DECISION DOCUMENT
GSA PROPERTY
FORMERLY USED DEFENSE SITE
#D01MA001902
WATERTOWN, MASSACHUSETTS

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Prepared for:

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CONTRACT NUMBER:
W912WJ-09-D0001

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB Environmental Services, Inc.
AEC	Atomic Energy Commission
AMEC	AMEC Environment & Infrastructure, Inc. (formerly MACTEC Engineering and Consulting, Inc.)
AMMRC	Army Materials and Mechanics Research Center
AMTL	Army Materials Technology Laboratory
ANL	Argonne National Laboratory
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	Below the Ground Surface
CD	Chlorinated Dibenzo
CDF	Chlorinated Dibenzofurans
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
CNSI	Chem Nuclear Systems, Inc.
COC	Chemicals of Concern
COPC	Chemicals of Potential Concern
CSA	Comprehensive Site Assessment
CSF	Cancer Slope Factors
CSM	Conceptual Site Model
DCGL	Derived Concentration Guideline Levels
DCR	Department of Conservation and Recreation
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DU	Depleted Uranium
ELCR	Excess Lifetime Cancer Risk
EPC	Exposure Point Concentration
EPH	Extractable Petroleum Hydrocarbons
ER	Engineer Regulations
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Differences
ft	Feet
ft/day	Feet per Day
FS	Feasibility Study
FUDS	Formerly Used Defense Site

GEI	GEI Consultants, Inc.
GERE	Grant of Environmental Restriction and Easement
GSA	General Services Administration
GSR	Green and Sustainable Remediation
HDPE	High Density Polyethylene
HELP	Hydrologic Evaluation of Landfill Performance
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HxCDF	Hexachlorodibenzofuran
IRM	Interim Remedial Measure
LOAEL	Lowest-observable Adverse Effect Levels
LUCs	Land Use Controls
MACTEC	MACTEC Engineering and Consulting, Inc.
MADPH	Massachusetts Department of Public Health
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MDC	Metropolitan District Commission
µg/g	micrograms per gram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MK	Morrison Knudsen
MTBE	Methyl-t-butyl Ether
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	non-detect
NFA	No Further Action
NOAEL	No-Observable-Adverse Effect Levels
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
pCi/g	pico Curies per gram
PeCDF	Pentachlorodibenzofuran
PPM	Parts Per Million
PRGs	Proposed Remediation Goals

RAB	Restoration Advisory Board
RAFs	Relative Absorption Factors
RAOs	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfCs	Reference Concentrations
RfDs	Reference Doses
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SARA	Superfund Amendments and Reauthorization Act
SMP	Soil Management Plan
SQL	Sample Quantitation Limits
Stage II ERC	Stage II Ecological Risk Characterization
SVOCs	Semi-volatile Organic Compounds
TCDD	Tetra Chlorinated Dibenzodioxins
TCDF	Tetrachlorodibenzofuran
TCLP	Toxicity Characteristic Leaching Procedure
TEF	Toxic Equivalency Factor
TEQs	Toxicity Equivalency
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	Treatment Storage and Disposal Facility
UCL	Upper Concentration Limit
UR	Unit Risk
USACE	United States Army Corps of Engineers, New England District
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tanks
VOCs	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbon
WHO	World Health Organization

1.0 PART 1: THE DECLARATION

1.1 Site Name and Location

The Watertown General Services Administration (GSA) site is located at 670 Arsenal Street, in the eastern portion of the town of Watertown in Middlesex County, Massachusetts (See Figure 1-1). The site is surrounded by state and federal delineated wetlands and is separated from the Charles River to the east by Greenough Boulevard and by a small brook (Sawins Pond Brook) on the west side (Figure 1-2). Grove Street bounds the site on the north and Arsenal Street bounds the site on the south. The site is bounded to the west by privately held properties facing Coolidge Avenue.

The site was part of the former U.S. Army Watertown Arsenal, and was referred to as the "Northeast Area" and the Federal Property Resources Center. The site contains two parcels, the 11.91-acre GSA Property parcel and the 1-acre, Metropolitan District Commission (MDC, now known as the Department of Conservation and Recreation (DCR))-owned, north-adjoining Property 20 parcel (Figure 1-2).

The U.S. Army acquired the GSA Property parcel in 1920 from the Commonwealth of Massachusetts. The deed for this parcel was subject to a clause stipulating that if the U.S. Army no longer needed the property, ownership should revert back to the Commonwealth. In 1984, the Commonwealth, through the MDC (now DCR), filed a notice of the intention to invoke the reverter clause.

The GSA Property remained largely vacant prior to World War II, but was gradually filled with rubble and debris to assist development. Following World War II, the U.S. Army used the property for storage of equipment, vehicles, and various salvage and scrap, and continued filling.

The parcel referred to as Property 20 was leased to the Army during the late 1940s. The designation as Property 20 was derived from a figure and table of the "Sequence of Land Purchases Which Formed the Watertown Arsenal" which was included as Appendix B to the 1980 Army Materials and Mechanics Research Center (AMMRC) Installation Assessment. The nomenclature presented in the 1980 Assessment apparently was derived from a real estate map of the Watertown Arsenal prepared for the United States Army Corps of Engineers, New England District (USACE) in March 1945 with revisions through 1960, referring to Property 20 as Tract 8-P (MACTEC Engineering and Consulting, Inc. [MACTEC], 2004). Through MDC (now DCR) permits covering the period 1948 to 1951, the Army was allowed to extend their land filling activities and place fill materials on Property 20 (MACTEC, 2004). After 1951, Property 20 reverted back to the DCR.

A 'burn area' was constructed in the northern portion of the property for scrap depleted uranium (DU) waste generated from machining operations at the former Watertown Arsenal. The Nuclear Regulatory Commission (NRC) issued the U.S. Army a license in 1961 for processing the DU within an area at the site referred to as the former burn box area (Figure 1-2). Within this area, DU chips and turnings were coated with oil, placed in a drum and transferred to the site and placed in a burn box located on a concrete pad surrounded by a chain link fence. The DU material was burned to convert the DU metal into a more chemically stable form. When the burn box container was full, it was welded shut and shipped off-site for appropriate disposal. A new burn box was then placed on the concrete pad.

In 1967, the U.S. Army discontinued use of the property. Following the transfer of the property from the U.S. Army to GSA in 1967, the property was used for storage. The GSA also leased portions of the property to various parties, including automobile dealers and a television production company. There was a police firing range in one of the buildings on the property, and another building was used to store flammable materials. The buildings and grounds of the site are currently unoccupied, and their condition has deteriorated in recent years. Demolition of the site buildings will be coordinated with the implementation of the selected remedy as described in Section 1.4.

The GSA Property is listed in USACE records as Formerly Used Defense Site (FUDS) number D01MA001902. The site is not listed on the National Priorities List (NPL). As such, the USACE must comply with, manage, and execute site closure procedures in accordance with the following programs/policies:

- Defense Environmental Restoration Program (DERP) statute (10 USC 2701 et seq.);
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 USC § 9601 et seq.);
- Executive Orders 12580 and 13016;
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP);
- All applicable Department of Defense (DoD) (e.g., DoD Management Guidance for the DERP [9 March 2012]) and Army policies (including FUDS Engineer Regulations (ER) 200-3-1); and
- DERP requires that CERCLA be followed in the cleanup of this site. Under CERCLA, the USACE seeks the oversight and consensus of the Massachusetts Department of Environmental Protection (MassDEP) on this project.

1.2 Statement of Basis and Purpose

This Decision Document presents the selected remedy for the GSA Property in Watertown, Massachusetts (the site). This document is issued by the USACE, the lead agency for site activities. The MassDEP has provided oversight and consensus on the investigation and proposed remediation of the site.

The selected remedy was chosen by the USACE in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and with concurrence from MassDEP. This decision is based on the information contained in the Administrative Record for the site and the public's input to the Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan. The Administrative Record, which contains information relevant to the USACE decisions, is maintained in the Information Repository located at the Watertown Free Public Library, Reference Department at 123 Main Street in Watertown, Massachusetts.

1.3 Assessment of Site

Investigations for the chemical and radiological releases have been conducted at the site since approximately 1966, including:

- 1966 U.S. Army radiological survey and soil remediation;
- 1973 AMMRC radiological survey and soil remediation;
- 1980 Argonne National Laboratory (ANL) radiological survey and soil remediation;
- 1989 GSA remedial action following the discovery of petroleum contamination and a Comprehensive Site Assessment (CSA) in 1990 conducted by Chem Nuclear Systems, Inc. (CNSI);
- 1993 USACE; Preliminary Assessment (PA) Report performed by AMEC Environment & Infrastructure, Inc. (AMEC) (formerly MACTEC) (formerly ABB Environmental Services, Inc. (ABB-ES)); and Harding ESE;
- 1993 USACE, Interim Remedial Measure (IRM) and field investigations in 1994 and 1995 performed by Morrison Knudsen (MK);
- 2007 DCR field investigation performed by GEI Consultants, Inc. (GEI); and
- 1994 - 2004, and in 2008 and 2010 USACE field investigations performed by AMEC (formerly ABB-ES; Harding ESE; and MACTEC).

As part of these investigations several soil removal actions were conducted to address radiological contamination in site soil in 1967, 1973, 1988, and 1993, and several underground storage tanks (USTs) were also removed. MassDEP provided a health physicist to oversee the supplemental radiological investigations and soil removal actions and UST removals in 1993.

The NRC issued the U.S. Army a license in 1961 for processing DU at the site. Although radiological constituents were detected during initial investigations, removal actions were conducted and supplemental investigations supported the release of the site for unrestricted use by the NRC in September 2003. This unrestricted use for radiological contamination evaluated the site future use as a skating rink, ball field, and playground and determined that the existing conditions did not pose an adverse risk to the public or environment. MassDEP and the Massachusetts Department of Public Health (MADPH) concurred with this decision in November 2003 (MassDEP, 2003).

Investigations continued through 2004 and identified volatile organic compounds, (VOCs), semi-volatile organic compounds (SVOCs), and inorganics at the site. Investigations conducted between 2007 and 2010 also identified polychlorinated biphenyls (PCBs) and dioxin in site soil. These chemical contaminants were addressed in the RI/FS through a site-specific human health and ecological risk assessment (ERA). The risk assessments incorporated public comments from the August 11, 2010 public meeting with interested stakeholders.

With the closure of the radiological site contamination, the chemical site data was evaluated and determined to adequately define the nature and extent of soil, sediment, and groundwater impact at the site. The selected remedy is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of Selected Remedy

Based on the evaluation presented in the Feasibility Study (FS) and the Proposed Plan, and stakeholder and public responses during the Proposed Plan public meeting, Alternative 3 *Excavation of PCB Soils >50 mg/kg and Soil Cover of PCB Impacted Area* was selected as the remedy that will address human and ecological exposures to the PCBs, dioxin, and metals found in contaminated surface soils in the PCB Impacted Area. This alternative will achieve the Remedial Action Objective (RAO) for the site which is to reduce human health and ecological risks associated with exposure to PCBs, dioxin, and metals in the PCB Impacted Area. The USACE established this RAO in coordination with MassDEP during the planning phase of the Remedial Investigation (RI) and FS. The site remediation goals to meet this RAO are shown in Table 1-1. Site data do not indicate the presence of a principal threat under the NCP as the contaminated soil can be reliably contained and presents a low risk below unacceptable levels in the event of exposure. As documented in the RI/FS, the PCBs do not readily volatilize or leach into the groundwater and the ability to install a soil cover to eliminate direct exposure to the contaminated soils would result in acceptable risk levels for the planned passive recreational use of the site.

Alternative 3 provides for the excavation of soil to a depth of 2 to 3 feet below the ground surface (ft bgs) (the purple areas defined in Figure 1-3) and transport of soil with greater than 50 milligrams per kilogram (mg/kg) PCBs off site to a permitted Toxic Substances Control Act

(TSCA) Treatment Storage and Disposal Facility (TSDF). Excavated areas will be backfilled with clean fill. To address the remaining soils containing PCBs (less than 50 mg/kg), but greater than 1 mg/kg, dioxin, and metals greater than the proposed remedial goals, Alternative 3 includes covering the entire PCB Impacted Area with geotextile (marker) fabric, overlain by 18 inches of clean soil and 6 inches of topsoil. Vegetation in the PCB Impacted Area would be cleared, chipped and spread onsite prior to the soil excavation.

It is important to note that the PCB Impacted Area is located within a 1-acre area of the site that is situated within a USACE delineated wetland area (Figure 1-4) and is classified as both state and federal jurisdictional wetlands. Since covering the existing wetland would change it to upland, the loss of this wetland would require wetland replication. Therefore, Alternative 3 also includes wetland replication. Of the three proposed wetland restoration options (Figure 1-5), Option C was selected since it provided for on-site wetland replication along Sawins Pond Brook and filtration of the storm water prior to its discharge into the Charles River. Prior to the construction of the replicated wetlands, the existing buildings will be demolished by the USACE to make way for the wetland replication.

After Alternative 3 is complete, the property owners, GSA and DCR, will implement a Grant of Environmental Restriction and Easement (GERE) to prevent the site from being developed for residential use or changed to other than a passive recreational use. The GERE will be in compliance with 40 Code of Federal Regulations (CFR) 761.61. Alternative 3 is the final response action for the site.

1.5 Statutory Determinations

1.5.1 Statutory Requirements

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions. The applicable or relevant and appropriate requirements (ARARs) for the site are presented in Table 1-2.

1.5.2 Statutory Preference for Treatment

The remedy does not satisfy the statutory preference for treatment as a principle element of the remedy because the small volume of impacted soil cannot be treated in a cost-effective manner.

1.5.3 Recurring (a.k.a. "Five-Year") Review Requirement and Ongoing Responsibility

Because this remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure (Table 1-1), a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

The DCR will design and construct site features in the future to support passive recreational use of the site. Following construction of the soil cover, deed notices will prevent other land uses. The GEREs will be filed with the Massachusetts Registry of Deeds by GSA and DCR so that any change in planned future use following transfer from the federal government would require evaluation in accordance with state and local requirements.

Following completion of the remedy, the USACE will provide annual monitoring and maintenance of the soil cover and replicated wetland for the first five-years. The USACE will also conduct CERCLA five-year reviews for monitoring the effectiveness of the soil cover. Any observed compromise of the remedy may require mitigation, such as repairs to the cover. The USACE will be responsible for major maintenance/repairs of the soil cover if needed. The DCR will be responsible for long term operation and maintenance (O&M) of the soil cover (e.g., clearing vegetation and mowing), and compliance with the GEREs.

1.6 Data Certification Checklist

The following information is included in the Decision Summary section of this Decision Document. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern (COC) and their respective concentrations (Section 2.5.1).
- Baseline risk represented by the COC (Section 2.7.1).
- Cleanup levels established for COC and the basis for these levels (Section 2.8).
- How source materials constituting principal threats are addressed (Section 2.9.5).
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and Decision Document (Sections 2.5.1 and 2.6).
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Sections 2.6.1 and 2.6.2).
- Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.10.3 and Table 2-6).
- Key factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (Section 2.10.1).

1.7 Authorizing Signatures

This Decision Document presents the selected remedy for the GSA Property site in Watertown, Massachusetts. The USACE is the lead agency under the DERP at the GSA Property and has developed this Decision Document consistent with CERCLA, as amended, and the NCP. This Decision Document will be incorporated into the Administrative Record file for the site which is available for public view at the Watertown Free Public Library at 123 Main Street in Watertown, Massachusetts and at the USACE office at 696 Virginia Road, Concord, Massachusetts. This document, presenting a selected remedy with a present worth cost estimate of $4.3 million, is approved by the undersigned, pursuant to Memorandum, DAIM-ZA, 9 September 2003, Subject: Policies for Staffing and Approving Decision Documents, and to Engineer Regulation 200-3-1, FUDS Program Policy.

Christine T. Altendorf, Ph.D., P.E.
Chief, Southwestern Division
Regional Integration Team
Directorate of Military Programs

Date

2.0 PART 2: THE DECISION SUMMARY

2.1 Site Name, Location, and Brief Description

The Watertown Arsenal was founded in 1816 on approximately 45 acres of farmland located near the former location of the Army Research Laboratory. At its maximum extent, the Arsenal covered approximately 130 acres of land including the site (i.e., the 11.91-acre parcel referred to as the GSA Property and the 1-acre parcel referred to as Property 20) (Figure 1-2).

The site was acquired by the U.S. Army from the Commonwealth of Massachusetts in 1920. The Army used the property for storage of industrial jigs and fixtures during the 1950s and subsequently for vehicle storage, miscellaneous military equipment, and various salvage and scrap property. The five structures (Buildings 234 through 237, and 653) located on the GSA Property were constructed during and after World War II and are currently vacant. The U.S. Army used the GSA Property to dispose of refuse and debris materials. Through MDC (now the DCR) permits covering the period 1948 to 1951, the U.S. Army was allowed to extend their land filling activities and place fill materials onto Property 20.

Around 1960, an area in the northern portion of the site was designated for stabilizing DU turnings and DU waste generated from machining operations at the Arsenal. This area is referred to as the former burn box area (Figure 1-2). DU chips and turnings were brought to the site and transferred into a burn box located on a concrete pad surrounded by a chain link fence. This material was burned to convert the DU metal into a more chemically stable oxide form. When the containers were full, they were welded shut and shipped off site for appropriate disposal.

The GSA received the site from the U.S. Army in 1967 and used it for storage and auction of excess property. Other agencies (Federal Bureau of Investigation, Drug Enforcement Agency, and the Internal Revenue Service) and tenants also used the site or portions thereof for storage and other purposes (2011 RI/FS).

On October 23, 1984, the Commonwealth of Massachusetts (through the MDC, now known as the DCR) filed a "Notice of Right-of-Entry for Condition Broken or Possibility of Reverter" for the 11.91-acre GSA Property. The site is currently managed by the GSA's Director of the Facility Support Center at the Thomas P. O'Neill Building, 10 Causeway Street, Boston, Massachusetts. Additional site description details can be found in the 2011 RI/FS.

2.2 Site History and Enforcement Activities

The GSA Property was formerly referred to as the "Northeast Area" of the U.S. Army Watertown Arsenal and as the Federal Property Resources Center. The parcel was filled to facilitate development during World War II, and was subsequently used by the U.S. Army and by the GSA for storing various materials and equipment. The buildings and grounds of the GSA Property are currently unoccupied, and their condition has deteriorated in recent years.

The area referred to as Property 20 was leased to the U.S. Army in 1948. The designation as Property 20 was derived from a figure and table of the "Sequence of Land Purchases Which Formed the Watertown Arsenal" which was included as Appendix B to the 1980 AMMRC Installation Assessment. The nomenclature presented in the 1980 Assessment apparently was derived from a real estate map of the Watertown Arsenal prepared for the USACE in March 1945 with revisions through 1960, referring to Property 20 as Tract 8-P (2004 Phase II CSA).

As listed in Section 1.3, investigations and studies related to radiological and chemical releases at the site were carried out from 1966 to 2010. Over the course of the investigations and studies, radiological surveys were conducted and surface and subsurface soil samples, sediment, groundwater, surface water, and indoor air samples were collected and submitted for laboratory analysis. Short summaries of the major investigation phases are presented below. Details of each investigation are provided in the 2011 RI/FS report.

Although environmental investigations conducted from 1994 to 2004 and in 2007 and 2008 followed the Massachusetts Contingency Plan (MCP) process, all subsequent efforts made by the federal government prior to the property transfer have and will conform to the specific requirements of the DERP-FUDS Program in accordance with CERCLA. The federal program includes substantial provisions for the role of the state government providing oversight for the site.

No enforcement orders have been issued for the site.

2.2.1 Radiological Surveys – 1967, 1973, and 1981

Radiological surveys were conducted at the site by the U.S. Army, AMMRC and ANL, respectively, in 1967 and 1973 to meet Atomic Energy Commission (AEC) guidelines and included radiological surveys and soil removal, including the area of the former burn box. Contaminated soil identified by the surveys was collected, placed in waste containers and shipped off site. A follow-up radiological survey for fixed alpha and beta-gamma surface activity levels and collection of soil samples was conducted of the burn box area results of which are documented in a report from October 1973. In 1993, contaminated soil and fill materials were removed from the former burn box area and disposed off site. Subsequent samples showed the highest uranium concentration in soil was 9.5 micrograms per gram (μg/g), or an activity concentration of approximately 3.8 pico Curies per gram (pCi/g) (2011 RI/FS).

A third radiological survey of the accessible interior and exterior building surfaces, direct reading instrumentation surveys, and surface and subsurface soil sampling were conducted in 1981. No radioactive surface contamination was detected on or in the buildings. Elevated radioactivity was found at 13 locations within the former burn box area and determined to be present due to DU. A few localized areas of slightly elevated radioactivity to the north of the former burn box area were reported as the natural radioactivity in the fill material. The radioactive contamination detected during the surveys mentioned above prevented the release of the property for unrestricted use.

2.2.2 1988-1989 Soil Removal and Creation of the Burn Pit

Between 1988 and 1989, radioactively contaminated soils, the burn box concrete pad, and debris were excavated from the northern portion of the site by GSA. This soil removal created a pit. During the remediation activities in the former burn box area, petroleum contamination was discovered in soil and rubble. These materials were shipped off site to a permitted disposal facility. GSA notified MassDEP, and excavation ceased pending further investigation (2011 RI/FS).

2.2.3 1990 Comprehensive Site Assessment

In 1990, GSA performed a CSA of the site which included radioactive and chemical constituents. This field investigation included 31 soil borings to depths ranging from 10 to 51 ft bgs, installation and sampling of 11 groundwater monitoring wells, collection of six surface water and sediment samples, characterization of site geology and hydrogeology, hydraulic conductivity testing, a wellhead elevation survey, and depth to groundwater measurements. Targeted analytes included VOCs, SVOCs, total recoverable petroleum hydrocarbons (TRPH), Resource Conservation and Recovery Act (RCRA) metals, and uranium. CNSI characterized the risk of harm to human health and public safety and welfare and concluded that the site posed a health risk to human receptors under future use scenarios through exposure via direct contact with surface soils, due to the presence of petroleum hydrocarbon residues; however, groundwater, surface water, and sediment in the brook were found not to pose a human health risk from chemical contamination.

2.2.4 1989-1993 Interim Remedial Measure

The USACE conducted an IRM that included identifying, removing, and disposing of radioactively contaminated and mixed hazardous waste materials in soil and groundwater from the site. Under NRC and MassDEP oversight, the IRM included the excavation of soil and debris from the former burn box area, and was expanded to include the removal of a 1,000-gallon heating oil UST and characterization of a concrete structure located north of the former burn box area.

In January 1993, the USACE excavated soil from the former burn box area and the immediate vicinity based on the prior site data. The former burn box area was estimated at 20 to 25 feet in diameter and 3 to 4 feet deep. As part of characterizing radioactive contamination at the site, MK also characterized the soil and groundwater samples collected from within the former burn box area for chemical constituents. The excavation ceased when confirmation sampling indicated a need for additional radiological characterization.

2.2.5 1992-1993 Preliminary Assessment

In 1993, the USACE performed a detailed PA of the Former Watertown Arsenal which included the GSA Property and Property 20. The PA focused on historical property usage, and did not include sampling and analysis.

2.2.6 1993-1996 Radiation Characterization Survey

The USACE performed instrument surveys, in-situ gamma spectroscopy analyses, collected soil and groundwater samples for offsite radiological analysis to characterize the site, and collected soil and groundwater samples within the former burn box area for chemical analysis. NRC license termination surveys of the site structures (Buildings 234, 235, 236, 237, and 653) were also performed. These additional surveys included the riverbank of the Charles River to assess for potential windborne DU contamination, Property 20 because of slightly elevated surface radiation levels that were measured on the property, boundary areas due to residual radioactivity found outside the original former burn box area fence, and in large portions of the fenced site interior. The USACE also evaluated and documented estimates for background natural uranium, total uranium contamination, and potential groundwater contamination at the site. The USACE found that gamma radiation was fairly uniform throughout the site, with some elevated levels due to natural radioactivity. The average concentrations of all radionuclides on the site were generally low, except for several samples of surface soil (less than one foot bgs), which contained the highest concentrations of DU. No radionuclides associated with the site were detected in any of the samples collected east of the site across Greenough Boulevard, in the area outside the perimeter fence, or in the sewer system on the site. Results of chemical analysis from groundwater samples collected from two monitoring wells (B-25 and B-31) located within the former burn box area showed the presence of lead at concentrations in excess of the MCP Upper Concentration Limit (UCL) of 300 micrograms per liter (μg/L) (1996 Radiological Characterization and Final Survey Report).

2.2.7 2000 – 2001 Historical Site Assessment and Report

Following the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidance for the radiological characterization of the site, the USACE consolidated the results of radiological investigations conducted at the site and defined the site-specific Derived

Concentration Guideline Levels (DCGLs) for the site (2001 Derivation of Site-Specific Soil DCGL). The DCGL represents a site-specific total uranium concentration in soil corresponding to a Condition of No Significant Risk for the receptors and exposure assumptions (current conditions and foreseeable future land use) used to derive the DCGL. This future use included the construction of an ice rink, ball fields, and a playground with unrestricted access by the public. Final consensus of the DCGL was received from the NRC, MADPH, and the MassDEP in December 2001.

2.2.8 2002 – 2003 Focused Uranium Tailings Investigation and Report

In September 2002, the USACE performed a field investigation, which included soil sampling in four areas in which it was theorized that the presence of uranium tailings in soil at those locations might be responsible for the slightly elevated gamma exposure rates encountered in these areas. The results showed that the presence of slightly elevated gamma exposure rates near the north property line were attributable to naturally occurring radioactivity and not the presence of uranium tailings (2002 Focused Uranium Tailings Investigation Report).

In April 2003, the USACE prepared an evaluation of the final radiological status of the site (Harding ESE, 2003). The evaluation concluded that the condition and requirements for unrestricted radiological release were met and the site could be released from the NRC's Site Decommissioning Management Plan list (2003 Evaluation of Final Radiological Status). The NRC published the release of the GSA site for unrestricted use on September 29, 2003, and MassDEP and the MADPH concurred with the decision (MassDEP, 2003).

2.2.9 1994 – 2003 Phase II Comprehensive Site Assessment

As part of the site MCP assessment process (non-radiological data), USACE reviewed data generated from the 1990 CSA to determine if the data were sufficient to complete a Risk Characterization for the site as the next phase in the site closure process under the MCP. Data gaps were identified. From October 1994 through September 2003, the USACE conducted field investigations to define the nature and distribution of constituents at the site to address these data gaps. The investigations included the installation of soil borings and monitoring wells, and the collection of soil, sediment, surface water, and groundwater samples to address the characteristics of fill material at the site and the quality of surface and subsurface soil, groundwater, surface water, and sediment in on-site wetlands and Sawins Pond Brook.

A magnetometer survey, and test trenching and drum removal activities were conducted on the northeast portion of the site. Biota and sediment samples were collected from the on-site wetlands to support a MCP Method 3, Stage II Ecological Risk Characterization (Stage II ERC) for the on-site wetlands. The USACE combined the data collected during these investigations with data from 18 monitoring wells and 106 soil samples previously collected between 1990 and

1993 to evaluate the nature and extent of contamination at the site as described in the 2004 Phase II CSA. This comprehensive evaluation concluded that:

- Surface and subsurface soil contamination at the site primarily consists of TRPH, extractable petroleum hydrocarbons (EPH), SVOCs (primarily polycyclic aromatic hydrocarbons [PAHs]), and metals.
- Most of the contaminants detected at the site are associated with the fill and were detected in soil and sediment samples.
- Impacts to groundwater at the site (primarily low concentrations of chlorinated solvents, methyl-t-butyl ether [MTBE], and TRPH) do not exceed MCP reporting criteria and do not pose a significant risk.
- Impacts to surface water do not pose a significant risk at the site.
- EPH, PAHs, and metals were all detected in sediment samples collected at the site.

Using the summarized data, the USACE conducted a human health risk assessment (HHRA) and ERA. This Risk Characterization concluded that A Condition of No Significant Risk exists for current land use, and that A Condition of No Significant Risk does not exist for potential future land use at the site due to potential non-cancer risks associated with ingestion of produce grown in soil at the site. However, the Risk Characterization concluded that cumulative receptor cancer and non-cancer risks for all other assumed future land uses, including recreational visitors, occupational workers, construction workers and young child visitors were within the MCP acceptable cancer and non-cancer risk limits (2004 Phase II CSA).

2.2.10 August 2004 Tank Removal

In April 2004, a 550-gallon steel storage tank was discovered on the ground surface of the wetland located outside and northwest of the fenced portion of the site, but within the property boundary, approximately 60 feet north-northwest of Building No. 236. The source of the tank and its former contents were unknown, and was not related to past Army use of the site. A sheen was observed on the surface of standing water surrounding the tank that appeared to be associated with the tank. GSA, USACE, and the MassDEP were notified. The emergency spill response contractor Clean Harbors responded to the site to contain and absorb released material floating on surface water. Since the wetland was under several feet of water due to unusually heavy rains and a blocked downgradient culvert, removal of the UST was not possible at that time. The town of Watertown cleaned the culvert, which allowed the surface water to properly drain from the site. Two surface water and four sediment samples were collected for EPH and volatile petroleum hydrocarbon (VPH) analyses in the immediate vicinity of the tank to determine potential impacts. The sediment samples were also analyzed for metals.

The sample results showed that a minor release of fuel related constituents may have occurred and contacted the sediment immediately surrounding the tank. The tank was removed in August 2004, and there was no evidence of any product on the inside of the tank. After the tank removal, the GSA collected four soil samples from beneath the former tank and at locations downgradient of the tank. The GSA summarized the tank removal activities in a Tank Removal Report dated October 1, 2004 and submitted the report to the MassDEP in 2004. The GSA evaluated the collected data and data collected in that area of the wetland area prior to 2004 and concluded that the August 2004 sediment data did not affect the conclusions of the Phase II CSA relative to human health and ecological risks. The GSA concluded that no further study regarding this tank was warranted. A copy of the tank removal report is included in the 2011 RI/FS.

2.2.11 October 2004 – Draft Response Action Outcome and Activity and Use Limitation

Following MassDEP concurrence with the Phase II CSA in May 2004, the USACE prepared a draft Response Action Outcome Statement and Land Use Controls (LUCs) in October 2004 to close the site under the MCP. The Draft LUCs allowed for the potential future use of the site for recreational activities, but did not evaluate recreational uses other than ball fields. Based on input from the public and MassDEP, it was determined that the future land use scenarios needed to be clarified due to the presence of wetlands and applicable wetland regulations associated with the reuse of the site. Since the initial wetland delineation was performed approximately 18 years prior, it was suggested that a re-delineation was necessary to reflect changes in wetland conditions at the site.

2.2.12 2007 USACE Wetland Delineation

As described in the 2011 RI/FS, the USACE completed an updated wetlands delineation in 2007 (Figure 1-4) to determine the jurisdictional boundaries of the site wetlands in order for the stakeholders to reach an agreement on the potential future use of the site. The updated delineation results indicated that the GSA Property portion of the site consists of approximately 6.8 acres upland and 5.7 acres wetland, and the Property 20 portion consists of 0.45 acres upland and 0.17 acres wetland. Most of the site upland area falls within the 100 foot Buffer Zone under the Massachusetts Wetlands Protection Act, and/or the 150 foot Buffer Zone under the Watertown Wetlands Ordinance. Only a small portion of the developable land is not under Watertown Conservation Commission jurisdiction, and the vicinity of the former burn box area is considered a Bordering Vegetated Wetland.

2.2.13 2007 DCR Due Diligence Investigation

In preparation for the potential property transfer from GSA to DCR, in April 2007 the DCR conducted a due diligence investigation of the site the focus of which was to supplement previously collected site data and to address potential data gaps based on DCRs planned site reuse as recreational space. The DCR collected 30 soil samples at two depth intervals (0 to 1 ft bgs and 1 to 3 ft bgs) from 15 locations. All of the collected soil samples were submitted for SVOCs, PCBs, and EPH analyses, and a subset of those samples were analyzed for metals and VPH. Groundwater samples were collected from existing monitoring wells and submitted for metals, VPH, EPH, VOCs, SVOC, and cyanide analysis. The DCR also collected wipe and bulk samples from site buildings for lead and PCBs analyses, and samples of building materials for lead paint and asbestos analyses.

DCR reported metals, PAHs, and petroleum compounds in surface soil at concentrations similar to those detected during previous investigations at the site (2011 RI/FS). PCBs were detected in surface soil at concentrations ranging from 0.111 mg/kg to 43 mg/kg, with the highest concentrations detected in soil samples collected from the 0 to 1 foot depth interval near the center of the site in the vicinity of the former burn box area. Concentrations of PCBs at 5 sample locations near the former burn box area exceeded the Massachusetts S-1 soil standard (2 parts per million [ppm]). PCBs, lead, and asbestos were detected in site buildings. DCR concluded that the Risk Characterization conducted by the USACE as presented in the 2004 Phase II CSA was no longer valid since PCBs were not identified as COCs. DCR concluded that additional subsurface investigations be conducted to define the horizontal and vertical extent of the PCB contamination in soil and in the wetland sediments at the site.

2.2.14 2008 Supplemental Field Investigation

Based on the results of the DCR's due diligence investigation, the USACE and MassDEP concluded that the findings of PCBs and concentrations of antimony and nickel required confirmation, and if confirmed through supplemental sampling, required additional delineation.

Supplemental sampling was conducted in two phases in summer 2008, with the majority of the samples collected occurring within areas identified as Bordering Vegetated Wetlands by the USACE in 2007. In June 2008, the USACE collected soil samples for PCB analysis from up to three depth intervals (0 to 3 ft bgs, 3 to 6 ft bgs, and 9 to 12 ft bgs) in concentric rings (i.e., Inner Ring and Outer Ring) around the former burn box area, including re-sampling locations where DCR reported PCBs at concentrations in excess of the site screening level (1 mg/kg) (Figure 2-1). Samples from the outer ring and the 9 to 12-foot interval were held pending results of the first two depth intervals, and were analyzed only if vertical delineation was not met and if PCB contamination was found to extend below the 6 feet. Eight soil samples were collected to determine if PCB contamination extended into that wetland area along the northwestern property boundary. Eight soil samples were also collected for antimony and nickel analysis to confirm the elevated concentrations of antimony and nickel reported by DCR in samples (vicinity of SS-114 and SS-115). Two samples (0 to 3 ft bgs and 3 to 6 ft bgs) were collected at location SS-114 and six samples (0 to 3 ft bgs and 3 to 6 ft bgs) at three locations spaced approximately 5 feet radially from location SS-114. Sampling at SS-115 was performed in the same manner as SS-114, but only the 0 to 3 ft bgs samples were collected due to refusal. Figure 2-1 presents the sample locations.

Results showed that the extent of PCB contaminated soil was delineated vertically, and partially delineated horizontally, and that the extent of antimony and nickel contamination was delineated. To further the horizontal delineation of PCBs to the south and west, a second phase of sampling was conducted in August 2008 to include the collection of additional soil samples from the 0 to 3 ft bgs interval for PCB analysis.

The 2008 supplemental sampling results confirmed the presence of PCBs in soils in the vicinity of the former burn box area at concentrations greater than the site screening level of 1 mg/kg. These results and the DCR sampling results indicate that a PCB Impacted Area exists in soil 0 to 3 ft bgs, the horizontal extent of which was not fully delineated. Results showed that PCB contamination in soils was delineated vertically and horizontally on the northern side of the site; however, additional horizontal delineation was required in the 0 to 3 ft bgs interval to the east, south, and west. The 2008 supplemental sampling results also showed that PCB contamination in soil does not extend into the open area wetlands. USACE noted that additional sampling in the vicinity of SS-132, which showed the highest concentration of Aroclor 1254 was also required to delineate the extent of PCB contamination in this area.

The concentrations of metals in soil detected in the 2008 supplemental sampling data were lower than the DCR due diligence results (Section 2.2.13). Antimony was detected in the 3 to 6 ft bgs interval at location SS-114 and SS-114D, but was not detected in the 0 to 3 feet intervals. Nickel was detected at several locations at and near SS-114 at lower and higher concentrations than those reported by DCR. USACE compared these results with the DCR 2007 results and concluded that discrete elevated concentrations of antimony and nickel likely exist in fill materials and are not indicative of hot spots or localized releases, but rather of the heterogeneity of the anthropogenic fill soils that are present at the site. USACE concluded that the extent of antimony and nickel contaminated soil was delineated and is consistent with the findings from the 2004 Phase II CSA.

2.2.15 2010 Supplemental Field Investigation

Based on results from the DCR 2007 and USACE 2008 field investigations and comments received during two public meeting and comment periods (October 2008 and March 2010), the USACE proposed additional sampling to refine the nature and extent of the PCB contamination at the site. This sampling program was designed to be consistent with the Conceptual Site Model (CSM), stepping out radially from the former burn box until soil samples exhibited PCB concentrations below 1 mg/kg. At the request of stakeholders, soil sampling to assess the potential presence of dioxin in site soils was also included as part of the 2010 investigation, consistent with the CSM.

The potential generation and deposition of dioxin on the site is related to the on-site burning of DU chips/turnings with PCB oils from 1960 to 1967. However, other sources of dioxin are known to have existed in the vicinity of the site including industrial/manufacturing facilities (military and private), incinerators, and vehicles burning and exhausting a variety of fuels. The intent of the 2010 dioxin sampling event was to evaluate whether dioxin on the site is related to the on-site burning of DU chips/turnings with PCB oils from 1960 to 1967 or related to other known sources of dioxin that existed in the area around the site. This determination was made by comparing the patterns of dioxin and furan congeners and the toxicity equivalency (TEQs) concentrations among the five composite samples that were collected, to each other and to literature-based information concerning the dioxin fingerprints associated with various dioxin sources.

In May 2010, USACE collected soil samples from three depth intervals (0 to 1 foot, 1 to 2 foot, 2 to 3 foot, unless refusal was encountered), at each of the Inner Ring (SS-205 through SS-213) and Outer Ring (SS-214 through SS-221) sample locations around the former burn box area (Figure 2-1). Samples (SS-200 through SS-204) were also collected from the 0 to 1 foot depth interval at the PCB Impacted Area at locations where the highest PCB concentrations were detected previously; this area is also referred to as the Central Area. USACE attempted to collect samples from deeper intervals (1 to 2 foot and 2 to 3 foot) at the Central Area; however, materials including brick, concrete fragments, and debris containing fill were encountered at many sample locations making advancement of the sampling tool to deeper sample intervals (1 to 2 foot and 2 to 3 foot) impossible. This refusal was encountered at 16 of the sampling locations. Full characterization of the vertical extent of Aroclor 1254 contamination within the 0 to 3 foot depth range was thus limited by practical constraints. Within the area between the fence and the northwestern property boundary and north of the former burn box area, USACE collected three soil samples (SS-222, SS-223, and SS-224) for PCB analysis from the 0 to 0.5 ft bgs depth interval using a hand auger at locations near the previous soil sampling location SS-132 (between samples SD-004 and SD-005). Two on-site sediment samples (SD-009 and SD-010) were also collected for PCB analysis from the 0 to 1 ft bgs depth interval at the southwest corner of site, along the stream bank where Sawins Brook enters the site (Figure 2-1).

To address the potential presence of dioxins, USACE collected composite surface soil samples (0 to 0.5 foot) from four locations inside the fence and one reference location outside the entrance gate to the site (Figure 2-2). The dioxin sample locations inside the fence were collected within the same areas where the PCB samples were collected as described above. Dioxin composite sample SS-001 was collected within the former burn box area. Composite soil samples SS-002 and SS-003 were collected within the same general areas (Inner Ring and Outer Ring, respectively) where the 2010 PCB samples were collected. Composite soil sample SS-004 (identified as “Around the site”) was collected from locations across the site, but away from the former burn box area. A reference location (SS-005), which was agreed to by MassDEP, was collected from an area located on the south of the site to evaluate “onsite” and “offsite” dioxin results and identify dioxin patterns of site related releases. It is important to note that the dioxin sampling was used as a screening tool to assess the potential presence of dioxin in site soils. The analytical method used for dioxin in soil at the site reported concentrations of homolog groups and 15 of the congeners considered to be most toxic. Each of these 15 congeners is associated with a common toxicological mechanism of action, but each exerts a different potency for that mechanism. The World Health Organization (WHO, 2006) and the United States Environmental Protection Agency (USEPA) have assigned a Toxic Equivalency Factor (TEF) to each dioxin congener relative to the toxicity of 2,3,7,8-tetra chlorinated dibenzodioxins (TCDD), which is the most toxic congener. The TEF is multiplied by its congener concentration to provide a 2,3,7,8-TCDD equivalent concentration for each congener. The 2,3,7,8-TCDD equivalent concentrations for all congeners are then summed to provide a TEQ concentration for the mixture.

Results of the 2010 Supplemental Field Investigation showed that Aroclor 1254 was the only PCB detected in soil samples above the 1 mg/kg (CERCLA) site screening level. Aroclor 1254 was detected in 31 of the 50 soil samples collected at concentrations ranging from 0.11 mg/kg to 132 mg/kg. All three soil samples collected from the 0 to 1 foot interval in the wetland area west of the former burn box area showed concentrations of Aroclor 1254 at less than the 1 mg/kg site screening level. No other PCB Aroclors were detected in these three soil samples. USACE concluded that lateral extent of PCB contamination was delineated on the north, west and southwestern edge of the property. Samples collected in the Central Area (SS-200 through SS-204) to refine the vertical extent of PCBs in the impacted area generally showed the highest concentrations of Aroclor 1254 detected during the May 2010 supplemental sampling event. The PCB Aroclor 1260 was detected at concentrations below the 1 mg/kg site screening level in 10 of the 50 soil samples collected, nine of which were collected from the 0 to 1 ft bgs depth interval. Aroclor 1254 and Aroclor 1260 concentrations in the two on-site sediment samples (SD-009 and SD-010) were below the site screening level or not detected.

USACE evaluated the dioxin data using two approaches: 1) compared total dioxin/furan TEQs among the samples; and 2) compared the signatures, based on homolog groups, among the samples. TEQ concentrations for samples collected at the site ranked highest to lowest were:

1) Inner Ring around the former burn box area;
2) Reference location;
3) Former burn box area;
4) Outer ring around the former burn box area; and
5) Around site (other areas of the site).

These data indicate that except for the inner ring around the former burn box area, dioxin concentrations at the site are consistent with the reference sample. The number two rank for the reference sample is notable since it confirms that dioxins and furans are present in the local area, as expected at an old urban and industrial setting with heavy vehicular traffic.

The results of the dioxin analysis were presented in the RI/FS as color charts for each sample location. The charts illustrated the prevalent homolog groups for each sample to facilitate comparison of dioxin found near the former burn box area, around the site, and the reference area. The pattern and relative concentration of the homolog groups coincide with the PCBs detected around the former burn box area.

Figures 2-1 and 2-2 (dioxin sample) present the sampling locations conducted at the site. It is important to note that these Figures do not include the radiological sampling conducted by ANL, GSA and USACE between 1981 and 1993.

In summary, site investigations conducted through 2004 included the collection of soil, groundwater, surface water, and sediment samples for chemical analysis. Results showed VOCs, SVOCs, and metals at the site. Investigations conducted between 2007 and 2010 identified PCBs and dioxin in site soil. The USACE determined that the data collected from the prior investigations would support the RI/FS to adequately define the nature and extent of soil, sediment, and groundwater impacts at the site. The data were compared to state and federal soil and groundwater standards. A limit of 1 mg/kg was also used as a screening level to delineate the PCB Impacted Area in soil.

Evaluation of the chemical data was addressed within the 2004 Phase II CSA and the 2011 RI/FS Report through site-specific baseline human health and ERAs. The technical approach for the human health and ERAs was presented to the stakeholder group in a letter to MassDEP dated June 30, 2010 and at public meetings on August 11, 2010 and February 16, 2011. These most recent risk assessments incorporated public comments from the 2010 and 2011 public meetings with interested stakeholders.

2.3 Community Participation

Public participation in the early steps of the cleanup and restoration of the site was accomplished through the Restoration Advisory Board (RAB) established for the Army Materials Technology Laboratory (AMTL) up through 2007 when the charter was closed. The current group of stakeholders is a forum for exchange of information and partnership among citizens, Watertown municipal departments, USACE, GSA, DCR, and MassDEP. The forum allows the USACE to explain the ongoing environmental investigation and remediation work and allows community members and other stakeholders to voice their thoughts and concerns. Prior to the finalization of key documents (i.e., summary reports, Proposed Plan), the USACE provides a response to comments received, and the affected document is updated as appropriate.

The RI/FS Report and Proposed Plan were made available to key stakeholders and the public in September and November 2011 respectively. The stakeholders were e-mailed an electronic copy of the Proposed Plan and an announcement of the public meeting date on November 8, 2011. The notice of availability of the Proposed Plan was published in the Watertown Tab & Press newspaper on November 11, 2011. A public comment period for the Proposed Plan was held from November 7, 2011 through December 9, 2011. In addition, a public meeting was held on December 1, 2011 to present the Proposed Plan. At this meeting, representatives from the USACE answered questions about the site and the remedial alternatives. Comments on the Proposed Plan were received both at the public meeting and via mail from stakeholders and from the public. USACE's response to the comments received during the public comment period is included in the Responsiveness Summary (Section 3.0), which is part of this Decision Document. These documents are maintained in the Administrative Record file and the Information Repository maintained at the Reference Department at the Watertown Free Public Library at 123 Main Street in Watertown, Massachusetts.

It should be noted that based on the comments received from the public, a majority consensus for the selected alternative as presented in the Proposed Plan (Alternative 2/Option C) *Soil Cover In Place with Wetland Restoration Option C and LUCs* was not reached. Therefore, the selected alternative was changed as described in Section 2.9.1.

2.4 Scope and Role of Response Action

Alternative 3/Option C will be the final response action for the site. When implemented, this response action will address human and ecological exposures to the PCBs, dioxin, and metals found in surface soils in the PCB Impacted Area. The RAO for the site is to reduce human health and ecological risks associated with exposure to PCBs, dioxin, and metals in the PCB Impacted Area. The USACE established this RAO in coordination with MassDEP during the planning phase of the RI/FS. The proposed remediation goals (PRGs) that were established to meet this RAO are shown in Table 1-1.

Site data do not indicate the presence of a principal threat under the NCP since the contaminated soil can be reliably contained and would present a low risk below unacceptable levels in the event of exposure. As documented in the 2011 RI/FS, the PCBs do not readily volatilize or leach into the groundwater and the ability to install a soil cover to eliminate direct exposure to the contaminated soils would result in acceptable risk levels for the planned passive recreational use of the site.

2.5 Site Characteristics

2.5.1 Site Conceptual Model

A CSM determines potential exposure routes (e.g., ingestion, inhalation) and suggests possible effects of the contaminants on human health and the environment by using information gained through site investigation activities to characterize the physical, biological, and chemical systems existing at a site. The CSM describes and integrates the processes that determine contaminant releases, contaminant migration, and potential receptor exposure to contaminants. An exposure pathway is the route a contaminant takes from its source (where it began), to its end point (where it ends), and how people or environmental receptors potentially come into contact with (or get exposed to) it. An exposure pathway has five parts:

1. a source of contamination (such as an Army arsenal);
2. an environmental media and transport mechanism (such as migration of contaminated soil by stormwater);
3. a point of exposure (such as a surface soil);
4. a route of exposure (eating, drinking, breathing, or touching); and
5. a receptor population (people potentially or actually exposed).

When all five parts are present, the exposure pathway is termed a completed exposure pathway. The CSM is used to determine which exposure pathways to potential receptors are complete. The complete exposure pathways are then evaluated in a risk assessment.

The 2011 RI/FS considered data from the site investigations (including the 2004 Phase II CSA), physical site characteristics, and the nature and extent of contamination to evaluate all exposure pathways. The complete exposure pathways identified are in soil, surface water, sediment, and air. However, as described in the Phase II CSA and within this Decision Document, although the surface water, sediment and air were complete exposure pathways they presented negligible risk and were not evaluated further. The soil exposure pathway was identified as the sole complete exposure pathway at the site. The site data were then carried forward into the risk assessments to assess the soil exposure pathway and potential impacts to receptors as described in the 2011 RI/FS.

The CSM components for the soil exposure pathway are discussed below to provide context and discussion for PCB Impacted Area soil contamination. The CSM provides the contaminant source areas, contaminant fate and transport, potential migration pathways, and potential receptors (depicted in Figure 2-3).

2.5.1.1 Contaminant Sources

The sources of site COCs as described in the RI/FS (i.e., PCBs, dioxin, and metals) include the former burn box area, historic fill, and the deposition of dioxin from the burn box operations. Drums identified in the Phase II CSA were removed from the site in 1996 and 2004. As described in detail in the Phase II CSA, these drums were not determined to be a source of contamination at the site. The DU was also addressed through removal actions and NRC license closure and therefore the DU is not considered to be a potential source in the CSM.

Former Burn Box Area. The former burn box area is the location where DU chips and turnings were burned inside a steel box placed on a concrete pad. The burning process converted the DU metal into a more chemically stable form. This process occurred from approximately 1960 until 1967. The DU turnings were known to have been coated with an oil containing PCBs to help prevent accidental burning during storage (prior to placement in the burn box). The handling of the DU and PCB-containing oil is the presumed source of PCBs in soils at this area. As detailed in the RI/FS, the DU is not a site COC.

Deposition of Dioxin from the Burn Box Operations. Dioxins are mainly by-products of industrial processes, but can also result from natural processes, such as forest fires. In terms of dioxin release into the environment, uncontrolled waste incinerators (solid waste and hospital waste) are often the worst contributors due to incomplete burning. The potential generation and deposition of dioxin on site soil is related to the onsite burning (from 1960 to 1967) of DU chips/turnings that were coated with oils that contained PCBs, and environmental deposition from surrounding industrial and vehicular emissions. Also, the area around the site historically was heavy industrial, including military and civilian manufacturing facilities, incinerators, and vehicles burning and exhausting a variety of fuels (2011 RI/FS).

Historic Fill. During the 1940s, the GSA Property was filled as the U.S. Army expanded their operations toward the Charles River. One likely source of the fill is the former Watertown Arsenal operations at the properties currently occupied by the Arsenal Mall and the former AMTL. The former Arsenal maintained large foundry, heat treating, sintering, and other metal working furnaces and equipment and probably generated debris such as off-spec castings, sand, slag, and heat treating furnace bricks. Fill materials observed during the field investigations at the site include metal castings, slag, metal cables, yellowish fire brick, concrete rubble, and a variety of glass, brick and man-made fill materials. Given the nature of the fill materials, the fill is a reasonable source of metals contamination in soil at the site.

2.5.1.2 Contaminant Fate and Transport

Fate and transport of contaminants refer to the physical movement and chemical alterations of contaminants as they move through environmental media. The site COCs (PCBs, dioxin, and metals) have unique fate and transport characteristics and are generally stable.

PCBs. PCBs have high chemical stability, very low solubility in water and low volatility. Therefore the transport of PCBs by dissolution in surface water and groundwater is low. PCBs can volatilize in air and be transported and deposited downwind. However, PCBs have a very low volatility making it unlikely that significant PCB deposition has occurred at the site and sampling at that site confirmed this. In addition, site soils include high levels of organic material that bind and immobilize PCBs. PCBs within the PCB Impacted Area were likely spread by surface water movement of contaminated soil particles.

Dioxins. Dioxin compounds have low solubility in water and are semi-volatile. In general dioxins are chemically stable, persistent and relatively immobile. These compounds are transported through the atmosphere as vapors or attached to airborne particulates and can be deposited on surfaces. Once environmental deposition occurs, dioxins may re-volatize and be transported further downwind. However the initial volatilization, and often creation, of dioxins is during high-temperature burning operations and unlike the conditions found in the environment at the site. Therefore, site dioxins have low mobility and have remained near the former burn box.

Metals. Unlike PCBs and dioxins, metals are elements rather than compounds and therefore do not break-down. Metals can be soluble in water and under the certain conditions can be transported down gradient in surface water or groundwater flow. Groundwater was evaluated as part of 2004 Phase II CSA and is not impacted above MCP GW-3 standards. The 2004 Phase II CSA determined that the migration of metals in groundwater is not anticipated to be a significant migration pathway. Metals have low volatility and are unlikely to be transported in a gaseous phase. The mobility of metals at the site is therefore low.

2.5.1.3 Migration Pathways

The contaminant sources at the site are located in site soil. Potential migration pathways for contaminated site soils are water and air pathways. Water pathways include the mobilization of contaminated media by precipitation and surface water or groundwater flow. Precipitation can mobilize contamination in the unsaturated vadose zone by dissolving contamination. In the saturated zone, precipitation increases groundwater flow accelerating the down-gradient movement of contamination. Groundwater at the site is classified as MCP GW-3 as described in the RI/FS. Contaminant concentrations in groundwater water at the site are below the MCP GW-3 standards, and indicate dissolution of site contaminants in groundwater is not significant. Therefore, the potential migration of contaminant by dissolution into and in groundwater is not anticipated to be a significant migration pathway.

Surface water can transport contaminated soil and sediment and dissolved contaminants. The amount of soil mobilization increases with increased flow rate and turbulence of the stream flow. During normal conditions, the surface water flow within site wetlands is limited due to the flat grade of the site; however, during flooding events, the site surface water flow increases and presents the potential for downgradient movement of contamination into Sawins Pond Brook along the southwestern and southern end of the site. Sampling for COCs has demonstrated no migration of contaminants above actions levels has occurred beyond the PCB Impacted Area.

Similarly to the water pathways, air can mobilize solid particles and volatilized contamination. Wind erosion can lift and carry surface soil particles downwind. Prevailing wind directions can, over time, move a mass of contamination in surface soils. The site COCs are located in surface soil increasing the ability of wind to scour and move impacted soil particles. However, much of the site is covered with building structures, pavement, and vegetation limiting the potential effects of wind erosion. Wind can also transport contamination that is in a gaseous phase, such as volatized contamination. The site COCs have low volatility, making this migration pathway not significant. Contaminants can also volatilize and spread in static air through diffusion. Diffusion allows for gaseous contaminants to be spread in static air, though at much slower ground velocities than through wind. The low velocity of this process and the low volatility of site COCs make the potential for migration through diffusion unlikely. Based on the low potential for contaminant migration through wind action or diffusion, the air exposure pathway is complete, but insignificant as shown in the CSM, Figure 2-3.

2.5.1.4 Receptors

Receptors are human and animal populations that could occur at the site and potentially be exposed to COC. Human receptors include park visitors, park workers, and construction workers. Ecological receptors evaluated for potential exposures to the COCs in soil at the site included the robin, shrew and raccoon. Results of the risk assessments were discussed in the RI/FS and are summarized in Section 2.7 of this Decision Document.

2.5.2 Overview of Site

As described previously, the site is located at 670 Arsenal Street, in the eastern portion of the town of Watertown in Middlesex County, Massachusetts (Figure 1-1). The site contains an 11.91-acre GSA Property parcel and a 1-acre, MDC (now DCR)-owned, north-adjoining Property 20 parcel (Figure 1-2). This 12-acre property is separated from the Charles River to the east by Greenough Boulevard and is surrounded by state and federal delineated wetlands, and by a small brook (Sawins Pond Brook) on the west side (Figure 1-2). Grove Street bounds the site on the north and Arsenal Street bounds the site on the south. The site is bounded to the west by privately held properties facing Coolidge Avenue. The site was part of the former U.S. Army Watertown Arsenal, and was referred to as the "Northeast Area" and the Federal Property Resources Center.

The Charles River is located approximately 150 feet east of the site across Greenough Boulevard and Sawins Pond Brook flows along the southern boundary of the site and into the Charles River. Sawins Pond, the source for Sawins Pond Brook, is located 500 feet west of the site. Water bodies also exist in a wetland along the western property line and at the north end of the site within Property 20.

At least four storm water catch basins are located at the site. In the northern and eastern portions of the site, ditches drain surface water from onsite wetlands and overland runoff during storm events. Drainage from the northern end of the site and Property 20 flows into a culvert, under Greenough Boulevard, and discharges on the other side of the road into small ditches that run parallel to the road. Runoff from the eastern wetland drains into a catch basin, and discharges via a culvert to the ditches on the opposite side of Greenough Boulevard. These ditches also receive runoff directly from Greenough Boulevard. Runoff from the ditch on the eastern side of Greenough Boulevard eventually drains into the Charles River.

Upstream of the GSA Property, the Sawins Pond Brook streambed runs between the Mt. Auburn Health Club and its parking lot. Several storm-drains that discharge runoff from surrounding streets and parking lots occur in this portion of the stream, just upgradient of the site. Runoff from a nearby asphalt plant and the UPS Maintenance Center drains to storm sewers that discharge to this portion of Sawins Pond Brook, upstream of the site.

2.5.3 Surface and Subsurface Features

USACE is not aware of any significant archaeological or historical structures/areas at the site.

2.5.3.1 Tanks

Under the MCP process, a 1,000-gallon heating oil UST was removed from the site in 1993 as part of an IRM under NRC and MassDEP oversight.

A 550-gallon steel storage tank was removed in August 2004. Based on the results of the confirmatory samples, GSA concluded that no further study regarding this tank was warranted.

2.5.3.2 Buildings/Structures

The remaining buildings and grounds of the site are currently unoccupied, and their condition has deteriorated in recent years. Demolition of the buildings will be coordinated and conducted during the implementation of the selected remedy (Alternative 3/Option C).

2.5.4 Sampling Strategy

Historical releases of waste material at the site were discovered and determined to be associated with the filling and grading of the site, and with the DU burning activities.

Investigations for radiological and chemical releases at the site were carried out from 1966 to 2010 as described in Section 2.2 of this Decision Document and in the 2011 RI/FS and listed below:

- 1966 U.S. Army radiological survey and soil remediation (NRC, 1993);
- 1973 AMMRC radiological survey and soil remediation (NRC, 1993);
- 1980-1981 ANL radiological survey and soil remediation (ANL, 1983);
- 1989 GSA remedial action following the discovery of petroleum contamination and a CSA in 1990 prepared by CNSI;
- 1993 USACE, PA Report prepared by AMEC (formerly ABB-ES);
- 1993 USACE, IRM and field investigations in 1994 and 1995 prepared by MK;
- 2007 DCR field investigation prepared by GEI; and
- 1994 - 2004, 2008, and 2010 USACE field investigations conducted by AMEC.

As part of these investigations, radiological contamination was detected and the impacted materials removed. Based on the results of sampling conducted after the removal of impacted materials, NRC released the site for unrestricted use in September 2003. This evaluation of radiological contamination considered the site future use as a skating rink, ball field, and playground and determined that the existing radiological conditions did not pose an adverse risk to the public or environment. Future use of the site was changed by DCR in 2009 to be passive recreation only.

Site investigations conducted through 2004 included the collection of soil, groundwater, surface water, and sediment samples. These samples were analyzed for chemical constituents. Results of the sampling identified VOCs, SVOCs, and metals at the site. Investigations conducted between 2007 and 2010 identified PCBs and dioxin in site soil.

Figures 2-1 and 2-2 (dioxin samples) presents the sampling locations conducted at the site.

2.5.5 Nature and Extent of Contamination

Because the GSA Property has been filled over the years with materials containing total petroleum hydrocarbons (TPH) and SVOCs, the identification of background at the site considered anthropogenic influences that would have existed if the burn box never existed at the site. Several background locations were selected in Watertown that had been historically filled with urban fill. The analytical results for samples collected from these locations were presented in the 2004 Phase II CSA. Background concentrations for soil and groundwater were then established in coordination with CERCLA and the state of Massachusetts regulations (310 Code of Massachusetts Regulations (CMR) 40.0006). The nature and extent of contamination at the site was based on comparison values consistent with MCP soil and groundwater criteria. A limit of 1 mg/kg was also used as a screening level to delineate PCB in soil.

Based on the extensive investigation results, the primary COCs were identified as PCBs, metals, and dioxin as follows:

- Surface and subsurface soil and sediment contamination consists of TPH and SVOCs (primarily PAHs), that appear to be directly associated with the fill material rather than a discrete release(s) of contaminants to the fill.
- Groundwater contamination detected at the site, as summarized in the 2004 Phase II CSA, was below the state GW-3 standards with no reportable concentrations. No further investigation of site groundwater was required.
- Surface water contamination detected at the site, as summarized in the 2004 Phase II CSA was determined to be related to storm water entering the site and other anthropogenic offsite sources. This contamination was not site related.
- Surface soil contamination included PCB Aroclor-1254 in the vicinity of the former burn box area at concentrations greater than the site screening level of 1 mg/kg. The PCB contamination in soil is generally limited to the 0 to 3 foot depth. Surface soil PCB contamination is delineated horizontally on the northern, western, and southwestern side of the site. Soil contamination to the southeast of the former burn box area had two locations exceeding the screening level such that surface soil PCB contamination likely extends to the east up to the fence line. Additional soil sampling may be conducted during the design of the remedial alternative for this area.
- PCB contamination in soil does not extend into the wetland area adjacent to the western portion of the former burn box area. Also, PCBs in Sawins Pond have not impacted onsite sediment.
- All the dioxin homolog groups, except for TCDD, Tetrachlorodibenzofuran (TCDF), Pentachlorodibenzofuran (PeCDF), and Hexachlorodibenzofuran (HxCDF), exhibit a similar profile within the site soil samples and the reference sample location. However, chlorinated dibenzo (CD) and chlorinated dibenzofurans (CDF) homolog groups believed to be derived from vehicle emissions are present at higher concentrations in the reference sample.
- TCDD, TCDF, PeCDF, and HxCDF concentrations in samples collected from around the former burn box area are higher than the reference sample, exhibit a different profile of concentrations relative to each other than in the reference sample and the sample from areas around the site (Around Site), and appear to coincide with the location and magnitude of concentrations of PCBs detected around the former burn box area. The presence of these four homolog groups is interpreted to be representative of a condition that is different from the reference sample.

2.5.6 Hydrogeology

The site hydrogeology information contained herein is based on data and observations recorded during field investigations conducted by the USACE as summarized in the 2004 Phase II CSA.

The site is located in an area that was historically wetland associated with the Charles River floodplain. Portions of the site remain wetland areas. Sawins Pond Brook flows along the southern site boundary. The Charles River flows eastward, then bends northward at approximately 400 feet southeast of the site and flows parallel to Greenough Boulevard and the eastern site boundary (Figure 1-1).

Shallow groundwater (between 2 and 7 ft bgs) flows through a coarse, rubble fill underlain by a clay and peat layer that likely impedes vertical flow of groundwater. Figure 3-1 presents the shallow groundwater elevations measured by the USACE in January 2001. On the eastern side of the site, shallow groundwater generally flows to the east, south/southeast towards the wetlands and Charles River. On the western side of the site, shallow groundwater flows to the west.

The peat layer is very fine grained, and represents a hydrologic barrier between the fill above and the sand below. The underlying stratified sand unit is confined by the peat layer, resulting in piezometric levels in the lower aquifer that are 0.4 to 1.5 feet higher in the northern end of the site than those of the upper aquifer. The head of the lower aquifer is approximately 0.7 feet lower than that of the upper aquifer in the southern section of the site.

The horizontal hydraulic gradient is essentially flat (0.0001 feet/feet) at the northern end of the site where groundwater either flows eastward and discharges to the Charles River or flows south/southeastward toward the southern portion of the site. A northward component that discharges into the wetland area north of the Property 20 parcel also exists. The horizontal hydraulic gradient at the center of the site is 0.007 feet/feet, and then flattens to 0.0001 feet/feet at the southern end. Groundwater from the southern end of the site discharges toward Sawins Pond Brook and the Charles River (2004 Phase II CSA).

USACE conducted hydraulic conductivity testing at the site and found hydraulic conductivity values ranged from 41.4 feet per day (ft/day) to 2,040 ft/day. The hydraulic conductivity of the lower, stratified sand unit was more uniform, which ranged from 1.9 to 34.5 ft/day and averaged 15.6 ft/day (2004 Phase II CSA).

Groundwater flow velocity in the northern area of the site where the water table is flat was calculated to be approximately 0.23 ft/day. The groundwater flow velocity in the northeastern portion of the site was calculated to be 13 ft/day to the north and east. Calculations performed using CNSI data indicate that the groundwater flow velocity in the southern area of the site ranges from 0.004 ft/day to 6.3 ft/day toward the Charles River and Sawins Pond Brook (2004 Phase II CSA).

2.6 Current and Potential Future Land and Water Uses

2.6.1 Land Uses

The GSA Property is currently owned by the GSA and managed by the GSA's Director of the Facility Support Center at the Thomas P. O'Neill Building, 10 Causeway Street, Boston, Massachusetts. The property comprising the site is currently zoned open space/conservancy as identified on the Town of Watertown zoning map dated July 8, 2008 (amended).

The buildings and ground on the property are currently unoccupied, and their condition has deteriorated in recent years. The buildings will be demolished and removed by USACE during the implementation of the selected remedy.

The property will be transferred to the DCR, and like the adjacent park that runs along the Charles River, the site will function as a passive recreational park, with walking trails and benches. GSA and DCR will apply a GERE to the two properties that makeup the site through a filing with the Massachusetts Registry of Deeds to assure that changes in land use following transfer from the federal government to DCR are evaluated in accordance with state and local requirements.

The land use outside of the government property is dense urban commercial and recreational. The site is bounded on the west by residential properties and parkland, on the south by Arsenal Street and further south by DCR-owned parkland, on the east by Greenough Boulevard and parkland owned by DCR, and on the northwest by privately held properties facing Coolidge Avenue. The properties abutting the site are a mixture of recreational, residential, light industrial and commercial use. Upgradient properties along Coolidge Avenue contain light industrial and commercial uses, as well as two condominium complexes, a parking lot, and tennis courts. The land area to the south, southwest of the site is occupied by the Arsenal Mall and the Watertown Mall, Harvard Community Health Plan offices, apartments, condominiums, and Arsenal Park and DCR park land. The area to the east and northeast of the site contains recreational pedestrian paths and open and wetland areas.

2.6.2 Groundwater and Surface Water

2.6.2.1 Groundwater

According to the guidelines established in the MCP, groundwater beneath and downgradient of the site is not considered a current or a Potential Drinking Water Source Area. The groundwater is also not located within any areas that would classify it as a drinking or potential drinking water source including:

- Potentially Productive Aquifer;

- Zone II of a public water supply;
- Interim Wellhead Protection Area for a public water supply;
- Zone A of a Class A surface water body used as a public water supply;
- 500 feet of a private water supply well;
- An area designated by Watertown specifically for the protection of groundwater quality to ensure its availability for use as a source of potable water supply; and
- 500 feet or more from a public water supply distribution pipeline.

Therefore, according to the MCP, groundwater at the site is classified as GW-3 groundwater (at a minimum) based on its potential to discharge to surface waters.

2.6.2.2 Surface Water

The surface water bodies located in the vicinity of the site are not currently used or have not been identified for potential future use as a drinking water source. Sawins Pond Brook flows along the southern boundary of the site and into the Charles River, which is located approximately 150 feet east of the site across Greenough Boulevard (Figure 1-1). Sawins Pond, the source for Sawins Pond Brook, is located 500 feet west of the site. Water bodies also exist in a wetland along the western property line and at the north end of the site within Property 20.

At least four storm water catch basins are located at the site. In the northern and eastern portions of the site, ditches drain surface water from onsite wetlands and overland runoff during storm events. Drainage from the northern end of the site and Property 20 flows into a culvert, under Greenough Boulevard, and discharges on the other side of the road into small ditches that run parallel to the road. Runoff from the eastern wetland drains into a catch basin, and discharges via a culvert to the ditches on the opposite side of Greenough Boulevard. These ditches also receive runoff directly from Greenough Boulevard. Runoff from the ditch on the eastern side of Greenough Boulevard eventually drains into the Charles River.

2.7 Summary of Site Risks

The potential human health and ecological risks posed by the chemicals of potential concern (COPC) were evaluated as part of the 2004 Phase II CSA for the site. Since completion of the 2004 Phase II CSA, additional sampling activities at the site have characterized the nature and extent of COCs (PCBs, dioxins, and metals) in soil. In addition, the future owner of the site (the DCR), has confirmed that the future use of the site will be passive recreational as opposed to active recreational as was identified in the initial risk assessment (2004 Phase II CSA).

The characterization of PCBs and dioxin and the future land use (passive recreation) represent new conditions that were not evaluated in the Phase II CSA risk assessment and, therefore, required characterization of risks to determine if a response action was required at the site. In addition, the location of PCBs identified in the supplemental sampling is in a semi-aquatic habitat at the site and, therefore, represents a condition that was not previously evaluated. Therefore, characterization of ecological risks was required to determine if a response action was necessary at the site.

The human health and ERAs were updated in the 2011 RI/FS to include data collected at the site between 2007 and 2010, assure compliance with CERCLA, to apply current dose-response data to characterize human health cancer and non-cancer risks, to characterize risks to ecological receptors, and to evaluate the newly selected future use of the site as passive recreational. The technical approach for the updated human health and ERAs was presented to the stakeholder group in a letter to MassDEP dated June 30, 2010 and at a public meeting on August 11, 2010. Written comments on this technical approach were incorporated into the risk characterization process as applicable.

Risks and hazards for humans, receptors, and hazards for ecological receptors were evaluated separately. The updated risk assessments evaluated potential future risks associated with the site and identified the types of human and ecological receptors that are likely to be exposed, (e.g., park visitor, or fish, birds, etc.) the pathways by which exposure may occur (e.g., ingestion of soil, direct contact with soil, inhalation of dust derived from site soil), and the degree (magnitude and frequency) of exposure. The updated risk assessment evaluated cancer risks and non-cancer hazards associated with potential human exposures to soil under future land use conditions.

Human health risks associated with current land use were not characterized in the updated risk assessment because results of the 2004 Phase II CSA risk characterization demonstrated that risks associated with potential soil exposures during trespassing activities at the site were negligible. Although the detection of PCBs at elevated concentrations in soil represents a new finding, the area where PCBs were detected is heavily vegetated and the soil is fairly wet. Therefore, it is unlikely that people who may trespass at the site would visit the area of the site where PCBs were detected. In addition, the site is secured with a fence and locking gate which is being inspected on a regular basis and repaired as necessary by GSA. Also, risk associated with potential exposure to surface water and sediment in the wetland areas at the site was demonstrated to be negligible in the 2004 Phase II CSA. Moreover, it is unlikely that any exposure to wetland areas would occur under the future passive recreational uses that are planned for the site. Therefore, surface water and sediment were not evaluated in the updated risk assessments.

Since the groundwater at the site is classified as Category GW-3, the groundwater would not be used as a source of drinking water. In addition, the existing site buildings are unoccupied and are slated for demolition. Future use of the site (passive recreational) will not include enclosed structures, so there will be no exposure pathway for vapor intrusion. Therefore, groundwater was not evaluated in the updated risk assessments.

2.7.1 Findings of the 2011 Human Health Risk Assessment

The 2011 supplemental HHRA evaluated potential human health risks associated with future use of the site as passive recreational under CERCLA. The primary objective of the 2011 HHRA was to quantitatively characterize the human health risk associated with potential future exposure to contaminated soil at the PCB Impacted Area, Area Outside the PCB Impacted Area, and Subsurface Soil. The results of the 2011 HHRA are shown in Table 1-1. Brief summaries of the relevant portions of the 2011 HHRA are discussed in subsequent sections below. A complete summary of the entire 2011 HHRA is included in the 2011 RI/FS.

2.7.1.1 Data Evaluation

Data evaluated in the 2011 risk assessment included soil data from the 2004 Phase II CSA risk characterization and soil and sediment data from USACE's supplemental sampling activities performed between 2004 and 2010 to delineate an area of elevated PCB concentrations in soil around the former burn box area. These data included:

- Soil samples collected prior to 2004 as evaluated in the Phase II CSA Risk Characterization (VOCs-113 analyses, SVOCs-111 analyses, PCBs-5 analyses, metals-99 analyses, TPH-191 analyses, and EPH and VPH-30 analyses).
- Soil samples collected by DCR in 2007 (SVOCs-30 analyses, PCBs-30 analyses, metals-11 analyses, EPH-30 analyses, and VPH-4 analyses).
- 80 soil samples collected by USACE in 2008 and 2010 (PCBs, and a subset of samples for antimony, nickel, thallium, and/or dioxin).

The results of the supplemental sampling (post-2004) showed that a PCB Impacted Area exists in soil 0–3 ft bgs in the vicinity of the former burn box area (Figure 2-1). The 2004 Phase II CSA and 2007 DCR investigations confirmed that no other PCB Impacted Areas exist in soil at the site, and that other constituents (e.g., metals) were present ubiquitously throughout the fill material at the site (e.g., at any area or depth where fill was present). Based on these findings, USACE evaluated data for the PCB Impacted Area and areas outside that area separately as described in the following data sets:

- **PCB Impacted Area:** This data set included the 2004 Phase II CSA soil samples and samples collected post-2004 from 0-3 ft bgs within the area of the site that is bounded by samples with PCB concentrations equal to or greater than 1 mg/kg (Figure 1-3).

- **Area Outside of PCB Impacted Area:** This data set included the Phase II CSA soil samples and samples collected post-2004 from 0-3 ft bgs outside of the area of the site that is bounded by samples with PCB concentrations equal to or greater than 1 mg/kg (i.e., all samples 0-3 ft bgs that are not within the PCB Impacted Area). Figures 1-3 and 2-1).
- **Subsurface Soil:** This data set included the Phase II CSA soil samples and samples collected post-2004 from 3-15 ft bgs throughout the site (Figures 1-3 and 2-1).

Analytes that were identified as COPC in the Phase II CSA Risk Characterization were included in these data sets. Some constituents including PAHs (associated with coal and wood ash containing fill), metals (consistent with background conditions), and some VOCs (detected at a very low frequency of detection and very low concentrations) were eliminated from the risk assessment or as individual risk drivers (2004 Phase II CSA and 2011 RI/FS). The only change to the identification of COPCs due to the supplemental sampling results (between 2008 and 2010) was to add dioxin and thallium as COPCs. PCBs were already included as COPCs in the 2004 Phase II CSA risk assessment.

Based on the locations of the dioxin samples (Figure 2-2) relative to the data sets identified above, the dioxin TEQ concentrations were included in the risk assessment data sets as follows:

- Sample SS-002 (Inner Ring sample) was included in the PCB Impacted Area data set.
- Sample SS-003 (Outer Ring sample) was included in the Area Outside of the PCB Impacted Area.
- No dioxin data were included in the **Subsurface Soil** (3 – 15 ft bgs) data set because dioxin samples were only collected in the surface soil. As described in the CSM, dioxin compounds attributable to former burn box area operations would be associated with surface soil only, and not subsurface soil.

All analytical data that were unqualified or qualified with a 'J' (estimated concentration) were included as detected concentrations. All analytical data qualified with a 'U' or 'UJ' qualifier were included as non-detect (ND) concentrations. All analytical data qualified with an 'R' (rejected) qualifier were excluded from the data sets.

TEQs were calculated using ½ the sample quantitation limit (SQL) as the value for congeners that were reported as ND. However, nearly all of the congeners were reported as detected in all of the samples. The differences in concentrations between TEQ calculated using 0 for NDs, and TEQ calculated using ½ the SQL for NDs, was negligible (i.e., less than 1 percent difference).

2.7.1.2 Exposure Assessment

An exposure assessment was conducted to identify potential exposure scenarios by which COCs in site media could contact humans, and to quantify the intensity and extent of that exposure. The assessment presented the future use of the site, characterized the potentially exposed populations, identified the important exposure pathways, and quantified the intake of each COPC from each medium for each population at risk. The CSM depicting receptors and complete exposure pathways is presented on Figure 2-3.

The future use of the site will be as a green space for passive recreational activities under the management of the DCR. Passive recreation implies that people of all ages who live or work near the site may use it for passive leisure including:

- Walking, jogging, or bicycling on pathways
- Wildlife and scenic observation
- Other passive leisure activities such as reading on park benches

DCR employees may also visit the site to maintain it (e.g., cut grass, maintain paths, remove litter, etc.).

Because the future use of the site is to be green space, unrestricted land uses were not evaluated in the risk assessment. The exposure pathways were quantitatively evaluated in the risk assessment and included:

- Park Visitors (adults and children) by incidental ingestion of, dermal contact with, and inhalation of particulates entrained from soil.
- Occupational Workers by incidental ingestion of, dermal contact with, and inhalation of particulates entrained from soil.
- Construction Worker by incidental ingestion of, dermal contact with, and inhalation of particulates from total soil during excavation activities.

2.7.1.3 Toxicity Assessment

The dose-response data (reference doses [RfDs], reference concentrations [RfCs], cancer slope factors [CSFs], unit risks [URs], and relative absorption factors [RAFs]) required for risk assessment were reviewed to identify values that have been updated since publication of the 2004 Phase II CSA Method 3 Risk Characterization.

Chronic RfDs/RfCs are applicable for evaluation of exposures lasting several years or more. Sub-chronic RfDs/RfCs are used to evaluate exposures lasting several days to several years.

Chronic RfDs characterize non-cancer hazards for exposures occurring over 30 years to a park visitor and park worker, and subchronic RfDs/RfCs characterize non-cancer exposures occurring over less than one year to a park visitor and construction worker (2011 RI/FS). A complete listing of the dose-response values is presented in the intake and risk calculation tables contained in Appendix I of the 2011 RI/FS.

2.7.1.4 Risk Characterization

For each receptor scenario, the relative significance of the calculated risks is evaluated in terms of a comparison with acceptable risk levels established in the NCP (USEPA, 1990). In accordance with the NCP, cancer risk estimates for a site are compared to an excess lifetime cancer risk (ELCR) range of (one in a million) 10^{-6} to 10^{-4} (one in ten-thousand). Non-cancer risks are compared to a hazard index (HI) value of 1, which corresponds to levels of exposure that people (including sensitive individuals such as children) could experience without expected adverse effects.

The HI that is calculated by summing the non-cancer risks for all COPCs may provide an overestimation of potential non-cancer risks. This is because the hazard quotient (HQ) for each COPC represents the ratio of the estimated COPC intake to the threshold dose for a *specific* adverse health effect as quantified by the RfD and RfC. Simply summing all HQs or HIs is only a preliminary step, since it may not provide a noncancer hazard estimate for a specific adverse health effect. According to USEPA and MassDEP guidance (USEPA, 1989; MassDEP, 1995), an HI above one may not indicate potential adverse health effects in cases where the effects of multiple COPCs are not similar. Consequently, if screening HI values are above 1, but no COPC has a HQ above 1, separate HI values for specific target organ effects should be calculated by summing only those HQs for similar adverse effects.

The PCB Impacted Area, defined as the area with soil concentrations 1 mg/kg PCB or greater, was defined as the exposure area. In this manner, discernible patterns of PCB contamination indicated by the sample data were used to determine data groupings for further evaluation. Exposure Point Concentrations (EPCs) for this area were based on the 95 percent UCL values (calculated using ProUCL).

The 2011 HHRA for future passive recreational use of the site concluded:

- The **PCB Impacted Area** (Figure 1-3) could pose risks to human health that exceed NCP risk management criteria based on presumed exposure to PCBs, antimony, lead, and nickel in soil.
- Surface soil (soil 0 to 3 ft bgs) **Area Outside of the PCB Impacted Area** would not pose risks to human health in excess of the NCP risk management criteria.

- **Subsurface Soil** throughout the site at 3 to 15 ft bgs would not pose risks to human health in excess of NCP risk management criteria if the public was fully exposed to these soils (e.g., ground surface).

COCs and EPCs for the each data set are provided in Tables 2-1 through 2-4. The summary of the HHRA is presented in Table 1-1. Complete data summaries are provided in Appendices I and K of the 2011 RI/FS.

2.7.2 Summary of Ecological Risks

The initial Stage II ERA was conducted as part of the 2004 Phase II CSA and concluded that the site poses no significant hazard to environmental receptors. The purpose of this update is to characterize the potential for ecological hazards associated with PCBs and dioxin at the site, and the new future land use (passive recreation) to determine whether a remedial response is needed due to the elevated concentrations of PCBs at the PCB Impacted Area. This 1.2-acre area contains both terrestrial (upland) and semi-aquatic (wetland) habitats based on the 2007 delineated wetland boundaries. Due to historic development, stormwater conveyance systems that discharge onto the site, and overall site drainage, this area is poorly drained. Soils become moist during periods of inundation (especially during the spring) with concurrent development of organic hydric soils. In order to maintain consistency with the prior risk assessment efforts, USACE used the same approach to evaluate ecological hazards to birds and mammals as was used in the 2004 Phase II CSA Stage II ERC using methods developed by MassDEP. The USACE determined that the ERA meets CERCLA requirements.

The food chain exposure models were used to quantify exposures at the PCB Impacted Area. Based on the habitat characteristics at the PCB Impacted Area, the following ecological receptors (and potential exposure pathways) were selected for evaluation based on their likely presence within that area and to satisfy the community's need to see several commonly evaluated species considered. These species represent an ecological trophic level of a species that could occur at the site based on the existing habitat:

- Robin: ingestion of soil, ingestion of invertebrates and plants that have accumulated COPCs from soil;
- Shrew: ingestion of soil, ingestion of invertebrates, plants, and other small mammals that have accumulated COPCs from soil; and
- Raccoon: ingestion of soil and invertebrates that have accumulated COPCs from soil.

Food chain models provided estimates of exposure to the indicator species through the exposure pathways identified above. The exposure estimates, as doses of COPC ingested, were then compared to toxicity reference values representing no-observable-adverse effect levels (NOAELs) and lowest-observable adverse effect levels (LOAELs) to derive HQs. HQs greater than one indicate that the modeled exposure (COPC intake) exceeds the threshold dose based on the NOAEL or LOAEL. As the magnitude of HQ increases, so does the likelihood of adverse effects.

Table 2-5 provides a summary of the HQs calculated for birds (represented by American robin), small mammals (represented by shrew) and omnivorous semi-aquatic receptors (represented by raccoon). The NOAEL-based HQs for the robin at the PCB Impacted Area exceed 1 for Aroclor 1254, Aroclor 1260, antimony, beryllium, cadmium, chromium, copper, lead, nickel, vanadium, zinc and dioxins (as Total TEQ). However, the LOAEL-based HQs for the robin are less than 1 for all but the site-related COPCs, which include Aroclor 1254, antimony, lead, and nickel. The ERA suggests that adverse effects to populations of avian and mammal omnivores are possible following exposure to PCB Aroclors, antimony, lead and nickel contamination at the PCB Impacted Area. The food chain models used in this risk assessment include the COPCs and EPCs at the PCB Impacted Area. Food chain models evaluated in the 2011 ERA are documented in Appendix L of the 2011 RI/FS.

The ERA of the PCB Impacted Area concluded:

- HQs for individual contaminants, as indicators of the potential for hazard, were greater than 1 indicating the potential for risks at the site may be greater than hazards at background areas for robins and shrews at the PCB Impacted Area.
- HQs for individual contaminants were less than 1 for raccoons at the PCB Impacted Area.
- Site-related COCs were identified as PCB Aroclors, dioxin TEQ, antimony, lead and nickel based on incremental hazard NOAEL and LOAEL HQs greater than 1.
- When the PCB Impacted Area is excluded, the site poses no significant hazard to environmental receptors.
- The ERA was ultimately of limited value in the decision making process.

2.7.3 Basis for Response Action

The USACE has determined that the response action selected in this Decision Document is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Implementation of the response action (Alternative 3/Option C) will be the final response action for the site. The response action will address human and ecological exposures to the PCBs, dioxin, and metals found in surface soils in the PCB Impacted Area.

Site data do not indicate the presence of a principal threat under the NCP as the contaminated soil can be reliably contained and would present a low risk below unacceptable levels in the event of exposure. As documented in the 2011 RI/FS, the PCBs do not readily volatilize or leach into the groundwater and the ability to install a soil cover to eliminate direct exposure to the contaminated soils would result in acceptable risk levels for the planned passive recreational use of the site.

2.8 Remedial Action Objectives

The RAO for the site is to reduce human health and ecological risks associated with exposure to PCBs, dioxin, and metals in the PCB Impacted Area. The USACE established this RAO in coordination with MassDEP during the planning phase of the RI and FS. The PRGs to meet this RAO are shown in Table 1-1.

2.9 Description of Alternatives

2.9.1 Documentation of Significant Changes

Based on comments received on the Proposed Plan, the USACE made the following change to the Proposed Plan preferred alternative in establishing the selected remedy.

The Proposed Plan for the GSA Property site (USACE, 2011) was released for public comment in November 2011. The Proposed Plan identified Alternative 2/Option C Soil Cover in Place with LUCs and Wetland Replication as the preferred alternative for the site. In addition to being made available to the public, the Proposed Plan was e-mailed/mailed to 65 stakeholders on the site mailing list. The USACE held a public meeting to present the Proposed Plan to the public on December 1, 2011. The public was given 30 days to provide comments pertaining to the selected remedial alternative.

The vast majority of public commenter's were opposed to the Preferred Alternative (Alternative 2/Option C) as identified in the Proposed Plan. Most commenter's were opposed to leaving contaminated soil in place at the site. Based on this strong public sentiment against leaving soil in place, the USACE determined that a change to the remedy as originally described in the Proposed Plan was appropriate. The USACE with concurrence from MassDEP, has selected Alternative 3/Option C as the final remedy for the site. Alternative 3/Option C (*Excavation of PCB soils >50 mg/kg and Soil Cover of the PCB Impacted Area)* was one of the remedial alternatives evaluated in the 2011 RI/FS.

Additional details are provided in the Section 3.0, Responsiveness Summary of this Decision Document.

2.9.2 Description of Remedy Components

Four remedial alternatives that were evaluated for this site cleanup are presented below. The alternatives are numbered to correspond with the numbers in the FS.

An important factor applied during the review of potential remedial technologies was the acceptance of the site soil at an offsite facility due to the site history/ contamination. Most permitted landfills restrict the acceptance of soils from sites with a history of radiological use even after the site has undergone remediation. In addition, the permits for many Massachusetts and some federal permitted landfills and TSDFs prohibit these facilities from accepting soil that contain PCBs at concentrations above 50 mg/kg. Also, soil excavated from the PCB Impacted Area during the 1993-1994 radiological clean-up exceeded the Toxicity Characteristic Leaching Procedure (TCLP) criteria for lead, and, therefore, were regulated under the RCRA. These conditions greatly reduce the number of available permitted soil disposal facilities.

Common Elements: Two of the alternatives require institutional controls (e.g., deed notice) to limit the use of property and would conform with Massachusetts law (M.G.L.c. 21E and 310 CMR 40) for a GERE. The GERE's would be signed by the property owners (GSA and DCR) and then filed in the Massachusetts Registry of Deeds. Monitoring to ensure the effectiveness of the remedy, including institutional controls, is also a component of each alternative except the "No Action" alternative.

The criteria used in evaluating the remedial alternatives include the following:

Threshold Criteria:

- Overall protection of human health and the environment; and
- Compliance with ARARs (Table 1-2).

Balancing Criteria:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume;
- Short-term effectiveness;
- Implementability; and
- Cost.

Modifying Criteria:

- State Acceptance
- Community acceptance

CERCLA and the NCP mandate that the above criteria be used as the basis for a proposed remedial action decision. The selected alternative must meet the threshold criteria, and the balancing criteria used to determine the best alternative under all the circumstances. Two additional modifying criteria, state and community acceptance, were also evaluated through review of the comments received from the MassDEP, stakeholders, and the public in response to the Proposed Plan (USACE, 2011).

Although it is not required, the DoD recommends Green and Sustainable Remediation (GSR) strategies "when and where they make sense." These other considerations involve the evaluation of remedial alternatives for waste reduction, energy conservation, material reuse and recycling. Green and sustainable practices typically are less disruptive, generate less waste, increase reuse and recycling, and emit fewer pollutants including greenhouse gases to the atmosphere.

The No Action alternative and three remedial alternatives were evaluated for the site as described below. The alternatives are numbered to correspond with the numbers in the 2011 RI/FS and in the Proposed Plan (USACE, 2011). For cost estimating purposes AMEC assumed that 30 years of O&M and/or five year reviews would be conducted. The costs for remedial Alternatives 2D and 3C have been updated from the Proposed Plan to included building demolition prior to the replication of wetlands.

2.9.2.1 Alternative 1: No Further Action (NFA)

Capital Cost:	N/A
Annual O&M Cost:	N/A
Present Worth Cost:	N/A
Implementation Timeframe:	Immediate
Time to Achieve RAOs:	N/A

N/A = not applicable

A typical No Action alternative specifies no remedial action and has no capital cost. It would involve no activity at the site. The No Action alternative is required by the NCP in order to establish a baseline for comparison. Strictly speaking, the No Action alternative would be to leave the PCB-impacted soil in place with no additional GERE's. The No Action response would not implement a remedial technology or process to reduce or minimize the volume, toxicity or mobility of the PCBs, metals, and dioxin in the soil. GERE's would not be implemented and so would not ensure against exposure.

2.9.2.2 Alternative 2: Soil Cover In Place with LUCs, and with Wetland Restoration

Under Alternative 2, vegetation in the PCB Impacted Area would be cleared, and then chipped and spread on-site. This alternative would then cover the soil containing PCBs at concentrations exceeding 1 mg/kg (Figure 1-3) with geotextile fabric overlain by 18 inches of clean fill, and then 6 inches of topsoil to restrict contact with contaminated soil. The topsoil would be seeded with grass to maintain its integrity. The PCB Impacted Area to which a soil cover will be applied is located within a 1-acre area of the site that is situated within a USACE delineated wetland area (Figure 1-4) that is both state and federal jurisdictional wetlands. Covering the existing wetland would change it to upland, and the loss would require wetland replication. For this site, the following three options for wetland replication were identified and evaluated as shown in Figure 1-5. For all three potential wetland replication areas (A, B, and C), excavation and processing of soil is required.

Option A: Offsite wetland replication on DCR land. For Option A, half of the excavated soil from the DCR land would be transported and reused on site. The other half would be transported off site for disposal. The costing purposes have assumed that the soil would be disposed of at Clean Harbor's TurnKey Landfill in New Hampshire.

Option B: On-site wetland replication to the west of the PCB Impacted Area. For wetland replication Option B, half of the excavated soil would be reused on site. The remaining half would be transported and disposed at one of the few TSDFs that can receive soil with residual DU. The costing purposes have assumed that this soil would be disposed of at the U.S. Ecology Facility in Grand View, Idaho, which is permitted to accept soil containing PCBs at concentrations greater than 50 mg/kg and DU at concentrations that average less than 16 pCi/g. Other cost effective facilities may be evaluated during the remedial design process.

Option C: On-site wetland replication at existing building locations at the west end of the site. This option will require demolition and removal of the site buildings prior to the wetland replication. The building demolition will be done in coordination with the remedial action. For Option C, following building demolition, half of the soil moved to create the wetland would be reused on site. The other half would be transported to a permitted TSDF (e.g., regional Subtitle C landfill).

The implementation of Alternative 2 with each wetland replication option is summarized below.

<u>Alternative 2/Option A</u>

Capital Cost:	$1,900,000
Annual O&M Cost:	$50,000
Present Worth Cost:	$1,950,000
Implementation Timeframe:	2 years

Time to Achieve RAOs:	3 years

Alternative 2/Option B

Capital Cost:	$3,950,000
Annual O&M Cost:	$50,000
Present Worth Cost:	$4,000,000
Implementation Timeframe:	4 years
Time to Achieve RAOs:	5 years

Alternative 2/Option C

Capital Cost:	$3,170,000
Annual O&M Cost:	$50,000
Present Worth Cost:	$3,220,000
Implementation Timeframe:	3 years
Time to Achieve RAOs:	4years

GEREs will be filed at the Massachusetts Registry of Deeds by GSA and DCR to assure that changes in land use following transfer from the federal government to DCR are evaluated in accordance with state and local requirements. The objectives of the GERE's are to prevent exposure to soil containing PCBs, dioxin, and metals by preventing disturbance of the soil, maintaining the integrity of the remedial action (soil cover), and assure access to the site by the regulatory agencies to maintain the remedy.

Following completion of the remediation, USACE would conduct CERCLA five-year reviews including monitoring and major maintenance repairs of the soil cover if needed. Any observed compromise of the remedy may require mitigation, such as repairs of the proposed cover. The DCR would be responsible for long term O&M of the soil cover (e.g., clearing vegetation and mowing), and compliance with the GEREs. USACE would inspect the soil cover and provide annual wetland operations and maintenance of the wetland replication area for the first five-years.

2.9.2.3 Alternative 3: Excavation of PCB Soils >50 mg/kg and Soil Cover of PCB Impacted Area

Alternative 3 includes excavation of soil to a depth of 2 to 3 ft bgs (the purple areas defined in Figure 1-3) and transport of soil with greater than 50 mg/kg PCBs off site to the TSDF (e.g., U.S. Ecology TSDF in Grand View, Idaho). To address the remaining soils containing PCBs (less than 50 mg/kg, but greater than 1 mg/kg), dioxin, and metals greater than the proposed remedial goals, the entire PCB Impacted Area would be covered with geotextile fabric, overlain by 18 inches of clean soil and 6 inches of topsoil. Vegetation in the PCB Impacted Area would be cleared, chipped and spread onsite prior to the soil excavation. As with Alternative 2, Alternative 3 requires wetland replication, which would follow wetland options A, B, or C as described in Alternative 2 (Section 2.9.2.2). Following completion of the remediation, the GSA and DCR will file GEREs with the Massachusetts Registry of Deeds to assure that changes in land use following transfer from the federal government to DCR are evaluated in accordance with state and local requirements. The objectives of the GERE's are to prevent exposure to soil containing PCBs, dioxin, and metals by preventing disturbance of the soil, maintaining the integrity of the remedial action (soil cover), and assure access to the site by the regulatory agencies to maintain the remedy.

USACE would conduct CERCLA five-year reviews including monitoring and major maintenance/repairs of the soil cover if needed. Any observed compromise of the remedy may require mitigation, such as repairs of the proposed cover. The DCR would be responsible for long term O&M of the soil cover (e.g., clearing vegetation and mowing), and compliance with the GEREs. USACE would inspect the soil cover and provide annual operations and maintenance of the wetland replication area for the first five-years.

The implementation of Alternative 3 with each wetland replication option is summarized below.

<u>Alternative 3/Option A</u>

Capital Cost:	$2,950,000
Annual O&M Cost:	$50,000
Present Worth Cost:	$3,000,000
Implementation Timeframe:	3 years
Time to Achieve RAOs:	4 years

<u>Alternative 3/Option B</u>

Capital Cost:	$5,050,000
Annual O&M Cost:	$50,000
Present Worth Cost:	$5,100,000
Implementation Timeframe:	5 years
Time to Achieve RAOs:	6 years

<u>Alternative 3/Option C</u>

Capital Cost:	$4,250,000
Annual O&M Cost:	$50,000
Present Worth Cost:	$4,300,000
Implementation Timeframe:	4 years
Time to Achieve RAOs:	5 years

The estimated costs for Alternative 3/Option C are presented in Table 2-6.

2.9.2.4 Alternative 4: Excavation of PCB Impacted Area

Alternative 4 includes excavation and offsite disposal at a TSDF of soil containing PCBs at concentrations greater than 1 mg/kg (the PCB Impacted Area shown in Figure 1-3). Vegetation clearing, chipping, and spreading as described in Alternatives 2 and 3, are included in this alternative. Soils within the PCB Impacted Area would be removed to a depth of 2 to 3 ft bgs. Excavated soils would be transported and disposed of at a TSDF (e.g., U.S. Ecology TSDF in Idaho). The excavated area would be backfilled with clean fill and the wetlands replicated in that area. The cost estimate assumed that the entire PCB Impacted Area would be restored as a larger wetland area of approximately 1.2 acres. No additional wetland replication would be necessary.

After property transfer, the USACE would conduct CERCLA five-year reviews including monitoring. Any compromise of the remedy would require mitigation, such as repairs to the wetland. The DCR would be responsible for long-term O&M of the site. The USACE would provide annual operations and maintenance of the wetland replication area for the first five-years, whereupon the DCR would assume that responsibility.

The implementation of Alternative 4 with wetland replication is summarized below.

Capital Cost:	$5,550,000
Annual O&M Cost:	$50,000
Present Worth Cost:	$5,600,000
Implementation Timeframe:	6 years
Time to Achieve RAOs:	7 years

2.9.3 Criteria for Evaluating the Cleanup Remedy

As documented in the 2011 RI/FS, a detailed analysis was performed on all of the alternatives presented for the site. The evaluation used the USEPA evaluation criteria listed below to select the proposed response action for the site. The nine criteria fall into three groups as defined by their main purposes.

2.9.3.1 Threshold Criteria

Threshold criteria are requirements that each alternative must meet in order to be eligible for selection and include the following:

1. **Overall Protectiveness of Human Health and the Environment** determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
2. **Compliance with ARARs** evaluates whether the alternative meets cleanup levels and remedial requirements based on relevant Federal or State environmental statutes or regulations that pertain to the contamination or to the remediation of the contamination, or whether a waiver is justified.

2.9.3.2 Primary Balancing Criteria

Primary balancing criteria are used to weigh major tradeoffs among alternatives and include the following:

1. **Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time.
2. **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
3. **Short-term Effectiveness** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
4. **Implementability** considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
5. **Cost** includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in

terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

2.9.3.3 Modifying Criteria

Modifying criteria may be considered to the extent that information is available during the FS, but can be fully considered only after public comment is received on the Proposed Plan. These criteria include:

1. **USACE and MassDEP Acceptance** considers whether the MassDEP concurs with the USACE's analyses and recommendations, as described in the 2011 RI/FS and Proposed Plan (USACE, 2011).
2. **Community Acceptance** considers whether the local community agrees with USACE's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

2.9.3.4 Other Considerations

The USACE also evaluated the alternatives for **Green/Sustainable Practices**, which include the alternative for reduction of waste, conservation of energy, reuse of materials, and recycling.

2.9.4 Evaluation of Alternatives

The nine criteria summarized above were then used to evaluate the four remedial alternatives individually and against each other in order to select a remedy for the site. The "Detailed Analysis of Alternatives" can be found in the 2011 RI/FS and are summarized in Table 2-7.

1. Overall Protection of Human Health and the Environment

All of the alternatives except Alternative 1 (No Action) would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through removal, engineering controls, and/or institutional controls. Alternative 2 would provide protection by preventing direct contact exposure to contaminated soils, by covering the area. Alternative 3 would remove some contaminants of concern (PCB concentrations > 50 ppm) and prevent direct exposure to residual contamination with a cover, while Alternative 4 would eliminate risk through removal of all contaminants of concern for offsite disposal.

Long term maintenance and monitoring would be required for Alternatives 2 and 3 to ensure that the soil cover is maintained.

Because Alternative 1 is not protective of human health and the environment, Alternative 1 was eliminated from consideration under the remaining criteria.

2. Compliance with ARARs

Alternatives 2, 3, and 4 comply with all identified ARARs (Table 1-2). Alternatives 3 and 4 best meet the criteria for protectiveness of human health and the environment required under 40 CFR 761.61 based on the excavation and off-site disposal of PCB-impacted soil.

3. Long-Term Effectiveness and Permanence

Alternatives 2 and 3 would provide long-term effectiveness through the proven technique of covering contaminated soil; however, monitoring would be necessary to ensure the long-term effectiveness of the cover. Alternatives 2/Option C and 3/Option C will include the removal of the deteriorated buildings and support the replication of wetlands adjacent to Sawins Pond Brook prior for the filtration of surface water prior to its discharge to the Charles River.

Alternative 4 would provide long-term effectiveness and permanence through excavation and offsite disposal of PCB Impacted Area soils with no need for a cover. Alternative 4 does not include the removal of the existing buildings and the wetlands would be replicated in the same location away from Sawins Pond Brook.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Alternative 2 would not reduce the toxicity or the volume of contaminants, but it would reduce the mobility of contaminants by the application of a cover. Both Alternatives 3 and 4 would reduce the volume and mobility of contaminants of concern at the site.

5. Short-Term Effectiveness

Alternatives 2, 3 and 4 involve excavation and thus will require additional preventive measures during excavation, backfilling, and restoration activities. Alternative 2 only involves excavation of materials associated with the construction of the wetland.

Excavation results in additional construction vehicle traffic and associated emissions, noise, and dust. Control of airborne dust and runoff from excavation, loading, and transport activities would be required to limit potential exposures to workers and residents.

Alternatives 2 and 3 will require measures to prevent exposures to workers during construction of the soil cover. The engineering controls (e.g., watering work area to control potential dust) will protect both the workers and residents on abutting properties during construction.

6. Implementability

Alternative 2 ranks highest for implementability because the supplies and personnel needed to install the soil cover are readily available and can be deployed in a short time compared to the excavation activities with Alternatives 3 and 4.

Observations during the site investigations of concrete blocks, bricks and urban debris indicating subsurface excavation may be difficult, and may require additional equipment under Alternatives 3 and 4.

Due to the soil characterization and site history, Alternative 4 will require radiological monitoring and safety during soil excavation and wetland construction as radiological concentrations are greater than background. Alternative 4 also has the greatest impact on off-site soil disposal currently planned for the U.S. Ecology TSDF in Grand View, Idaho.

7. Cost

The present value cost of each alternative increases with the level of effort required to implement, and with the location of wetland restoration (Options A, B, or C).

- $1.95 million for Alternative 2 with wetland restoration off site on DCR land (Option A).
- $3.22 million for Alternative 2 with onsite site wetland restoration at the demolished buildings area (Option C).
- $3.0 million for Alternative 3 with wetland restoration off site on DCR land (Option A).
- $4.3 million for Alternative 3 with on-site site wetland restoration at the demolished buildings area (Option C).
- $4 million and $5.1 million for Alternatives 2 and 3, respectively, with onsite wetland restoration away from the buildings area (Option B).
- $5.6 million for Alternative 4 with the entire PCB Impacted Area restored as a wetland of approximately 1.2 acres.

8. State Acceptance

This criterion was continually evaluated during the development of the FS and the public comment period. Based on the response to comments from the Proposed Plan public comment period, MassDEP concurs with the selected Remedial Alternative 3/Option C.

9. Community Acceptance

The USACE released the Proposed Plan for a 30-day public comment period on November 7, 2011, and presented the plan at a public meeting on December 1, 2011. Questions and comments from the public were recorded for the record. The public comment period ended on December 9, 2011. A number of oral and written comments were received on the preferred alternative (Alternative 2 Soil Cover In Place and LUCs with Wetland Restoration Option C) presented in the Proposed Plan, and are addressed in Section 3.0 of this Decision Document.

Based on comments received, the public and future property owner overwhelmingly preferred Alternative 3/Option C (*Excavation of PCB Soils >50 mg/kg and Soil Cover of PCB Impacted*

Area) over Alternative 2 Soil Cover In Place and LUCs with Wetland Restoration Option C. The GSA, DCR and Town of Watertown Conservation Commission also recognized the wetland location benefits of Alternative 3C over Alternative 4. Based on this public input, the USACE in consultation with the MassDEP has selected Alternative 3/Option C for the GSA Property final remedy as described in Section 2.10.2 of this document.

Although it is not required, the DoD recommends GSR strategies "when and where they make sense." Alternative 2 has the greatest use of GSR. Alternative 3/Option C presents some use of local/regional soil for the construction of the soil cap, recycling and on-site reuse of waste/soil to replicate wetlands, creating or enhancing habitat on-site. Alternatives 2 and 3 have less energy intensive excavation and transport and offsite disposal of soil than Alternative 4.

Alternative 4 has the most energy intensive activities and generates the most emissions due to on-site excavation and offsite transport of soil to Idaho.

2.9.5 Principal Threat Waste

The NCP establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable. Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those considered to be highly toxic or highly mobile and which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would only present a low risk in the event of exposure.

Wastes that generally will be considered to constitute principal threats include but are not limited to the following:

- Liquid source material - waste contained in drums, lagoons, or tanks; free product in the subsurface (i.e., nonaqueous phase liquids) containing COCs (generally excluding groundwater).
- Mobile source material - surface soil or subsurface soil containing high concentrations of COCs that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., VOCs), surface runoff, or subsurface transport.
- Highly toxic source material - buried, drummed non-liquid wastes; buried tanks containing non-liquid wastes; or soils containing significant concentrations of highly toxic materials.

Wastes that generally will not constitute principal threats include but are not limited to the following:

- Non-mobile contaminated source material of low to moderate toxicity - surface soil containing COCs that generally are relatively immobile in air or ground water (i.e., non-liquid, low-volatility, low-leachability contaminants such as high-molecular-weight compounds) in the specific environmental setting.
- Low-toxicity source material - soil and subsurface soil concentrations not greatly above RfD levels or that present an excess cancer risk near the acceptable risk range, were exposure to occur.

Site data do not indicate the presence of a principal threat under the NCP as the contaminated soil can be reliably contained and would present a low risk below unacceptable levels in the event of exposure. As documented in the RI/FS (AMEC, 2011), the PCBs do not readily volatilize or leach into the groundwater and the ability to install a soil cover to eliminate direct exposure to the contaminated soils would result in acceptable risk levels for the planned passive recreational use of the site.

2.10 Selected Remedy

2.10.1 Summary of the Rationale for the Selected Remedy

Based on comments received during the public comment period, the public and future property owner overwhelmingly opposed the recommended alternative listed in the Proposed Plan (Alternative 2 Soil Cover In Place with LUCs and Wetland Restoration Options). Based on this public opposition, the USACE in consultation with the MassDEP changed the final remedial alternative to *Alternative 3 Excavation of PCB Soils >50 mg/kg and Soil Cover of PCB Impacted Area/Option C On-Site Wetland Restoration* as the final remedial action for the GSA Property FUDS.

The final remedy (Alternative 3/Option C) was selected because it is expected to achieve substantial and long-term risk reduction through excavation and disposal to allow the property to be used for the anticipated future land use of passive recreation by the DCR.

Based on information currently available, the USACE and the MassDEP believe the selected remedy meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives. The USACE and MassDEP expect the selected remedy to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

2.10.2 Description of the Selected Remedy

This section expands on the description of the selected remedy from that provided in Section 2.9, Description of Alternatives. The selected final remedy (Alternative 3/Option C) includes the following major components.

2.10.2.1 Excavation of Soil

This alternative involves excavation of soil to a depth of 2 to 3 ft bgs (the purple areas defined in Figure 1-3) and transport of soil with greater than 50 mg/kg PCBs off site to the TSDF (e.g., U.S. Ecology TSDF in Grand View, Idaho or equivalent). The excavation areas will be backfilled with clean fill. Vegetation in the PCB Impacted Area will be cleared, chipped and spread onsite prior to the soil excavation.

Work Plans: The contractor will prepare site-specific work plans prior to excavation activities that will include quality assurance plan, health and safety plan, work plan, and standard field procedures. A minimal Remedial Design will be completed. An O&M plan and Soil Management Plan (SMP) will also be prepared. The plans will be reviewed and approved by USACE and MassDEP prior to remedial activities. The estimated time for completion of these plans is three months. This includes incorporation of review comments and revisions.

Site Set-up: Site set-up for the excavation, offsite disposal and backfilling at GSA Property will consist of setting up of a decontamination station and equipment/materials staging areas. The only water needs of the remedial activities are for decontamination and dust suppression. Therefore, water will either be trucked in to the site or will be provided from a nearby fire hydrant, in coordination with the town of Watertown. The remediation does not have any electrical needs, so electrical hookup is not required. Construction activities will be conducted during daylight hours, so lighting is not required. The cost elements for preparing the work zone are presented below.

- The equipment decontamination station will be constructed with material such as high density polyethylene (HDPE) for containment purposes. The decontamination station will be bermed to ensure containment of any decontamination liquids.
- A portable storage tank will be used throughout the duration of the removal activities to store water for the decontamination station.

Excavation: For cost estimating purposes, it is assumed that an excavator will be used to excavate the soil. Soil may be deposited into a pile and then loaded into box containers using a backhoe or directly loaded into the trucks from the excavation and transported to Worcester where the containers will be placed on rail cars. These rail cars will be brought to the permitted disposal facility. It is assumed that the excavation will proceed at the rate of 200 tons per day, assuming that the disposal facility can receive wastes at this rate. The estimated length of time for the excavation is 2 weeks. A water truck will be required on site during excavation activities for decontamination and dust suppression purposes. Air monitoring for dust generation using a dust meter as specified in the health and safety plan will also be performed. The decontamination liquids generated from equipment cleaning will be collected and tested for offsite disposal.

To assist in the placement of the soil cover, pre-design sampling will be conducted to further define the area where PCB concentrations are greater than 1 mg/kg to the east-southeast of the PCB Impacted Area, near the property fence line. These samples will be collected radially from the existing sample locations, consistent with the CSM and prior soil sampling methods.

Dioxin and metals are largely co-located with the PCBs and will be cleaned up during remediation of the PCBs. Excavation will continue until the soil remedial goal has been met. Soil will be excavated and stockpiled within designated area. Composite sampling of the stockpiles will be conducted for offsite analysis for RCRA waste characteristics to confirm disposal requirements.

2.10.2.2 Covering of Remaining Soils

To address the remaining soils containing PCBs (less than 50 mg/kg, but greater than 1 mg/kg), dioxin, and metals greater than the remedial goals (Table 1-1), the entire PCB Impacted Area will be covered with geotextile fabric (marker material), overlain by 18 inches of clean soil and 6 inches of topsoil (Figure 1-3).

2.10.2.3 Wetland Replication

The existing buildings will be abated for lead, asbestos, and mercury light fixtures, and then demolished for offsite disposal or recycling of construction debris. This will include the removal of the concrete building footings and foundations. Following demolition and removal of site buildings, on-site wetland replication will be conducted on the west end of the site. Half of the soil removed to create the wetland will be reused on site. The other half will be transported off site for disposal.

2.10.2.4 Institutional Controls

Following completion of the remediation, the GSA and DCR will file GEREs with the Massachusetts Registry of Deeds to assure that changes in land use following transfer from the federal government to DCR are evaluated in accordance with state and local requirements. The objectives of the GERE’s are to prevent exposure to soil containing PCBs, dioxin, and metals by preventing disturbance of the soil, maintaining the integrity of the remedial action (soil cover), and assure access to the site.

The DCR and USACE will prepare an O&M plan to define the responsibilities and procedures to maintain the soil cover. The DCR would then design and construct site features in the future to support passive recreational use.

2.10.2.5 Five-Year Reviews (CERCLA 121(c) and 300.430(f)(4)(ii))

Following completion of the remedy as described above, the USACE will conduct CERCLA five-year reviews including conducting major maintenance/repairs of the soil cover by the USACE if needed. Any observed compromise of the remedy may require mitigation, such as repairs of the proposed cover. The DCR will be responsible for long term O&M of the soil cover (e.g., clearing vegetation and mowing), and compliance with the deed notices. The USACE will provide annual inspection of the soil cover and O&M of the wetland replication area for the first five-years. The USACE and the GSA/DCR will prepare an O&M plan to clearly identify roles and responsibilities for the remedial action.

After the remedial action has been completed and the final inspection approved by the USACE and MassDEP, a Completion Report will be completed. The report will include site drawings, sample data, copies of all manifests, and a detailed narrative of the remedial action. The report will be submitted to the MassDEP, GSA, DCR, and the town of Watertown for review and comment. Comments will be incorporated into the Final Completion Report.

2.10.3 Summary of the Estimated Remedy Costs

The estimated remedial cost for Alternative 3/Option C is approximately $4.3 million as shown in Table 2-6. Costs are based on excavation and disposal of soil to a permitted TSDF. The estimated time to implement the selected remedy is approximately 5 years after completion of remedial design. The time to implement the alternative is dependent on USACE funding appropriated annually from Congress.

The information in the cost estimate summary table is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the selected remedy. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences (ESD), or a Decision Document amendment. This cost estimate is an order-of-magnitude engineering estimate that is expected to be within –30 to +50 percent of the actual project cost.

A detailed schedule and cost estimate will be developed as a part of the remedial design phase.

To calculate disposal amounts, it was assumed that the excavations as shown on Figure 1-3, will be two to three feet deep and the excavated soil disposed off site as described in Section

2.10.2. The estimated contaminated soil volume is approximately 1,200 cubic yards. Assuming the density of the soil material is 1.5 tons/cubic yards, the total mass of contaminated material to be excavated will be approximately 1,760 tons. Pre-design soil samples will be collected at each excavation and analyzed for PCBs, dioxin, and metals. Backfilling the excavated areas with clean fill soil will be performed as part of the soil cover. Conventional earthmoving equipment such as excavators, backhoes, and box containers will be used for excavation of the contaminated soil.

For cost estimating purposes, it is assumed that 100 percent of the soil excavated from the PCB Impacted Area is hazardous and will be disposed of at a permitted TSDF. Approximately 50 percent of the soil from the wetland replication area will be disposed off site as a hazardous waste. In addition, it was assumed that the decontamination water will be non-hazardous, so it will be disposed at a permitted municipal waste water facility. For materials classified as RCRA hazardous waste, the transporter must be licensed and permitted to transport hazardous wastes from the site to the destination facility.

2.10.4 Expected Outcomes of the Selected Remedy

Upon completion of the remedy, the site will be released for use as a publicly accessible park for passive recreation. The USACE provided information regarding the selected remedy for cleaning up the site to the public through public meetings, publication of a Proposed Plan, and published announcements. The USACE selected a final remedy for the site after reviewing and considering all comments submitted during a 30-day public comment period for the Proposed Plan in December 2011.

2.11 Statutory Determinations

The lead agency must select remedies that are:

- Protective of human health and the environment
- In compliance with ARARs (unless a statutory waiver is justified)
- Cost effective

Permanent solutions and alternative treatment technologies or resource recovery technologies, will be used to the maximum extent practicable. In addition, preference is given for remedies that employ treatments that permanently and significantly reduce the volume, toxicity, or mobility of contaminants as a principal element. There is a bias against remedies that include offsite disposal of untreated wastes. The following subsections discuss how the selected remedy meets these statutory requirements and describes the five-year review requirements.

2.11.1 Protection of Human Health and the Environment

The selected remedy, Alternative 3/Option C, will be protective of human health and the environment. Contaminated soils with PCBs greater than 50 mg/kg will be removed and disposed off site at a permitted TSCA TSDF. The remaining soils will exceed the site remediation goals (Table 1-1), but will be contained and free from contact by the public and environment by the installation of a 2-foot soil cover.

2.11.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

The selected remedy complies with all ARARs as listed in Table 1-2. The selected remedy does not require waivers for any ARARs.

2.11.3 Cost-Effectiveness

The selected remedy meets the statutory requirement for a cost-effective remedy. Table 2-7 provides a cost-effectiveness matrix to demonstrate the cost-effectiveness of the selected remedy against the other alternatives evaluated. The USACE judged the final selected remedy (Alternative 3/Option C) as cost-effective and a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost effective if its costs are proportional to its overall effectiveness" [40 CFR 300.430(f)(1)(ii)(D)]. USACE evaluated the overall effectiveness by assessing the following three balancing criteria: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. The relationship of the overall effectiveness of the selected remedy was determined proportional to its costs and, therefore, represents a reasonable value for the money to be spent.

2.11.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

The selected remedy does not include any treatment components. However, treatment was not a practicable response since the volume of contaminated soil to be removed from the site is not sufficient to support the cost-effective physical treatment alternatives for the COPCs (e.g., thermal treatment). The selected remedy is cost-effective because lower-concentration soils that are unlikely to pose an unacceptable risk (soils whose concentration ranges between the unrestricted and restricted use cleanup criteria) are left in-place under a soil cover remain under passive recreational use.

2.11.5 Preference for Treatment as a Principal Element

The selected remedy addresses primary constituents of concern at the site without using treatment technologies, as treatment was not a practicable response to the level and volume of contamination present at the site.

2.11.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. This review will continue to be conducted every five years until such time that the remaining soils at the PCB Impacted Area meet the site remediation goals (Table 1-1). For cost estimating purposes in the FS, it was assumed that 30 years of O&M and/or five year reviews would be conducted. Five year reviews will be conducted until such time that the site soil no longer posses a potential significant risk to the human health or environment. The five-year reviews may need to continue potentially more than 100 years.

3.0 PART 3: RESPONSIVENESS SUMMARY

3.1 Public Review Process

3.1.1 Introduction

This Responsiveness Summary provides a summary of comments and concerns received during the public comment period related to the GSA Property, Watertown, Massachusetts Proposed Plan, and provides the responses of the USACE to those comments and concerns. The RI/FS describe the nature and extent of the contamination at the GSA Property and evaluated remedial alternatives to address this contamination. The Proposed Plan (USACE, 2011) identifies USACE's preferred remedy and the basis for that preference. Public involvement in the review of Proposed Plans is stipulated in Section 117(a) of the CERCLA of 1980, as amended, and Sections 300.430(f)(3)(i)(F) and 300.430(f)(5)(iii)(B) of the NCP. These regulations provide for active solicitation of public comment.

All public comments from the Proposed Plan were answered. Many of the similar comments were grouped together and are addressed in this Responsiveness Summary. This Responsiveness Summary was prepared following guidance provided by the USEPA in EPA 540-R-92-009 and the Office of Solid Waste and Emergency Response (OSWER) in OSWER 9836.0-1A. The comments presented in this document have been considered in USACE's final decision in the selection of a remedy to address the contamination at the GSA Property. The text of this Responsiveness Summary explains the public review process and how comments were responded to. In addition to this text, there are four attachments:

- Letter from the Watertown Board of Health and Conservation Commission, dated December 8, 2011
- Letter from the DCR, Commonwealth of Massachusetts, dated December 9, 2011
- Letter from Ms. Nancy Hammett, Watertown resident, dated December 8, 2011
- Letter from Ms. Susan Falkoff, Town Councilor at-Large and Ernesta Kraczkiewicz, Watertown Citizens for Environmental Safety and Planning Committee Member

3.1.2 Public Review Process

The Proposed Plan was issued in November 2011 for public comment. The public notice of the availability of the Proposed Plan was published in the Watertown Tab & Press newspaper on November 11, 2011. In addition, a public meeting was held on December 1, 2011 to present the Proposed Plan. At this meeting, representatives from the USACE answered questions about the site and the remedial alternatives. The preferred alternative for the site that was proposed by the USACE in the Proposed Plan and presented during the December 1, 2011 public meeting was Alternative 2/Option C Soil Cover in Place with Wetland Replication.

The public comment period was held from November 7, 2011 through December 9, 2011. Verbal and written comments were received at the December 1, 2011 public meeting and via the mail. Comments that were received in either written or oral form during the public comment period are summarized below. Those comments that were similar were grouped together. Each comment is followed by a response to that comment.

3.1.3 Information Repositories

Watertown Public Library
Reference Department
123 Main Street
Watertown, Massachusetts 02172
Tel: (617) 972-6431

Ellen Iorio
USACE, New England District
696 Virginia Road
Concord, Massachusetts 01742-2751
Tel: (978) 318-8433

3.2 Summary and Public Response

3.2.1 Selected Remedy

Based on public comments received, the public and future property owner overwhelmingly opposed Alternative 2/Option C. The majority of comments supported Alternative 3/Option C while some requested complete removal of the contaminated soil under Alternative 4. Based on the public input and supporting information provided by the stakeholders, USACE selected Alternative 3/Option C as the remedial action for the site. The selected alternative was changed from Alternative 2/Option C to Alternative 3/Option C as described in Sections 2.9.1 and 2.10.1. Alternative 3/Option C involves excavation of contaminated soil in the PCB Impacted Area greater than 50 mg/kg PCBs, installation of a soil cover and geotextile fabric (marker material), GERE's, and wetland restoration Option C as described in detail in Section 2.10.2. Prior to the wetland restoration the existing buildings will be demolished and disposed of off-site by USACE.

3.2.2 Public Comment

Many of the comments received from the public and key stakeholders during the public comment period were found to be similar and were grouped together. All of the comments are addressed in this Responsiveness Summary. The following comments lead to the USACE's decision to select Alternative 3/Option C and further actions during the design and construction process of the remedial alternative:

1. Verbal comment (public meeting) and Watertown Board of Health and Conservation Commission Letter: Don't leave highest concentrations of PCBs in the residual soil; possibly develop an alternative to remove the highest concentrations of PCBs.
2. DCR Letter: Concerned with the management of PCBs in soil greater than 50 mg/kg and requested that this soil be removed. During a teleconference on January 4, 2012, DCR representative, Mike Misslin stated that DCR Commissioner would not accept alternative 2C.
3. Ms. Susan Falkoff, Town Councilor at-Large and Ernesta Kraczkiewicz, Watertown Citizens for Environmental Safety and Planning Committee Member Letter: Want the contaminated soil removed from the site for off-site disposal.
4. Ms. Nancy Hammett, Susan Falkoff and Ernesta Kraczkiewicz Letters: Did not want contaminated soil to remain on site under a soil cover.

The additional significant comments were received from the public and key stakeholders during the public comment period that apply to selected remedial alternative 3C:

1. Ms. Nancy Hammett, Susan Falkoff and Ernesta Kraczkiewicz Letters: Were concerned with the disposal facility selection, waste characterization and cost evaluation conducted. Felt that additional information would support potentially less expensive alternatives and the ability for full removal of the PCB Impacted Area soils (Alternative 4).
2. Verbal comment (public meeting), Watertown Board of Health and Conservation Commission Letter: Removal of the buildings and replication of the wetlands in this area will provide the best option for functioning wetlands on the GSA site.
3. Watertown Board of Health and Conservation Commission Letter and various stakeholder letters: Want to be involved in the review and comment of the remedial alternative design and construction. Want to make sure that the design will withstand site flooding based on different storm events.
4. Watertown Board of Health and Conservation Commission Letter and various stakeholder letters: Want to review and comment on the O&M plan defining the roles and responsibilities for both the DCR and USACE.

5. Verbal comment (public meeting): The remedy has taken a very long time to get to this point. The people who live in the vicinity of the site are satisfied with the USACE proposal and just want to get the project started.
6. Watertown Energy and Efficiency Committee (verbal comment public meeting): Wanted to re-evaluate the site reuse plan and soil cover design to possibly support the installation of solar panels on the site.
7. Verbal comment (public meeting), Ms. Nancy Hammett, Susan Falkoff and Ernesta Kraczkiewicz Letters: Contaminated soil remaining in place and covered with a soil cover will not reduce the potential risk from the soil and a failure of the soil cover. Will the two foot soil cover be protective? What is the design life of the geosynthetic? What will happen to the soil cover in the years following the design life of the soil cover?

3.3 Detailed Response to Comments

The detailed comments and response to comments are summarized in below.

Comments provided by the Watertown Board of Health and Conservation Commission – December 8, 2011

Opening Statement:

As we noted in the October comment letter, the Commission accepts rejection of Alternative 4 as it is not cost-effective, and the Human Health and ERAs demonstrate that soils outside of the PCB area do not contribute to unacceptable risk, even when the more stringent Massachusetts risk limits are used. Therefore, we can accept rejection of Alternative 4 based on cost and on the findings of No Significant Risk outside of the PCB area.

Comment:

1. In our October comment letter, we noted a strong preference for Alternative 3, and we urged the Corps of Engineers to explore opportunities for removal of the on-site buildings. We appreciate the effort that has been undertaken to find mechanisms outside of the FUDS program to support demolition and removal of the buildings.

   Removal of the buildings will allow the wetlands replacement at the site of the buildings. This will provide the best option for functioning wetlands at the GSA Property as the wetlands will connect with Sawins Pond Brook and provide filtration, flood protection, and improvement of the quality of water that will discharge to the Charles River.

   Replacement of wetlands at the locations of the buildings also reflects the most likely original configuration of the property prior to filing by the Army.

Response:

Since the area of the existing buildings is the only viable upland area suitable for wetland reconstruction at the site, selected remedial alternative 3C will provide for the removal of the buildings and reconstruction of the wetlands within the footprint of the demolished buildings.

Comment:

2. Our objections to Alternative 2 were largely addressed at the public meeting. Although we continue to support an Alternative that includes removal of the soil with the highest concentrations of PCBs, we would support Alternative 2C, which includes removal of the buildings and replacement of wetlands at the site of the buildings.

   We request that the Corps consider a modified Alternative 2C/3C that would remove some soil with the highest PCB concentrations, possibly greater than 200 mg/kg.

Response:

Based on the comments provided by the stakeholders during the public comment period, the USACE has selected Alternative 3C that will include the removal of PCB-contaminated soil greater than 50 mg/kg. Following the soil removal and off-site disposal, the excavated areas will be backfilled with clean soil and the PCB Impacted Area covered with geotextile fabric (marker material), 2 feet of soil and stabilized with a grassed surface. The remaining site soil being covered will range in PCB concentrations between 1.0 mg/kg and 26 mg/kg.

Comment:

3. We acknowledge that a soil/geomembrane cover is an appropriate remedial action for contaminated soil. It is important for all to recognize that Alternative 2C creates an unlined hazardous waste landfill with an engineered cap.

Response:

As noted in the 2011 RI/FS and at the public meeting, the PCBs and metals adhere to the organic soils found in the wetland soils. These contaminants have a low level of mobility and have not been found in the site groundwater or surface water. It should be noted that Alternative 2C would not create a hazardous waste landfill.

Comment:

4. The FS seems to indicate that the Corps of Engineers is considering the Alternative Cap Design Guidance (Gagne and Choi, 1997, 2001), with a soil layer and geomembrane or geosynthetic clay liner.

   We look forward to reviewing the proposed design. We request that the recommended design be evaluated using a model such as USEPA's Hydrologic Evaluation of Landfill

Performance (HELP). We also request that the evaluation of the recommended design include the entire site and the hydraulic relationships between the capped area, which will be upland and at a higher elevation than it is currently, and the new wetland area at the location of the buildings. In addition to using climatological and rainfall data for Boston, the evaluation should include the 25-, 50-, and 100-year storms over a 24-hour duration. The review should also include an evaluation of the existing culvert at the outlet of Sawins Pond Brook and recommendations for re-sizing the culvert if necessary. The design should include perimeter groundwater monitoring wells to insure groundwater quality through the life of the project.

Response:

The Proposed Plan indicates that the soil cover will be constructed with a geotextile fabric (marker material) and 2 feet of soil. Prior to the construction of the soil cover, the PCB-contaminated soil greater than 50 mg/kg will be removed for off-site disposal and the area backfilled with clean soil. The design of Alternative 3C for the GSA site will be completed by the USACE and will incorporate the potential flooding of the site. This design document will be made available for review and comment by the stakeholders.

Comment:

5. We also ask that the design document will include a detailed inspection plan that covers both routine inspections and mechanisms for non-scheduled inspections after storm events, particularly in the summer when intense rainfall can occur over very small geographic areas. The Town should not be responsible for triggering inspection requests.

Response:

The USACE will prepare an O&M plan as part of the project design and it will be available for review and comment by the stakeholders. This O&M plan will include a SMP to support the O&M activities.

Comments provided by the Department of Conservation and Recreation, Commonwealth of Massachusetts– December 8, 2011

Opening Statement:

The report summarized the remedial alternatives under consideration for the site and presented the evaluation of the alternatives and the Preferred Alternative. USACE presented the results of the Plan at a public meeting in Watertown on December 1, 2011. The Preferred Alternative, designated Alternative 2/Option C, consists of covering all of the PCB-contaminated soil in place with a soil cover consisting of 18 inches of clean fill and 6 inches of topsoil. Because the area to be covered is located within a wetland, wetlands will be replicated in the area currently occupied by the site buildings. Half of the excavated soil will be reused on site and half will be disposed off-site. Under the Plan, the buildings will be demolished by DCR prior to remediation and wetland replication.

Comment:

1. The TSCA regulations (40 CFR 761.61) do not require the cleanup of soil that was contaminated with PCBs prior to 1978. However, based on conversations with Ms. Kimberly Tisa of the USEPA, we recommend the excavation and off-site disposal of soil containing PCBs equal to or greater than 50 mg/kg, followed by capping of the remaining PCB-contaminated soil (Alternative 3). If disposal of soil with PCBs equal to or greater than 50 mg/kg would be subject to the TSCA requirements for cleanup and disposal of PCB remediation waste. The requirement to manage soil with equal to or greater than 50 mg/kg PCBs in accordance with the TSCA regulations would restrict DCR's ability to construct and maintain a park on the site due to the significant added cost to manage soil in accordance with the TSCA regulations.

Response:

Based on the comments provided by the stakeholders during the public comment period, the USACE has selected Alternative 3C that will include the removal of PCB-contaminated soil greater than 50 mg/kg followed by the installation of a marker material, 2 feet of soil and a grassed surface. An O&M plan and SMP will be prepared to support the maintenance of the soil covered area.

Comment:

2. We do not have other comments regarding the technical content of the RI/FS. We note however that the Preferred Alternative requires demolition of the site buildings prior to remediation and replication of wetlands. FUDS regulations specify that the USACE cannot remove the buildings. However, Massachusetts regulations prohibit use of state funds for work on federally-owned properties; therefore DCR cannot remove the buildings prior to remediation. If an alternative funding source for building removal cannot be found, we suggest replication of the wetlands elsewhere on the site.

Response:

Under Alternative 3C, the demolition of the buildings is an integral part of the remedial action. USACE will demolish the buildings prior to the reconstruction of the wetlands. Alternative 3C costs have been revised to include the building demolition costs.

3.4 Technical and Legal Issues

Technical Issues: Based on public comments, an O&M plan and SMP will be prepared as part of the remedial design documents to clearly identify the roles and responsibilities of the USACE and DCR for the maintenance of the site and repair of the soil cover, as necessary.

Legal Issues: An agreement will be memorialized between DCR and GSA on the property transfer from GSA back to the Commonwealth of Massachusetts in accordance with the reverter clause in the Deed. The USACE will support the GSA and DCR in the development of GERE's. These GERE's will be prepared for both the GSA parcel and Property 20 (DCR owned) that make up the site to restrict the future site use to passive recreation. These GERE's will be filed in the Registry of Deeds following the completion of this Decision Document.

4.0 PART4: REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1993. Former Watertown Arsenal Preliminary Assessment, Watertown, Massachusetts. October.

AMEC Environment & Infrastructure, Inc. (AMEC), 2011. Remedial Investigation, Final Report, GSA Property Formerly Used Defense Site (FUDS) Property No. D01MA001902, Watertown, Massachusetts. September 1.

GEI Consultants, Inc. (GEI), 2007. Due Diligence Field Investigation, GSA Parcel, 670 Arsenal Street, Watertown, MA. August 21.

Harding ESE, 2001. Derivation of the Site-Specific Soil DCGL, GSA Property, Watertown, Massachusetts, Prepared for the U.S. Army Corps of Engineers, New England District, Concord, MA. September.

Harding ESE, 2002. Focused Uranium Tailings Investigation Report, GSA Property, Watertown, Massachusetts, Prepared for the U.S. Army Corps of Engineers, New England District, Concord, MA. December.

Harding ESE, 2003. Evaluation of the Final Radiological Status of the Watertown GSA Site, Watertown GSA Site, 670 Arsenal Street, Watertown Massachusetts. April.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2004. Final Supplemental Phase II Comprehensive Site Assessment (CSA), GSA Property, Watertown, Massachusetts, Contract No. DACA33-97-C-0023, DERP Property No. D01MA001902, DEP Case No. 3-02722. January.

Massachusetts Department of Environmental Protection (MassDEP), 2003. Evaluation of the Final Radiological Status (EFRS) of the Watertown GSA Site, GSA Property, Watertown, Massachusetts, DEP Site # 3-2722. November 13.

Morrison Knudsen (MK), 1996; Radiological Characterization and Final Survey Report, General Services Administration (GSA) Site, Watertown, Massachusetts. January.

United States Army Corps of Engineers-New England Division (USACE), 2011. Proposed Plan for the GSA Property FUDS Site, Property No. D01MA001902, Watertown, Massachusetts. November.

TABLES

Table 1-1
Risk Assessment Results and Site Remediation Goals

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

Chemical of Concern	**EPC PCB Impacted Area** (mg/kg)	**Human Health Risk-Based PRGs (mg/kg) [a]**					**Ecological Risk-Based PRGs**				**Background Value [e]** (mg/kg)	**Site Remediation Goal (mg/kg) [g]**
		Cancer Risk			HI		Robin		Shrew			
		1E-06	1E-05	1E-04	1		NOAEL	LOAEL	NOAEL	LOAEL		
PCBs	170	0.89	8.9	89	6.3	[b]					NA	1 [h]
Aroclor-1254	170						0.82	8.2	0.16	1.6	NA	1 [h]
Aroclor-1260	0.99						0.80	8.0	0.051	0.51	NA	1 [h]
Dioxin	0.00022	0.0000096	0.000096	0.00096	NA	[b]	0.000063	0.00063	0.0000016	0.000016	0.000208 [f]	0.00075 [i]
Antimony	414	NC	NC	NC	64	[c]	0.96	9.6	197	212	19.3	19.3
Cadmium	12.4	NCOC					7.2	27	6.0	23	2.18	N/A [j]
Chromium	264	NCOC					71	292	89	1305	25.2	N/A [j]
Copper	1000	NCOC					667	1333	1418	14185	66.2	N/A [j]
Lead	1031	984				[c,d]	100	176	165	5394	506	506
Nickel	17263	NC	NC	NC	1726	[c]	1213	1677	565	1129	22.3	565
Vanadium	74	NCOC					40	398	19	191	44.5	N/A [j]
Zinc	855	NCOC					232	2093	1158	3917	278	N/A [j]

Prepared by: BJR 12/16/10
Checked by: DEH 12/17/10

[a] - For cancer-based values, calculated as: EPC x Target Risk /Risk for passive recreational visitor (sum of three populations) for non-cancer risk, calculated as: EPC/HI calculated for either young child subchronic scenario or young child chronic scenario (whichever is higher)
[b] - Based on young child chronic scenario
[c] - Based on young child subchronic scenario
[d] - Based on IEUBK modeling - see Appendix K of the RI/FS (AMEC, 2011)
[e] - Maximum concentration; Table 7-1 from Final Phase II CSA (MACTEC, 2004)
[f] - Concentration measured at reference location in southwest corner of site.
[g] - PRG is lowest value (rounded) of Human Health PRG, Ecological PRG or background if background is greater than Human Health and Ecological PRGs.
[h] - PRG based on USEPA guidance in lieu of background concentration.
[i] - Concentration of Dioxin found at "Other Areas Around site"
[j] - Not applicable as metals associated with unregulated fill material found on site and not related to site activities.
EPC - Exposure Point Concentration
HI - Hazard Index
IEUBK - Integrated Exposure Update Biokinetic
LOAEL - Lowest Observed Adverse Effect Level
mg/kg - milligrams per kilogram
NA - Not Applicable
NC - Not Carcinogenic (by oral/ingestion routes)
NCOC- Not a Chemical of Concern
NOAEL - No Observed Adverse Effect Level
PRG - Preliminary Remediation Goal
USEPA - United States Environmental Protection Agency

Table 1-2
ARARs, Criteria, Advisories, and Guidance

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

Regulatory Authority	Area	Chemical, Activity, or Location Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	Applicable To Alternative
State	Surface Water	Chemical Specific	Massachusetts Surface Water Quality Standards [314 CMR 4.04 (1) and (7)4.]	Applicable	Protection of Existing Uses. In all cases existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.	Cleanup actions will be designed, implemented, and monitored to attain Massachusetts Surface Water Quality Standards if Site surface water is generated (e.g., construction dewatering).	Alternatives 3 and 4
Federal	TSCA	Action Specific	TSCA [40 CFR Part 761.61 b Subpart D] Storage and Disposal	Relevant and Appropriate	Performance-based disposal. Disposing of non-liquid PCB remediation waste by a chemical waste landfill approved.	These requirements were incorporated into alternatives that result in the excavation, transport, and disposal of PCB impacted soils.	Alternatives 3 and 4
Federal	TSCA	Action Specific	TSCA regulations on Decontamination [40 CFR 761.79 (b), (e), (g)]	Applicable	This regulation applies to concentrations of PCBs >50 ppm and establishes decontamination standards and procedures for removing PCBs from water, organic liquids, and various types of surfaces including equipment used in excavation or other handling of PCB containing materials.	These requirements would be attained through the proper use of decontamination procedures.	Alternatives 3 and 4
Federal	Wetlands	Location Specific	40 CFR Part 230.93 (f), (1) Compensatory Mitigation for Losses of Aquatic Resources	Relevant and Appropriate	Requires a compensation ratio of at least one-to-one by acreage or linear foot for lost aquatic resources.	These requirements were incorporated into alternatives that result in the loss of wetlands.	Alternatives 2, 3, and 4

Notes/Abbreviations:

ARAR = Applicable or Relevant and Appropriate Requirement
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
PCBs = Polychlorinated Biphenyls
TSCA = Toxic Substances Control Act

Prepared by: ARM 11/30/10
Checked by: DEH 12/17/10
Revised by: DGK 07/25/11
Checked by: DEH 07/27/11

Table 2-1
Data Summary and Exposure Point Concentrations - PCB Impacted Area

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

PARAMETER	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	95% UCL [1]	EPC
Volatile Organics (mg/Kg)						
1,1,2-Trichloro-1,2,2-trifluoroethane	1 / 3	0.011 : 0.023	0.017 - 0.017	0.011	NC [a]	0.017 Max
Acetone	1 / 4	0.011 : 20	0.14 - 0.14	2.5	NC [a]	0.14 Max
Methylene Chloride	3 / 4	2 : 2	0.01 - 0.036	0.26	NC [a]	0.036 Max
Tetrachloroethene	3 / 4	2 : 2	0.009 - 0.063	0.27	NC [a]	0.063 Max
PCBs (mg/Kg)						
Aroclor 1254	35 / 35		0.542 - 361	40	170 NP [f]	170 95% UCL
Aroclor 1260	7 / 35	0.057 : 34.5	0.52 - 2.1	2.1	0.99 NP [d]	0.99 95% UCL
Inorganics (mg/Kg)						
Antimony	7 / 12	7.15 : 9.1	5.7 - 1400	180	414 NP [e]	414 95% UCL
Barium	8 / 8		92.4 - 308	200	256 NP [c]	256 95% UCL
Beryllium	5 / 8	0.326 : 5	0.27 - 0.655	0.64	0.53 NP [d]	0.53 95% UCL
Cadmium	8 / 8		0.29 - 16.4	4.2	12.4 NP [g]	12.4 95% UCL
Chromium	8 / 8		94.5 - 415	207	264 NP [e]	264 95% UCL
Cobalt	4 / 4		6 - 13.9	10.3	NC [b]	13.9 Max
Copper	4 / 4		381 - 1000	632	NC [b]	1000 Max
Lead	8 / 8		343 - 2220	1031	1460 NP [c]	1031 Average
Manganese	4 / 4		1070 - 1900	1345	NC [b]	1900 Max
Mercury	8 / 8		0.174 - 0.94	0.38	0.54 NP [e]	0.54 95% UCL
Nickel	12 / 12		82.6 - 18800	1918	17263 NP [f]	17263 95% UCL
Silver	5 / 8	2.5 : 5	2.09 - 14.9	4.9	8.7 NP [d]	8.7 95% UCL
Thallium	4 / 12	0.5 : 11.9	0.48 - 8.03	2.4	3.0 NP [c]	3.0 95% UCL
Uranium						861 [2]
Vanadium	8 / 8		45.7 - 109	60	74 NP [e]	74 95% UCL
Zinc	8 / 8		249 - 1040	651	855 NP [c]	855 95% UCL
Petroleum Hydrocarbons (mg/Kg)						
TRPH	8 / 8		469 - 5170	1746	3300 G [h]	3300 95% UCL
EPH (mg/Kg)						
C11-C22 Aromatics (unadj.)	2 / 10	12 : 20	17 - 26	9.9	26 NP [d]	26 95% UCL
C19-C36 Aliphatics	8 / 10	13 : 16	32 - 150	56	85 NP [c]	85 95% UCL

Table 2-1
Data Summary and Exposure Point Concentrations - PCB Impacted Area

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

PARAMETER	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	95% UCL [1]	EPC
Dioxins (mg/Kg)						
Total TEQ (WHO 2005)						0.00011 SS-002
Total TEQ Bird (WHO 1998)						0.00054 SS-002

mg/Kg = milligram per kilogram
EPC = Exposure Point Concentration

[1] 95% UCL is calculated using ProUCL software (V. 4.00.04).
[2] Mass of uranium that is equal to the Derived Concentration Guideline Level of 340 picocuries per gram of depleted uranium (see Phase II CSA)
NC = Not Calculated
[a] Data set is too small to compute reliable and meaningful statistics and estimates.
[b] Only one distinct data value was detected
NP = Nonparametric Distribution
[c] 95% KM (t) UCL
[d] 95% KM (Percentile Bootstrap) UCL
[e] 95% KM (BCA) UCL
[f] 99% KM (Chebyshev) UCL
[g] 95% KM (Chebyshev) UCL

Prepared by / Date: KJC 08/27/10
Checked by / Date: BJR 09/01/10

G - Gamma Distribution
[h] 95% Approximate Gamma UCL

Table 2-2
Data Summary and Exposure Point Concentrations - Area Outside PCB Impact Area

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

PARAMETER	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	95% UCL [1]	EPC
Volatile Organics (mg/Kg)						
Acetone	4 / 38	0.01 : 0.04	0.054 - 0.18	0.018	0.064 NP [a]	0.064 95% UCL
Benzene	1 / 52	0.005 : 0.7	0.3 - 0.3	0.040	NC [f]	0.3 Max
Ethylbenzene	1 / 52	0.005 : 0.7	0.3 - 0.3	0.040	NC [f]	0.3 Max
Methylene Chloride	1 / 38	0.005 : 0.01	0.006 - 0.006	0.0036	NC [f]	0.006 Max
Tetrachloroethene	1 / 38	0.002 : 0.01	0.014 - 0.014	0.0037	NC [f]	0.014 Max
Toluene	2 / 52	0.002 : 0.7	0.078 - 0.3	0.041	0.30 NP [b]	0.30 95% UCL
Trichloroethene	1 / 38	0.002 : 0.01	0.021 - 0.021	0.0039	NC [f]	0.021 Max
Xylenes, Total	6 / 52	0.003 : 0.7	0.012 - 1.1	0.076	0.40 NP [b]	0.40 95% UCL
Semivolatile Organics (mg/Kg)						
4-Methylphenol (p-Cresol)	1 / 40	0.33 : 10	2.5 - 2.5	0.83	NC [f]	2.5 Max
Carbazole	1 / 27	0.33 : 10	4.8 - 4.8	1.0	NC [f]	4.8 Max
Dibenzofuran	1 / 40	0.045 : 10	1.6 - 1.6	0.81	NC [f]	1.6 Max
Phenol	1 / 40	0.33 : 10	13 - 13	1.1	NC [f]	13 Max
PCBs (mg/Kg)						
Aroclor 1254	35 / 62	0.027 : 1.1	0.017 - 1.45	0.30	0.36 NP [a]	0.36 95% UCL
Aroclor 1260	16 / 62	0.027 : 1.1	0.037 - 0.9	0.096	0.12 NP [a]	0.12 95% UCL
Inorganics (mg/Kg)						
Antimony	6 / 24	6 : 29	7.49 - 69	11.5	24 NP [b]	24 95% UCL
Barium	39 / 42	125 : 133	18 - 554	120	200 NP [d]	200 95% UCL
Beryllium	6 / 36	0.411 : 5	0.22 - 1	0.63	0.62 NP [b]	0.62 95% UCL
Cadmium	21 / 42	0.25 : 5	0.512 - 13	1.7	2.4 NP [b]	2.4 95% UCL
Chromium	42 / 42		16 - 1560	160	344 NP [d]	344 95% UCL
Cobalt	29 / 29		2 - 75	13.1	24 NP [d]	24 95% UCL
Copper	29 / 29		33 - 5760	462	1717 NP [e]	1717 95% UCL
Lead	51 / 51		20 - 2100	402	718 NP [d]	402 Average
Manganese	35 / 35		200 - 2400	666	1051 NP [d]	1051 95% UCL
Mercury	38 / 42	0.023 : 0.0629	0.024 - 1.19	0.22	0.39 NP [d]	0.39 95% UCL
Nickel	46 / 46		13 - 2840	164	431 NP [d]	431 95% UCL
Silver	4 / 34	0.71 : 10	1.4 - 25	2.3	10.4 NP [b]	10.4 95% UCL
Thallium	2 / 40	1 : 33.3	2.6 - 38.3	2.7	8.9 NP [d]	8.9 95% UCL
Uranium						861 [2]
Vanadium	36 / 36		9 - 1530	190	587 NP [e]	587 95% UCL
Zinc	42 / 42		32 - 3920	497	990 NP [d]	990 95% UCL

Table 2-2
Data Summary and Exposure Point Concentrations - Area Outside PCB Impact Area

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

PARAMETER	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	95% UCL [1]	EPC
Petroleum Hydrocarbons (mg/Kg)						
TRPH	55 / 63	530 : 650	51 - 6980	1265	1593 NP [c]	1593 95% UCL
EPH (mg/Kg)						
C11-C22 Aromatics	20 / 30	11 : 15	6.6 - 500	81	224 NP [e]	224 95% UCL
C19-C36 Aliphatics	23 / 30	11 : 15	23 - 740	142	210 NP [c]	210 95% UCL
C9-C18 Aliphatics	9 / 30	8.6 : 15	8.8 - 110	17.2	28 NP [a]	28 95% UCL
VPH (mg/kg)						
C5-C8 Aliphatics	3 / 14	0.55 : 2	0.67 - 0.83	0.59	0.83 NP [b]	0.83 95% UCL
C9-C10 Aromatics	4 / 14	0.55 : 2	0.75 - 1.7	0.75	1.3 NP [b]	1.3 95% UCL
C9-C12 Aliphatics	6 / 14	0.7 : 2	0.63 - 8.3	1.4	2.5 NP [b]	2.5 95% UCL
Dioxins (mg/Kg)						
Total TEQ (MassDEP)						0.000044 SS-003

mg/Kg = milligram per kilogram
EPC = Exposure Point Concentration

[1] 95% UCL is calculated using ProUCL software (V. 4.00.04).
[2] Mass of uranium that is equal to the Derived Concentration Guideline Level of 340 picocuries per gram of depleted uranium (see Phase II CSA)
NP = Nonparametric Distribution
[a] 95% KM (t) UCL
[b] 95% KM (Percentile Bootstrap) UCL
[c] 95% KM (BCA) UCL
[d] 95% KM (Chebyshev) UCL
[e] 97.5% KM (Chebyshev) UCL
NC = Not Calculated
[f] Only one distinct data value was detected

Prepared by / Date: KJC 09/03/10
Checked by / Date: BJR 09/07/10

Table 2-3
Data Summary and Exposure Point Concentrations - Subsurface Soil

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

PARAMETER	Frequency of Detection			Range of Reporting Limits for Non Detects			Range of Detected Concentrations			Average of All Samples	95% UCL [1]		EPC [1]	
Volatile Organics (mg/Kg)														
2-Butanone	20	/	71	0.011	:	50	0.013	-	1.3	0.446253521	0.13	NP [a]	0.13	95% UCL
Acetone	36	/	71	0.011	:	50	0.015	-	4.8	0.722028169	1.1	NP [b]	1.1	95% UCL
Carbon Disulfide	4	/	71	0.002	:	5	0.01	-	0.067	0.04234507	0.023	NP [c]	0.023	95% UCL
cis-1,2-Dichloroethene	4	/	51	0.006	:	0.017	0.008	-	0.012	0.004166667	0.012	NP [c]	0.012	95% UCL
Ethylbenzene	2	/	90	0.005	:	5	0.56	-	0.63	0.077594444	0.56	NP [d]	0.56	95% UCL
Methylene Chloride	10	/	71	0.006	:	5	0.006	-	0.72	0.061760563	0.050	NP [d]	0.050	95% UCL
Tetrachloroethene	8	/	71	0.002	:	5	0.009	-	0.11	0.043992958	0.015	NP [d]	0.015	95% UCL
Toluene	5	/	90	0.003	:	5	0.011	-	1.5	0.087472222	0.062	NP [d]	0.062	95% UCL
Trichloroethene	2	/	71	0.004	:	5	0.008	-	0.021	0.040985915	0.0087	NP [d]	0.0087	95% UCL
Xylenes, Total	3	/	90	0.006	:	5	0.038	-	1.4	0.083394444	0.17	NP [b]	0.17	95% UCL
Semivolatile Organics (mg/Kg)														
bis(2-Ethylhexyl)phthalate	2	/	67	0.091	:	25	0.46	-	1	1.035828358	0.51	NP [d]	0.51	95% UCL
Carbazole	4	/	59	0.072	:	11	1.1	-	45	2.218322034	43	NP [c]	43	95% UCL
Dibenzofuran	8	/	67	0.052	:	11	0.53	-	82	3.137029851	5.8	NP [d]	5.8	95% UCL
Di-n-butylphthalate	3	/	67	0.36	:	25	1.3	-	6.3	1.143134328	6.3	NP [c]	6.3	95% UCL
PCBs (mg/Kg)														
Aroclor 1254	2	/	15	0.0579	:	0.174	0.696	-	0.7	0.133953333	0.70	NP [c]	0.70	95% UCL
Inorganics (mg/Kg)														
Antimony	10	/	35	2	:	60	3.9	-	52	7.881428571	11.2	NP [d]	11.2	95% UCL
Barium	60	/	60				9	-	3440	139.205	390	NP [e]	390	95% UCL
Cadmium	10	/	60	0.22	:	6	0.85	-	13	0.93325	1.7	NP [c]	1.7	95% UCL
Chromium	60	/	60				8	-	517	82.01833333	142	NP [e]	142	95% UCL
Copper	60	/	60				7.4	-	1630	180.3433333	345	NP [e]	345	95% UCL
Lead	60	/	60				8	-	8740	346.925	997	NP [e]	347	Average
Manganese	60	/	60				39.4	-	4720	632.0833333	1099	NP [e]	1099	95% UCL
Mercury	48	/	60	0.022	:	0.06	0.038	-	1.27	0.199383333	0.26	NP [a]	0.26	95% UCL
Nickel	63	/	64	3.7	:	3.7	6.5	-	1440	112.9648438	234	NP [e]	234	95% UCL
Silver	11	/	49	1	:	12	1.4	-	14	1.615306122	2.5	NP [d]	2.5	95% UCL
Thallium	6	/	64	0.35	:	3	0.53	-	2.7	0.7234375	1.5	NP [c]	1.5	95% UCL
Uranium													861	[2]
Vanadium	60	/	60				6	-	721	49.79833333	102	NP [e]	102	95% UCL
Zinc	60	/	60				9.8	-	6060	296.0633333	795	NP [e]	795	95% UCL

Table 2-3
Data Summary and Exposure Point Concentrations - Subsurface Soil

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

PARAMETER	Frequency of Detection			Range of Reporting Limits for Non Detects			Range of Detected Concentrations			Average of All Samples	95% UCL [1]		EPC [1]	
Petroleum Hydrocarbons (mg/Kg)														
TRPH	102	/	120	43.8	:	1800	33	-	31800	2396.070417	4099	NP [e]	4099	95% UCL
VPH (mg/kg)														
C11-C22 Aromatics	20	/	20				59	-	2600	504.45	1077	NP [e]	1077	95% UCL
C19-C36 Aliphatics	20	/	20				72	-	14000	1355.45	5618	NP [b]	5618	95% UCL
C9-C18 Aliphatics	20	/	20				13	-	1500	210.6	554	NP [e]	554	95% UCL
EPH (mg/Kg)														
C5-C8 Aliphatics	6	/	19	0.5	:	1	0.88	-	30	2.491578947	5.7	NP [d]	5.7	95% UCL
C9-C10 Aromatics	7	/	19	0.5	:	1.1	4	-	110	11.14736842	24	NP [d]	24	95% UCL
C9-C12 Aliphatics	16	/	19	0.5	:	0.65	1.2	-	300	29.03026316	191	NP [f]	191	95% UCL

[1] 95% UCL is calculated using ProUCL software (V. 4.00.04).
[2] Mass of uranium that is equal to the Derived Concentration Guideline Level of 340 picocuries per gram of depleted uranium (see Phase II CSA)
NP - Non-Parametric Distribution
[a] 95% KM (BCA) UCL
[b] 97.5% KM (Chebyshev) UCL
[c] 95% KM (Percentile Bootstrap) UCL
[d] 95% KM (t) UCL
[e] 95% KM (Chebyshev) UCL
[f] 99% KM (Chebyshev) UCL

Table 2-4
Lead Exposure Point Concentrations and IEUBK Modeling Results

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

Exposure Area	Lead EPC (mg/kg)	Adjusted EPC [a] (mg/kg)		IEUBK Results [b]			
		subchronic	chronic	Subchronic		Chronic	
	Exposure Frequency:	90 / 211 (= 155 / 365)	90 / 365	Geomean PbB (ug/dl)	% Above 10 ug/dl	Geomean PbB (ug/dl)	% Above 10 ug/dl
PCB Impacted Area	1031	438	254	4.8	5.8%	3.2	0.78%
Area Outside of PCB Impacted Area [c]	402	227	174	--	--	--	--
Subsurface Soil [c]	347	204	160	--	--	--	--

[a] - Calculated as: EPC x Exposure frequency. Exposure frequency values are provided in Table 6-4 of the RI/FS (AMEC, 2011).
[b] - Model outputs are provided in Appendix J
[c] - EPCs for these exposure points include exposure to lead at the MassDEP background value (99 mg/kg) on days when exposure at the Site does not occur.
-- - IEUBK not run for these scenarios because EPCs are lower than the EPC of 254 mg/kg, which is shown to not pose unacceptable risks.
PbB - blood lead concentration
ug/dl - micrograms per deciliter

Prepared by: JHP 9/7/2010
Checked by: KJC 9/8/2010

Table 2-5
Summary of Hazard Quotients for Ecological Receptors

Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

	Robin						Shrew						Raccoon					
	Hot Spot		Background		Incremental Risk (1)		Hot Spot		Background		Incremental Risk (1)		Hot Spot		Background		Incremental Risk (1)	
COPC	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
1,1,2-Trichloro-1,2,2-trifluoroethane	3.2E-07	1.6E-07	NA	NA	3.2E-07	1.6E-07	4.7E-07	2.3E-07	NA	NA	4.7E-07	2.3E-07	6.3E-10	3.1E-10	NA	NA	6.3E-10	3.1E-10
Acetone	4.3E-07	4.3E-08	NA	NA	4.3E-07	4.3E-08	5.9E-05	1.2E-05	NA	NA	5.9E-05	1.2E-05	1.3E-07	2.6E-08	NA	NA	1.3E-07	2.6E-08
Methylene Chloride	1.6E-04	1.9E-05	NA	NA	1.6E-04	1.9E-05	5.2E-05	6.1E-06	NA	NA	5.2E-05	6.1E-06	1.2E-07	1.3E-08	NA	NA	1.2E-07	1.3E-08
Tetrachloroethene	9.6E-04	4.8E-04	NA	NA	9.6E-04	4.8E-04	1.4E-03	7.0E-04	NA	NA	1.4E-03	7.0E-04	1.8E-06	9.0E-07	NA	NA	1.8E-06	9.0E-07
Aroclor 1254	**2.1E+02**	**2.1E+01**	NA	NA	**2.1E+02**	**2.1E+01**	**1.0E+03**	**1.0E+02**	NA	NA	**1.0E+03**	**1.0E+02**	5.2E-01	4.1E-01	NA	NA	5.2E-01	4.1E-01
Aroclor 1260	**1.2E+00**	1.2E-01	NA	NA	**1.2E+00**	1.2E-01	**2.0E+01**	**2.0E+00**	NA	NA	**2.0E+01**	**2.0E+00**	9.7E-05	6.1E-05	NA	NA	9.7E-05	6.1E-05
Antimony	**4.3E+02**	**4.3E+01**	**2.1E+01**	**2.1E+00**	**4.1E+02**	**4.1E+01**	**2.1E+00**	**2.0E+00**	1.0E-01	9.3E-02	**2.0E+00**	**1.9E+00**	2.9E-03	2.7E-03	1.4E-04	1.3E-04	2.8E-03	2.6E-03
Barium	2.0E-01	9.8E-02	7.2E-02	3.6E-02	1.2E-01	6.2E-02	7.7E-02	3.3E-02	2.8E-02	1.2E-02	4.9E-02	2.1E-02	1.3E-04	5.5E-05	4.6E-05	2.0E-05	8.0E-05	3.5E-05
Beryllium	**4.0E+00**	4.0E-01	**7.3E+00**	7.3E-01	B	B	1.1E-02	1.1E-02	2.1E-02	2.1E-02	B	B	2.2E-05	2.2E-06	4.1E-05	4.1E-06	B	B
Cadmium	**1.7E+00**	4.6E-01	4.2E-01	1.1E-01	**1.3E+00**	3.5E-01	**2.1E+00**	5.4E-01	5.2E-01	1.3E-01	**1.5E+00**	4.0E-01	1.3E-03	3.3E-04	2.2E-04	5.9E-05	1.0E-03	2.7E-04
Chromium	**3.7E+00**	9.0E-01	3.6E-01	8.6E-02	**3.4E+00**	8.2E-01	**3.0E+00**	2.0E-01	2.8E-01	1.9E-02	**2.7E+00**	1.8E-01	8.3E-03	5.7E-04	2.9E-03	2.0E-04	5.5E-03	3.7E-04
Cobalt	5.6E-02	2.3E-02	5.1E-02	2.1E-02	4.8E-03	2.0E-03	3.0E-02	1.3E-02	2.7E-02	1.2E-02	2.6E-03	1.1E-03	5.3E-05	2.3E-05	4.8E-05	2.1E-05	4.6E-06	2.0E-06
Copper	**1.5E+00**	7.5E-01	1.3E-01	6.7E-02	**1.4E+00**	6.8E-01	7.0E-01	7.0E-02	1.1E-01	1.1E-02	6.0E-01	6.0E-02	1.0E-02	7.8E-03	4.1E-03	3.2E-03	6.0E-03	4.6E-03
Lead	**1.0E+01**	**5.9E+00**	**3.8E+00**	**2.1E+00**	**6.6E+00**	**3.7E+00**	**6.3E+00**	1.9E-01	**2.5E+00**	7.5E-02	**3.8E+00**	1.2E-01	1.3E-02	4.1E-04	4.7E-03	1.4E-04	8.8E-03	2.7E-04
Manganese	5.6E-02	5.6E-03	1.3E-02	1.3E-03	4.3E-02	4.3E-03	2.5E-01	7.8E-02	6.3E-02	1.9E-02	1.9E-01	5.9E-02	4.7E-04	1.5E-04	1.1E-04	3.5E-05	3.6E-04	1.1E-04
Mercury	1.4E-01	6.8E-02	5.3E-02	2.6E-02	8.5E-02	4.1E-02	7.4E-02	7.4E-03	1.4E-01	1.4E-02	B	B	1.0E-03	1.0E-04	1.8E-04	1.8E-05	8.4E-04	8.4E-05
Nickel	**1.4E+01**	**1.0E+01**	1.9E-02	1.3E-02	**1.4E+01**	**1.0E+01**	**3.1E+01**	**1.5E+01**	4.0E-02	2.0E-02	**3.1E+01**	**1.5E+01**	2.4E-02	9.5E-03	1.4E-04	5.5E-05	2.4E-02	9.4E-03
Silver	1.9E-01	1.9E-02	1.8E-02	1.8E-03	1.7E-01	1.7E-02	3.1E-02	1.5E-02	2.9E-03	1.4E-03	2.8E-02	1.4E-02	4.1E-05	2.1E-05	3.8E-06	1.9E-06	3.8E-05	1.9E-05
Thallium	2.6E-02	1.8E-02	3.0E-01	2.1E-01	B	B	9.8E-01	9.8E-02	**1.1E+01**	**1.1E+00**	B	B	4.1E-03	4.1E-04	4.8E-02	4.8E-03	B	B
Uranium	**1.5E+00**	1.5E-01	NA	NA	**1.5E+00**	1.5E-01	**2.9E+00**	**1.5E+00**	NA	NA	**2.9E+00**	**1.5E+00**	5.9E-03	3.0E-03	NA	NA	5.9E-03	3.0E-03
Vanadium	**1.9E+00**	1.9E-01	**1.1E+00**	1.1E-01	7.5E-01	7.5E-02	**3.9E+00**	3.9E-01	**2.3E+00**	2.3E-01	**1.6E+00**	1.6E-01	7.7E-03	7.7E-04	4.6E-03	4.6E-04	3.1E-03	3.1E-04
Zinc	**3.7E+00**	4.1E-01	**2.0E+00**	2.2E-01	**1.7E+00**	1.9E-01	7.4E-01	2.2E-01	4.7E-01	1.4E-01	2.7E-01	7.8E-02	2.2E-03	6.4E-04	1.8E-03	5.2E-04	4.0E-04	1.2E-04
Total TEQ Bird (WHO 1998)	**8.5E+00**	8.5E-01	NA	NA	**8.5E+00**	8.5E-01												
Total TEQ Mammal (MassDEP)							**1.4E+02**	**1.4E+01**	NA	NA	**1.4E+02**	**1.4E+01**	8.7E-02	8.7E-03	NA	NA	8.7E-02	8.7E-03

(1) - Incremental Risk = Hotspot HQ - Background HQ
B - Consistent with background
NA - Background not available
COPC - Chemical of Potential Concern
HQ - Hazard Quotient
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level
Shaded and Bolded values indicate HQs greater than 1

Prepared by: BJR
Checked by: KASK

Table 2-6
Watertown GSA Site
670 Arsenal Street
Watertown, Massachusetts

Alternative 3C - PCB Impacted Area Excavation (>50 mg/kg PCBs) to 2.5'
Offsite Disposal and 24" Soil Cover with Geotextile Fabric and
Onsite Wetland Replication Under Former Buildings (Area C) Estimated Costs

Scenario	Quantity	Units	Unit Cost	Extended Cost
Planning & Preparation				
Dig-Safe Call and Markings	1	LS	$700	$700
Health & Safety Plan	1	LS	$2,000	$2,000
Permitting and coordination (local and/or state agencies)	1	LS	$10,000	$10,000
Field Effort - Excavate PCB Impact Area and Install Soil Cover				
Excavate Soil (PCB > 50 mg/Kg to 2.5')				
Mobilization and Site Preparation	1	LS	$5,000	$5,000
Site Clearing	1	LS	$4,000	$4,000
Install erosion controls around Site	1,500	LF	$5	$7,500
Excavator w/Operator (200 CY/day excavated)	6	Day	$1,500	$9,000
Subcontractor Field Crew (2 Laborers)	6	Day	$1,500	$9,000
Oversight of Field Project (excavation oversight, soil cover placement)	6	Day	$1,000	$5,900
Waste Characterization Samples (1 per 500 CY)				
Waste Characterization (PCBs, metals, rad)	4	Each	$1,500	$6,000
Transport and Dispose of Excavated Soil (PCB > 50 mg/Kg)				
Transport of PCB-impacted soil as TSCA-regulated, RCRA, rad waste, includes trucking to Worcester and loading onto railcar to Idaho	1,756	Tons	$234	$411,000
MassDEP Hazardous Waste Transporter Fee	3,512,665	Pound	$0.0264	$92,700
Disposal of PCB-impacted soil as TSCA-regulated, RCRA, rad waste	1,756	Tons	$150	$263,500
Backfill Excavation & Install Soil Cover				
Geotextile Liner	5,854	SY	$6	$35,200
Backfill Excavation (24", calculated using 20% of PCB-Impact Area)	1,200	CY	$30	$36,000
Furnish and Install Common Fill (18" plus 20% for bulk)	3,513	CY	$30	$105,400
Furnish and Install Topsoil and Seed (6" thick; plus 20% for bulk)	1,171	CY	$45	$52,700
Excavator w/Operator (300 CY/day placed)	20	Day	$1,500	$29,000
Subcontractor Field Crew (2 Laborers)	20	Day	$1,500	$29,000
Oversight of Field Project (excavation oversight, soil cover placement)	20	Day	$1,000	$19,600
Fill Sampling				
PCBs in soil (standard TAT)	12	Each	$90	$1,100
PP-13 Metals (standard TAT)	12	Each	$120	$1,500
Field Effort - On-Site Wetland Replication in Building Area				
Building Demolition and Hazardous Materials Transport & Disposal to Recyling or Landfill	1	LS	$400,000	$400,000
Wetland Replication in Building Area, 50% Off-site disposal, 50% on-site re-use				
Excavation of Fill Material to 2.5' deep with Excavator and Operator (200 CY day)	35	Day	$1,500	$53,000
Subcontractor Field Crew (2 Laborers)	35	Day	$1,500	$53,000
Oversight of Field Project (wetland replication)	35	Day	$1,000	$35,100
Installation of hydric soils (1' plus 20% for compaction)	1,631	CY	$35	$57,100
Wetland Planting (including limited seedlings and seeding)	1	LS	$50,000	$50,000
Handling of Excavated Soil/Fill (50% on-site, 50% off-site)				
On-site processing and spreading of 50% of Soil/Fill				
Beneficial Use Determination (BUD) (310 CMR 19.060) coordination with MassDEP	1	LS	$5,000	$5,000
Sorting and crushing of soils (includes analytical testing, as required) (200 CY/day)	18	Day	$2,500	$44,000
Spreading of soil/BUD material on-site with Excavator and Operator (300 CY/day)	23	Day	$1,500	$35,200
Subcontractor Field Crew (2 Laborers)	23	Day	$1,500	$35,000
Oversight of Field Project (spreading excavated, crushed material)	23	Day	$1,000	$23,400
Furnish and Install Topsoil and Seed over BUD on Site (6" thick; plus 20% for bulk)	1,171	CY	$45	$52,700
Transport and Dispose of 50% of Soils under Building				
Excavator and Operator (200 CY day) to load trucks	18	Day	$1,500	$26,400
Subcontractor Field Crew (2 Laborers)	18	Day	$1,500	$26,000
Oversight of Field Project (soil/fill excavation)	18	Day	$1,000	$17,600
Transport and Disposal to Subtitle C Landfill ($175/ton T&D, $56/ton MassDEP Hazardous Waste Transporter Fee)	5,269	tons	$231	$1,217,200
Radiological screening of excavated soils/fill	18	Day	$2,000	$36,000
CERCLA Submittals				
Remediation design and specifications (for bidding)	1	LS	$20,000	$20,000
Remedial Design/Remedial Action (RD/RA)	1	LS	$20,000	$20,000
As-Built Construction and Final Inspection	1	LS	$15,000	$15,000
Registered Land Surveyor - Site Survey	1	LS	$5,000	$5,000
Filing AUL/LUC	1	LS	$10,000	$10,000
Completion Report	1	LS	$10,000	$10,000
CERCLA Five-Year Review for 30 years	6	LS	$10,000	$60,000
Wetland Operations & Maintenance (O&M)				
Annual O&M (includes minor wetland repairs/replanting)	5	year	$10,000	$50,000
Five Year Wetland Report & DCR taking ownership of Site	1	LS	$10,000	$10,000
			Subtotal	**$3,503,000**
20% Contingency	1	LS	$700,600	$700,600
			Grand Total	**$4,300,000**

CY = Cubic Yard   TAT = Turnaround Time
LS = Lump Sum   PCBs = Polychlorinated Biphenyls
LF = Linear Feet   SY = Square Yards

Created by: DGK 08/26/10
Checked by: DEH 09/17/10
Revised by: DGK 02/20/12
Checked by: DEH 02/20/12

Notes & Assumptions:
1) Approximate tonnage assumes 1.5 tons/CY for soil
2) Approximate volume assumes 1.2 soil expansion factor.
3) Number of samples based on one sample per 500 CY of fill.
4) Field effort based on 8-hour day @ $75/hr plus vehicle rental and miscellaneous (sustenance; supplies).
5) Duration of days for excavation based on approximately 200 CY excavated and 300 CY placed per day.
6) Engineer's estimate is anticipated to be within 30% below to 50% above actual costs.
7) Transport and disposal estimates provided by US Ecology and Global Remediation.

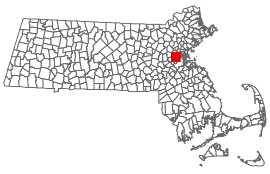
Table 2-7
Matrix of Cost and Effectiveness Data for the Alternative Evaluation

670 Arsenal Street
Watertown GSA Site
Watertown, Massachusetts

Evaluation Criteria: **Alternative & Description:**	**Overall Protection of Human Health and the Environment.**	**Compliance with ARARs.**	**Long-term Effectiveness and Permanence.**	**Reduction of Toxicity, Mobility, or Volume through Treatment.**	**Short-term Effectiveness.**	**Implementability.**	**Cost.**
Alternative 1: No Action	Provides no overall protection of human health and environment.	Does not comply with ARARs.	None provided.	None provided.	None provided.	Easy to implement.	$0
Alternative 2: Soil Cover In Place Site preparation, geotextile fabric, 18" of clean fill, 6" of topsoil over PCB Impacted Area, restoration and land use control (LUC) with the following wetland replication options:	Reduces direct contact with impacted soils and is protective of human health and the environment.	Complies with ARARs.	Provides long-term effectiveness and permanence via soil cover.	Mobility is reduced. Does not reduce toxicity or volume.	Site clearing and construction may present adverse effects on human health and environment. Dust suppression and fencing will mitigate these risks.	Services, equipment, and materials are readily available for this alternative.	$1,950,000
2A Offsite Wetland Replication							
2B Onsite Wetland Replication							$4,000,000
2C Onsite Wetland Replication under Buildings							$3,220,000
Alternative 3: Excavation of PCB soils >50mg/kg and soil cover of the PCB Impacted Area Site preparation, off-site disposal of PCB-impacted soils (>50 mg/kg), soil cover consisting of geotextile fabric, 18" of clean fill, and 6" of topsoil over PCB Impacted Area, restoration and LUC. Wetland replication included at either Area A, B, or C.	Removal of soils with PCB concentrations > 50 mg/kg is protective of human health and the environment. Soil cover of lower levels of contamination restricts access to these remaining impacted soils.	Complies with ARARs.	Provides long-term effectiveness and permanence via excavation and soil cover.	Toxicity of PCB-impacted soils (>50 mg/kg) will be reduced through offsite stabilization. The stabilization process will marginally increase the volume of soil. Offsite disposal and soil cover will restrict mobility of site contaminants.	Site clearing and construction may present adverse effects on human health and environment. Dust suppression, erosion controls, and fencing will mitigate these risks.	Services, equipment, and materials are readily available for this alternative.	$3,000,000
3A Offsite Wetland Replication							
3B Onsite Wetland Replication							$5,100,000
3C Onsite Wetland Replication under Buildings							$4,300,000
Alternative 4: Excavation of PCB Impacted Area Site preparation, excavation of 3' of soil to PCB >1 mg/kg (or refusal), off-site disposal and backfilling. Wetland restoration.	Removal of soils > 1 mg/kg PCB concentrations is protective of human health and the environment.	Complies with ARARs.	Provides long-term effectiveness and permanence via excavation.	Toxicity of PCB-impacted soils (>1 mg/kg) will be reduced through offsite stabilization. The stabilization process will marginally increase the volume of soil. Offsite disposal will restrict mobility of site contaminants.	Site clearing and construction may present adverse effects on human health and environment. Dust suppression, erosion controls, and fencing will mitigate these risks.	Services, equipment, and materials are readily available for this alternative. Coordination with the Conservation Commission will be conducted.	$5,600,000

Created by: DGK 01/07/11
Checked by: DEH 01/08/11
Revised by: DGK 02/20/12
Checked by: DEH 02/20/12

FIGURES



USGS Topo quad images obtained from Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

N

0 1,000 2,000 Feet

Legend

GSA Property Boundary

Figure 1-1
Site Location Map
Decision Document

Watertown GSA Site
Watertown, Massachusetts

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Wakefield, MA 01880

Prepared by BJR	Checked by ARM

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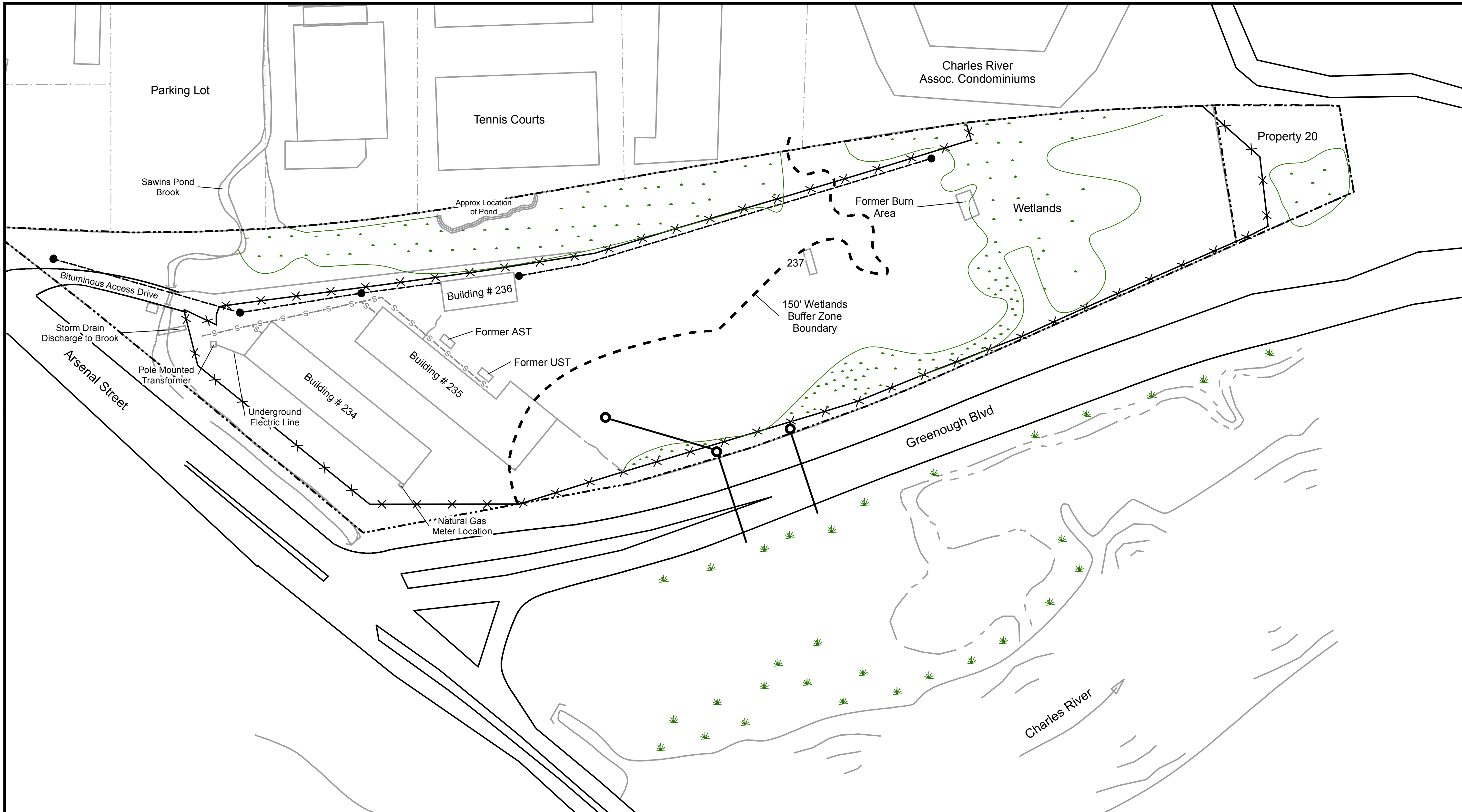

Legend

- ● Hydrant
- ○ Catch Basin
- 1992 Wetland Delineation Line
- Storm Drain
- -S- Sanitary Sewer
- Water Line
- Fence

N

0 65 130 Feet

Prepared/Date: BJR 01/13/12 | Checked/Date: ARM 01/13/12

Figure 1-2
Site Layout Map

Decision Document
Watertown GSA Site
Watertown, Massachusetts

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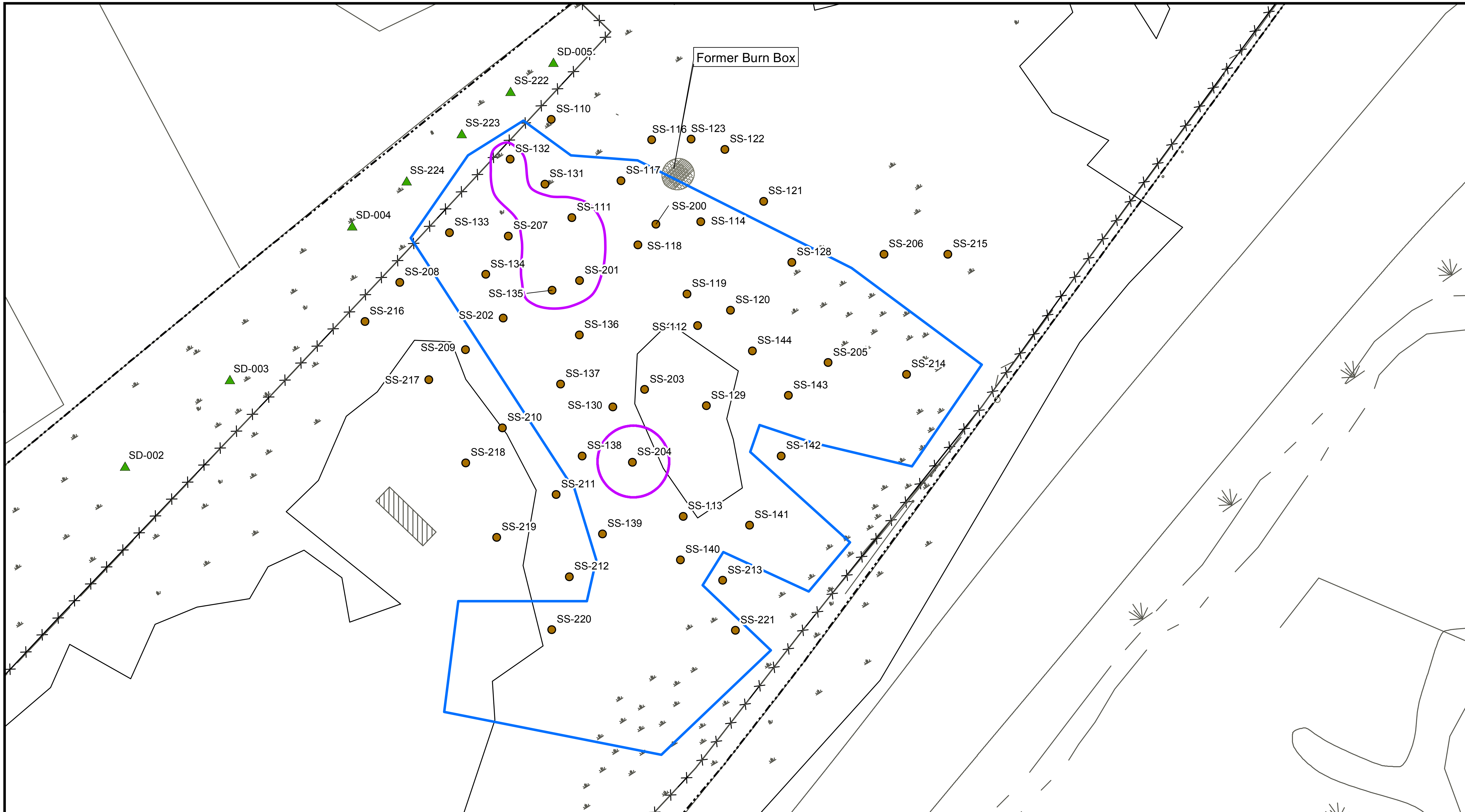

N

0 25 50 Feet

Prepared/Date: BJR 01/13/12 | Checked/Date: DEH 01/13/12

Legend

- Soil Sample Location
- Sediment Sample Location
- PCB Concentration Greater Than 1 mg/kg
- PCB Concentration Greater Than 50 mg/kg
- PropertyLine
- Fence

Figure 1-3
PCB Impacted Area and
Proposed Soil Excavation/Soil Cover Area
Decision Document
Watertown GSA Site
Watertown, Massachusetts

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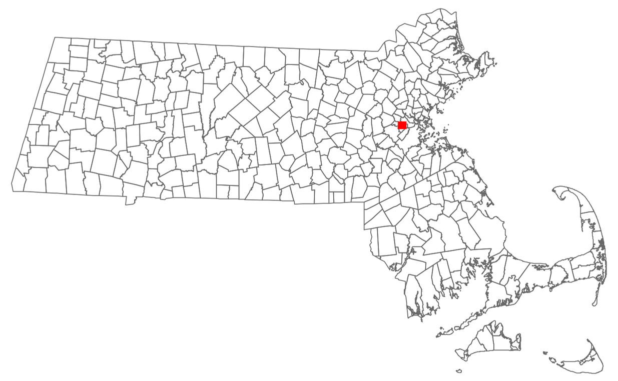
Document: P:\old_Wakefield_Data\projects\GIS\Projects\GSA-Watertown\Mapdocuments\GSA_11X17.mxd PDF: P:\old_Wakefield_Data\projects\3650100153 - WHG - Watertown GSA\4.0 Project Deliverables\4.1 Reports\4.5 Decision Document\USACE Deliverable 05-10-12\Figure 1-3 PCB Impacted Area and Proposed Soil Excavation Soil Cover Area.pdf 05/10/2012 1:18 PM bjroden



Legend

PropertyLine — Fence

Bordering Vegetated Wetland

N

0 37.5 75 Feet

Prepared by BJR | Checked by DEH

Note:
2008 aerial photo obtained from "Office of Geographic Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs"

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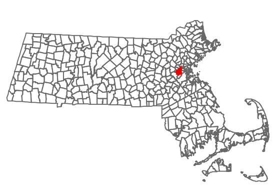
US Army Corps of Engineers®
New England District

Figure 1-4
USACE 2007 Wetland Delineation Map

Decision Document
Watertown GSA Site
Watertown, Massachusetts



Prepared/Date: BJR 06/29/11 | Checked/Date: DGK 06/29/11

Legend

- Approximate Area A
- Approximate Area B
- Approximate Area C
- PCB Concentration Greater Than 1 mg/kg
- PCB Concentration Greater Than 50 mg/kg
- Bordering Vegetated Wetland
- MassDEP Wetlands
- Stream

Figure 1-5
Proposed Wetland Replication Areas

Decision Document
Watertown GSA Site
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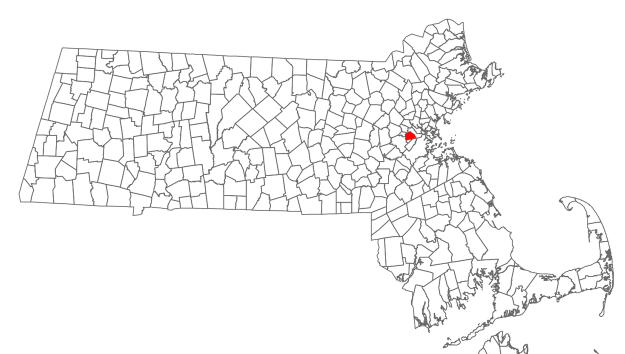

0 30 60
Feet

Prepared/Date: BJR 01/13/12 | Checked/Date: DEH 01/13/12

Legend

- Monitoring Well Location
- Soil Sample Location
- Surface Water or Sediment Location

Figure 2-1
All Sample Locations Up to 2010
Decision Document
Watertown GSA Site
Watertown, Massachusetts

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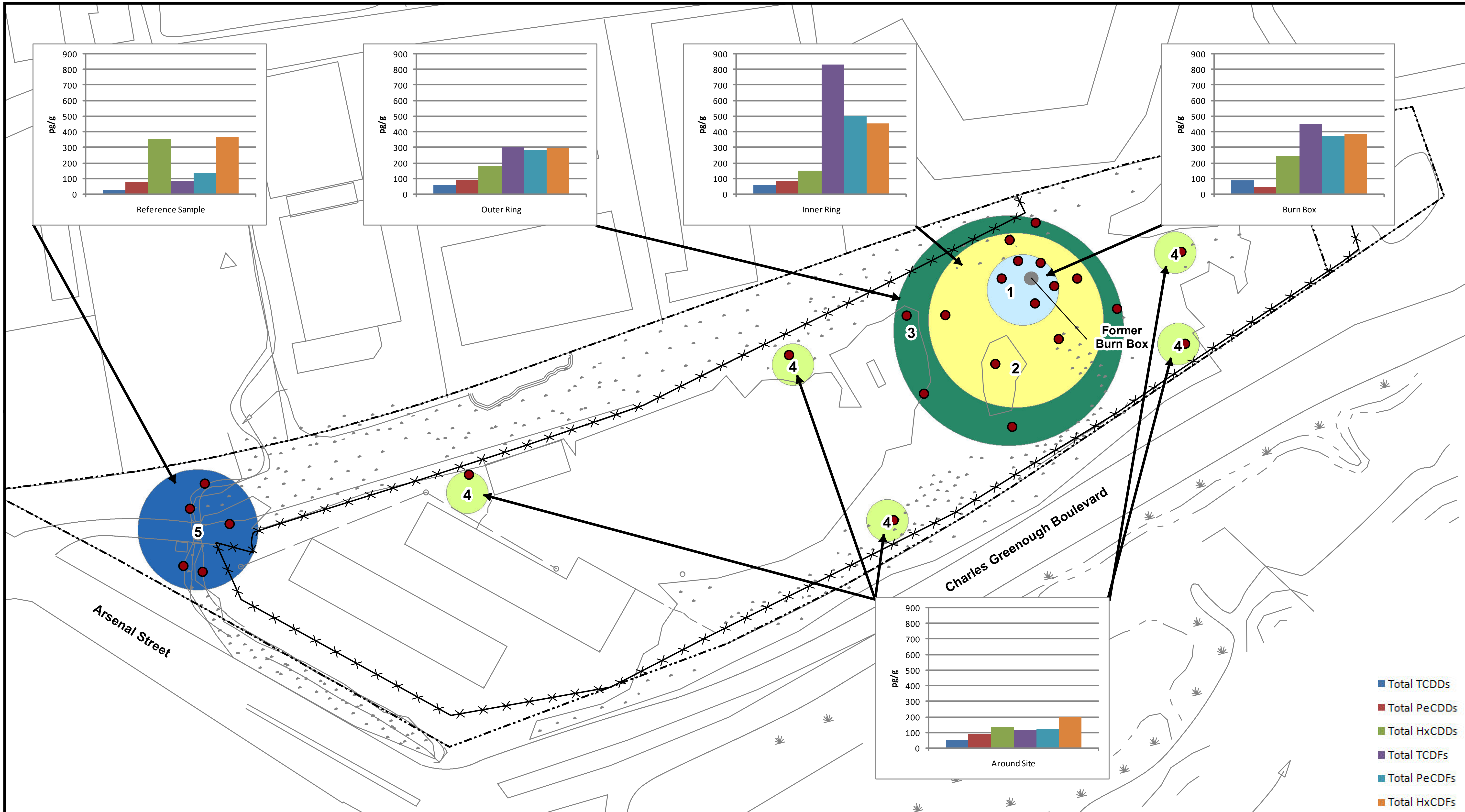

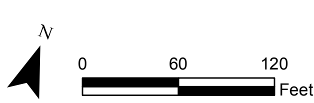

Notes:
1. Composite soil samples were collected from 0 - 6 inches. Each dioxin composite sample consists discrete samples, denoted by the red circle.
2. Numbers indicate composite sample areas.
3. Number 4 is a combination of areas across the site.
4. Units for graphs are in picogram/gram.

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Figure 2-2
Dioxin Sample Locations and Results

Decision Document
Watertown GSA Site
Watertown, Massachusetts

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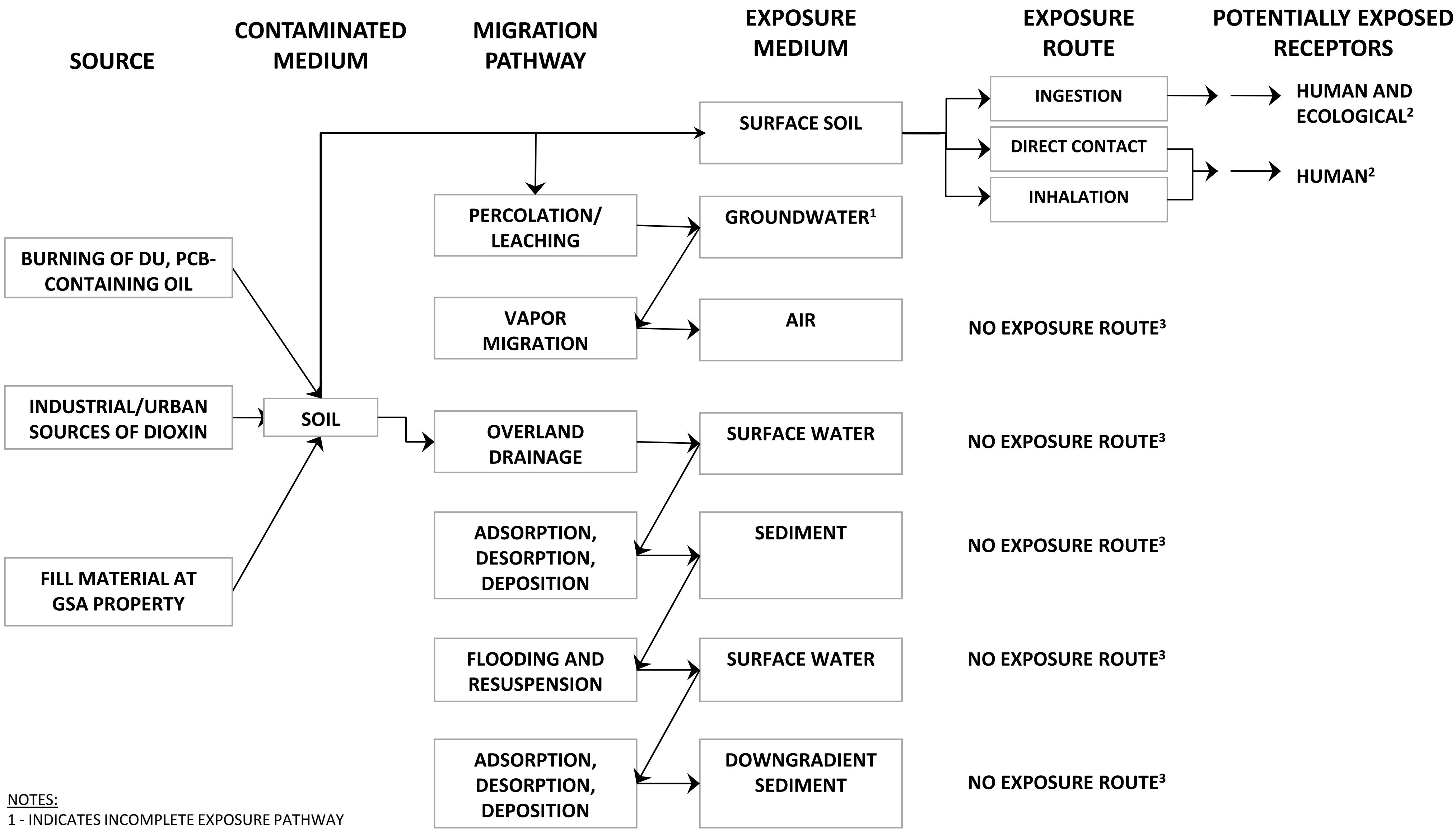
Document: P:\GIS\Projects\GSA-Watertown\Mapdocuments\GSA_11X17_LS_Rotated_GraphsREV.mxd PDF: P:\3650100153 - WHG - Watertown GSA\4.0 Project Deliverables\4.1 Reports\4.5 Decision Document\Figures\Figure 2-2 Dioxin Sample Locations.pdf 01/13/2012 1:47 PM bjroden



NOTES:
1 - INDICATES INCOMPLETE EXPOSURE PATHWAY
2 - INDICATES COMPLETE EXPOSURE PATHWAY
3 - INDICATES COMPLETE BUT INSIGNIFICANT EXPOSURE PATHWAY

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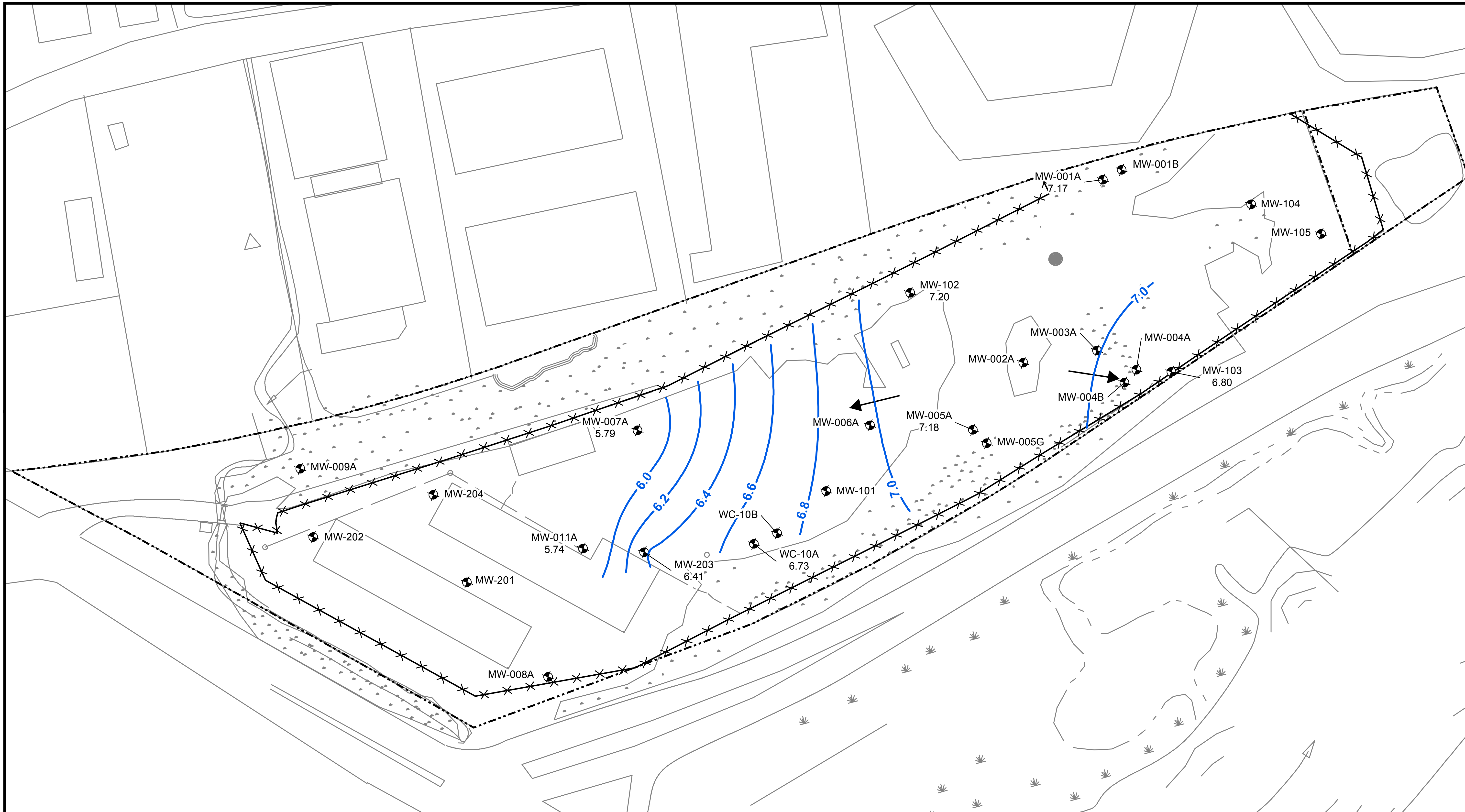
FIGURE 2-3 CONCEPTUAL SITE MODEL

Decision Document
Watertown GSA Site
Watertown, Massachusetts



Legend

- Groundwater Contour
- Groundwater Flow Direction
- Monitoring Well
- 6.00 - Groundwater Elevation

N

0 60 120 Feet

Prepared/Date: BJR 01/13/12 | Checked/Date: DEH 01/13/12

Figure 3-1
Groundwater Contour Map
January 2001
Decision Document
Watertown GSA Site
Watertown, Massachusetts

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