US Army Corps of Engineers®

# SECOND FIVE-YEAR REVIEW REPORT FOR WATERTOWN ARSENAL - D01MA0019 Project 02

## MIDDLESEX COUNTY, MASSACHUSETTS

**Prepared by**

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## EXECUTIVE SUMMARY

This is the Second Five-Year Review of Watertown Arsenal – Former General Services Administration (GSA) Property, Formerly Used Defense Site Project Number D01MA0019_02, located in Watertown, MA. The Decision Document's (DD) Remedial Action Objective is to reduce human health and ecological risks associated with exposure to polychlorinated biphenyls (PCBs), dioxin, and metals in the PCB Impacted Area. The site contains one Project.

The site achieved construction completion with the completion of the Remedial Action Closeout Report on September 30, 2014. The U.S Army Corps of Engineers (USACE) constructed the remedy in accordance with the 2012 DD requirements and the 2013 Remedial Action Work Plan which included the construction of a soil cap. Although the GSA property is 11.91 acres, the soil cap is approximately two acres. The five-year review trigger date was August 15, 2013. The First Five-Year Review Report was completed on August 3, 2018.

The Former GSA Property's remedy remains protective of human health and the environment. The remedy's elements that protect human health and the environment are:

- Excavated and transported offsite contaminated soil in the PCB Impacted Area greater than 50 mg/kg PCBs.
- Installed a soil cover and geotextile fabric (marker material) over residual PCB contamination less than 50 mg/kg.
- Completed a Grant of Environmental Restriction and Easement, which includes land use controls limiting onsite and intrusive activities.
- Conduct soil cover inspections and five-year reviews.

The Former GSA Property's soil cover remedy is functioning as designed by severing the soil exposure pathway. The DD's soil and surface water Applicable or Relevant and Appropriate Requirements have been met.

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| | |
|---|---|
| ARARs | Applicable or Relevant and Appropriate Requirements |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CMR | Code of Massachusetts Regulations |
| COCs | Contaminants of Concern |
| DEM | Digital Elevation Model |
| DERP | Defense Environmental Restoration Program |
| DU | Depleted Uranium |
| EPC | Exposure Point Concentration |
| ERA | Ecological Risk Assessment |
| FUDS | Formerly Used Defense Site |
| FYR | Five-Year Review |
| VOC | Volatile Organic Compounds |
| SVOC | Semi-Volatile Organic Compounds |
| GE | Google Earth |
| GERE | Grant of Environmental Restriction and Easement |
| GSA | General Services Administration |
| HI | Hazard Index |
| IEUBK | Integrated Exposure Update Biokinetic |
| LOAEL | Lowest Observed Adverse Effect Level |
| mg/kg | milligrams per kilogram |
| LUCIP | Land Use Control Implementation Plan |
| MassDCR | Department of Conservation and Recreation |
| MassDEP | Massachusetts Department of Environmental Protection |
| MCLs | Maximum Contaminant Levels |
| MCP | Massachusetts Contingency Plan |
| MDC | Metropolitan District Commission |
| mg/kg | milligrams per kilogram |
| MGL | Massachusetts General Law |
| NA | Not Applicable |
| NAIP | National Agricultural Imagery Program (USDA) |
| NC | Non-carcinogenic |
| NCOC | Not a Chemical of Concern |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NOAA | National Oceanographic and Atmospheric Administration |
| NOAEL | No Observed Adverse Effect Level |
| NPL | National Priorities List |
| O&M | Operation and Maintenance |
| PCB | Polychlorinated biphenyl |
| PRG | Preliminary Remediation Goal |
| RA | Remedial Action |
| RAO | Remedial Action Objective |
| RIFS | Remedial Investigation/Feasibility Study |
| TEQ | Toxicity Equivalence |
| TSCA | Toxic Substances Control Act |
| USACE | U.S. Army Corps of Engineers |
| USDA | U.S. Dept. of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |

## 1.0 INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Army Corps of Engineers (USACE) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)) and considering Department of Defense, Formerly Used Defense Sites (FUDS), and U.S. Environmental Protection Agency (EPA) policy.

This is the second FYR for the Watertown Arsenal FUDS property. The triggering action for this statutory review is signing of the previous FYR on August 3, 2018 (USACE, 2018). The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Property (site)consists of one Project which will be addressed in this FYR. Project 02 (GSA Property) addresses the soil remedy.

The Watertown Arsenal FYR was led by Jeffrey Dvorak of USACE. Participants included hydrogeologist Drew Clemens, ecologist Cliff Opdyke, and geographic information systems specialist Sarah Wilkinson all of USACE. The review began on November 18, 2022.

### 1.1 Site Background

The site is located at 670 Arsenal Street, in the eastern portion of the town of Watertown in Middlesex County, Massachusetts (Figure 1) (USACE, 2012). It 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 MassDCR-owned, Property 20 parcel (Figure 1).

The site contains vacant land classified open space/conservancy by the City of Watertown with adjacent land considered industrial, mixed use, and residential (City of Watertown, 2022). The boundaries are heavily vegetated, and the interior contains an engineered, compensatory wetland and maintained soil cover (Figure 2). Structures related to former site operations were removed as part of the remedy, and there is no active use of the property. The nearest located water supply wells are over 1.4 miles north of the site in central Watertown, (MassMapper, 2023, USACE, 2012). The site is not within a current or a potential Drinking Water Source Area and is not within a surface water protection zone. Public access is restricted by a fence and locked gates constructed by Massachusetts Department of Conservation and Recreation (MassDCR). Historically, portions of the site were classified as both State and Federal wetlands. MassDCR and the City of Watertown plan to utilize this area as greenspace for passive recreation public access.

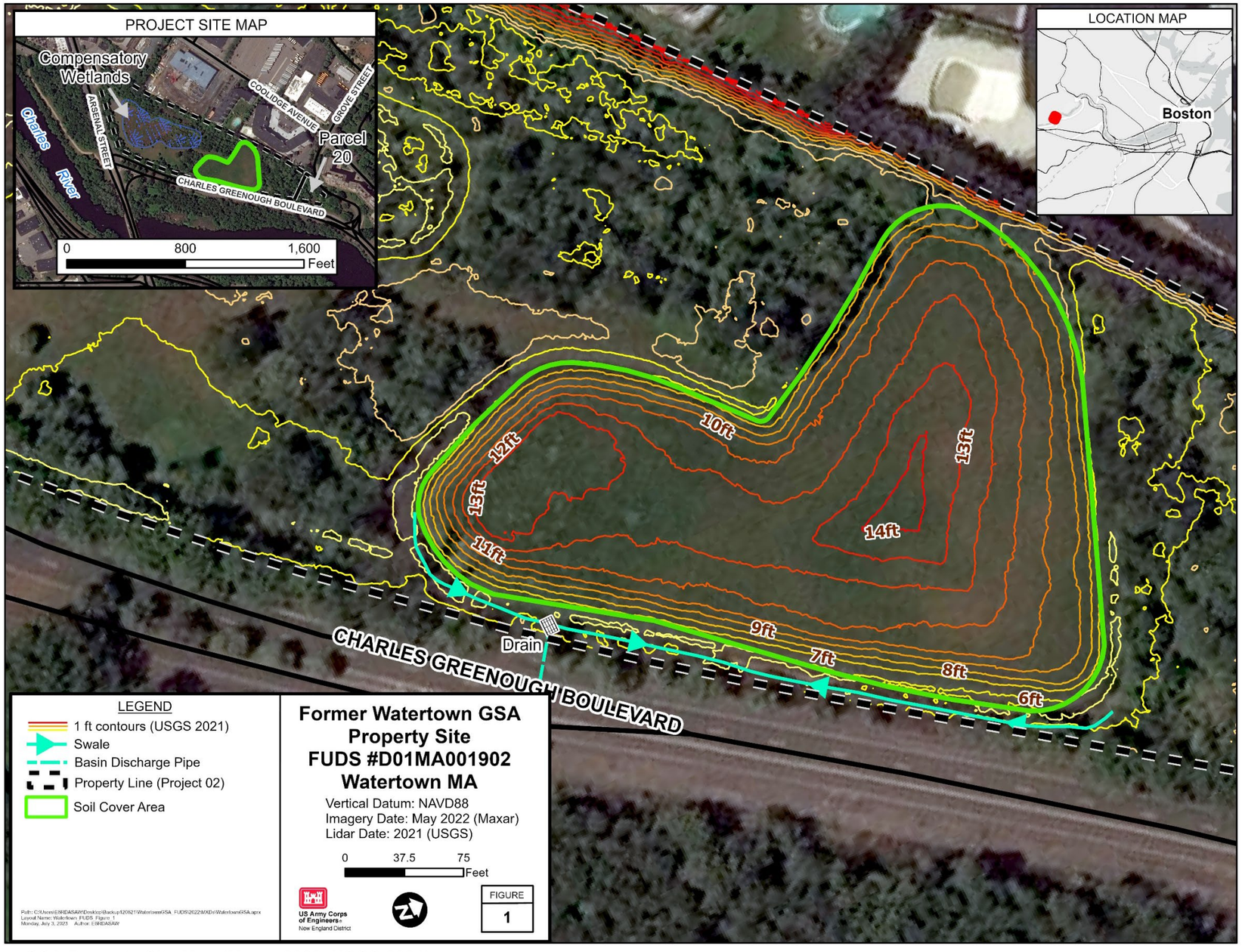


**Figure 1. Former Watertown GSA Property Site Map (Maxar 2022, USGS 2021).**

The MassDCR owned nearly 12-acre site is bounded on the west by residential properties and parkland, on the south by Arsenal Street and further south by MassDCR-owned parkland, on the east by Greenough Boulevard and parkland owned by MassDCR, and on the northwest by condominiums, apartments, and businesses. Upgradient properties contain light industrial and commercial uses, as well as two condominium complexes and a parking lot. The Arsenal Mall, the Watertown Mall, Arsenal Park, and MassDCR parkland occupy the land area to the south, southwest of the site. The area to the east and northeast of the site contains recreational pedestrian paths, open and wetland areas.

The property was filled to facilitate development during World War II and was subsequently used by the Army and by the GSA for storing and managing various materials and equipment. Prior to the Army's transfer of the property to GSA, the Nuclear Regulatory Commission (NRC) issued the U.S. Army a license in 1961 for processing
the depleted Uranium (DU) within an area at the site referred to as the former burn box area. The GSA also leased portions of the property to various parties, including automobile dealers and a television production company. One building was used as a police firing range and to store flammable materials (USACE, 2012).

### 1.2 History of Contamination

A 'burn area' was constructed in the northern portion of the property for scrap DU waste generated from machining operations at the former Watertown Arsenal (USACE, 2012). The Nuclear Regulatory Commission 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. The burn area vicinity was later classified as both State and Federal wetlands (Figure 2).

DU chips and turnings were coated with oil, placed in a drum, 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.

Investigations conducted between 2007 and 2010 identified polychlorinated biphenyls (PCBs) and dioxin in site soil centered on the former burn box. It is suspected that the oil used to coat the DU chips may have contained PCBs. The dioxin may be a result of partially combusted, PCB-containing oil from the burning process. PCBs outside the burn pit may be a result of spillage during operations or oils used for dust suppression on roads.

During the 1940s, the GSA Property was filled as the U.S. Army expanded their operations toward the Charles River. 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.

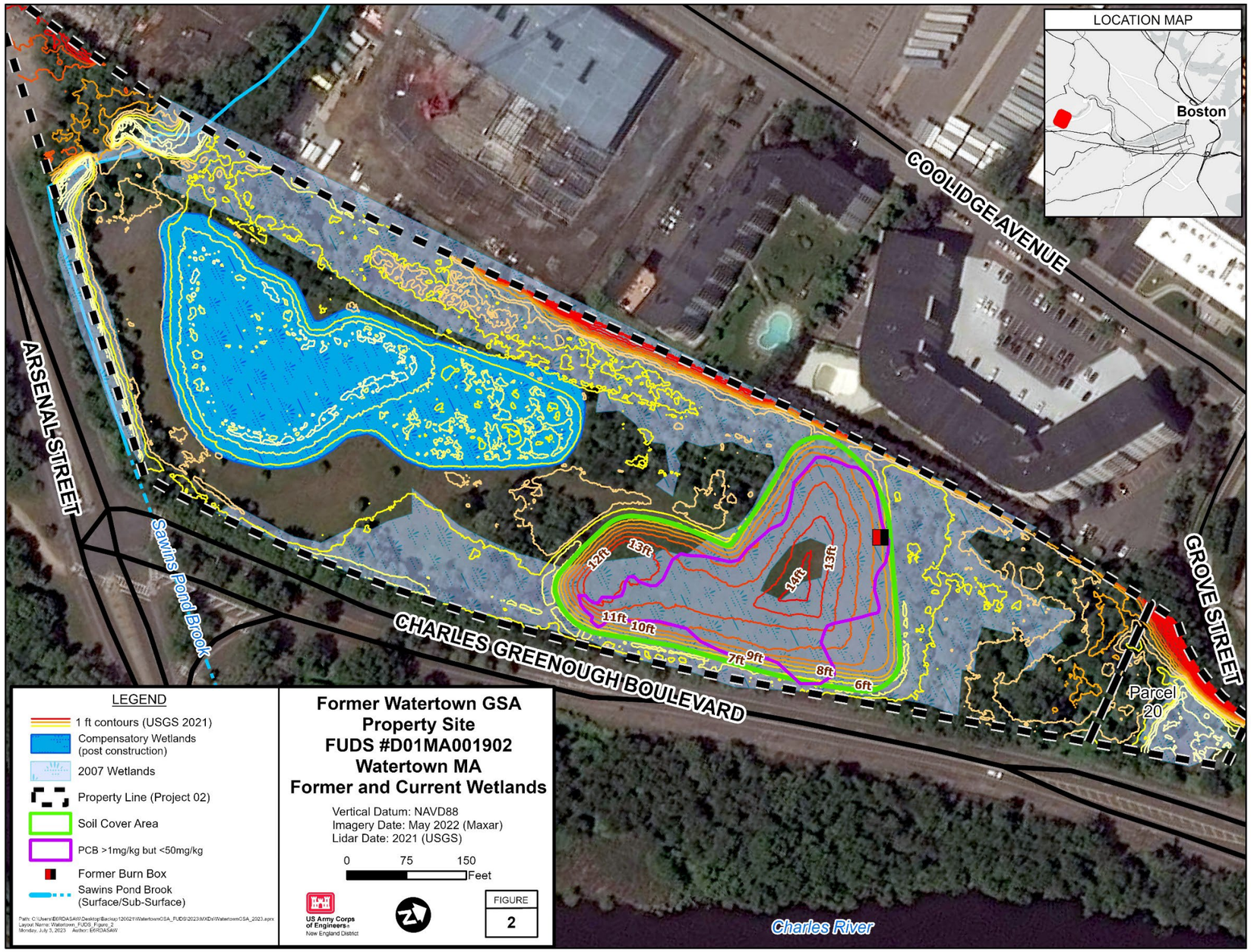


**Figure 2. Former Watertown GSA Property Site: Former and Current Wetlands (Maxar, 2022, USGS, 2021, USACE, 2017).**

Given the nature of the fill materials, the fill is a reasonable source of metals contamination in soil at the site. 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 downgradient 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 (USACE, 2012).

The chronology of site events is shown in Appendix A, Table 5.

## FIVE-YEAR REVIEW SUMMARY FORM

| SITE IDENTIFICATION | | |
|---|---|---|
| **Property Name:** Watertown Arsenal | | |
| **FUDS Property No.:** D01MA0019_02 | | |
| **Region:** 1 | **State:** MA | **City/County:** Watertown, Middlesex |

| SITE STATUS | |
|---|---|
| **NPL Status:** Non-NPL | |
| **Multiple OUs?**<br>No | **Has the Site achieved construction completion?**<br>Yes |

| REVIEW STATUS |
|---|
| **Lead agency:** Other Federal Agency<br>**If "Other Federal Agency" was selected above, enter Agency name:** United States Army Corps of Engineers (USACE) |
| **Author name (Federal or State Project Manager):** Jeffrey Dvorak |
| **Author affiliation:** USACE |
| **Review period:** 11/18/2022– 8/3/2023 |
| **Date of site inspection:** 3/31/23 |
| **Type of review:** Statutory |
| **Review number:** 2 |
| **Triggering action date:** 8/03/2018 |
| **Due date *(five years after triggering action date)*:** 08/03/23 |

## 2.0 RESPONSE ACTION SUMMARY

### 2.1 Basis for Taking Action

PCBs, metals, and dioxin are the primary COCs at the site, and were identified in the PCB Impacted Area shown in Figure 2 as the soil cover Area. Potential exposures to PCBs, metals, and dioxin in soils in the vicinity of the burn box (PCB Impacted Area) posed the only documented site-related unacceptable risks to human health and the environment. Site data did not indicate the presence of a principal threat under the NCP as the contamination was reliably contained and presented 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 has resulted in acceptable risk levels for the planned passive recreational use of the site.

### 2.2 Response Actions

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. From 1967 to 2003, several radiological surveys occurred at the site, resulting in 140 cubic yards of soil, fill material, DU debris, and two tanks, being removed (MacTec, 2011). The NRC released the site for unrestricted use for radiological concerns in November 2003. The Remediation Goals to meet this RAO are shown in Table 1. As indicated in the DD, USACE, with concurrence from MassDEP, selected the following major remedy components:

- Excavate contaminated soil in the PCB Impacted Area greater than 50 mg/kg PCBs,
- Install a soil cover and geotextile fabric over the PCB impacted area, and
- Grant of Environmental Restriction and Easement (GERE)

### 2.3 Status of Implementation

Charter Contracting Company, LLC (Charter) completed mobilization and pre-remedy construction tasks between December 2012 and August 2013. Clearing and grubbing, building demolition, utility, and monitor well abandonment were completed between January and April 2013. PCB Impacted Area delineation sampling was completed in late July 2013, and the Remedial Action soil removal began mid-August 2013. Approximately 960 tons of PCB contaminated soil greater than 50 mg/kg was excavated from 1 to 7 feet below grade in the PCB Impacted Area, and transported to the Wayne Disposal Landfill in Belleville, Michigan between August and December 2013 (Charter, 2014a). MassDEP approved using soil removed as part of the compensatory wetland construction, and about 600 tons of material excavated from the area around historical soil sample SS-104, to build the soil cover. The soil cover is approximately two acres.

**Table 1. Soil Risk Assessment Results and Remediation Goals (USACE, 2012).**

| Chemical of Concern | EPC PCB Impacted Area (mg/kg) | Human Health Risk-Based Preliminary Remediation Goals (PRGs) (mg/kg) [a] | | | | | Ecological Risk-Based PRGs | | | | "Background Value" [e] (mg/kg) | Site Remediation Goal [g] (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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] |

[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 (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 TSCA - PCB Site Revitalization Guidance Under the TSCA - 2005in 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.

The soil cover and filter fabric warning layer extended 10 feet beyond the 1 mg/kg PCB boundary except where retaining walls or the Greenough Boulevard fence limited workspace. The filter fabric is overlain by 18 inches of clean fill and 6 inches of clean topsoil, respectively. From September 2013 through June 2014, Charter constructed an approximately 2-acre compensatory wetland and adjacent upland meadow habitat at the site and in the process found and removed an underground storage tank (Charter, 2014a). The wetland replication area restores and replaces the functions and values of the wetland area impacted during soil removal and cover construction and replicated the incidental impacts to wetlands during remedy construction. A final inspection site walk with USACE, MassDEP, MassDCR, GSA, and the Watertown Conservation Commission to confirm completion of construction activities and site conditions occurred on July 16, 2014.

### 2.3.1 Soil Excavation

Spanning April 2013 through July 2014, remedial design, excavation, and confirmatory soil sampling were done in an iterative process to ensure material containing greater than 50 mg/kg PCBs was identified and removed for offsite disposal. Final confirmation sampling showed residual contamination levels were less than 50 mg/kg, and the 1 mg/kg remediation goal boundary is within the property boundary (purple polygon in Figure 2) (Charter, 2014b, USACE, 2012). Soil excavated as part of the compensatory wetland construction contained 1 to less than 50 mg/kg PCBs and was placed into the PCB Impacted Area excavations. The constructed soil cover encompasses the 1 mg/kg boundary except for a small portion on the eastern swale (Figure 2).

### 2.3.2 LUCIP Survey

The LUCIP and GERE review combined with the findings from the first FYR found the soil cover area correctly located (USACE, 2018). It was initially discovered in the first FYR the site plan's boundary data contained positional data documentation errors (Charter, 2014c, USACE, 2014). These errors were carried over from the as-built site survey and include the property boundaries and co-located fence (Holmberg & Howe, 2018). The corrected property boundary was used for all figures provided in this Second FYR. Site features assessed in this FYR were taken from satellite imagery and lidar derived digital elevation models (Maxar 2022, USGS 2021, USDA NAIP 2014, Maxar 2018, Maxar 2020, Maxar 2021).

## 2.4 Grant of Environmental Restriction and Easement

The Remedy's Land Use Control Implementation Plan (LUCIP) addresses the soil cover and non-soil cover areas through the GERE as outlined in the Decision Document. The covenants and restrictions in the GERE run with the land and are binding upon future owners of the property in perpetuity until otherwise released by the grantee. The GERE was established consistent with the provisions of M.G.L. c. 21E, sec. 6 and the applicable provisions of 310 CMR 40.1071, and otherwise is satisfactory to MassDEP as grantee (Table 2). The restrictions in the GERE include a description of prohibited and permitted uses and activities, including restrictions on soil disturbance within both the Soil Cover Area and the Non-Cover Area. The GERE was recorded immediately prior to the transfer of the GSA parcel from the Unites States. On Property 20, a Notice of Environmental Restriction and Easement was recorded, which is modeled on the GERE.

The soil cover Area is defined by a series of boulders and survey markers outlining its extent. No intrusive, active maintenance or recreational activities (school, gardening) are permitted on the soil cover. The non-soil cover area contains the rest of the site, including Parcel 20, and is marked by a MassDCR-installed chain link fence following the surveyed Site boundary (Figure 2). A retaining wall is located on the western site boundary and is not part of the site. Intrusive activities are permitted when done in accordance with the GERE's Soil Management Plan.

### 2.4.1 Permitted and Restricted Uses and Activities

**Permitted Uses and Activities**

The property owner has agreed to the following permitted uses and activities at the site:

- Pedestrian activity and other passive recreational uses, including sitting at and otherwise passively utilizing any meadow areas, viewing nodes, areas for nature study, park benches, shade structures and interpretive kiosks that may be located in the Non-Cover Area, and in each case in a manner that does not disturb the Soil Cover Area or Non-Cover Area, including the soil surface of the Soil Cover Area or Non-Cover Area, in a manner prohibited by the restricted use and activities (as defined below);
- Non-intrusive routine site maintenance, including cleaning drainage structures, mowing the shoulders along any trails and meadows, mowing the Soil Cover Area, leaf raking, and, on the paved or stabilized path or roadways that may be located in the Non-Cover Area, snow removal and ice treatment, provided, however, that such maintenance does not disturb the Soil Cover Area or Non-Cover Area, including the soil surface of such Areas, in a manner prohibited by the restricted use and activities (as defined below); and
- Excavation, drilling or otherwise disturbing soil, loam, peat, gravel, sand, rock or other mineral or natural resource in, below or on the Non-Cover Area in accordance with the Soil Management Plan (Exhibit C of the GERE).

**Restricted Uses and Activities**

Restricted uses and activities are not permitted at the site. Restricted uses and activities include the following:

**Soil Cover Area**

- Residential, daycare, school activities, gardening, or active recreational activities.
- Excavating, drilling, or otherwise disturbing any soil, loam, peat, gravel, sand, rock or other mineral or natural resource in, below or on the Soil Cover Area, including any disturbance or breaching of the permeable soil cover in the Soil Cover Area in any way, including by digging, drilling, plowing, planting, cultivating, or by constructing buildings or other structures.
- Reduction in the grade below the ground surface grade of the Soil Cover Area.
- Using or otherwise bringing motorized vehicles, including cars, trucks, snowmobiles, and all-terrain vehicles on or over the Soil Cover Area, or using bicycles, skis, or sleds in, on or over the Soil Cover Area, but excluding motorized vehicles with ground pressure of 15 psi or less; and
- Any other use or activity in the Soil Cover Area which would interfere with, or would be reasonably likely to interfere with, the implementation, effectiveness, integrity, operation, or maintenance of the Selected Remedy, including but not limited to (a) interference with the Benchmarks, or (b) interference with any systems used to monitor groundwater, surface water, soils, or sediments.

**Non-Cover Area**

- Residential, daycare, school activities, gardening, or active recreational activities.

- Excavation, drilling or otherwise disturbing any soil, loam, peat, gravel, sand, rock or other mineral or natural resource in, below or on the Non-Cover Area, except in accordance with the Soil Management Plan (Exhibit C of the GERE).
- Using motorized vehicles by the public, including cars, trucks, snowmobiles, dirt bikes and all-terrain vehicles on or over the Non-Cover Area except in paved areas designated for parking.
- Using bicycles, skis, snowboards, or sleds on or over the Non-Cover Area except on paved ways; and
- Using or otherwise bringing motorized vehicles, including cars, trucks, snowmobiles and all-terrain vehicles on or over the Non-Cover Area, or using bicycles, skis or sleds in, on or over the Non-Cover Area, but excluding (a) any such use of motorized vehicles, bicycles, skis or sleds that is conducted on a paved or stabilized path or roadway in good repair, and (b) motorized vehicles or equipment used by public employees in carrying out their lawful duties, provided, however, that such motorized vehicles and equipment do not disturb the Non-Cover Area;
- Any other use or activity in the Non-Cover Area which would interfere with, or would be reasonably likely to interfere with, the implementation, effectiveness, integrity, operation, or maintenance of the Selected Remedy, including but not limited to (a) interference with the Benchmarks, or (b) interference with any systems used to monitor groundwater, surface water, soils, or sediments (Charter, 2014b).

### 2.4.2 Compilation and finalization of the GERE

The GERE comprises the following (Charter, 2014b, USACE, 2012):

- A prepared map indicating the soil cover Area and Non-Cover Area boundary areas over which the LUCs will apply.
- A survey plan showing the property boundaries, soil cover Area and Non-Cover Area, prepared by a professional land surveyor registered by the Commonwealth of Massachusetts agency for the limited purpose of providing public notice of the environmental conditions of and limitations on the use of property (copies will be provided to MassDEP).
- A title certification consistent with Massachusetts title certification standards, showing no encumbrances inconsistent with the GERE.
- LUC monitoring to verify the LUCs are being properly implemented and that the LUC objectives are being met on an annual basis unless the frequency is reduced by agreement with MassDEP. The LUC monitoring results are included in a separate report and provided to MassDEP.
- Reporting and notification requirements include the following:
    - Notification to MassDEP no longer than ten days after discovery of any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs.
    - The United States, acting through GSA, shall provide a copy of executed lease of transfer documents to MassDEP.
    - USACE shall submit annual LUC monitoring reports to MassDEP no later than 30 days after the inspection. If the United States has transferred the land to another entity, the annual evaluation will address whether the LUCs were communicated in the GERE, whether the owners and state and local agencies were notified of

the use restrictions and controls affecting the property, and whether use of the property has conformed to such restrictions and controls.
    - USACE shall notify MassDEP and MassDCR at least 7 days before any LUC compliance inspection so that either party will have the opportunity to participate in the LUC inspection if it so chooses.
- Obtain MassDEP concurrence prior to modifying or terminating the LUCs or implementation actions.
- Evaluate the effectiveness of the LUCs as part of each Five-Year Review.

As indicated in Table 2 below, the GERE was finalized on October 21, 2014, and amended on January 28, 2021, to reference a plan with corrected coordinate data.

**Table 2. Summary of Planned and/or Implemented Institutional Controls**

| Media, engineered controls, and areas that do not support UU/UE based on current conditions | ICs Needed | ICs Called for in the Decision Documents | Impacted Parcel(s) | IC Objective | Title of IC Instrument Implemented and Date (or planned) |
|---|---|---|---|---|---|
| Soil | Yes | Yes | Property A: 670 Arsenal Street Book 4363 Page 281 | GERE filed with the Massachusetts Registry of Deeds to assure changes in land use are evaluated in accordance with state and local requirements. The objectives 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. | Grant of Environmental Restriction and Easement (GERE) – October 21, 2014 and revised January 28, 2021 |

### 2.5 System Operation/Operation and Maintenance, and Monitoring

Long term monitoring and maintenance of the soil cover began in 2014 to ensure soil cover integrity. USACE and MassDCR, in coordination with MassDEP, conduct inspections of the soil cover and compensatory wetlands (Table 3) using the approved scheme based on the signed Decision Document and the resulting O&M Plan (Charter 2014a, b, 2013, USACE, 2012).

**Table 3. Remedy Operations and Maintenance Summary (Charter, 2014a).**

| Activity | Performing Agency | Frequency/Duration |
|---|---|---|
| Inspect vegetative (soil) cover (includes surface elevation or settlement monitoring) | USACE in coordination with MassDCR and MassDEP | Annually |
| Mow vegetative (soil) cover, including swales; remove deep-rooted vegetation; clean drainage swales, check dams, and the catch basin | MassDCR | Once per year for mowing; Once per year or more often as needed for other activities. |
| Maintenance of remedy, including vegetative cover not delegated to MassDCR; repair of vegetative cover; and the correction of design flaws in the vegetative cover | USACE | As identified during inspections |
| Maintenance and inspection of compensatory wetlands | MassDCR | Semi-Annual After 15 August 2018 |
| Compensatory wetlands monitoring and reporting | MassDCR | Annually After 15 August 2018 |
| Soil cover reports | USACE | Annual after initial 5 years |
| Five-year review reports | USACE | Every 5 Years |

### 2.5.1 Annual Soil Cover Monitoring and Maintenance

Soil cover inspections transitioned to annual events starting in 2018 through 2022 as indicated in Table 3 due to PCBs remaining at the site between 1 and 50 mg/kg concentration (USACE, 2016, Charter, 2014a). Annual Monitoring and maintenance activities include annual mowing of the soil cover and non-soil cover areas by MassDCR. MassDCR also clears the drainage swale and catch basin adjacent to the soil cover area. USACE then performs an inspection to determine whether the land use controls are still being fully implemented. Over the previous five years, notable observations and maintained activities have included:

- In 2018, several animal burrows on the soil over area. USACE contracted a landscaper to fill the burrows and replant the disrupted area as no damage was observed to the liner.
- In 2019, USACE observed the site's drainage swale was filled with standing water and the swale was ironed-stained.
    - The presence of iron-staining and standing water are not new site condition and has been observed since long term monitoring and maintenance began in 2014 (USACE, 2018b). The staining likely reflects the natural precipitation of iron from solution in groundwater when exposed to air at the surface.
    - The surface water accumulation was noted after a significant rain event. USACE representatives observed that the catch basin was completely blocked by vegetation and no flow/drainage from the site was occurring. MassDCR cleared the catch-basin allowing the surface water to drain from the drainage swale.
- Field observations were not located on the checklist's accompanying imagery in accordance with the requirements of the O&M Plan checklist for four of the last five annual inspections, preventing problem analysis over time and across the site for many

findings identified in the inspection reports (First FYR review maps used for all USACE 2018-2022 inspections) (USACE, 2018 - 2022).

### 2.5.2 Eastern Swale

The soil cover extends about 50 ft to the northeast into a wetland, which drained southeast toward the boundary fence along Greenough Boulevard before entering one of two catch basins discharging into the Charles River (MacTec, 2011). The eastern swale riprap or channel armor parallel to Greenough Boulevard has been iron-stained since at least September 2014 and retains water after major storm events. The ponded water in the eastern swale may be due to clogged check dams and catch-basin (maintained by MassDCR) or ground water break out. The swale and its catch basin occupy a pre-1951 drainage ditch and wetland (Harding ESE, 2004, ABB Environmental, 1993) (Figure 1). The wetland described in this section was ultimately filled as a result of the cap installation.

### 2.5.3 Compensatory Wetlands

USACE conducted inspections every two to four weeks starting May 2014, and continued through September 2014 (Charter, 2014b Lucas Environmental, 2014). Frequency was reduced to 3-to-4-month intervals through 2016 in accordance with the Operations and Maintenance Plan (Charter, 2014a). USACE began semi-annual inspections in 2017 through August 2018, when MassDCR took over the program for the entirety of this second five-year period (2018-2023) (USACE, 2017c, Charter, 2014a).

## 3.0 PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the **last** five-year review as well as the recommendations from the **last** five-year review and the current status of those recommendations.

**Table 4. Protectiveness Determinations/Statements from the 2018 FYR (USACE, 2018).**

| Project # | Protectiveness Determination | Protectiveness Statement |
|---|---|---|
| 02 | Protective | The former GSA Property's remedy is protective of human health and the environment. |

As indicated in Table 4, no issues were identified during the first five-year review (USACE, 2018).

## 4.0 FIVE-YEAR REVIEW PROCESS

### 4.1 Community Notification, Involvement & Site Interviews

A public notice was made available by newspaper posting titled “Public Notice for Start of Second Five-Year Review for the Watertown Arsenal, Former GSA Property, Watertown, Massachusetts” in The Boston Globe on November 18, 2022, both in the newspaper and on their website (see Appendix B). The posting stated that there was a five-year review and inviting the public to submit any comments to USACE. The results of the review and the report will be made available at the site information repository located at the Watertown Free Public Library, 123 Main Street, Watertown MA, 02472. It will also be posted on the public USACE website for the site. The results of the review and the report will be made available on the USACE website:

https://www.nae.usace.army.mil/Missions/Projects-Topics/Watertown-Arsenal-FUDS/

#### 4.1.1 Interviews

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The results of these interviews are summarized below. A request for interview with representatives of the City of Watertown, MassDEP, and MassDCR was sent in an email dated September 30, 2022. Joanne Dearden of MassDEP participated in an interview on April 13, 2023, and the interview summary is included for record in Appendix D. Ms. Dearden indicated on the overall status of the project and site, she thought the Remedy is performing as expected; one of the areas that regularly requires attention is the maintenance of the drainage swale. She stated USACE has been responsive to fixing observed minor disturbances to the soil cover including burrows & run-off channeling. No other stakeholders participated in interviews as part of the second FYR.

### 4.2 Data Review

No data was collected as part of the remedy over the last five years, however, the 5YR used lidar survey data to evaluate soil cover settlement over time.

#### 4.2.1 Soil Cover Area

A review of as-built contours of the soil cover area (Holmberg & Howe, 2014) and digital elevation model derived from 2021 lidar (ground points only, DEM generated at 1.6 ft cell size) (USGS, 2021) (Appendix E) showed settlement areas less than 1 ft deep over areas no bigger than 6 feet (Figure 4).

Observations from the Second FYR Site Inspection are included in Section 4.3.

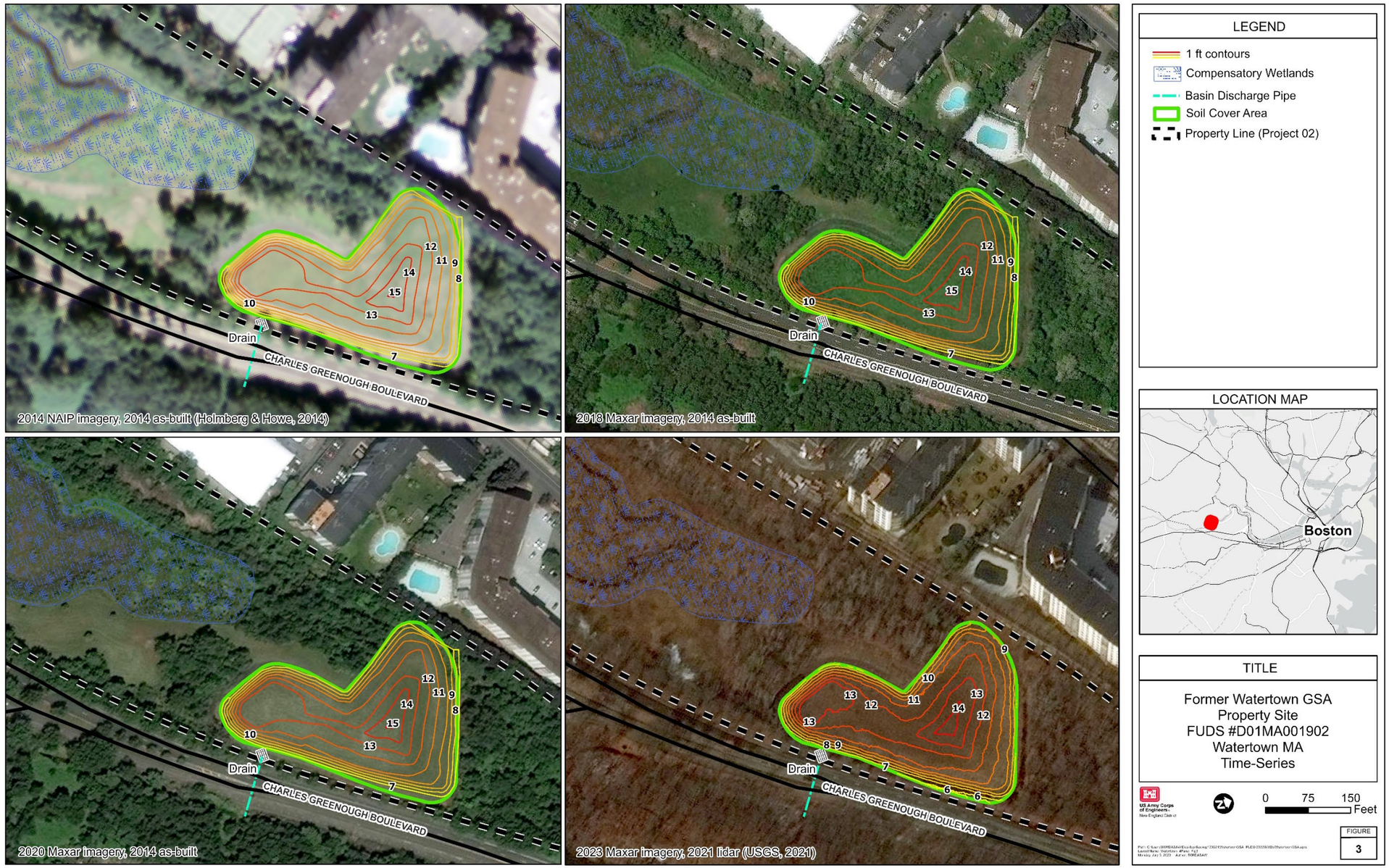


**Figure 3. Changes to the soil cover area from 2014 to 2021 (USDA NAIP 2014, Holmberg & Howe, 2014, Maxar, 2018, Maxar, 2020, Maxar, 2023, USGS, 2021)**


**Figure 4. Elevation change (delta) from 2014 to 2021 (Holmberg & Howe, 2014, USGS, 2021, Maxar, 2022). Positive values show potential Soil Cover settlement.**

### 4.3 Site Inspection

The inspection of the site was conducted on 3/31/2023. In attendance were Jeff Dvorak and Drew Clemens from USACE, Joanne Dearden (MassDEP), Muhammad Chowdhury (MassDCR), Katie Swan (City of Watertown), and Samantha Velluti-Fry (Tighe & Bond, City of Watertown-retained Consultant) accompanied the USACE team. The purpose of the inspection was to assess the protectiveness of the remedy.

The soil cover integrity has not been compromised, but several depressions noted in the DEM analysis were found during the inspection (Appendix E). Soil cover inspections show no indication that the filter fabric warning layer has been penetrated by burrowing rodents or any other potential intrusive threats and no active or abandoned animal burrows were noted during the 31 March 2023 FYR site walk.

Sod cover was thin on the southern part of the cap, and some spots on the north-facing slope. More than half of the original disk pins locating the edge of the membrane appear to be missing, and the boulders on the northern portion appear to have been moved from the boundary of the cap. Exposed tree roots penetrate the soil cover in one location but are outside the 1 mg/kg PCB boundary. The location of the inlet and outfall pipes utilized in the first FYR was found to be off from the location observed during the site inspection (USACE, 2018). This has been corrected and updated in all figures associated with the Second FYR.
Leaf litter in the swale continues to limit flow and clog the inlet grate. The offsite outfall appears to be functioning. A depression within the Eastern Drainage Swale appears to create local standing water. There has been no change in iron staining extent first documented on September 27, 2014 (Google Earth, 2017). MassDCR maintains the six check dams, catch basin and associated outfall across Greenough Boulevard following inspections. Below grade sediment and debris conditions are not known.
Locations of site observations are shown in Appendix F; Figure F-1. A photograph log of the site inspection is included as Appendix G.

*Phragmites* clumps are present in the northern swale's edges. Plant debris clogs the six check dams, and some have been lowered to facilitate flow. While onsite, USACE personnel unclogged the catch basin grate of vegetation debris. The eastern swale's riprap channel armor is iron stained.

None of the observations made during the site visit indicated a potential for current or future impact protectiveness of the Remedy.

## 5.0 TECHNICAL ASSESSMENT

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

Yes. Original confirmation sampling showed soil exceeding 50 mg/kg of PCBs were successfully excavated and transported to regulated landfill offsite. Remaining soils contaminated with less than 50 mg/kg of PCBs were consolidated onsite, covered with a filter fabric warning layer, and clean soil as designed. The soil cover successfully prevents receptor access to the underlying contaminated materials. Soil cover inspections show no indication that the filter fabric warning layer has been penetrated by burrowing rodents or any other potential intrusive threats. The temporal topography comparison between post construction survey and

2021 lidar does not indicate any major settlements or alterations to the soil cover therefore indicating the cap is in similar condition to post construction condition, and the remedy is still in place. The soil cover is maintained in accordance with the O&M plan. As there has been no major settlements, alterations to the soil cover, and the liner has not daylighted during any of the site inspection activities, contaminated soil will have stayed below the cap, cutting the pathway of direct contact.
As indicated in Section 2.4, the Remedy's LUCIP addresses the soil cover and non-soil cover areas through the GERE as outlined in the Decision Document. The GERE is in place and functioning as intended as it has been effective in preventing exposure through covenants and restrictions, annual maintenance, monitoring and reporting.

**Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?**

Yes. The remedy's exposure assumptions remain valid, however several of the values have changed since the RI was written and those are detailed in Appendix C. There have not been any changes in the physical site conditions that could affect the protectiveness of the remedy. Appendix C summarizes exposure pathways and routes evaluated in the human health and ecological risk assessments.

No toxicity factors or exposure assumptions for COCs have changed since the completion of the Decision Document, so cleanup levels and RAOs used at the time of the remedy remain valid. The only two COCs with Remediation Goals (RGs) based on risk were nickel (No Observed Adverse Effect Level for the Shrew) and PCBs (2005 EPA Guidance). The remedial action is complete and has achieved its RAOs.

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

No.

## 6.0 ISSUES AND RECOMMENDATIONS

| Issues/Recommendations |
|---|
| **Project(s) without Issues/Recommendations Identified in the Five-Year Review:** |
| *02* |

No issues or recommendations affecting current and or future protectiveness were identified in the five-year review.

### 6.1 Other Findings

In addition, the following are recommendations that were identified during the FYR and (may reduce costs, improve management of O&M, and conserve energy), but do not affect current and/or future protectiveness:

- Operations & Maintenance Plan Execution – Inspection findings should be geo-referenced and tracked over time in accordance with the O&M Plan (e.g., tree roots).
    - Observed potential disturbances such as the tree roots should be removed and noted during annual inspection and maintenance activities.
- Six Swale Check Dams – The drainage swale's check dams retain water for several days after precipitation events and should be cleaned. During regular mowing activities and swale maintenance completed by MassDCR, the check dams and receiving catch basin should be inspected and serviced if needed, including camera inspection of the pipe under Greenough Blvd.
- Elevation Verification – Complete a site survey by a MA licensed surveyor to better quantify low spots in the swale and to confirm the soil cover perimeter. At the time of the survey, survey markers should be replaced where necessary.
- Site Assessment – Utilize drone-based assessment methods for inspections.

## 7.0 PROTECTIVENESS STATEMENT

| Protectiveness Statement(s) | | |
|---|---|---|
| *Project:*<br>02 | *Protectiveness Determination:*<br>Protective | *Planned Addendum Completion Date:*<br>Not Applicable |
| *Protectiveness Statement: The remedy at Project 02 (GSA Property) is protective of human health and the environment.* | | |

The following actions are affectively reducing the exposure risk to PCBs, dioxin, and metals:

- Excavated and transported offsite contaminated soil in the PCB Impacted Area greater than 50 mg/kg PCBs.
- Installed a soil cover and geotextile fabric (marker material) over residual PCB contamination less than 50 mg/kg.
- Completed a GERE, which includes land use controls limiting site and intrusive activities.
    - LUCs (covenants and restrictions, annual maintenance, monitoring and reporting) are effectively limiting site and intrusive activities.
- Conduct soil cover inspections.

## 8.0 NEXT REVIEW

The next five-year review report for the Watertown Arsenal – Former GSA Property is required five years from the completion date of this review.

## 9.0 REFERENCES


ABB Environmental Services Inc (ABB Environmental, Inc), 1993. Former Watertown Arsenal Preliminary Assessment, Watertown Massachusetts. U.S Army Corps of Engineers New England Division Waltham Massachusetts, 321 p.

Charter Environmental, Inc., 2013. Remedial Action Work Plan – GSA Property D01MA001902, Watertown MA. Prepared for the US Army Corps of Engineers under Contract W912WJ-11-D-0009/0003 and submitted 17 May 2013, 143 p.

Charter Environmental, Inc., 2014a. Draft Final Operations and Maintenance Plan – GSA Property D01MA001902, Watertown MA. Prepared for the US Army Corps of Engineers under Contract W912WJ-11-D-0009/0003, 38 p.

Charter Environmental, Inc., 2014b. Final Land Use Control Plan – GSA Property D01MA001902, Watertown MA. Prepared for the US Army Corps of Engineers under Contract W912WJ-11-D-0009/0003, 81 p.

Charter Environmental, Inc., 2014c. Final Remedial Action Closeout Report– GSA Property D01MA001902, Watertown MA. Prepared for the US Army Corps of Engineers under Contract W912WJ-11-D-0009/0003, 506 p.

Chute, N.E., 1959. Glacial Geology of the Mystic Lakes-Fresh Pond area, Massachusetts. US Geological Survey Bulletin 1061-F, 38 p.

City of Watertown, 2022. Watertown Planning and Zoning Dept. Zoning Map dated 12 May 2022. Accessed from: https://www.watertown-ma.gov/218/Planning-Zoning, Watertown Zoning Map (PDF) Accessed 14 April 2022.

Google Earth, 2017. Imagery collected on 14 April 2017 over the Watertown MA area.

Harding ESE, 2004. Draft Response Action Outcome Statement, GSA Site, Watertown Massachusetts, Release Tracking Number 3-02722. Prepared for USACE New England District under Contract No DACA33-97-C-0023, January 2004, 109 p.

Holmberg & Howe, 2014. As-Built Site Plan, Remedial Action at the GSA Property (D01MA001902), Watertown MA. Date: 9/29/14. Prepared for Charter Environmental (Plan #6). Found in page 130 of Final RACR.

Holmberg & Howe, 2018. Plan of Land, Remedial Action at the GSA Property (D01MA001902), Watertown MA. Date: 10/04/2013, Revised 04/17/2018. Prepared for Charter Environmental (Plan #1).

Lucas Environmental, 2014. GSA Property DOMA001902 670 Arsenal Street, Watertown, Massachusetts. Prepared for Charter Environmental 28 Oct 2014, 22 p.

MacTec, 2011. Remedial Investigation/Feasibility Study (RI/FS), GSA Property, Watertown, Massachusetts. Formerly Used Defense Sites Project Number D01MA001902, DEP CASE NO. 3-02722. Prepared for USACE New England District by MacTec and Woods Hole Group under Contract Number W912WJ-09-D0001, 249 p.

MassMapper, 2023. MassGIS Data: Public Water Supplies, https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html, accessed on 17 April 2023.

Maxar 2018 Pan Sharpened Natural Color Imagery. Collected 5 May 2018. File: 2018_05_05_R2C4. Downloaded from G-EGD https://evwhs.digitalglobe.com/myDigitalGlobe/ March 2023.

Maxar, 2020. Pan Sharpened Natural Color Imagery. Collected 14 June 2020. File: 2020_06_14_R1C3. Downloaded from G-EGD https://evwhs.digitalglobe.com/myDigitalGlobe/ March 2023.

Maxar 2023. Pan Sharpened Natural Color Imagery. Collected 5 March 2023. File: 2023_03_05_R1C2 and 2023_03_05_R1C1. Downloaded from G-EGD https://evwhs.digitalglobe.com/myDigitalGlobe/ March 2023.

United States Army Corps of Engineers (USACE), 2007. Wetland Delineation Report, Former Watertown Arsenal, GSA Property, Watertown, Massachusetts. Prepared By: Department Of Army New England District, Corps of Engineers, Engineering/Planning Division, Evaluation Branch, Environmental Resources Section, 128 p.

USACE, 2012. Decision Document GSA Property Formerly Used Defense Site # D01MA001902 Watertown, Massachusetts D01MA001902, signed 20 June 2012. Prepared by: Woods Hole Group, Inc. 81 Technology Park Drive East Falmouth, Massachusetts and AMEC Environment & Infrastructure, Inc. 107 Audubon Road Wakefield, Massachusetts Contract Number: W912WJ-09-D0001, 97 p.

USACE, 2014. Grant of Environmental Restriction and Easement. Prepared by USACE New England District notarized 21 October 2014 and submitted to MassDEP.

USACE, 2016. Compensatory Wetland and Soil Cover Monitoring and Maintenance Report, April 2015, GSA Property DOMA001902, 670 Arsenal Street, Watertown, Massachusetts, prepared 16 Feb 2016, 31 p.

USACE, 2018. Five-Year Review Report, First Five-Year Review for Watertown Arsenal – Former GSA Property, Formerly Used Defense Site Project Number D01MA0019_02, Town of Watertown, Middlesex County, Massachusetts.

USACE, 2019. Soil Cover Monitoring and Maintenance Summary Report, GSA Property DOMA001902, 670 Arsenal Street, Watertown, Massachusetts, prepared September 2020, 33 p.

USACE, 2020. Soil Cover Monitoring and Maintenance Summary Report, GSA Property DOMA001902, 670 Arsenal Street, Watertown, Massachusetts, prepared September 2020, 25 p.

USACE, 2021. Soil Cover Monitoring and Maintenance Summary Report, GSA Property DOMA001902, 670 Arsenal Street, Watertown, Massachusetts, prepared September 2021, 25 p.

USACE, 2022. Soil Cover Monitoring and Maintenance Summary Report, GSA Property DOMA001902, 670 Arsenal Street, Watertown, Massachusetts, prepared September 2022, 27 p.

United States Department of Agricultures (USDA) National Agriculture Imagery Program (NAIP), 2014. NAIP Imagery Entity ID M_4207147_NE_19_1_20140712. Project Name 201407_MASSACHUSETTS_NAIP_1X0000M_UTM_CNIR. Collection Date: 12 June 2014. Downloaded from https://earthexplorer.usgs.gov/ 22 March 2023.

USEPA, 2005. PCB Site Revitalization Guidance Under the Toxic Substances Control Act

USEPA, 2011. OSWER Directive 9355.7-18 Recommended Evaluation of Institutional Controls: Supplemental to the Comprehensive Five-Year Review Process, 28 p.

USEPA, 2012. OSWER Directive 9200.2-111 Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews, 5 p.

USEPA, 2015. OSWER Publication 9200.2-154 – OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources To Indoor Air. Published by the U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, June 2015, 267 p, available at https://www.epa.gov/vaporintrusion/technical-guide-assessing-and-mitigating-vapor-intrusion-pathway-subsurface-vapor.

U.S. Geological Survey (USGS), 2015. USGS Lidar Point Cloud MA Sndy-CMPG 2013 19TCG225920 LAS 2015: U.S. Geological Survey 20150528. Collected: 16 November 2013 11-16 to 31 December 2014-12-31. Metadata available at: https://www.sciencebase.gov/catalog/item/5a868722e4b00f54eb371b9a.

USGS 2021. USGS Lidar Point Cloud MA_CentralEastern_2021_ B2119TCG322692: U.S. Geological Survey 20221013. Collected: 20 March 2021 to 24 April 2021. Metadata available at https://www.sciencebase.gov/catalog/item/634b44cad34e47431c14b1c9. Accessed Feb 2023 from https://apps.nationalmap.gov/downloader/.

## APPENDIX A – CHRONOLOGY OF SITE EVENTS

**Table 5. Chronology of Site Events (Charter, 2014, 2013, USACE, 2012).**

| Event | Date |
|---|---|
| US Army acquires the GSA property from the Commonwealth of Massachusetts | 1920 |
| US Army used the property for landfilling, outdoor vehicle, and material storage | 1940s through early 1950s |
| US Army treated depleted uranium (DU) scrap by coating with oil and burning in a burn box | 1961-1967 |
| US Army transferred the property to GSA | 1967 |
| Radiological surveys and soil removal actions | 1967, 1973, 1988 |
| Comprehensive Site Assessment | 1990 |
| Interim Remedial Measure removing 130 cubic yards of soil, fill material, debris, and an underground tank | 1989-1993 |
| Preliminary Assessment | 1992-1993 |
| Radiation Characterization Survey | 1993-1996 |
| Historical Site Assessment and Report | 2000-2001 |
| Focused Uranium Tailings Investigation and Report | 2002-2003 |
| Phase II Comprehensive Site Assessment | 1994-2003 |
| MassDEP and the Massachusetts Department of Public Health concurred with the Nuclear Regulatory Commission's recommendation releasing the Site for unrestricted use | November 2003 |
| Draft Response Action Outcome and Activity and Use Limitation | January 2004 |
| Tank Removal | August 2004 |
| USACE Wetland Delineation | 2007 |
| Massachusetts Department of Conservation and Recreation (MassDCR) Due Diligence Investigation | 2007 |
| Supplemental Field Investigation | 2008 |
| Governing program changed from the MCP to the DERP-FUDS Program in accordance with CERCLA | 2009-2010 |
| Supplemental Field Investigation | 2010 |
| Remedial Investigation/Feasibility Study (RI/FS) completed, documenting polychlorinated biphenyls (PCBs) and dioxin | September 2011 |
| Proposed Plan Approved | November 2011 |
| Decision Document | May 23, 2012 |
| Remedial Action Work Plan, initial clearing, demolition, and soil sampling completed. | July 2013 |
| Soil cover construction begins with off-site disposal of areas with PCB contamination equal to/or than great than 50 mg/kg | August 15, 2013 |
| Operations and Maintenance Plan approved by USACE and MassDEP | April 16, 2014 |
| Remedial Action removed PCB-contaminated soil, constructed the soil cover and compensatory wetland. | September 30, 2014 |
| Semi-annual and Annual Monitoring | 2014 to 2018 |
| First Five-Year Review Report Completed | August 3, 2018 |
| Annual Monitoring | 2018 to present |

## APPENDIX B – PUBLIC NOTICE

**Boston Globe, The**


Publication Name:
**Boston Globe, The**

Publication URL:
**www.boston.com/**

Publication City and State:
**Boston, MA**

Publication County:
**Suffolk**

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Notice Popular Keyword Category:

Notice Keywords:
**former GSA property**

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|---|---|
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**Notice Content**

*PLEASE NOTE: The following text was electronically converted from the PDF document above, and may not be 100% accurate. Because of this, please view the PDF for the most accurate information.*

Public Notice for Start of Second Five-Year Review for the Watertown Arsenal, Former GSA Property, Watertown, Massachusetts The U.S. Army Corps of Engineers (USACE) is conducting the second Five-Year Review (FYR) of the selected rem- edy at the Watertown Arsenal, Former General Services Administration (GSA) Property Formerly Used Defense Site (FUDS) located 670 Arsenal Street, Watertown, Middlesex County, Massachusetts (the Site). The FYR will be conduct- ed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Con- tingency Plan (NCP) under the Defense Environmental Res- toration Program (DERP). FYRs provide an opportunity to evaluate the implementation and performance of a rem- edy to determine whether it remains protective of human health and the environment. Generally, reviews take place five years following the start of a CERCLA r

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Back

Public Notice for Start of Second Five-Year Review for the Watertown Arsenal, Former GSA Property, Watertown, Massachusetts

The U.S. Army Corps of Engineers (USACE) is conducting the second Five-Year Review (FYR) of the selected remedy at the Watertown Arsenal, Former General Services Administration (GSA) Property Formerly Used Defense Site (FUDS) located 670 Arsenal Street, Watertown, Middlesex County, Massachusetts (the Site). The FYR will be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) under the Defense Environmental Restoration Program (DERP). FYRs provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. Generally, reviews take place five years following the start of a CERCLA response action and are repeated every succeeding five years so long as future uses remain restricted. The selected remedy included excavation and removal of PCB contaminated soil, installation of soil and geotextile fabric cover over residual PCB contaminated soils, Land Use Control annual notification, and annual inspections.
If the review identifies issues that affect protectiveness, the Five-Year Review report will recommend improvements. USACE plans to issue the final Five-Year Review in August 2023.
The public is invited to provide any information regarding this site that it deems relevant to the review process and is requested to postmark comments no later than December 31, 2022. Public input should be directed to the U.S. Army's point of contact listed below. Upon completion of the FYR, the report will be placed in the Information Repository, and another public notice will be issued to present findings of the review.

**Information Repository**
Watertown Free Public Library
123 Main Street
Watertown MA 02472

**Administrative Record**
The Administrative Record can be found at:
USACE–New England District Office
696 Virginia Road
Concord, MA 01742
The Administrative Record can also be found through the USACE– New England District website for the Watertown GSA FUDS:
https://www.nae.usace.army.mil/Missions/Projects-Topics/Watertown-Arsenal-FUDS/

**For more information, or to send comments, please contact:**

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## APPENDIX C – ARAR, RISK ASSESSMENT ASSUMPTIONS, AND TOXICITY REVIEW

## 1.0 REVIEW OF ARARS

Applicable or Relevant and Appropriate Requirements (ARARs) for the site were identified in the Decision Document (USACE, 2012) are shown in Table C-1 and include the following:

- Massachusetts Surface Water Quality Standards (chemical specific)
- Federal Toxic Substance & Control Act (TSCA) on Storage and Disposal (action specific)
- Federal TSCA regulations on Decontamination (action specific)
- Federal Compensatory Mitigation for Losses of Aquatic Resources (Federal – location specific)

No “To-Be Considered” criteria were identified in the Decision Document.

The Federal TSCA ARARs are action specific and do not apply to operation and maintenance. The Decision Document highlighted the Massachusetts Surface Water Quality Standards chemical specific criteria as ARARs. The remedial action is complete and has achieved those standards as applicable.

## 2.0 HUMAN HEALTH TOXICITY AND CHEMICAL CHARACTERISTICS

Examination of the EPA’s Integrated Risk Information System (www.epa.gov/iris) indicates no change to the toxicity values assigned to COCs identified in the 2012 Decision Document, so the cleanup goals remain protective.

## 3.0 HUMAN HEALTH EXPOSURE ASSESSMENT

The following exposure pathways were evaluated in the 2011 Human Health Risk Assessment:

- 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.

Several of the exposure factors used in the derivation of the risk in 2011 have been updated and changed since. Table C-2 below compares the original exposure factors used with the updated exposure factors. As the variables in the exposure equations are directly related to changes in the resulting risk values, the intake equation ouputs were also updated in Table C-3 to show how the risks would be altered using updated exposure values. Ratios displayed in Table C-3 that are less than unity exhibit how the resulting risk characterization would be lowered if recalculated, conversely, ratios greater than one would exhibit greater risks. Future construction worker and occupation worker intakes (and also resulting calculated risks) would decrease with the new exposure factors while the future adult recreator intakes both increased and decreased and the future child recreator’s intakes were mostly increased in value which would result in overall greater risk. In all exposure pathways however, the risk assumes that the receptors can encounter site soils, however, the cap remains in place and therefore there is no

complete exposure pathway and no concomitant risk, regardless of changes in exposure values.

**Table C-1. Applicable or Relevant and Appropriate Requirements (USACE, 2012).**

| REGULATORY AUTHORITY | AREA | CHEMICAL, ACTIVITY, OR LOCATION SPECIFIC | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|---|---|
| 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). |
| Federal | TSCA | Action Specific | TSCA [40 CFR Part 761.61b Subpart D] Storage and Disposal | Relevant and Appropriate | Performance-based disposal. Disposing of non- liquid PCB remediation waste by a chemical waste landfill has been approved. | These requirements were incorporated into a remedial action that results in the excavation, transport, and disposal of PCB impacted soils. |
| Federal | TSCA | Action Specific | TSCA regulations on Decontamination [40 CFR 761.79 (b), I, (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. |
| 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 remedial actions that result in the loss of wetlands. |

**Table C-2. Updated Exposure Values - Comparison.**

| Exposure Value | Future Occupational Worker (OLD) | Future Occupational Worker (NEW) | Future Construction Worker (OLD) | Future Construction Worker (NEW) |
|---|---|---|---|---|
| *soil ingestion rate* [1] | 50 mg/day | **50 mg/day** | 110 mg/day | **100 mg/day** |
| *skin surface area* [1] | 3473 $cm^2$ | **3473 $cm^2$** | 3473 $cm^2$ | **5653 $cm^2$** |
| *adherence factor* [1] | 0.03 $mg/cm^2$ | **0.03 $mg/cm^2$** | 0.29 $mg/cm^2$ | **.19 $mg/cm^2$** |
| *body weight* [2] | 61.1 kg | **80 kg** | 58 kg | **80 kg** |
| *exposure duration* | 27 yr * | **27 yr *** | 1 yr [1] | **1 yr [1]** |

| Exposure Value | Future Child Recreator - Subchronic (OLD) | Future Child Recreator - Subchronic (NEW) | Future Young Child Visitor (OLD) | Future Young Child Visitor (NEW) | Future Older Child Visitor (OLD) | Future Older Child Visitor (NEW) |
|---|---|---|---|---|---|---|
| *soil ingestion rate* [1] | 100 mg/day | **100 mg/kg** | 100 mg/day | **100 mg/day** | 50 mg/day | **50 mg/day** |
| *skin surface area* [1] | 1670 $cm^2$ | **1840 $cm^2$** | 2431 $cm^2$ | **2431 $cm^2$** | 4427 $cm^2$ | **4427 $cm^2$** |
| *adherence factor* [1] | 0.35 $mg/cm^2$ | **.35 $mg/cm^2$** | 0.35 $mg/cm^2$ | **.35 $mg/cm^2$** | 0.14 $mg/cm^2$ | **.14 $mg/cm^2$** |
| *body weight* [2] | 10.7 kg | **10.7 kg** | 17 kg | **18.6 kg** | 39.9 kg | **56.8 kg** |
| *exposure duration* | 1 yr [1] | **1 yr [1]** | 7 yr * | **7 yr *** | 7 yr [3] | **6 yr [3]** |

**Table C-2. Updated Exposure Values - Comparison. (Continued)**

| Exposure Value | Future Adult Recreator (OLD) | Future Adult Recreator (NEW) |
|---|---|---|
| *soil ingestion rate* [1] | 50 mg/day | **50 mg/day** |
| *skin surface area* [1] | 5653 $cm^2$ | **5653 $cm^2$** |
| *adherence factor* [1] | 0.13 $mg/cm^2$ | **0.13 $mg/cm^2$** |
| *body weight* [2] | 58.7 kg | **80 kg** |
| *exposure duration* | 16 yr [3] | **26 yr** [3] |

**Sources:**

1. Massachusetts Department of Environmental Protection (MADEP).
   Occupational and Construction workers: MCP Numerical Standards Development Spreadsheets. Values for S-2 Soil (Occupational Worker) and S-3 (Construction Workers). OLD values are from 2009 edition; NEW values are from 2014 edition. (https://www.mass.gov/lists/risk-assessment-information).
   Parameter values for Park Visitor Short Form (Adult and Child). OLD values are from 2007 edition; NEW values are from 2012 edition. (https://www.mass.gov/lists/risk-assessment-information).
2. United States Environmental Protection Agency (USEPA). *Exposure Factors Handbook, October 2011.* Chapter 8: Body Weight Studies.
3. USEPA. *Regional Screening Levels (RSLs) - Equations, May 2023.* Recreator for Soil/Sediment, Adult and Child.

* = assumption made in RI/FS report from 2011

**Table C-3. Intake Equation Differences based on Updated Exposure Values.**

| Intake Equation | Future Occupational Worker (OLD) | Future Occupational Worker (NEW) | Ratio (new/old) |
|---|---|---|---|
| | | | |
| nc intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 2.242E-09 | **1.71233E-09** | *0.76* |
| | | | |
| nc intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 4.67188E-09 | **3.56815E-09** | *0.76* |
| | | | |
| c intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 8.64772E-10 | **6.6047E-10** | *0.76* |
| | | | |
| c intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 1.80201E-09 | **1.37629E-09** | *0.76* |

| Intake Equation | Future Construction Worker (OLD) | Future Construction Worker (NEW) | Ratio (new/old) |
|---|---|---|---|
| | | | |
| nc intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 1.03921E-08 | **6.84932E-09** | *0.66* |
| | | | |
| nc intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 9.51507E-08 | **7.35664E-08** | *0.77* |

**Table C-3. Intake Equation Differences based on Updated Exposure Values.**

| Intake Equation | Future Construction Worker (OLD) | Future Construction Worker (NEW) | Ratio (new/old) |
|---|---|---|---|
| | | | |
| c intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 7.4229E-11 | **4.89237E-11** | *0.66* |
| | | | |
| c intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 6.79648E-10 | **5.25475E-10** | *0.77* |

| Intake Equation | Future Adult Recreator (OLD) | Future Adult Recreator (NEW) | Ratio (new/old) |
|---|---|---|---|
| | | | |
| nc intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 2.33367E-09 | **1.71233E-09** | *0.73* |
| | | | |
| nc intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 2.14374E-09 | **9.67979E-10** | *0.45* |
| | | | |
| c intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 5.3341E-10 | **6.36008E-10** | *1.19* |
| | | | |
| c intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 4.89997E-10 | **3.59535E-10** | *0.73* |

**Table C-3. Intake Equation Differences based on Updated Exposure Values. (Continued)**

| Intake Equation | Future Child Recreator - Subchronic (OLD) | Future Child Recreator - Subchronic (NEW) | Ratio (new/old) |
|---|---|---|---|
| nc intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 4.41464E-08 | **4.41464E-08** | *1.00* |
| | | | |
| nc intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 2.58036E-07 | **2.84303E-07** | *1.10* |
| c intake-ingestion = (IR x ED x CF1)/(BW x AT x CF2) | 3.65785E-10 | **3.65785E-10** | *1.00* |
| c intake-dermal = (SA x AF x ED x CF1)/(BW x AT x CF2) | 2.13801E-09 | **2.35565E-09** | *1.10* |

## 4.0 HUMAN HEALTH RISK RESULTS

Risks above target action levels (i.e., Excess Lifetime Cancer Risk > $1E10^{-4}$ and/or Hazard Index >1) were found for the future park visitors for the following areas and media:

- The PCB Impacted Area (Figure 1) could pose risks to human health that exceed NCP risk management criteria based on presumed exposure to PCBs, antimony, lead, and nickel in soil (0 to 3 ft below ground surface [bgs]).
- 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).

It should be noted there have not been any changes in the physical site conditions that could affect the protectiveness of the remedy.

## 5.0 ECOLOGICAL RISK ASSESSMENT RESULTS

The Ecological Risk Assessment (ERA) evaluated the following:

- 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.

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 hazards at the site may be greater than 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 No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) HQs greater than 1.
- When the PCB Impacted Area is excluded, the site poses no significant hazard to environmental receptors.
-

## 6.0 BASIS FOR REMEDIATION GOALS

The only two COCs with Site Remediation Goals (RGs) based on risk were nickel (No Observed Adverse Effect Level for the Shrew) and PCBs (2005 EPA guidance). Antimony and lead RGs were based on background, and the dioxin RG was based on “other areas around the site.”

## APPENDIX D - FIVE-YEAR REVIEW INTERVIEWS

| INTERVIEW DOCUMENTATION FORM | | | |
|---|---|---|---|
| The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews. | | | |
| Joanne Dearden | Project Manager, Federal Facilities Program | MassDEP | 4/13/2023 |
| Name | Title/Position | Organization | Date |
| Name | Title/Position | Organization | Date |
| Name | Title/Position | Organization | Date |
| Name | Title/Position | Organization | Date |
| Name | Title/Position | Organization | Date |
| Name | Title/Position | Organization | Date |

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Former GSA Property, FUDS #D01MA001902 | | **EPA ID No.: N/A** |
| **Subject:** Five-Year review for: Former GSA Property, Second Five-Year Review | **Time:** 10:00 | **Date:**4/13/2023 |
| **Type:** ■ Telephone □ Visit □ Other<br>**Location of Visit:** Web Based interview | | □ Incoming □ Outgoing |

**Contact Made By:**

| | | |
|---|---|---|
| **Name:** Jeffrey Dvorak | **Title:** Lead Author | **Organization:** USACE North Atlantic Division |

**Individual Contacted:**

| | | |
|---|---|---|
| **Name:** Joanne Dearden | **Title:** Project Manager, Federal Facilities Program | **Organization:** MassDEP Bureau of Waste Site Cleanup |

| | |
|---|---|
| **Telephone No:** (781) 407-1595<br>**Fax No:** N/A<br>**E-Mail Address:** joanne.dearden@state.ma.us | **Street Address:** 100 Cambridge Street, Suite 900<br>**City, State, Zip:** Boston, MA 02114 |

**Summary Of Conversation**

**Q1: What is your overall impression of the project and site?**
A1: The project appears to be going well and stakeholders historically have been happy with the outcome. The Remedy is performing as expected; one of the sticking points is the maintenance of the drainage swale. USACE has been responsive to fixing observed minor disturbances to the soil cover including burrows & run-off channeling.

**Q2: Are you aware of any issues the five-year review should focus on?**
A2: No. Timely maintenance and cleaning of the drainage swale is important and although not a current issue, the chances it becomes an issue are greatly reduced by continuing with the annual inspections, O&M, and keeping the lines of communication among stakeholders open.

**Q3: Who should USACE speak to in the community to solicit local input?**
A3: in the past 5 years, I haven't received any interest from the public, but historical contact regarding the project has been from the former RAB group, the adjacent property owners, the condominium association, and the City of Watertown.

**Q4: Is the remedy functioning as expected?**
A4: Yes. Note - as long interaction of stakeholders and the O&M is being followed.

**Q5: Is the Town actively involved in the site or do they show an active interest?**
A5: Yes, the city is, but public has had limited interest since the remedial action was completed.

**Q6: Have there been any changes in the site or surrounding property in the last 5 years, or are changes planned?**

# INTERVIEW RECORD

| **Site Name:** Former GSA Property, FUDS #D01MA001902 | **EPA ID No.: N/A** |
|---|---|

A6: There has been none onsite since the remedial action was completed. MassDCR will address future plans for the site. Surrounding the site there appears to be much more commercial and retail development since the completion of the remedial action. The City of Watertown would have more information on property/ usage changes.

**Q7: Does MassDEP have any questions about the previous five years or the project in general?**
A7: No current questions/issues. As far as future use, any future development would need to be in accordance with the Decision Document, O&M Plan and GERE.

## APPENDIX E – DATA ANALYSIS

## 1.0 DEM ANALYSIS

To determine possible change in the soil cap condition over time, the most recent elevation data were compared to post-construction elevation data (as-built survey). The first FYR utilized lidar data cited as being from 2015; however, the date of collection of this data was actually 2013 to 2014 (USGS, 2015). This 2013-2014 lidar was collected over the span of over 1 year and the project area was flown prior to the construction of the soil cap (cover area) being completed, resulting in irregular surface with drop-off on the southern side of the cap (instead of smooth mound surface).

The contours utilized as post-construction survey elevations in the first FYR were found to be design contours. For this FYR, as-built contours were utilized from Holmberg and Howe 2014 (page 130 of Final RACR) which were in NAVD 88 feet. To make a smooth surface from these contours, half-foot contours were created mid-way between each 1-foot contour. In addition, contours were created to capture high points on the south end of the soil cap that fell slightly below 1-foot contour (e.g., 13.96 ft). A raster surface was created from these contours (Feature to Raster) which was then smoothed (Focal Statistics). This created surface retained more characteristics of the original contours than prior effort (Topo to Raster) which eliminated high points of the cap.

There was only one available lidar data set collected post construction of the soil cap, collected March-April 2021 (USGS, 2021). This dataset met American Society for Photogrammetry and Remote Sensing (ASPRS) standards with a non-vegetated vertical accuracy (95% confidence level) of 19.6 cm. Ground point spacing was 0.5 m and the vertical datum was NAVD 88 meters. From this dataset, classified ground points were selected, and a DEM was created with a 0.5 m (1.64 ft) cell size. Elevation was converted from meters to feet. The created 2021 surface was subtracted from the 2014 surface to produce an estimated difference or delta/change surface between the present and when soil cap was constructed. This delta surface (Figure 4) is an approximation due to the 2014 contour surface being modeled. A more accurate difference was added to Figure 4 (purple numbers) using the exact measurements called out on the 2014 as-built survey (e.g., specific points where surveyor added exact elevation like 13.25 ft) along with points on the contour lines where were assumed to be the value of that contour (e.g., point on 8 ft contour line = 8 ft). The value at these exact points on the 2021 DEM were subtracted from the 2014 points.

The 2014 to 2021 differenced or delta surface shows a range of 1.7 ft to –1.3 feet where positive values show areas where the 2014 elevation is higher and negative values show areas where the 2021 elevation is higher. However, the range in difference at exact points was 0.55 to –0.32 ft indicating a much smaller deviation. Potential reasons for the 2014 elevation being higher could be soil cover settling or sod depletion. This was confirmed by March 2023 site visit where the top of the south end of the mound appeared to have a depression and sod disturbance (Figure F-1). Reasons for the 2021 elevation being higher (negative numbers) on the perimeter of the soil cover area could be 2014 boundary boulders moved during 2022 or armor stone bank stabilization placement over time.

**APPENDIX F – MARCH 2023 FIVE-YEAR REVIEW SITE INSPECTION**


**Figure F-1. March 2022 Site Visit Notes (Holmberg and Howe, 2018, Maxar, 2022).**

| I. SITE INFORMATION | |
|---|---|
| **Site Name:** Former GSA Property | **Date of inspection:** March 31, 2023 |
| **Location and Region:** Watertown MA, Region I | **EPA ID:** Not on the NPL |
| **Agency, office, or company leading the five-year review:** USACE New England District | **Weather/temperature:** Sunny, 40-44°F, winds <10 mph |

**Remedy Includes**: (Check all that apply)

- ■ Landfill cover/containment
- ■ Access controls
- ■ Institutional controls
- □ Groundwater pump and treatment
- □ Surface water collection and treatment
- ■ Other storm water runoff ditches and drain
- □ Monitored natural attenuation
- □ Groundwater containment
- □ Vertical barrier walls

**Attachments:** ■ Inspection team roster attached ■ Site map attached

**II. INTERVIEWS (Check all that apply)**

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed □ at site □ at office □ by phone Phone no. _____
   Problems, suggestions; □ Report attached _____

   This site does not have an onsite O&M Site Manager

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed □ at site □ at office □ by phone Phone no. _____
   Problems, suggestions; □ Report attached _____

   This site does not have an onsite O&M staff. The USACE FYR geotechnical and ecology team members conducted annual soil cover and compensatory wetlands inspections since the last review.

| Inspection Team: | |
|---|---|
| Jeff Dvorak | Lead Author |
| Drew Clemens | Hydrogeologist |

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _MassDCR_____

Contact _Muhammad Chowdhury_ Assis. Dir. Boston Region 31 March 2023 (857)-270-8697
Name Title Date Phone no.

Problems; suggestions; □ Report attached
Leaves block ditch drain and check dam seepage. MassDCR will be addressing this year.

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Agency MassDEP

Contact _Joanne Dearden_ Project Manager, Federal Facilities Program March 31, 2023 (781) 407-1595
Name Title Date Phone no.
Problems; suggestions; □ Report attached

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Agency _City of Watertown_____
Contact __Katie Swan_ _Environmental Planner/ Conservation Agent_ March 31, 2023
Name Title Date
(857) 303-9427
Phone no.
Problems; suggestions; □ Report attached

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Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; □ Report attached

---

4. **Other interviews** (optional) □ Report attached.

| III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply) | | | | |
|---|---|---|---|---|
| 1. | **O&M Documents** | | | |
| | ■ O&M manual | ■ Readily available | ■ Up to date | □ N/A |
| | ■ As-built drawings | ■ Readily available | □ Up to date | □ N/A |
| | □ Maintenance logs | □ Readily available | □ Up to date | ■ N/A |
| | Remarks Drawing files have no layer documentation and are incomplete. Annual soil cover inspection Google Earth Maps do not locate features discussed in the inspection checklists and lack scale bars & north arrows. | | | |
| 2. | **Site-Specific Health and Safety Plan** | □ Readily available | ■ Up to date | □ N/A |
| | □ Contingency plan/emergency response plan | □ Readily available | □ Up to date | ■ N/A |
| | Remarks Site Safety and Health Plan was prepared for the soil cover inspections. Accident Prevention Plan & Activity Hazard Analysis addresses all activities including grate removal. | | | |
| 3. | **O&M and OSHA Training Records** | ■ Readily available | ■ Up to date | □ N/A |
| | Remarks_____ | | | |
| 4. | **Permits and Service Agreements** | | | |
| | □ Air discharge permit | □ Readily available | □ Up to date | ■ N/A |
| | □ Effluent discharge | □ Readily available | □ Up to date | ■ N/A |
| | □ Waste disposal, POTW | □ Readily available | □ Up to date | ■ N/A |
| | □ Other permits_____ | □ Readily available | □ Up to date | ■ N/A |
| | Remarks_____ | | | |
| 5. | **Gas Generation Records** | □ Readily available | □ Up to date | ■ N/A |
| | Remarks_____ | | | |
| 6. | **Settlement Monument Records** | □ Readily available | □ Up to date | ■ N/A |
| | Remarks No settlement monuments were installed as part of the remedy._____ | | | |
| 7. | **Groundwater Monitoring Records** | □ Readily available | □ Up to date | ■ N/A |
| | Remarks_____ | | | |
| 8. | **Leachate Extraction Records** | □ Readily available | □ Up to date | ■ N/A |
| | Remarks_____ | | | |
| 9. | **Discharge Compliance Records** | | | |
| | □ Air | □ Readily available | □ Up to date | ■ N/A |
| | □ Water (effluent) | □ Readily available | □ Up to date | ■ N/A |
| | Remarks_____ | | | |
| 10. | **Daily Access/Security Logs** | □ Readily available | □ Up to date | ■ N/A |
| | Remarks_____ | | | |

## IV. O&M COSTS

1. **O&M Organization**

■ State in-house □ Contractor for State
□ PRP in-house □ Contractor for PRP
□ Federal Facility in-house □ Contractor for Federal Facility
□ Other_____

2. **O&M Cost Records**

■ Readily available ■ Up to date
■ Funding mechanism/agreement in place
Original O&M cost estimate $50,000/year □ Breakdown attached

Total **USACE** annual cost by year for review period if available

| | | | |
|---|---|---|---|
| From 1 OCT 18 (Date) | To 30 SEP 18 (Date) | $55,000 (Total cost) | □ Breakdown attached |
| From 1 OCT 19 (Date) | To 30 SEP 19 (Date) | $21,000 (Total cost) | □ Breakdown attached |
| From 1 OCT 20 (Date) | To 30 SEP 20 (Date) | $14,000 (Total cost) | □ Breakdown attached |
| From 1 OCT 21 (Date) | To 30 SEP 21 (Date) | $26,000 (Total cost) | □ Breakdown attached |
| From 1 OCT 22 (Date) | To 30 SEP 23 (Date) | $90,000 (Projected) (Total cost) | □ Breakdown attached |

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons:

none

**Breakdown of USACE operations, maintenance, and monitoring costs by fiscal year. MassDCR are not included.**

| Fiscal Year | Soil Cover | Compensatory Wetlands | Project Management | Total | Notes |
|---|---|---|---|---|---|
| **FY19 Actuals** | $20,000 | $0 | $35,000 | $55,000 | |
| **FY20 Actuals** | $12,000 | $0 | $7,000 | $21,000 | |
| **FY21 Actuals** | $8,000 | $0 | $6,000 | $14,000 | |
| **FY22 Actuals** | $16,000 | $0 | $10,000 | $26,000 | |
| **FY23 Projected** | $50,000 | $0 | $40,000 | $90,000 | Second Five-Year Review |

## V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable □ N/A

### A. Fencing

1. **Fencing damaged** □ Location shown on site map ■ Gates secured □ N/A
Remarks Fence and gates are in good condition.

### B. Other Access Restrictions

1. **Signs and other security measures** □ Location shown on site map □ N/A
Remarks Posted signs on access gate and fence are secured and legible, most of the compensatory wetlands' signs are missing. _____

### C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented □ Yes ■ No □ N/A
Site conditions imply ICs not being fully enforced □ Yes ■ No □ N/A

Type of monitoring – (e.g., self-reporting, drive by) Self-reported soil cover and wetlands inspections
Frequency _Annual inspections and reporting.
Responsible party/agency US Army Corps of Engineers New England District
Contact __Jeff Dvorak __ _____ __Project Manager____ March 31, 23 978-318-8464__
Name Title Date Phone no.

Reporting is up-to-date ■ Yes □ No □ N/A
Reports are verified by the lead agency ■ Yes □ No □ N/A

Specific requirements in deed or decision documents have been met ■ Yes □ No □ N/A
Violations have been reported □ Yes □ No ■ N/A
Other problems or suggestions: □ Report attached
_____
_____
_____
_____

2. **Adequacy** ■ ICs are adequate □ ICs are inadequate □ N/A
Remarks Soil cover is in good condition with minor ruts from lawn mower, minor settlement observed at the site and in the DEM comparison (none holding water). No animal burrows were found. Boulders marking end of cap material on the north side were pushed to the mowing perimeter. Tree roots daylight at one spot on the cap's western margin.

### D. General

1. **Vandalism/trespassing** □ Location shown on site map ■ No vandalism evident
Remarks_____
_____

2. **Land use changes on site** □ N/A
Remarks No change in land use since construction completed.

3. **Land use changes off site** □ N/A
Remarks No change in land use since construction completed.

## VI. GENERAL SITE CONDITIONS

**A. Roads** ■ Applicable □ N/A

1. **Roads damaged** □ Location shown on site map ■ Roads adequate □ N/A
Remarks Access road is in good condition.

**B. Other Site Conditions**

Remarks Overall site is in good condition. Vegetation in the drainage swales has been cut down and awaiting herbicide treatment for root removal. Debris covering the catch basin was pulled back, but leaves surrounding the basin and on upstream sides of check dams needs to be removed. Check dams should be regularly maintained during annual cap and swale maintenance activities.

**VII. LANDFILL COVERS ■ Applicable □ N/A**

**A. Landfill Surface**

1. **Settlement** (Low spots) ■ Location shown on site map □ Settlement not evident
Areal extent Most is located on the SW portion of the cover (see map) Depth < 1 ft
Remarks: Settlement is assessed by quantitatively comparing most recent bare earth digital elevation model (DEM) with historic DEMs and estimated post construction survey data model (contours developed from several spot elevations). About half of the original 34 metal pin disks marking the geotextile boundary are missing (unclear if the result of vandalism or cap mowing).

2. **Cracks** □ Location shown on site map ■ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** □ Location shown on site map ■ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** □ Location shown on site map ■ Holes not evident
Areal extent _____ Depth___.
Remarks Rodent holes noted in 2022 annual inspection appear filled in with topsoil.

5. **Vegetative Cover** ■ Grass ■ Cover properly established ■ No signs of stress
□ Trees/Shrubs (indicate size and locations on a diagram)
Remarks Sod cover on the southern and northern portions is thin.

6. **Alternative Cover (armored rock, concrete, etc.)** ■ N/A
Remarks_____

7. **Bulges** □ Location shown on site map ■ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ■ Wet areas/water damage not evident
□ Wet areas □ Location shown on site map Areal extent_____
□ Ponding □ Location shown on site map Areal extent_____
□ Seeps □ Location shown on site map Areal extent_____
□ Soft subgrade □ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** □ Slides □ Location shown on site map ■ No evidence of slope instability
Areal extent_____
Remarks_____
_____

**B. Benches □ Applicable ■ N/A**
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** □ Location shown on site map □ N/A or okay
Remarks_____
_____

2. **Bench Breached** □ Location shown on site map □ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** □ Location shown on site map □ N/A or okay
Remarks_____
_____

**C. Letdown Channels □ Applicable ■ N/A**
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** □ Location shown on site map □ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** □ Location shown on site map □ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** □ Location shown on site map □ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** □ Location shown on site map □ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ □ No obstructions
□ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
□ No evidence of excessive growth
□ Vegetation in channels does not obstruct flow
□ Location shown on site map Areal extent_____
Remarks_____
_____

**D. Cover Penetrations □ Applicable ■ N/A**

1. **Gas Vents** □ Active □ Passive
□ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition
□ Evidence of leakage at penetration □ Needs Maintenance
□ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
□ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition
□ Evidence of leakage at penetration □ Needs Maintenance □ N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
□ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition
□ Evidence of leakage at penetration □ Needs Maintenance □ N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
□ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition
□ Evidence of leakage at penetration □ Needs Maintenance □ N/A
Remarks_____
_____

5. **Settlement Monuments** □ Located □ Routinely surveyed □ N/A
Remarks_____
_____

**E. Gas Collection and Treatment** □ **Applicable** ■ **N/A**

1. **Gas Treatment Facilities**
   □ Flaring □ Thermal destruction □ Collection for reuse
   □ Good condition □ Needs Maintenance
   Remarks_____
   _____

2. **Gas Collection Wells, Manifolds and Piping**
   □ Good condition □ Needs Maintenance
   Remarks_____
   _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   □ Good condition □ Needs Maintenance □ N/A
   Remarks_____
   _____

**F. Cover Drainage Layer** □ **Applicable** ■ **N/A**

1. **Outlet Pipes Inspected** □ Functioning □ N/A
   Remarks_____
   _____

2. **Outlet Rock Inspected** □ Functioning □ N/A
   Remarks_____
   _____

**G. Detention/Sedimentation Ponds** □ **Applicable** ■ **N/A**

1. **Siltation** Areal extent_____ Depth_____ □ N/A
   □ Siltation not evident
   Remarks_____
   _____

2. **Erosion** Areal extent_____Depth_____
   □ Erosion not evident
   Remarks_____
   _____

3. **Outlet Works** □ Functioning □ N/A
   Remarks_____

4. **Dam** □ Functioning □ N/A
   Remarks_____
   _____

**H. Retaining Walls** □ **Applicable** ■ **N/A**

1. **Deformations** □ Location shown on site map □ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____
_____

2. **Degradation** □ Location shown on site map □ Degradation not evident
Remarks_____
_____

**I. Perimeter Ditches/Off-Site Discharge** ■ **Applicable** □ **N/A**

1. **Siltation** □ Location shown on site map ■ Siltation not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Vegetative Growth** □ Location shown on site map □ N/A
■ Vegetation does not impede flow
Areal extent ~5000 sq feet Type Reeds and cat tails
Remarks Vegetation was trimmed to near ground surface in late 2022 and is awaiting herbicide treatment by MassDCR to remove remaining stalks and roots. A few Spring 2022 growth patches remain in the northern ditch.

Potential settlement in the drainage ditch is restricting flow on the northeast corner of the cap.

Staining similar to iron oxidation is present on the southeastern part of the ditch system, with high water marks indicating seasonal and/or storm-related ponding occurs. Ponding is exacerbated by leaf debris clogging the drainage grate and the six check dams.

3. **Erosion** □ Location shown on site map ■ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Inlet/Discharge Structure** ■ Functioning □ N/A
Remarks Catch basin grate originally obstructed by leaf litter from late 2022 vegetation trimming. Once leaf litter was cleared from the grate by the inspection team, ponded surface water began to discharge into the catch basin. Discharge pipe was submerged by about 4 inches of standing water, but flow was observed from the pipe after removing debris from inlet grate. The inspection team noted the location of the catch basin and associated discharge pipe across Greenough Boulevard. differs from construction drawings by approximately 24 meters. This has since been corrected in all figures associated with the FYR.

| VIII. VERTICAL BARRIER WALLS □ Applicable ■ N/A | |
|---|---|
| 1. | **Settlement** □ Location shown on site map □ Settlement not evident<br>Areal extent_____ Depth_____<br>Remarks_____<br>_____ |
| 2. | **Performance Monitoring** Type of monitoring_____<br>□ Performance not monitored<br>Frequency_____ □ Evidence of breaching<br>Head differential_____<br>Remarks_____<br>_____ |
| **IX. GROUNDWATER/SURFACE WATER REMEDIES** □ Applicable ■ N/A | |
| **A. Groundwater Extraction Wells, Pumps, and Pipelines □ Applicable □ N/A** | |
| 1. | **Pumps, Wellhead Plumbing, and Electrical**<br>□ Good condition □ All required wells properly operating □ Needs Maintenance □ N/A<br>Remarks_____<br>_____<br>_____ |
| 2. | **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**<br>□ Good condition □ Needs Maintenance<br>Remarks_____<br>_____ |
| 3. | **Spare Parts and Equipment**<br>□ Readily available □ Good condition □ Requires upgrade □ Needs to be provided<br>Remarks_____<br>_____ |
| **B. Surface Water Collection Structures, Pumps, and Pipelines □ Applicable □ N/A** | |
| 1. | **Collection Structures, Pumps, and Electrical**<br>□ Good condition □ Needs Maintenance<br>Remarks_____<br>_____ |
| 2. | **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**<br>□ Good condition □ Needs Maintenance<br>Remarks_____<br>_____ |
| 3. | **Spare Parts and Equipment**<br>□ Readily available □ Good condition □ Requires upgrade □ Needs to be provided<br>Remarks_____<br>_____ |

**C. Treatment System** □ **Applicable** □ **N/A**

1. **Treatment Train** (Check components that apply)
   □ Metals removal □ Oil/water separation □ Bioremediation
   □ Air stripping □ Carbon adsorbers
   □ Filters_____
   □ Additive (*e.g.*, chelation agent, flocculent)_____
   □ Others_____
   □ Good condition □ Needs Maintenance
   □ Sampling ports properly marked and functional
   □ Sampling/maintenance log displayed and up to date
   □ Equipment properly identified
   □ Quantity of groundwater treated annually_____
   □ Quantity of surface water treated annually_____
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   □ N/A □ Good condition □ Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   □ N/A □ Good condition □ Proper secondary containment □ Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   □ N/A □ Good condition □ Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   □ N/A □ Good condition (esp. roof and doorways) □ Needs repair
   □ Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   □ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition
   □ All required wells located □ Needs Maintenance □ N/A
   Remarks_____
   _____

| D. Monitoring Data | |
|---|---|
| 1. | Monitoring Data<br>□ Is routinely submitted on time □ Is of acceptable quality |
| 2. | Monitoring data suggests:<br>□ Groundwater plume is effectively contained □ Contaminant concentrations are declining |

| E. Monitored Natural Attenuation | |
|---|---|
| 1. | **Monitoring Wells** (natural attenuation remedy)<br>□ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition<br>□ All required wells located □ Needs Maintenance □ N/A<br>Remarks_____<br>_____ |

**X. OTHER REMEDIES**

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

No other remedies are implemented at this Site.

**XI. OVERALL OBSERVATIONS**

**A. Implementation of the Remedy**

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The Remedial Action Objectives for the site are to reduce human health and ecological risks associated with exposure to polychlorinated biphenyls, dioxins, and metals in the PCB impacted area. The soil cover does show signs of settlement in the southwest portion, but it is unknown if this occurred soon after construction or since the last FYR. The filter fabric does not appear to be penetrated by burrowing rodents, for the filled burrow spoils contain no filter fabric debris and the burrow depths are less than the designed filter fabric depth. Trees and brush are not present on the soil cover, but tree roots are exposed in one location. See Figure F-1 for location of observations.

**B. Adequacy of O&M**

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
The Operation and Maintenance Plan inspection requirements adequately address all facets of soil cover and compensatory wetlands maintenance and monitoring. Identified issues (e.g., burrows, invasive plant species, need for replacement plantings, drainage swale vegetation removal), were or are being addressed by MassDCR and USACE.

Soil cover perimeter survey markers (survey disks and boulders) may need to be replaced or pushed back in their original location.

Wetland signage may need to be replaced and annual inspection reports need to be routinely completed.

**C. Early Indicators of Potential Remedy Problems**

| XI. OVERALL OBSERVATIONS |
|---|
| Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.<br>Excluding the first FYR year, and this projected second FYR year, and the year USACE project management changed project managers, USACE OM&M costs have not exceeded the estimated $50,000/year cost presented in the decision document. This will be reviewed in the future with concern of inflation and the cost of completing the work.<br>Armor stone in the drainage swale parallel to Greenough Boulevard contains an iron oxidation coating not present in any other part of the swale system. The oxidation's color is most intense on the swale system's northeast corner and suggests groundwater from underneath the soil cover may seasonally be entering the swale system.<br>The eastern drainage swale may have a depression preventing water leaving the site. |
| **D. Opportunities for Optimization** |
| Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.<br>Continue to evaluate Soil Cover settlement areas comparing post 2022 DEMs to historic DEMs<br>Employ a cellphone-based site assessment app to map annual inspection findings for trend analyses over time.<br>Complete an annual site survey by a MA licensed surveyor to better quantify low spots in the swale and to confirm the soil cover perimeter.<br>Conduct a camera inspection of the drainage pipe under Greenough Blvd, repair if needed, and add results to next FYR.<br>Utilize drone-based methods for annual inspections or next FYR.<br>Remove leaf litter during dry periods, improving flow through the check dams<br>Continue to monitor tree roots encroaching the soil cover area. |

**APPENDIX G – MARCH 31, 2023 SITE VISIT PHOTOS**

## PHOTOLOG INDEX

**Photo 1. Compensatory Wetlands looking northeast, showing one of the few remaining plastic wetland boundary signs.**

**Photo 2. Compensatory Wetlands looking southwest, showing one of the few remaining plastic wetland boundary signs.**

**Photo 3. Soil cover looking southwest toward the Compensatory Wetlands, showing good sod cover.**

**Photo 4. Daylighting Tree Roots. Uncertain if these are under or outside the membrane.**

**Photo 5. Potential former animal burrow surrounded by thin sod cover; grate hook used for scale.**

**Photo 6. Disk marking soil cover extent. Over half of the original disks appear to be missing.**

**Photo 7. Boulder marking soil cover extent moved into brush line since last review.**

**Photo 8. Possible depression in Eastern Drainage Swale at the northeast gate, limiting surface water discharge. No inlet grate or off-site discharge pipe present. Sheen in center foreground appears to be organic material, not petroleum.**

**Photo 9. Leaf litter-clogged Check Dams within the Eastern Drainage Swale; some check dams appear to have had stone material removed from their centers to expedite surface water discharge.**

**Photo 10. Eastern Drainage Swale Inlet Grate with leaf litter blocking grate partially removed.**

**Photo 11. Eastern Drainage Swale Inlet Grate at the end of the site inspection. Triangle shows material removed from the upstream check dam, looking northeast.**

**Photo 12. Southwestern portion of the soil cover showing minor depressions less than 0.9 feet deep. View is looking east.**

**Photo 13. GSA stormwater discharge pipe (submerged) southeast of Greenough Boulevard.**

**Photo 14. Disconnected power pole with transformer next to access gate. (*Removed from site as of April 28, 2023 per MassDCR)**

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