question.

Response. The answer to Question B in the current five year answers the question without the use of additional language that doesn't affect the conclusion. No changes have occurred in the assumptions since the last review period.

57 Page 2-28, Question B – The mention of an "ARAR Review" is inadequate. Please amend this section (and all subsequent Question B sections) to include a review of ARARs that were presented in the ROD. Specifically, the text should identify any ARARs that have been modified since the signing of the ROD and may affect the protectiveness of the implemented remedial action. (See Section 3.6.1 of the 2010 FYR.)

Response. The ARARs were reviewed. A table was included in the Appendix for Shepley's Hill to provide the reader an easier format to review. The only change that occurred in the ARARs was the arsenic MCL, and this was reviewed in the text.

58 Page 2-28, Question C – Please amend this discussion to reflect that in Section 3.6 of the 2010 FYR.

Response. The text has been updated to include the following:
The ATP and LTMMP are evaluated annually and the data is used to adjust operation, maintenance and monitoring activities accordingly. In general arsenic concentrations in LTMMP wells remain relatively stable compared over time.

The MCL for arsenic in effect at the time of the ROD (50 µg/L) was selected as a groundwater cleanup goal. Arsenic was present onsite at concentrations greater than its MCL during the RI and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 1995 ROD. Changes to the MCL for arsenic, in association with changes of the USEPA National Primary Drinking Water Regulations for arsenic as implemented on January 23, 2006, effectively reduce the clean-up level for arsenic from 50 µg/L to 10 µg/L.

Monitoring wells upgradient and cross-gradient from the landfill, and wells outside the influence of the ATP, exhibit arsenic concentrations in excess of the MCL. This suggests that the expectation that the Contingency Remedy can achieve the ROD objectives is potentially unrealistic due to elevated local background arsenic concentrations and the source strength of reducing conditions within the landfill and throughout the impacted area.

59 Page 2-30, Section 2.76, Technical Assessment Summary – For reasons previously discussed, while there do not appear to be concerns related to the short-term effectiveness of the remedy, the fact that EPA, MassDEP and the Army have all acknowledged that the current ATP system is incapable of meeting of the RAOs set forth in the 1995 ROD, poses real concerns about the long-term protectiveness of the remedy. As such, this entire discussion needs to be stricken and revised to reflect a more accurate, collaboratively-based assessment of the current remedy. Specifically, the revised discussion should acknowledge, at a minimum, the following:

- The current SHL remedy is inadequate for achieving the RAOs (and cleanup goals) set forth in the 1995 ROD in a reasonable timeframe;
- The current RAO requiring cleanup to MCLs may not be achievable, in a realistic timeframe, given the complexity of site conditions (i.e. naturally-occurring arsenic concentrations in bedrock under and around the SHL) and the
- ~~The revised, 2013 draft LTMMP needs to be amended to focus specifically on the collection (and assessment) of data needed to select a final remedy and develop performance metrics to evaluate cleanup progress; also, current summary reports (presenting current and historical trends in water chemistry) are too general in nature to support the design and decision-making process and warrant revision~~

Response. The two issues listed in the five year were not deleted. The first bullet indicates an understanding of the capture zone is needed to determine how the ATP is affecting the arsenic present in groundwater. The second bullet indicates the current remedy may not achieve the remedial goals, as the EPA comment indicates. The text has been updated to include the following:

- *The current ROD clean up goal to meet MCLs downgradient of the SHL is unlikely to be achieved within a realistic timeframe, given the complexity of the site conditions (i.e., naturally occurring arsenic concentrations in aquifer sands, till and bedrock).*

60 Page 2-9, Section 2.7.6, Technical Assessment Summary – EPA disagrees with the statement that "refinement of the CSM" is critical to addressing "technical concerns" raised in this discussion (and in the subsequent section 2.8), which seems to be contrary to the Army's 12/31/14 responses to EPA comments on the draft LTMMP. Specifically, the Army states that, "While refinement of the CSM is an ongoing process, ***the Army believes that all critical elements of the current CSM are sufficient for both the evaluation of the current remedy and development of an alternate SHL remedy***". As you are aware, attempts over the last decade to resolve major differences between Army and EPA interpretations of the CSM have proven unsuccessful. The Army's conceptual model is based around the assumption that elevated arsenic in this area is due to dissolution of arsenic-bearing iron oxyhydroxides that derive solely from the natural geology in which the landfill is placed. The EPA/ORD conceptual model, on the other hand, is based on the assumption that historically disposed materials (i.e., incinerator ash disposed proximate to monitor well location SHM-10-12) are the primary historical source of arsenic contained in the arsenic-bearing iron oxyhydroxides within aquifer solids immediately below the landfill footprint. A second disagreement is the source of elevated arsenic concentrations observed within the NIA. Again, the Army CSM presumes that dissolution of previously attenuated arsenic is a significant source of currently elevated concentrations, as well as increasing concentrations that have been observed for a limited number of monitoring wells in the portion of the aquifer between the extraction wells and Sculley Road. The EPA/ORD CSM presumes that the primary source of elevated/increasing concentrations is attributed to transport of the landfill-derived plume prior to installation of the extraction system in 2006 and plume movement in response to changing flow gradients from operation of the ATP.

In an effort to move BCT discussions forward on the development and timely implementation of a more effective, long-term remediation strategy, earlier this year EPA suggested that the Army and EPA "agree to disagree" on the CSM issue. While the Army seemed to accept EPA's recommendation at the time, more recent correspondence seems to suggest that the Army will not move forward until this issue can be resolved. EPA, on the other hand, firmly believes that the most critical issue for selection of the final remedy is determination of the most technically feasible and cost-effective remedy that can achieve and sustain the cleanup target, which can be accomplished without a mutually-acceptable CSM.

Response. See Army response to comments on the draft final LTMMP Update. A determination of a technically feasible and cost effective remedy requires an understanding of the site and its background condition. A Conceptual Site Model is widely considered a living document that changes with the site over time as remedies are applied. To effectively understand the complexity of SHL and the NIA, the Army needs to revisit the CSM, determine background arsenic concentrations and evaluate flow models to determine a remedy that will achieve a final goal.

61 Page 2-9, Section 2.7.6, Technical Assessment Summary- EPA is opposed to even a "temporary shut-down" of the existing ATP to "evaluate potential rebound of arsenic following shut-off" nor it is willing to consider a TI waiver until all of the previously-agreed upon issues have been successfully addressed

and all of the previously-identified tasks have been completed. Please delete these items from the FYR. Their inclusion is premature and misleading.

Response. The bullet referencing a rebound evaluation has been deleted.

62 Page 2-29, Section 2.8, Issues – Please amend this section to include the following items:

- The current SHL remedy is inadequate for achieving the RAOs (and cleanup goals (i.e. MCLs) set forth in the 1995 ROD, in a reasonable timeframe
- The aerial extent of the impacted aquifer and degree of complexity in hydrogeologic and geochemical conditions may preclude achievement of the current RAO requiring cleanup to MCLs
- The ROD does not include specific RAOs for the restoration of groundwater within the NIA
- There is no comprehensive groundwater monitoring program in place to effectively evaluate the performance of all current remedial system components

Response. The Issues section of a five year review typically lists concerns that affect the protectiveness of a remedy. The issues listed in the comment are technical and were addressed in the previous section. The remedy in place with the ICs is protective. The time frame to achieve the MCLs outlined in the ROD with the selected remedies is significant, however human health and the environment are not negatively affected as is shown through LTM data.

63 Page 2-29, Section 2.9 – Recommendations and Follow up Actions – This section should be revised to address, at a minimum, each of the "Issues" identified in comment 46. above:

- Amend/finalize the LTMMP Update to reflect a groundwater monitoring program that effectively:
  - → includes sufficient well locations, sampling frequency and analysis/statistical metrics for analysis of monitoring data;
  - → evaluates the performance of all current remedial system components;
  - → evaluates contaminant source strength under the landfill, plume response at the toe of the landfill, and plume response in the NIA;
  - → includes frequent collection of groundwater samples from the expanded (2013) monitoring well network;
  - → evaluates trends in contaminant concentrations and geochemical parameters prior to and following startup of the ATP,
  - → analyzes concentration trends relative to remedial approach at north toe of SHL, and
  - → identifies critical DQOs (using site-specific data) to support development of a Final FS, selection of final remedy and development performance metrics to comprehensively evaluate final remedy performance

- Develop a SHL specific, arsenic background value (and/or some acceptable "range" from which to gauge remedy performance) that is derived from statistical analysis of existing monitoring locations with datasets supported from historical or on-going sampling programs

- Develop a long-term remediation strategy that:
  - → contains (and/or treats) high-arsenic groundwater at the north end of the landfill;

→ is technically feasible and cost-effective
→ is able to achieve the RAOs and cleanup goals as set forth in the 1995 ROD (or yet-to-be-determined, site-specific cleanup target level(s) in a ROD Amendment);
→ includes RAOs for the restoration of groundwater within the NIA

- Refine current groundwater flow model – (1) account for the potential decline in arsenic concentrations in the absence of changes in "geochemical parameters" that might be used as indicators of redox conditions (2) incorporate site-specific data to evaluate contaminant source strength under the landfill, plume response at the toe of the landfill, and plume response in the NIA

- Continue to operate the existing ATP at an extraction rate consistent with that specified in the SHL Contingency Remedy RD/RA Work Plan (i.e., 50 gpm).

Response. See previous comment on Issues section.

64 Page 2-29, Section 2.10, Protectiveness Statement – Please amend this section to read, "The SHL remedy is considered protective in the short-term, because there is no evidence of current exposure and exposure pathways that could result in unacceptable risks . Appropriate ICs in the forms of LUCs in the NIA have been implemented to restrict access to groundwater, prohibit the withdrawal and/or future use of water from the aquifer (within the identified groundwater LUC boundary), except for monitoring. In order for the SHL remedy to remain protective in the long-term, a comprehensive remediation strategy that contains (and/or treats) high-arsenic groundwater at the north end of the landfill, achieves the RAOs (and cleanup goals) as set forth in the 1995 ROD (or yet-to-be-determined, site-specific cleanup target level(s), and effectively addresses groundwater restoration within the NIA, must be developed and memorialized in a ROD Amendment.

Response. The text has been updated to include the following

The remedy is considered to be protective of human health and the environment in the short-term. Short-term protectiveness is achieved because:

- *There is no current exposure of Site related waste to humans or the environment at levels that would represent a health concern.*
- *The landfill cover system prevents exposure to the waste material and contaminants within the landfill.*
- *The remedy protects potential residential receptors from exposure to contaminated groundwater migrating from the landfill through land use controls that prohibit access to groundwater.*

Long-term protectiveness will be accomplished through continued performance of operation, maintenance, and monitoring activities and the eventual restoration of the groundwater to cleanup goals or background conditions.

SECTION 3 - DEVENS CONSOLIDATION LANDFILL (AOCs 9, 40, and SA 13) highlight needs discussion

65 Page 3-1, Section 3.0 - This entire section should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

66 Pages 3-3 and 3-4, Sections 3.3.4.1 – 3.3.4.3 – Please amend these subsections to include the level of detail provided in the 2010 FYR (Sections 9.2.1.1 – 9.2.1.3).

Response. Sections 3.3.4.1-3.3.4.3 presents a concise summary discussion of the history of contamination for the AOCs included within the DCL. The text will remain unchanged.

67 Page 3-6, Section 3.3.7 – Consistent with Section 9.3 of the 2010 FYR, please insert the following RAO:

- Prevent exposure by ecological receptors to landfill-contaminated sediments exceeding acceptable risk-based thresholds

Response. The text has been updated to include the referenced RAO listed above.

68 Page 3-8, Section 3.3.8.4, ¶ 5 – Typo. Change "ACOs" to "AOCs".

Response. The change will be made.

69 Page 3-9, Section 3.4 – Type. Please delete "… And will be verified by groundwater monitoring at the DCL to assess potential migration" from the Protectiveness Statement.

Response. The above line will be deleted, it was copied in error.

70 Page 3-11, Section 3.5.4 – Please amend this section to include a discussion of DCL long-term monitoring and leachate monitoring data collected since the 2010 FYR.

Response. A summary discussion of the DCL LTM and leachate data has been presented in Section 3.5.4. As stated, groundwater EPH, VPH, pesticide and metals data from 2010 through 2014 were below applicable standards. The last paragraph states that the leachate effluent sample results were within discharge permit limits from 2010 through 2014. The text will remain unchanged.

71 Page 3-13, Section 3.6 – Please amend this section to provide detailed responses to the three key questions for the contributor sites and the DCL (see GC 1 above). EPA disagrees with the Army's recommendation to remove the DCL and its contributor sites from the CERCLA FYR process. As you aware, ICs were incorporated into the quitclaim deed for parcels A2A (AOC 9), A8 (SA13), and A4 (AOC 40) to prevent residential development of the properties. Due to the LUCs placed in the quitclaim deed,

these three contributor sites became (and remain) subject to five-year reviews. (AOC 11 did not include LUCs because it was remediated to unrestricted reuse.)).

In addition, the presentation and discussion of results and recommendations contained in the "Optimization Evaluation" of long-term monitoring at the DCL, should be deleted. The referenced report is a draft document, undergoing regulator review and evaluation. It is, therefore, inappropriate and misleading to include any discussion of it in this document.

Response (part 1). ***Section 3.6 (second and third paragraphs will be revised to include the following):***

Under the CERCLA Five Year guidance, the DCL contributor sites (AOC 9, AOC 40 and SA13) meet the ROD remediation goals for unrestricted use/unrestricted exposure (UU/UE). It is recommended that the DCL contributor sites be removed from the CERCLA five year review process.

The human health and ecological risk discussed in the ROD have been eliminated from the contributor sites by the excavations and removal of the soils and implementation of the ICs and LUCs to prevent exposure. The details of the remediation and landfill construction have been presented in the approved Remedial Action Closure Report (Shaw, 2003). While LTM and leachate monitoring results have consistently been below applicable standards, LTM and leachate monitoring of the DCL will continue to assess the effectiveness of the source containment remedy.

Response (part 2). The revised LTMMP was approved "Final", dated February 2015. The text will remain unchanged.

72 Page 3-14, Section 3.9 – For reasons discussed in comment 77 above, EPA disagrees with the Army's recommendation to remove the DCL and its contributor sites from the CERCLA FYR process. Therefore, please amend the section to reflect the fact that the next FYR will be conducted in September 2020.

Response. Section 3.10 will be revised to include the following:

Under the CERCLA Five Year guidance, the DCL contributor sites (AOC 9, AOC 40 and SA13) meet the ROD remediation goals for unrestricted use/unrestricted exposure (UU/UE). It is recommended that the DCL contributor sites be removed from the CERCLA five year review process.

The remedy at DCL is protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled. (keep second P)

The following sentence will be inserted at the end of the paragraph in section 3.11: "The next five year review for the DCL only will be conducted five years from the completion of this review."

SECTION 4.0 – SOUTH POST IMPACT AREA (AOCs 25, 26, 27, and 41)

73 Page 4-1, Section 4.0 - This entire section should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

74 Pages 4-3 and 4-4, Sections 4.3.1.1 – 4.3.1.4 – Please amend these subsections to include the level of detail provided in the 2010 FYR (Sections 6.2.1 – 6.2.4).

Response. Sections 4.3.1.1-4.3.1.4 presents a concise summary discussion of the history of contamination for the AOCs included within the SPIA. The text will remain unchanged.

75 Page 4-7, Section 4.3.3 – Perchlorate was added as an analyte for the drinking water well (D-1). Please acknowledge this additional analysis in this section.

Response. The following sentence will be added to the first paragraph in Section 4.3.3.

Perchlorate was added as a contaminant of concern for AOC 26 in 2006. (See Section 4.5.4.2).

76 Page 4-13, Section 4.5.4.2 – AOC 26 Groundwater – The first paragraph discusses that "water discharging from the Kettle Pond to the west beyond Firebreak Road may be impacted". Based on the recommendations section of the Perchlorate and Explosives Investigation Report, dated March 2015, please include a statement saying that the Army plans to monitor surface water seasonally over the course of one year at the same locations sampled previously in order to evaluate impacts to surface water.

Response. The text has been updated to include the following:

Based on results of the surface water sample 26SW-14-01, collected near 26WP-06-01/26M-14-SWEL2, elevated levels of perchlorate and explosives contamination appears to be discharging to the Kettle Pond in the general vicinity of 26M-14-SWEL2. The low detections of RDX and HMX in the surface water sample (26SW-14-03) collected near 26M-14-SWEL1 suggests that water discharging from the Kettle Pond to the west beyond Firebreak Road may be impacted. No contamination was detected in the surface water sample collected at Slate Rock Brook. Based on recommendations in the Perchlorate and Explosives Investigation Report (March 2015), surface water samples will be monitored seasonally over the course of one year to in order to evaluate impacts.

77 Page 4-14, Section 4.6 – Please amend this section to ensure that it addresses each of the items listed under Questions A, B and C in GC 1 above.

Response. Questions A and B are acceptable as written. The text has for Section 4.6, Question C text has been updated to include the following:

No other information has come to light that would call into question the protectiveness of the remedy as defined by the 1996 "No Action" ROD. Additional surface water and groundwater sampling has been recommended to confirm the results of the 2014 perchlorate and explosives investigation and evaluate the extent of contamination. However, there is no potential for off-site migration.

78 Page 4-15, Section 4.6.3 - Please insert "draft" prior to "revised LTMMP" in the second sentence since it has yet to be approved by EPA. Reference to results of the "optimization evaluation" and recommendations related thereto should be prefaced by a statement that the report is a draft document, undergoing regulator review and evaluation.

Response. The revised LTMMP was approved "Final", dated February 2015. The text will remain unchanged.

79 Page 4-16, Section 4.6.7 – Text states that further investigations of surface water for contamination by perchlorate and explosives "has been proposed". These proposed investigations should be mentioned as a recommended action in Section 4.8. In the absence of an evaluation in the Five Year Review Report of the potential aquatic impact of already measured perchlorate and explosives concentrations in surface water, it is unknown whether the remedy is protective of the environment. Therefore, the protectiveness should be **deferred** in Section 4.9 and the Executive Summary, and it should be stated that the protectiveness to the environment is unknown and will be investigated during the next five year review period.

Response. See response to Comment #77. The remedy in place at the SPIA is protective of human health and the environment. There is NO potential for off-site migration. The protectiveness statement in Section 4.9 will remain unchanged.

80 Page 4-17, Section 4.7, Issues – For reasons identified in comments 78 and 79 below, please delete the last sentence of this paragraph.

Response. The last sentence will be deleted. The text has been updated to include the following:

This Five-Year Review for SPIA sites AOC 25, AOC 26, AOC 27, and AOC 41 indicates that no issues are present that currently prevent the "no action remedy" from being protective now or in the future. ~~During completion of this five year review, no concerns or areas needing additional information were identified.~~

81 Page 4-17, Section 4.8, Recommendations and Follow-Up Actions –Although the current monitoring network appears to be sufficient for purposes of meeting the ROD-specified RAOs, EPA requests that additional information regarding ongoing training activities, both inside and outside of the SPIA, be provided. Specifically, the additional information requested includes:

- Figure(s) showing the locations of training conducted
- Types and description of training exercises conducted (including, but not limited to the use of pyrotechnics). Please include details regarding the explosives, ammunition, and or ordnance deployed during each activity
- Figure showing the location of drinking water wells within 1 mile of the South Post boundary.
- Figure showing groundwater flow directions across the South Post.
- The location and description of monitoring (if any) that has been conducted to verify that contaminants resulting from these training activities is not migrating off the South Post.

In addition, fire suppression techniques utilized at AOC 26 were briefly discussed during the July 6, 2015 site visit. As a follow-on to those discussions, EPA requests that the Army provide information regarding the current and/or former use of chemical fire suppressants at active training areas on the South Post, with particular attention to the use of Aqueous Film Forming Foams (AFFFs).

Response. The Army is preparing a response to address this request. This information will not be included in this FYR.

82 Page 4-17, Section 4.8, Recommendations and Follow-Up Actions – Although the current remedy appears effective at meeting the ROD-specific RAOs, EPA is concerned about the potential presence of PFCs in drinking water well D-1. As you are aware, PFCs (specifically PFOA and PFOS) are CERCLA emerging contaminants that, if released into the environmental, can pose imminent and substantial dangers to public health and welfare. At military installations, they have been commonly found at areas associated with fire training areas, air fields and in/around hangars. Therefore, in accordance with DOD Instruction (DoDi), Number 4715.18, Section 4.0, dated June 11, 2009 (certified current through June 11, 2016) and recent EPA guidance regarding emerging contaminants (specifically PFCs), EPA requests that this well be sampled and analyzed for PFCs, to ensure that potable drinking water associated with D-1 is, and remains, safe for human consumption.

Response. PFCs are not included in the ROD for SPIA. The recommendation for the addition of these contaminants to the LTM will be taken into consideration during the next LTMMP review period.

SECTION 5.0 –BARNUM ROAD MAINTENANCE YARDS (AOCS 44 AND 52)

83 Page 5-1, Section 5.0 - This entire section should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

84 Pages 5-3 and 5-4, Sections 5.3.2 – 5.3.5 – Please amend these sections to include the level of detail provided in the 2010 FYR (Sections 2.3.2 – 2.3.3.3).

Response. Sections 5.3.25.3.5 present a concise summary discussion of the history of contamination for the AOCs included within the Barnum Road Yards. The text will remain unchanged.

85 Page 5-4, Section 5.3.5 - Although groundwater monitoring has discontinued, tetrachloroethylene was detected in the past (section 5.3.5, page 5-5). 1, 4-dioxane should be measured because this chemical has been found at sites that are contaminated with chlorinated VOCs. This sampling recommendation should be memorialized in this section and the executive summary.

Response. The compound, 1,4-dioxane, is not include in the ROD for AOCs 44/52. The recommendation for the addition of 1,4-dioxane to the Barnum Road LTM will be taken into consideration during the next LTMMP review period.

86 Page 5-6, Table 5.2 – Please amend the "Protectiveness Statement" from the 2010 FYR to reflect text in Section 2.9 (Page 2-15). The current language appears to be from the 2005 FYR.

Response. The text has been updated to include the correct protectiveness statement from the 2010 FYR.

87 Page 5-9, Section 5.6 – Please amend this section to ensure that it addresses each of the items listed under Questions A, B and C in GC 1 above.

Response. Section 5.6 has been reviewed and addresses each of the items listed under Questions A, B, C. The text will remain unchanged.

88 Page 5-11, Section 5.8 – An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that groundwater should be sampled for 1, 4-dioxane because this chemical has been found at sites that are contaminated with chlorinated VOCs.

Response. The RAOs for soil specified in the ROD have been permanently achieved and a Final RI report was issued in 2005. The text will remain unchanged. (see Comment #85)

SECTION 6.0 – DRMO (AOCS 32 AND 43A)

89 Page 6-1, Section 6.0 - This entire section should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

90 Page 6-5, Section 6.2.6 – Please amend this section to include the level of detail provided in the 2010 FYR (Sections 7.3.3.1 and 7.3.3.2).

Response. Section 6.2.6 presents a concise summary discussion of the history of contamination for the AOCs included within the DRMO. The text will remain unchanged.

91 Page 6-7, Section 6.3 – Please amend this section to include the "Building Construction/Well Replacement" discussion in Section 7.3.4 (Page 7-9) of the 2010 FYR.

Response. The text in Section 7.3.4 of the 2010 FYR discusses well replacement performed in 2001. No new wells were constructed or replaced between 2010 and 2015. The text will remain unchanged.

92 Page 6-13, Section 6.6 – Please amend this section to ensure that it addresses each of the items listed under Questions A, B and C in GC 1 above.

Response. Section 6.6 has been reviewed and addresses each of the items listed under Questions A, B, C. The text will remain unchanged.

93 Page 6-13, Section 6.6.1 – Please expand this section to elaborate on remedial action performance since the 2010 FYR (please see Section 7.6 in the 2010 FYR).

Response. The remedial action performance since the 2010 FYR following the persulfate injection is discussed in Section 6.3.5. Section 6.6.1 presents a summary discussion in response to Question A. The text will remain unchanged.

94 Page 6-14, Section 6.6.2 – Please expand this section to provide details on monitoring results of the persulfate injection treatment. In addition, the last sentence of this section is confusing. Is sampling performed annually… in the spring and fall? Please clarify.

Response. The remedial action performance since the 2010 FYR following the persulfate injection is discussed in Section 6.3.5. The last sentence of Section 6.6.2 has been updated to include the following:

Beginning in 2010, four LTM monitoring wells at AOC 32 have been be sampled annually during the spring monitoring event.

95 Page 6-14, Section 6.6.3 – Please insert "draft" prior to "revised LTMMP" in the second sentence since it has yet to be approved by EPA. Reference to results of the "optimization evaluation" and recommendations related thereto should be prefaced by a statement that the report is a draft document, undergoing regulator review and evaluation.

Response. The revised LTMMP was approved "Final", dated February 2015. The text will remain unchanged.

96 Page 6-14, Section 6.6.5 – Please elaborate on the purchase of the warehouse by Ozark Automotive Distributers, Inc. and more specifically, on the installation and sampling of monitoring wells on the property (i.e., how do/will they comply with current restrictions on groundwater use).

Response. The warehouse was purchased by Ozark Automotive in 2013. However, the work was conducted by MassDevelopment. The Army is aware monitoring wells have been installed, but does not receive copies of this information. A request has been made to MassDevelopemnt for this information and upon receipt it will be supplied under separate cover. No additional information is available at this time and the text will remain unchanged.

97 Page 6-16, Section 6.7 – An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that the LTMP should be amended to

include sampling for 1,4 - dioxane since chlorinated VOCs have been detected in site groundwater. Such analysis is recommended for any site with chlorinated VOCs.

Response. The compound, 1,4-dioxane, is not include in the ROD for AOCs 32/43A. The recommendation for the addition of 1,4-dioxane to the LTM will be taken into consideration during the next LTMMP review period.

SECTION 7.0 – HISTORIC GAS STATION (AOCS 43G AND 43J)

98 Page 7-1, Section 7.0 - This entire section should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

99 Page 7-5, Section 7.2.4 – Please insert "Should the Army change the use of either AOC, additional assessment and/or possible remedial action may be needed. In addition, if the Army transfers either AOC by lease or deed, an Environmental Baseline Survey (EBS) will be performed, and a determination will be made by the Army and USEPA whether the remedy remain protective of human health and the environment." (see Section 5.3.3 in the 2010 FYR).

Response. The text has been updated to insert the above statement after the last paragraph

100 Page 7-5, Section 7.2.4 - Please expand the discussion to describe each of components of the remedy (see Section 5.3.4 in the 2010 FYR).

Response. Section 7.2.4 presents a concise summary discussion of the select remedy for AOCs43G.43J. The text will remain unchanged.

101 Page 7-8, Sections 7.3.6 - 7.3.9 – Consistent with the 2010 FYR, each of the sections should be subsections of Section 7.3.5. Please amend.

Response. The overall format numbering will be reviewed for consistency with the 2001 guidance. (See Comment # 96).

102 Page 7-9, Section 7.3.6 – Please insert a new section 7.3.6 to include the "VPH Boundary Standard" discussion in Section 5.3.5.6 of the 2010 FYR.

Response. The following section will be inserted before "Sulfate Injection Pilot Study".

Remedial action implementation at both AOCs consisted of continued LTM and data reporting. The first long-term groundwater monitoring round was performed in December 1999. LTM has been performed annually since 1999. The resulting LTM data was evaluated against the groundwater performance and VPH boundary standards.

The Army uses the MCP Method 1 GW-1 concentrations for VPH boundary performance standards. Remediation goals within the plume are not established for VPH. However, if Method 1 GW-1 concentrations are exceeded at the boundary or compliance point, the Army will develop risk-based VPH concentrations. As concluded in the IRA, migration of VPH concentrations in exceedance of GW-1 standards is not probable and no risk-based concentrations are required at this time.

103 Page 7-9, Section 7.3.10 – Following the preceding comments, change to Section 7.3.7 (and present in **bold** text). In addition, amend the discussion to include details of the "Test Pit Investigation" and "Additional Monitoring Well Installations/Quarterly Monitoring" (see Section 5.3.5.7 in the 2010 FYR).

Response. The test pit investigation and additional well monitoring well installations were performed in 2006 and 2007 and are not relevant to the 2010 -2015 FYR. The text will remain unchanged.

104 Page 7-10, Section 7.4 – Please amend the first sentence to accurately reflect progress since the 2010 FYR. Although protectiveness statements for AOCs 43G and 43J were combined together in FYRs conducted prior and including 2005, separate protectiveness statement were provided beginning in 2010. Therefore, Table 7.2 should be revised to show two, separate Protectiveness Statements (see Section 5.9 in the 2010 FYR).

Response. The text will be updated to present the two separate protectiveness statements for AOC43G and 43J that were presented in the 2010 FYR.

105 Page 7-11, Table 7.4 – Since there were no recommendations or follow-up actions for AOC 43G in the 2010 FYR, the table should only reference AOC 43J.

Response. Table 7.4 will be revised to only reference AOC43J.

106 Page 7-11, Section 7.4, last sentence – Please insert "draft" before "2014 Annual Report" and acknowledge that EPA has yet to concur with the document and as such, conclusions regarding the injection programs effectiveness at reducing VOCs to below ROD cleanup goals" are preliminary.

Response. The revised LTMMP was approved "Final", dated February 2015. The text will remain unchanged.

107 Page 7-12, Section 7.5 – Please amend this discussion to include details provided in Section 5.4 (Page 5-16) in the 2010 FYR.

Response. The discussion of 43J in Section 7.5 presents a concise summary discussion of AOC43J management. The text will remain unchanged.

108 Pages 7-13, Section 7.6.4 – This entire section should be rewritten to accurately and thoroughly provide results of groundwater sampling events from commencement of monitoring activities to present. In addition, it must include an evaluation of this data to confirm that the current monitoring program is adequate for determining the protectiveness of the remedy and to confirm continued progress toward achievement of RAOs.

Response. Section 7.6.4 presents a data review discussion AOCs 43G/43J data for the past five years (2010-2015) covered by this FYR. The text will remain unchanged.

109 Page 7-18, Section 7.7.3 – Please amend (or delete) reference to results of the "optimization evaluation" and recommendations related thereto to clarify that the referenced report is a draft document, undergoing regulator review and evaluation.

Response. The revised LTMMP was approved "Final", dated February 2015. The text will remain unchanged.

110 Page 7-17, Section 7.7 – Please amend this section to ensure that it addresses each of the items listed under Questions A, B and C in GC 1 above.

Response. Section 7.7 has been reviewed and addresses each of the items listed under Questions A, B, C. The text will remain unchanged.

111 Page 7-22, Section 7.10 – This section should be revised to provide more detail to support the protectiveness determination (see Page 5-42, Section 5.9 of the 2010 FYR).

Response. Section 7.10 has been reviewed and adequately addresses the Protectiveness Statements for AOCs 43G and 43J. The text will remain unchanged.

SECTION 8.0 – FORMER ELEMENTARY SCHOOL SPILL SITE (AOC 69W)

112 Page 8-1, Section 8.0 - This entire section should be amended to follow the format in EPA's June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

113 Page 8-6, Section 8.3, 2nd bullet – Please insert, "Eight wells would be monitored semiannually for EPA, VPH, iron, manganese, arsenic, and bis (2-ethylhexyl) phthalate."

Response. Bis (2-ethylhexyl) phthalate is NOT on the target compound list for AOC69W and VPH has been removed from the target compound list. See Section titled "System Operation /Operations and Maintenance". No changes will be made to the text in Section 8.3.

114 Page 8-6, Section 8.3 – Please insert the following text as the last paragraph in this section, "*The LTMP states that if there is an indication that contaminants are migrating downgradient from the former source area, the Army, in conjunction with MassDEP and USEPA representatives, will evaluate the need for additional action. Under the LTMP, downgradient migration is defined by the presence of a COC concentration in groundwater in any of the designated sentry wells (ZWM-95-15X, ZWM-95-18X, ZWM-99-23X, and ZWM-99-24X) above its monitoring criteria.*"

Response. The above test will be inserted as the last paragraph in Section 8.3.

115 Page 8-7, Section 8.3.1 – Please specify where the deed can be found for review/reference.

Response. The deed is located at the BRAC office at Fort Devens. text has been updated to include the following:

116 Page 8-7, Section 8.4, Table 8.3- Please revise the "Protectiveness Statement" text to reflect the three paragraphs in Section 8.9 (Page 8-23) in the 2010 FYR. Also, please delete ".. that limits exposure to the soil and groundwater at the site." From the first paragraph (current text).

Response. The last line in Table 8.3 will be deleted. The two paragraphs following the table are the second two paragraphs from the 2010 FYR protectiveness statement (Section 8.9). No changes to the text are needed.

117 Page 8-8, Section 8.5.1 – Please amend the discussion to accurately reflect that the Army is the lead on the FYR (EPA was not present at the January 15, 2015 RAB meeting).

Response. The text has been updated to include the following:

The commencement of this five-year review was announced at the RAB meeting on 1/15/2015. The Devens Superfund Site Five-Year Review was led by Robert Simeone, the Community Involvement Coordinator (CIC). Elizabeth Anderson of H&S Environmental assisted in the review as the representative for the support agency. The EPA was not present at the meeting.

SECTION 9.0 – FORMER MOORE ARMY AIRFIELD (AOC 50)

118 Page 9-1, Section 9.0 - This entire section should be amended to follow the format in EPA'S June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

119 Page 9-5, Section 10.3.3 – Typo. Should relate to section 9.0 (not 10.0).

Response. The text will be updated with the correct Section reference and all subsequent section numbers will be corrected.

120 Page 9-5, Section 9.3 - Please expand the discussion to describe each of components of the remedy (see Section 10.3.1 in the 2010 FYR).

Response. Section 9.3 presents a concise summary discussion of the selected remedy for AOC50. The text will remain unchanged.

121 Pages 9-5 – 9-7, Sections 9.3.1 – 9.3.4 – Consistent with the 2010 FYR, each of the sections should be subsections of Section 9.3.1 (see Section 10.3.2 in the 2010 FYR). Please amend.

Response. See Comment #118 and 119 above. All sections numbers will be corrected.

122 Page 9-27, Section 9.8 - An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that supplemental ERD Injections (with pre- and post- monitoring) should be performed in targeted areas with TCE concentrations above remedial goals.

Response. The Section 9.8 text has been updated to include the following:

An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that supplemental ERD Injections (with pre- and post- monitoring) will be performed in targeted areas with TCE concentrations above remedial goals.

SECTION 10.0 – BUILDING 3713 FUEL OIL SPILL SITE (AOC 57)

123 Page 10-1, Section 10.0 - This entire section should be amended to follow the format in EPA'S June 2001, "Comprehensive Five-Year Review Guidance". See GC 1 and 23 above.

Response. The respective sections for each AOC address all topics outlined in EPA's June 2001 Guidance. The overall format numbering will be reviewed for consistency with the 2001 guidance.

124 Pages 10-4 and 10-5, Sections 10.2.1 – 10.2.3 – Please amend these sections to include the level of detail provided in the 2010 FYR (Sections 4.2.1 – 4.2.3).

Response. The discussions presented in Section 10.2.1 through 10.2.3 provide a concise summary of the background of AOC57. The text will remain unchanged.

125 Pages 10-5 – 10-10, Sections 10.3 and 10.4– Please expand the current discussions to include identification of the specific RAOs developed for each Area (see Sections 4.3.1 and 4.3.2 in the 2010 FYR) and the key components of the remedy selected for each (see Section 4.3.4 in the 2010 FYR).

Response. The discussions in Sections 10.3 and 10.4 present a concise summary of the specific RAOs and the key components of the remedy with emphasis on the last five years 2010 through 2015.

126 Page 10-17, Section 10.7.3 - Please amend (or delete) reference to results of the "optimization evaluation" and recommendations related thereto to clarify that the referenced report is a draft document, undergoing regulator review and evaluation.

Response. The revised LTMMP was approved "Final", dated February 2015. The text will remain unchanged.

127 Page 10-18, Section 10.7.10, ¶ 2 – See comment 124 above.

Response. The revised LTMMP was approved "Final", dated February 2015. The text will remain unchanged.

RESPONSE TO COMMENTS – MassDEP Review of the *2015 Five-Year Review Report for Former Fort Devens Army Installation.*
H&S Environmental, Inc.
Received 20 July 2015

MassDEP Review of the
Draft 2015 Five-Year Review Report for Former Fort Devens Army Installation
Former Fort Devens Army Installation, Devens, MA
July 2015

Executive Summary

1. Page E-viii: Please confirm/correct the Review Period listed in the summary form (October 2010 - June 2015 rather than February 2015 – June 2015?).

Response. Comment noted. The review period noted on the Executive Summary form refers to the period of time spent reviewing all information as it pertains to the five year report. See EPA Comment #18.

Shepley's Hill Landfill

2. Section 2.7, Question A: The report should not indicate that the remedial action implemented to date "generally achieves the RAOs of the ROD" or "is functioning as intended". Monitoring data continue to indicate that groundwater with concentrations exceeding MCLs is migrating from the landfill, which is inconsistent with the first RAO (Section 2.3.4) and inconsistent with the intended function of the remedial action (to prevent migration of groundwater with concentrations exceeding MCLs from the landfill). The report indicates that the Army intends to assess an alternative hypothesis (arsenic migration from bedrock, Section 2.7.6); however, until this alternative hypothesis is validated, the reasonable possibility that groundwater with concentrations exceeding MCLs is migrating from the landfill cannot be ruled-out.

Response. The text has been updated to include the following: see EPA comment #54

3. Section 2.7, Question C: The report should not indicate that no information has come to light that could call into question the protectiveness of the remedy. For example, Section 2.7.6 states "Additional site characterization and CSM refinements continue to indicate the existing remedy is unlikely to achieve groundwater cleanup goals per the ROD…"

Response. The text has been updated to include the following: see EPA comment #58

4. Section 2.10: In accordance with USEPA guidance, the protectiveness statement should indicate that the remedy is protective in the short-term because the remedy currently relies on interim LUCs to prevent exposure to groundwater and will not be protective in the long-term until the remedial goals are achieved or are expected to be achieved. The 2010 FYR report presented a similar conclusion (Table 2.3).

Response. The text has been updated to include the following:

The remedy is considered to be protective of human health and the environment in the short-term. Short-term protectiveness is achieved because:

- *There is no current exposure of Site related waste to humans or the environment at levels that would represent a health concern.*
- *The landfill cover system prevents exposure to the waste material and contaminants within the landfill.*
- *The remedy protects potential residential receptors from exposure to contaminated groundwater migrating from the landfill through land use controls that prohibit access to groundwater.*

Long-term protectiveness will be accomplished through continued performance of operation, maintenance, and monitoring activities and the eventual restoration of the groundwater to cleanup goals or background conditions.

Devens Consolidation Landfill

5. Sections 3.6 and 3.10: The DCL is not suitable for unrestricted use; operation and maintenance activities and groundwater monitoring continue to be necessary to prevent exposure to the wastes disposed at the site. Consequently, the recommendation to remove the site from the 5-year review process should be deleted from the report.

Response. Sections 3.7 and 3.10 have been updated to include the following:

Section 3.7 (second and third paragraphs will be revised to include the following):

Under the CERCLA Five Year guidance, the DCL contributor sites (AOC 9, AOC 40 and SA13) meet the ROD remediation goals for unrestricted use/unrestricted exposure (UU/UE). It is recommended that the DCL contributor sites be removed from the CERCLA five year review process.

The human health and ecological risk discussed in the ROD have been eliminated from the contributor sites by the excavations and removal of the soils and implementation of the ICs and LUCs to prevent exposure. The details of the remediation and landfill construction have been presented in the approved Remedial Action Closure Report (Shaw, 2003). While LTM and leachate monitoring results have consistently been below applicable standards, LTM and leachate monitoring of the DCL will continue to assess the effectiveness of the source containment remedy.

Section 3.10 will be revised to include the following:

Under the CERCLA Five Year guidance, the DCL contributor sites (AOC 9, AOC 40 and SA13) meet the ROD remediation goals for unrestricted use/unrestricted exposure (UU/UE). It is recommended that the DCL contributor sites be removed from the CERCLA five year review process.

The remedy at DCL is protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled. (keep second P)

The following sentence will be inserted at the end of the paragraph in section 3.11: "The next five year review for the DCL only will be conducted five years from the completion of this review."

South Post Impact Area

6. Section 4.6, Question C: The report should not indicate that no information has come to light that could call into question the protectiveness of the remedy. As noted in Section 4.6.4, results from a recently collected surface water sample indicate that explosives constituents may be migrating out of the SPIA, and the Army is preparing a plan to assess the situation.

Response. The text has for Section 4.6, Question C text has been updated to include the following:

No other information has come to light that would call into question the protectiveness of the remedy as defined by the 1996 "No Action" ROD. Additional surface water and groundwater sampling has been recommended to confirm the results of the 2014 perchlorate and explosives investigation and evaluate the extent of contamination. However, there is no potential for off-site migration.

7. Appendix E: The location of the "cap" referred in Section III of the Site inspection Form should be identified.

Response. The cap reference in Section III is referring to the well caps. The statement will be revised to state:

No signs of well cap failure or erosion.

Areas of Contamination 32 and 43A

8. Section 6.6.1: The report should include an estimate of the expected time to achieve remedial goals.

Response. The text has been updated to include the following:
The time frame estimated to achieve the remedial goals outlined in the ROD is still estimated to be in compliance with the 2029 goal.

Areas of Contamination 43G and 43J

9. Section 7.7.1.1 should include a statement indicating that the AOC 43G remedial goals are or are not expected to be achieved within the ROD-specified timeframe.

Response. The following will be added to Section 7.7.1.1:

. Metals dissolution and limited migration is an expected byproduct of hydrocarbon degradation within this and similar petroleum release sites. The un-impacted downgradient (relative to the source area) conditions are oxidizing in nature; the dissolved metals are expected to come out of solution within the more oxidizing portions of the aquifer. The degradation by-products will attenuate over time as groundwater conditions change, and therefore off site migration is not an issue.

It should be noted that while manganese concentrations were above the cleanup goal during the 2014 LTM event, the 2014 manganese concentrations are less than those observed during the 2013 LTM event. The remedial goals are expected to be achieved within the ROD specified time frame.

10. Section 7.7, Question C: The report should not indicate that no information has come to light that could call into question the protectiveness of the AOC 43J remedy. As noted in Section 7.7.6, the remediation timeframe is uncertain because contaminant degradation at AOC 43J is occurring at a slower rate than expected.

Response. Section 7.7, Question C has been updated to include the following:

AOC 43G

As noted in previous sections, there has been variations in manganese in AOC 43G wells XGM-94-04X and AAFES-7 since fall 2009 as a result of hydrocarbon degradation. These byproducts (dissolved metals) will attenuate over time as groundwater conditions approach clean-up goals. Continued LTM sampling is required to monitor decreasing petroleum compounds and confirm off site migration is not occurring.

AOC 43J Contaminant degradation at AOC 43J is occurring at a slower rate than anticipated and the remediation time frame is uncertain. The results of the pilot test seem promising in accelerating the degradation rate at AOC 43J. Groundwater data from sentry wells at both AOCs support the position that the BTEX groundwater plume with concentrations exceeding MCLs is not expanding or migrating.

Area of Contamination 69W

11. Section 8.6.1: The report should include an estimate of the expected time to achieve remedial goals.

Response. The text has been updated to include the following:

The time frame estimated to achieve the remedial goals outlined in the ROD is still estimated to be in compliance with the 2026 goal.

12. Appendix I: The AOC 43G/43J Checklist & Interview Form included here should be replaced with a form concerning AOC 69W.

Response. The correct AOC69W Checklist and Interview form will be included.

Area of Contamination 50

13. Section 9.6, Question C: The report should not indicate that no information has come to light that could call into question the protectiveness of the remedy. As noted in Section 9.5.8.3, results from a recently completed source area investigation indicate that the current injection process may have to be modified to effectively treat contamination in relatively deep, dense low permeability zones, and the Army is testing an alternative approach (Section 9.6.11).

Response. Section 9.8 has been updated to include the following: (EPA comment #122)

An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that supplemental ERD Injections (with pre- and post- monitoring) will be performed in targeted areas with concentrations above remedial goals.

The response to Question C will remain unchanged.

Appendix J: Figure 9.1 should identify the location of AOC 50.

Response. The location of AOC50 will be added to Figure 9.1.

Area of Contamination 57

14. Section 10.6.4: The report should be revised to eliminate inconsistent text concerning Figure 10.6. Text discusses PCE data. Figure 10.6 presents TCE data.

Response. The text has been updated to add "and TCE" to the sentence.

The PCE and TCE concentrations in groundwater from all Area 2 and Area 3 groundwater and surface water samples collected from 2010 through 2014 were either below detection limits or below the cleanup goal of 5 µg/L (Appendix K Figures 10.5 and 10.6).

RESPONSE TO COMMENTS – PACE/ECR Review of the *Draft 2015 Five-Year Review Report for Former Fort Devens Army Installation.*
H&S Environmental, Inc.
Received September 11, 2015

Shepley's Hill Landfill (SHL):

1. We disagree with the Protectiveness Statement for SHL which concludes that the remedy is "protective." Consistent with EPA's September 13, 2012 memorandum,[1] the SHL remedy should be classified as "short-term protective" due to the failure of the groundwater extraction system to adequately capture the arsenic plume, and the resulting anticipated failure of the remedy to achieve the arsenic cleanup goal in a reasonable time frame.

Response. The text has been updated to include the following:

The remedy is considered to be protective of human health and the environment in the short-term. Short-term protectiveness is achieved because:

- *There is no current exposure of Site related waste to humans or the environment at levels that would represent a health concern.*
- *The landfill cover system prevents exposure to the waste material and contaminants within the landfill.*
- *The remedy protects potential residential receptors from exposure to contaminated groundwater migrating from the landfill through land use controls that prohibit access to groundwater.*

Long-term protectiveness will be accomplished through continued performance of operation, maintenance, and monitoring activities and the eventual restoration of the groundwater to cleanup goals or background conditions.

2. Recommended actions to achieve long-term protectiveness for the SHL Operable Unit should include upgrading the groundwater extraction system to achieve full capture of the arsenic plume. The existing recommendation to expend additional resources in further attempts to classify the elevated arsenic concentrations as naturally-occurring is duplicative of earlier efforts and should be deleted.

Response. See comment to Question #1 above.

South Post Impact Area:

3. The 2005 date of discontinuation of annual long-term monitoring in the last entry of Table 4.1 is inconsistent with the earlier entry stating that monitoring was conducted annually between 2005 and 2009. Please clarify.

Response. The last entry of Table 4.1 was clarified to read:

Annual LTM sampling was discontinued at AOC in 2005. The Table was clarified to include the following note: Note: Annual LTM & Maintenance activities include annual inspection of monitoring wells and every 5 years water levels are collected

Historic Gas Stations:

4. The cleanup goal for manganese is stated as 291 micrograms per liter (ug/L) in Section 7.2.3.1 and 375 ug/L in Section 7.6.4.1. A footnote in Table 7.8 explains that the goal was changed with EPA approval in 2008; however, a similar statement should be included in the text.

Response. Additional text was added to the RAO and data review sections 7.4.1.1 (second bullet) and 7.6.4.1(last paragraph) stating:

7.4.1.1 - (*note: the goal for manganese was changed to 375 µg/L in 2008).*

7.6.4.1 - *It should be noted that EPA revised the cleanup goal for manganese in 2008 to 375 µg/L from 291 µg/L.*

5. Sections 7.3.6 and 7.3.7 should more clearly explain the meaning of a "boundary standard," and discuss the similarities and differences between a "boundary standard" and a "cleanup goal." Because the Record of Decision (ROD) did not mention boundary standards, a discussion of how and why they are now included as part of the on-going evaluation of AOC 43G should be included.

Response. The text has been updated to include the following new section:

7.4.13 VPH Boundary Standard

Remedial action implementation at both AOCs consisted of continued LTM and data reporting. The first long-term groundwater monitoring round was performed in December 1999. LTM has been performed annually since 1999. The resulting LTM data was evaluated against the groundwater cleanup goals per the ROD.

The Army uses the MCP Method 1 GW-1 concentrations for VPH/EPH to evaluate remedy performance. Remediation goals within the plume are not established for VPH. However, if Method 1 GW-1 concentrations are exceeded at the boundary or compliance point, the Army will develop risk-based VPH concentrations. As concluded in the IRA, migration of VPH concentrations in exceedance of GW-1 standards is not probable and no risk-based concentrations or "VPH boundary standards" are required at this time.

6. Although the ROD did not include a cleanup goal for Volatile Petroleum Hydrocarbons (VPH), it stated that VPH analysis was a component of the evaluation of the intrinsic remediation remedy. As shown on Table 7.8, concentrations of C_5-C_8 aliphatics at well AAFES-2 have remained essentially unchanged over the past 15 years, and are roughly a factor of four above the GW-1 standard. These data indicate that it is doubtful that the intrinsic remediation approach will be successful by the ROD-specified target cleanup date of 2026. Therefore, similar to the above comment regarding SHL, the Protectiveness Statement should conclude that the remedy is "short-term protective" rather than "protective."

Response. See previous response to Question #5

7. The bookmarks in the pdf version of the FYR reference nine Mann-Kendall charts showing trend analyses for various wells and constituents (Appendix H.5). However, only five charts are contained in the report. The missing charts show trend analyses for VPH constituents. Please include these charts in the report.

Response. The bookmarks in the pdf have been corrected. Only the constituents outlined in the ROD have been included with the five year report.

AOC 69W, Parker Charter School:

8. In Section 8.2.4, it is stated that groundwater at AOC 69W will not be used as a drinking water source. However, AOC 69W is within the Zone II Area of Contribution for the MacPherson well, meaning that AOC 69W is by definition part of a current drinking water source area.

Response. The comment is acknowledged. The text is not being revised.

9. Section 8.6.1 states that "Based on the review of 2010 through 2014 data, COC concentrations at AOC 69W are decreasing over time," and the Executive Summary states that "Groundwater concentrations for VPH and EPH are decreasing over time." These statements are contradicted by the data presented for the past five years in Table 8.5, which indicates stable concentrations of C11- C22 aromatics in well 69W-94-13, and increasing concentrations in well ZWM-99-22X. These stable and increasing concentration trends must be acknowledged in the text of the FYR, and an objective evaluation of the effectiveness of the intrinsic remediation remedy needs to be undertaken and documented in the report. The conclusions and Protectiveness Statement should be revised as necessary.

Response. The data has been evaluated and determined to be decreasing for ZWM-99-22x over time, and stable for 69W-94-13. The recent data during the review period indicates slight fluctuations in concentrations at both locations but the data indicates stable conditions. The text will be changed in the Executive Summary to state:

Groundwater concentrations for VPH and EPH are stable or decreasing over time and sentry wells indicate no off site migration.

The conclusions and protectiveness statements will not be revised.

10. The "Annual Land Use Checklist and Interview Form" for AOC 69W (Appendix I) is missing; the form included in Appendix I appears to be for AOC 43G.

Response. Appendix I has been reviewed and the site form is included.

AOC 50, Former Moore Army Airfield:

11. Section 9.2 (Background) states that the AOC 50 Source Area is both leased to MassDevelopment (paragraph 2) and retained by the Army (paragraph 4). Please clarify.

Response. The property is leased to MassDevelopment while the Army still retains ownership.

12. The Remedial Action Objectives (RAOs) for AOC 50 listed in Section 9.3 are stated as being "per the ROD"; however, no similar listing of RAOs was found in the January 2004 ROD. Please clarify the source of these RAOs.

Response. The RAOs and institutional controls are located in section 12.1.1 of the ROD.

13. The wording of the third Source Area RAO[1] in Section 9.3 should be clarified to clearly state whether or not commercial/industrial workers are to be protected from exposure to tetrachloroethylene vapors migrating from the subsurface into occupied buildings. The existing wording mentions only residential receptors.

Response. The Army did not revise the wording for the third Source Area RAO as it is taken verbatim from the Record of Decision.

14. Section 9.3.3 (Selected Remedy) is mis-numbered as Section 10.3.3.

Response. The document has been reformatted to correct all numbering and formatting issues.

15. In Section 9.6, the brief response to Question A ("Yes. The remedy is functioning as intended by the 2004 ROD with annual evaluations and modifications.") should be expanded to include a reference to the uncertainty associated with the elevated concentrations recently discovered in the source area.

Response. The Enhanced Reductive Dechlorination (ERD) injections have shown to effectively address the impacts to groundwater. As such, the answer to question A will not be modified. The Army is completing targeted ERD injections in the deeper zones, which will address the same compounds as those that have been treated at shallower depths.

Interviews:

16. The summary of the interview with the undersigned in Appendix B and Section 2.6.6 mis-characterizes the statements made and omits important information. During the interview, concern was expressed regarding fundamental disagreements, including the Army's assertion that the primary source of arsenic at SHL is naturally-occurring. This statement needs to be included in the summary along with the positive statements made. In addition, the assertion that the undersigned is not aware of any community concerns is inaccurate and should be deleted.

Response. A review was conducted of the interview notes, the concerns stressed in question 16 will be included and the interview form revised. The report text has been revised to include:

Mr. Doherty of PACE indicated a fundamental disagreement with the Army's assertion that the primary source of arsenic at SHL is naturally-occurring