U. S. ENVIRONMENTAL PROTECTION AGENCY
EPA NEW ENGLAND - REGION 1

RECORD OF DECISION

CREESE & COOK TANNERY (FORMER) SUPERFUND SITE
CERCLIS EPA ID #: MAD001031574
OPERABLE UNIT 1 – East Study Area (ESA)
OPERABLE UNIT 2 – West Study Area (WSA)

Danvers, Massachusetts

July 2019

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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PART 1: DECLARATION FOR THE RECORD OF DECISION

A. SITE NAME AND LOCATION

Creese & Cook Tannery (Former) Superfund Site
Danvers, Essex County, Massachusetts
CERCLIS EPA ID No.: MAD001031574
Operable Unit 1 (OU1) – East Study Area (ESA)
Operable Unit 2 (OU2) - West Study Area (WSA)

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for both Operable Units 1 and 2 (OU1 and OU2) of the Creese & Cook Tannery (Former) (Site), in Danvers, Essex County, Massachusetts, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 USC §§ 9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 *et seq.*, as amended. The Region 1 Director of the Superfund and Emergency Management Division has been delegated the authority to approve this Record of Decision (ROD). This decision document constitutes the first ROD for the Site. Figure 1 in Appendix A of this ROD shows the site location and identifies OU1 and OU2.

This decision was based on the Administrative Records for OU1 and OU2, each of which were developed in accordance with Section 113 (k) of CERCLA, and which are available for review at the Peabody Institute Library, located at 15 Sylvan Street in Danvers, Massachusetts, and at the United States Environmental Protection Agency (EPA) Region 1 OSRR Records Center, located at 5 Post Office Square, Boston, Massachusetts, and on-line at: *www.epa.gov/superfund/creese*
The Administrative Record Indexes (Appendix B to the ROD) identify each of the items comprising each Administrative Record upon which the selection of the remedial action is based.

The Commonwealth of Massachusetts, as the support agency, concurs with the selected remedy. See Appendix C of this ROD for a copy of the concurrence letter.

A glossary of terms and acronyms is included in Appendix D of this ROD.

C. ASSESSMENT OF THE SITE

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants or contaminants into the environment.

D. DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for the ESA – OU1 and the WSA – OU2 areas of the Site. Figures 1 and 2 in Appendix A of this ROD depict the site location and the properties that comprise both the ESA and WSA of the Site. The Crane River, OU3, will be addressed as a separate operable unit remedy. The selected remedy for OU1 and OU2 is a comprehensive soil remedy for these areas of the Creese & Cook Tannery (Former) Site, and utilizes soil excavation, on-site consolidation and capping, and off-site disposal, in conjunction with institutional control components, along with wetland restoration, or replication if necessary, and long-term monitoring to address unacceptable exposure risks in soil posed by the Site.

The selected response actions for OU1 and OU2 establish soil cleanup levels which are protective of residential and recreational use in designated areas as described in the ROD and include protective covers where waste is left in place as well as a protective cap on the consolidation area. PCB concentrations in soil at the Site are well below 50 ppm, industrial operations pre-date 1978, and there is no evidence of post-1978 spills or releases on the property. As a result, the Site is not regulated for cleanup and disposal under 40 C.F.R. Part 761.

In addition, Site soils are not considered to be principal threat wastes; rather, they are classified as low-level threat wastes. No principal threat waste was identified for OU1 or OU2. Principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Wastes generally considered to be principal threats are liquid, mobile, and/or highly-toxic source material. The selected response actions will address low-level threat wastes at the Site through excavation and soil covers, on-site consolidation and capping, off-site disposal actions, and controlling exposures through implementation of institutional controls.

The proposed remedy in this ROD does not include a groundwater component because the results of the human health risk assessments indicate that there are no unacceptable risks from exposure to shallow groundwater. Additionally, MassDEP has issued a Groundwater Use and Value Determination for the Site and surrounding area that concludes that groundwater under the Site is not a current or potential future drinking water supply[1].

The Site and surrounding area are supplied with potable drinking water by the town of Danvers and according to the Town of Danvers Board of Health, any potable water well must be installed at a depth greater than 100 ft bgs and would require authorization prior to any well installation. The remedial measures selected in this ROD include the following:

[1] The Groundwater Use and Value Determination is consistent with an EPA endorsed Massachusetts Core Comprehensive State Groundwater Protection Program.

East Study Area Soil (ESA – OU1)

EPA's selected soil remedy for both 33 and 45 Water Streets is ESA Residential-2A-Soil Excavation (0-3 ft). The remedy for this area includes the following components:

- Excavating 0-3 feet below ground surface (ft bgs) of approximately 4,300 cubic yards (CY) of contaminated soil that exceed Cleanup Levels (CLs) from paved and unpaved locations at 33 and 45 Water Street (excluding under existing condominium buildings).
- Backfill excavated areas with clean soil cover and restore landscaping or asphalt to its original condition.
- Off-site disposal at an appropriate disposal facility of hazardous wastes and soil exceeding the Massachusetts Department of Environmental Protection's Upper Concentrations Limits (UCLs), if encountered during remedial design.
- Onsite consolidation, grading and capping of non-hazardous material on the northwestern portion of 55 Clinton Avenue; existing containment/solidification cell at 55 Clinton Avenue to remain in place.
- Engineering controls will be used to limit fugitive dust emissions, noise, physical safety, inconvenience, increased traffic.
- Wetland restoration, or replication if necessary, of areas that are disturbed from the actions along with monitoring of the restoration efforts.
- Institutional Controls, where necessary, will be implemented by EPA and enforced in accordance with federal and state law, to limit future excavation and other activities that could pose unacceptable risk(s) and to prevent exposures.
- Long-term operation[2] and maintenance of soil cover.
- Five-year reviews of the remedy will be conducted to ensure that the remedy remains protective.

See Figure 3 in Appendix A of this ROD, which depicts the above listed properties and the approximate areas targeted for soil excavation.

EPA's selected remedy for the MBTA Right of Way (MBTA ROW) and the MBTA property located at 35 Water Street is ESA MBTA- 3-Soil Excavation (0-3 ft). The selected remedy for this area includes the following components:

- Excavate (0-3 ft bgs) of approximately 9,600 CY of contaminated soil that exceed CLs from the MBTA ROW and the MBTA property at 35 Water Street. (excluding under monuments) after removal and recycling of railroad tracks from the MBTA Right of Way.

[2] Includes all monitoring activities.

- Off-site disposal of all excavated material at an appropriate disposal facility.
- Backfill excavated areas with clean soil cover and restore vegetation to its original elevation.
- Engineering controls will be used to limit fugitive dust emissions, noise, physical safety, inconvenience, increased traffic.
- Wetland restoration, or replication if necessary, of areas that are disturbed from the actions along with monitoring of the restoration efforts.
- Institutional Controls, where necessary, will be implemented by EPA and enforced in accordance with federal and state law, , to limit future excavation and other activities that could pose unacceptable risk(s) and to prevent exposures.
- Long-term operation and maintenance of soil cover.
- Five-year reviews of the remedy will be conducted to ensure that the remedy remains protective.

See Figure 4 in Appendix A of this ROD, which depicts the above listed properties and the approximate areas targeted for soil excavation.

EPA's selected remedy for the ESA Riverfront soil is ESA Riverfront 2A-Soil Excavation (0-2 ft bgs). The selected remedy for this area includes the following components:

- Using temporary cofferdams to dewater and excavate (0-2 ft bgs) approximately 2,600 CY of contaminated soil that exceeds CLs from the Riverfront Area.
- Excavate soil that exceeds the UCL for lead on 20 Cheever Street (approximately 4 ft bgs).
- Backfill excavations with clean soil cover and restore vegetation.
- Offsite disposal of hazardous waste and material exceeding UCL.
- Onsite consolidation, grading, and capping of non-hazardous material on northwestern portion of 55 Clinton Avenue.
- Engineering controls will be used to limit fugitive dust emissions, noise, physical safety, inconvenience, increased traffic.
- Wetland restoration or replication if necessary, of areas that are disturbed from the actions along with monitoring of the restoration efforts.
- Institutional Controls, where necessary, will be implemented by EPA and enforced in accordance with federal and state law, to limit future excavation and other activities that could pose unacceptable risk(s) and to prevent exposures.
- Long-term operation and maintenance of soil cover.
- Five-year reviews of the remedy will be conducted to ensure that the remedy remains protective.

See Figure 5 in Appendix A of this ROD, which depicts the above listed properties and the approximate areas targeted for soil excavation.

Removal Action Memo – ESA – OU1 - 45 Water Street

On September 20, 2018, EPA issued a Removal Action Memo to expedite a portion of the soil cleanup action being proposed for one of the residential condominium complexes, located at 45 Water Street, on the southern tip of ESA. As part of this action, it is expected that all excavated soil will be shipped off-site for disposal rather than disposed of in the consolidation area as part of the selected remedy for this area of the Site. Additional pre-removal soil sampling will be conducted to determine the final volume of contaminated soil to be addressed. See Appendix E of this ROD for a copy of the Removal Action Memo.

<u>West Study Area Soil (WSA – OU 2)</u>

The selected soil remedy for the WSA soil is WSA-2-Comprehensive Soil Excavation South of Former Beamhouse and Surface Excavation (0-3 ft) of the remaining WSA area soil. The selected remedy for this area includes the following components:

- Excavation of all contaminated soil south of the former beamhouse to levels that allow for unrestricted residential use and backfill with clean soil (estimated up to 4 ft bgs).
- Excavation of contaminated soil north of the former beamhouse (0-3 ft bgs in locations where soil exceeds CLs, or to 10 ft in a limited area where soil exceeds UCLs (excluding the existing consolidation and cemetery areas) and backfill with clean soil cover.
- Total of approximately 32,700 CY of contaminated soil excavated from both north and south of the former beamhouse.
- Off-site disposal of potentially hazardous waste and/or soil exceeding UCLs, if encountered.
- Construction of on-site consolidation area in the northern area of 55 Clinton Avenue, overlying the existing consolidation cell and the adjacent areas.
- On-site consolidation and capping of excavated soil and beamhouse building debris with a protective RCRA-D cap on the northern portion of 55 Clinton Avenue.
- Construct storm water controls.
- Engineering controls will be used to limit fugitive dust emissions, noise, physical safety, inconvenience, increased traffic.
- Wetland restoration or replication if necessary, of areas that are disturbed from the actions along with monitoring of the restoration efforts.
- Institutional Controls, where necessary, will be implemented by EPA and enforced in accordance with federal and state law, to limit future excavation and other activities that could pose unacceptable risk(s) and to prevent exposure.

- Long-term operation and maintenance of the soil cover and consolidation area cap, including groundwater monitoring around capped area.
- Five-year reviews of the remedy will be conducted to ensure that the remedy remains protective.

See Figure 6 in Appendix A of this ROD, which depicts the above listed properties and the approximate areas targeted for soil excavation.

The excavation, offsite disposal, consolidation and capping components of the remedy will prevent direct contact with contaminants by human and ecological receptors. In addition, the remedy will help prevent migration of soil contaminants to surface water of the Crane River. The estimated present value cost of the selected remedy is $24.3 million.

E. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

EPA has determined that there are no principal threat wastes present at the areas of the Site identified in OU1 and OU2. None of the alternatives apply active treatment but all require excavation of soil. Therefore, the selected remedy does not satisfy the statutory preference for treatment as a principal element because treatment is technically impracticable due to: existing residential structures; the heterogeneous mixture of co-located disposed wastes from tannery and railroad operations; the characteristics of the off-site fill (soil and construction debris) that was placed on the Site over time; and ash waste from the coal power plant at 33 Water Street and other anthropogenic sources, e.g., steam locomotives from railroad operations.

Because this remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, and because land use restrictions are necessary, a statutory Five-Year Review of the remedy will be conducted five years after the start of remedial actions to ensure that the remedy continues to provide adequate protection of human health and the environment. Five-year reviews will continue as long as waste remains at the Site and unlimited use is restricted.

F. SPECIAL FINDINGS

Issuance of this ROD embodies the following specific determinations.

Wetland Clean Water Act Impacts

As defined by Section 404(b) of the Clean Water Act and regulations promulgated under the Act at 40 C.F.R. Parts 230, 231 and 33 C.F.R. Parts 320-323 the Regional Administrator or her delegee finds that the selected remedy is the Least Environmentally Damaging Practicable Alternative (LEDPA) for protecting federal jurisdictional wetlands and aquatic ecosystems at OU1 and OU2 under these standards. In compliance with standards within relevant and appropriate Wetland Protection and Floodplain Management regulations (44 C.F.R. Part 9), EPA solicited public comment on its LEDPA finding within the Proposed Plan.

EPA will minimize potential harm and avoid adverse impacts to wetlands by using best management practices during excavation to minimize harmful impacts on the wetlands, wildlife or habitat, and by restoring or replicating, if necessary, these areas consistent with federal and state wetlands protection laws. Any wetlands affected by remedial work will be restored (or replicated if necessary) to its original condition as a wetland area and any restoration efforts will be monitored. Mitigation measures will be used to protect wildlife and aquatic life during remediation, as necessary. EPA's responses to general comments regarding wetland issues are located in the Responsiveness Summary (Part 3) of this ROD. In summary, EPA's selected remedy balances the need to address the contamination that poses a risk to human health and an ecological risk to the wetlands and its ability to restore any (temporarily or permanently) altered wetland resources impacted by the remediation. Wetlands identified in OU1 and OU2 are shown on Figure 7 in Appendix A of this ROD.

Floodplain Impacts

Further, the Regional Administrator or her delegee solicited public comment, under 44 C.F.R. Part 9, on its determination that there is no practicable alternative to temporary occupancy and/or modification of portions of the floodplain in both the ESA and WSA. To address remedial measures that may affect floodplain resources, waste located within the floodplain will be excavated and backfilled with clean fill and restored to grade so that the current flood storage capacity of these areas and any adjacent wetlands will not be diminished after completion of the proposed remedial actions. BMPs will be used during construction, which includes erosion control measures, regrading, and restoration and monitoring of impacted areas. EPA's responses to general comments regarding floodplain issues are located in the Responsiveness Summary (Part 3). Floodplains identified in OU1 and OU2 are shown on Figure 7 in Appendix A of this ROD.

G. ROD DATA CERTIFICATION CHECKLIST

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

1. Chemicals of concern (COCs) and their respective concentrations
2. Baseline risk represented by the COCs

3. Cleanup Levels (CLs) established for COCs and the basis for the levels
4. Current and reasonably anticipated future land and groundwater use assumptions used in the baseline risk assessment and ROD
5. Land and groundwater use that will be available at the site as a result of the selected remedy
6. Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected
7. Decisive factor(s) that led to selecting the remedy

H. AUTHORIZING SIGNATURES

This ROD documents the selected remedy for soil and Riverbank soil for both the ESA (OU1) and the WSA (OU2) at the Creese & Cook Tannery (Former) Superfund Site. This remedy was selected by EPA with concurrence of the Massachusetts Department of Environmental Protection (MassDEP). A copy of the State's concurrence letter is included as Appendix C to this ROD.

U.S. Environmental Protection Agency

By: ______________________ Date: 7/22/19

Bryan Olson
Director
Superfund and Emergency Management Division
Region 1

PART 2: THE DECISION SUMMARY

A. SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Creese & Cook Tannery (Former) Superfund Site or "Site" (CERCLIS ID# EPA ID No.: MAD001031574) is located in Danvers, Massachusetts. EPA is the lead agency and MassDEP is the support agency. EPA has performed Remedial Investigation/Feasibility Study (RI/FS) activities for this Site as Fund-lead. The Site was the former location of leather tannery facilities that operated from the 1870's until the early 1980's on the east and west sides of the Crane River. Creese and Cook used raw animal hides to produce leather shoes, handbags, gloves, and garment leather, primarily from cowhide stock.

The Site, listed in the National Priorities List (NPL) in 2013, includes nine properties: 33 Water Street, 35 Water Street, 45 Water Street, 12 Cheever Street, 20 Cheever Street, and the Massachusetts Bay Transportation Authority (MBTA) Right of Way (ROW) on the east side of the Crane River, and 27 Clinton Avenue, 55 Clinton Avenue, and 15 Pleasant Street located adjacent to Route 128. Therefore, the Site was divided into the East Study Area (ESA) and West Study Area (WSA) for the purpose of conducting the RI/FS. The ESA is designated as Operable Unit 1 (OU1) and the WSA is designated at Operable Unit 2 (OU2). The Crane River, which bisects OU1 and OU2, is also part of the Site, but is not addressed as part of this ROD. The Crane River (Operable Unit 3) will be the subject of a separate RI/FS in the future.

Figure 2 in Appendix A of this ROD depicts the individual nine properties which comprise both the ESA and WSA of the Site. These properties are described in detail below:

The East Study Area (ESA -OU1) includes the following properties:

- <u>33 Water Street</u> – This parcel of land was the original location of tannery operations from the mid 1870's until the early 1980s. The Creese & Cook Company Calfskin Tannery (Creese & Cook) began operations at 33 Water Street in 1903 and ceased operations in about 1984. This parcel was redeveloped into a residential condominium complex in 1986 and includes 28 condo units in four separate buildings. The property is approximately 3.5 acres and is currently zoned for residential use.

- <u>45 Water Street</u> – This parcel of land was formerly residential/farm property that was redeveloped to include a five-unit residential condominium complex in 1989. The property is approximately one acre and is currently zoned for residential use.

- <u>35 Water Street</u> – This parcel of land formerly housed railroad station and is located between 33 and 45 Water Street. A monument, the Colonel Hutchinson Memorial, is featured on the parcel, which is currently owned by Massachusetts Bay Transportation Authority (MBTA). The property is approximately 0.1 acre and is currently zoned for residential use.

- MBTA ROW – This parcel of land is a former railroad line that was constructed in the 1840's and is located adjacent to the Crane River and to 33, 35 and 45 Water Streets. This property is owned by the MBTA. The rail line is no longer active, and the tracks are only partially intact. The property is currently zoned for residential use.

- 12 Cheever Street – This parcel of land was formerly residential and commercial and has been occupied by the Polish Russian Lithuanian American Citizens' Club since 1941. It is 1.3 acres in size and located adjacent to 33 Water Street. This property is currently zoned as "Waterfront Village[3]," which allows for mixed both commercial or residential use.

- 20 Cheever Street – This parcel is an undeveloped, heavily vegetated property, with a large wetland area. The property, which is approximately 2.3 acres in size, is entirely within the 100-year floodplain and currently zoned for residential use.

The West Study Area (WSA – OU2) includes the following properties:

- 55 Clinton Avenue – This parcel of land is the former tannery property where most of the Creese & Cook tannery operations occurred from 1914 until the early 1980's. The tannery beamhouse building, originally located onsite, was demolished in place by the current property owner without proper approval by MassDEP, and the building debris remains onsite. A short rail spur originally existed in the upper northeast corner to facilitate a direct connection to the main rail line for tannery operations. Two historical burial grounds, known as the Endicott and Russell Cemeteries are also located on this parcel. The property is approximately 12.7 acres and is currently vacant and overgrown, privately owned, and zoned for residential use.

- 27 Clinton Avenue – This parcel of land was formerly owned by Creese & Cook and was subsequently sold and used as a local radio station, including a radio tower, in the 1960's There was a fire at some point and burned remnants of the former radio station building and radio tower remain onsite. The property, approximately 3.5 acres, is currently vacant and overgrown, privately owned, and is currently zoned for residential use.

- 15 Pleasant Street – This parcel of land was investigated as a possible tannery waste disposal area (based on the discovery of probable tannery wastes during construction work by the Massachusetts Department of Transportation). It is located immediately south and adjacent to the Route 128 highway embankment. The property is approximately 0.3 acres in size, vacant, and currently zoned for residential use.

[3] This term Waterfront Village District is described at Section 16 of Town of Danvers, Zoning Bylaws, as a district whose purpose is to allow for mixed business, residential and recreational use in waterfront areas to serve as a "transitional zone from abutting residential and industrial areas."

B SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. History of Site Activities

Two of the properties that comprise the Site (33 Water Street and 55 Clinton Avenue) were occupied by leather tanneries between the late 1800s until the early 1980s. More specifically, from the 1870s through 1903, portions of what is now 33 Water Street housed tanneries that operated under several names, including the Cross & Murphy Morocco Manufactory and the Alfred A. Bates Morocco Factory. Creese began operations at the 33 Water Street property in 1903 and ceased operations in 1981 due to bankruptcy. Creese then leased the facility to the Danversport Tanning Company, which ceased all tanning operations at this location in 1983.

Creese used raw animal hides to produce leather shoes, handbags, gloves, and garment leather, primarily from cowhide stock. The original Creese facility on Water Street was a four-story building, with beamhouse and tanning operations occurring on the first floor, leather finishing on the second floor, leather tacking and ironing on the third floor, and leather drying on the fourth floor. Heat and power were supplied by a single 100 horsepower coal-fired steam engine which was situated at the rear of the building, the exhaust from which was reportedly expelled from a 50-foot iron chimney. After its initial construction at 33 Water Street in 1903, the Creese & Cook Tannery facility was significantly expanded in several phases over its operational history, including across the Crane River. Sampling revealed evidence of dumping and landfilling at 20 Cheever Street, possibly connected to local operations. Sampling was also conducted at 12 Cheever Street due to its proximity to tannery operations.

Most tannery operations, except for finishing operations and offices, were reportedly moved to a larger new facility at 55 Clinton Avenue on the west side of the Crane River in 1914. Tannery beamhouse operations were reportedly moved across the River for several reasons, including complaints of odors from beamhouse operations at the Water Street factory, and the need for a more productive and higher quality water source. The Water Street factory was served by a supply well that produced increasingly saline water with the enhanced pumping and deeper well development needed for expanding tannery operations. A review of limited historical information indicates that there was a large settling tank located beneath the former building at 33 Water Street that discharged directly to the Crane River. At the time of beamhouse construction, a multi-purpose bridge, the Creese & Cook footbridge, was constructed across the Crane River to carry steam piping, water piping, and electric power lines, and to provide worker access between the new beamhouse facility on Clinton Avenue and the original Creese & Cook Tannery facility on Water Street.

The 55 Clinton Avenue facility contained three sub-slab lime pits and a series of interconnected trenches presumed to channel large volumes of liquids into and out of the area. Two trenches identified in the shipping and storage area were assumed to have been used to convey liquid waste from the building into a four-chambered concrete settling pit, located north of the building. The trenches had reportedly been backfilled with sand sometime prior to 1995 and there were five 275-gallon aboveground storage tanks (ASTs), two located in the office/administration area of the building and three located west of the 55 Clinton Avenue building. In the mid-1970s a municipal sewer line was installed in the northern part of 55 Clinton Avenue and tannery operations were connected to the system.

In addition, solid wastes from the Creese & Cook tanning process on 55 Clinton Ave were disposed of in two onsite landfills. Liquid wastes from the tanning processes were sent to an onsite lagoon system located approximately 150 feet east of the former building. Sludge settled from the liquid effluent and accumulated in the lagoons, and the liquid effluent was then directly discharged into the Crane River until 1975 and later to the municipal sanitary sewer system. Based on conversations EPA held with area residents familiar with past Site operations, it is believed that tannery wastes may have sometimes been released to the area south of the lagoons and onto the northwestern portion of 27 Clinton Avenue via overland runoff of liquids from waste lagoons when the tannery was in operation. Historically, 15 Pleasant Street may have been impacted by tannery operations.

The former building on 55 Clinton Avenue was reportedly demolished by the current property owner without proper approval, in 2004. In 1983, a fire burned a portion of the former tannery building that was located at 33 Water Street. Historically, the MBTA ROW and 35 Water Street, were both part of former rail operations for freight and passenger use, and constructed to serve needs of the area, likely including the shipping and receiving of tannery related products.

The former Creese & Cook properties, including 33 Water Street, 55 Clinton Avenue were later sold or transferred. The 33 Water Street parcel was redeveloped into a condominium complex in 1986 and the 45 Water Street parcel was developed as condominiums in 1989. In addition, 27 Clinton Avenue was sold to a private owner on or about November 2007; and the MBTA ROW and 35 Water Street, formerly owned by Boston and Maine Railroad and its predecessors, was purchased by the MBTA in approximately 1976. The parcel at 12 Cheever Street, home of a Polish-Lithuanian Club (Polish Club), although not part of the former tannery operations, has been sampled and evaluated as part of the Site due to its proximity to the former tannery and railroad operations.

A more detailed description of the Site history can be found in Section 1.3 of the September 2018 FS.

2. <u>History of Federal and State Investigations and Removal and Remedial Actions</u>

Since the mid-1980s, during a span of over twenty years, the Massachusetts Department of Environmental Protection ("MassDEP") oversaw PRP-lead investigations and response actions at some of the properties that comprise the Site under the State cleanup regulations known as the Massachusetts Contingency Plan (MCP). Initial response actions conducted included fencing of Imminent Hazard Areas that contain high levels of arsenic in soil, and construction of a waste disposal cell at the 55 Clinton Avenue parcel.

After tannery operations ceased in 1983, tannery wastes remained on-site in the former waste disposal areas (landfills and lagoons), in trenches and pits in the building, and in abandoned containers. The wastes were described as including black organic waste, black oily waste, and lime with strong ammonia and sulfide odors. In 1984 and 1985, MassDEP conducted an initial investigation to determine the nature and extent of contamination and evaluate potential remedial options under state cleanup regulations for the 55 Clinton Avenue parcel. From 1988 through 1990, MassDEP reviewed and then approved a plan to design and construct a lined containment cell on the 55 Clinton Avenue property to address contaminated soil on the property.

In 1989 and 1990, the property owners completed a response action under the MCP at 55 Clinton Avenue. The actions included consolidation of tannery waste material that remained on the property, with placement into an on-site containment cell to prepare the property for redevelopment. Tannery wastes were reportedly excavated from the two on-site landfills, the sludge lagoons, and trenches and pits inside the beamhouse facility; mixed with cement or cement kiln dust, lime and fly ash, water, and a deodorizing spray using a portable concrete plant mobilized to the Site; deposited into a containment cell in the northwest corner of the property; and capped with an undefined liner and soil cover material. Groundwater monitoring between 1990 and 1995 showed levels of arsenic and chromium remained above MassDEP cleanup goals. As a result, MassDEP withheld final approval of the cleanup work performed at 55 Clinton Avenue.

Subsequent investigations, performed by the owner, found that high concentrations of contaminants remained in soil at the former tannery waste source areas (former Landfill Areas A and B and former Sludge Lagoon Area C), as well as other areas including the Upland Soil Pile Area and the former building area. MassDEP required fencing to be installed around these areas in 1995 and 2007 to prevent direct contact with concentrations of arsenic and dioxins/furans in soil that met Imminent Hazard (IH) criteria as defined by the MCP. The building on 55 Clinton Avenue was reportedly demolished in place in 2004 by the property owner, without required approvals or review by MassDEP. The building debris and foundation and roofing and flooring debris remain on-site, enclosed by chain-link fence.

In response to MassDEP's request that EPA investigate the area, in 2010, EPA conducted a site inspection for 55 Clinton Avenue, 33 Water Street, 20 Cheever Street, 35 Water Street, and the MBTA ROW. The results of this investigation are summarized in the Final Report for Creese & Cook (Former 2), Site Inspection, Danvers, MA, dated July 2012; Site Assessment Report for 55 Clinton Avenue, with results summarized in a report titled Final Report for Creese & Cook (Former 1), and Site Reassessment, Danvers, MA, dated August 2012.

After completing an initial investigation of the area, EPA's Removal Program performed a targeted Preliminary Assessment and Site Investigation ("PA/SI") at 33 Water Street and issued an Action Memorandum under CERCLA removal authority for performance of a non-time critical removal action at this property to address contaminated soil located mainly around back decks of one of the condominium buildings at 33 Water Street (building D), in 2012. As part of this removal action, EPA removed and properly disposed of about 450 tons of arsenic-contaminated soil.

MassDEP also requested that EPA consider the Site area properties for inclusion as a Superfund site on the National Priorities List ("NPL") of federal Superfund sites. After conducting investigations referenced above, and reviewing other relevant data, the Site was proposed for inclusion in September 2012 and included on the final listing of NPL sites in 2013.

In addition, the following additional response activities have been performed by EPA since NPL listing and in preparation for selection of the Site remedy: Remedial Investigation ("RI") sampling activities, on the East Study Area ("ESA") of the Site, which included taking over 350 soil samples at 67 borings, installing 13 groundwater monitoring wells, and obtaining 60 groundwater samples, 15 sediment samples, and including a tidal survey of the Crane River; RI Sampling activities at the West Study Area ("WSA") of the Site, which included taking over 575 soil samples from 88 soil borings, installing eight groundwater monitoring wells, and obtaining 57 groundwater samples, 15 sediment samples, and including a tidal survey of the Crane River; A separate human health and screening level ecological risk assessment for the WSA and ESA; and a combined FS for the ESA & WSA, to evaluate a number of different means for addressing and cleaning up the unacceptable risk(s) posed by contaminants present at the Site.

3. History of CERCLA Enforcement Activities

Since 2015, EPA has notified five parties of their potential liability as owners, operators or generators of waste at one or more parcels that comprise the Site, including a demand for payment of costs.

The PRPs have not been active in the remedy selection process for this Site; however, any comments presented by the PRPs and interested public during the public comment period are included in the Administrative Record for the Site and summarized in Part III of this ROD, The Responsiveness Summary.

C. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement has been consistent. EPA has kept the community and other interested parties apprised of Site activities through informational meetings, fact sheets, press releases and public meetings. Below is a brief chronology of public outreach efforts:

- In September 2012 EPA published a press release on the Creese and Cook Site's proposal to the National Priority List.
- In May 2013 EPA published a press release that the Site was finalized on the National Priorities List.

- In August 2014, EPA initiated consultation concerning OU 1 and 2, pursuant to EPA's obligations under Section 106 of the National Historic Preservation Act of 1966, as amended. Efforts included providing a Community Update and cover letter to the Massachusetts Historical Commission (MHC), the Mashpee Wampanoag Tribe and the Wampanoag Tribe of Gay Head (Aquinnah), to provide notification concerning the upcoming RI/FS activities and a Site update.

- In October 2014, EPA finalized a Draft Community Involvement Plan for the Site.

- On April 30, 2014, EPA held a public informational meeting in Danvers, MA, to describe plans for the upcoming Remedial Investigation and Feasibility Study.

    - The meeting was held at the Polish Club, which is adjacent to the Site, and was well attended by over 40 people, including local town officials.

- During the RI, EPA solicited community input regarding the current and reasonably anticipated future land use of the Site properties and potential beneficial ground-water uses at the Site were obtained from MassDEP, property owners, and the Town of Danvers. EPA also reviewed local zoning requirements and records at the Town Hall of Danvers.

- In July 2015, EPA released preliminary results of the Remedial Investigations for the ESA and WSA by mailing, hand delivering, and posting online a Community Site Update for local and adjacent residents, as well as for local town officials.

- In October 2016, EPA released final results of the Remedial Investigations for the ESA and WSA by mailing, hand delivering, and posting online a Community Site Update for local and adjacent residents, as well as for local town officials.

- On October 5, 2018, EPA made the administrative record, including the Feasibility Study, available for public review at EPA's offices in Boston and at Peabody Institute Library, 15 Sylvan Street, Danvers, MA. This is the primary information repository for local residents and will be kept up to date by EPA.

- On October 9, 2018, EPA published a legal notice announcing the release of an on-line link to EPA's Proposed Plan in the Boston Globe, posted a publicly accessible link on EPA's website, mailed out and hand delivered over 1000 post cards to the surrounding area residents, businesses and local officials, and provided a copy to the Peabody Institute Library, 15 Sylvan Street, Danvers, MA (posted on their website and available in hard copy).

- From October 9, 2018, through November 9, 2018, EPA held a thirty-day public comment period to accept public comments on the alternatives presented in the

Feasibility Study and the Proposed Plan.

- On October 25, 2018, EPA held a public informational meeting, immediately followed by the Public Hearing, to describe and then discuss the Proposed Plan, and to accept any oral or written comments. A transcript of this meeting and the comments, as well as EPA's response to comments, comprise the Responsiveness Summary, which is included as Part 3 of this Record of Decision.

D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As with many Superfund sites, the problems at this Site are complex. As a result, EPA has organized the work into three Operable Units (OUs). There are two Operable Units which are addressed by this ROD; the ESA is OU1 and the WSA is OU2. The Crane River is not included in this ROD and will be the subject of a separate study and decision document for operable unit three (OU3) in the future. The rational for the sequencing of OUs is to help prevent contaminated Riverbank soil[4] from the WSA or ESA from entering the Crane River. Soil contamination from within the Riverbank areas of OU 1 and OU 2, which are adjacent to and above the mean high tide of the Crane River, needs to be remediated before conducting work within the Crane River to avoid recontamination.

This is a comprehensive remedy for ESA-OU1 and WSA-OU2 that addresses soil contamination; shallow groundwater at the Site does not present a risk to construction workers or local residents from vapor intrusion. In addition, MassDEP has issued a use and value determination for area groundwater and concluded that groundwater is not a current or potential future drinking water supply. The selected remedy was developed by combining components of different source control soil alternatives to obtain a comprehensive approach for Site remediation. In summary, the selected remedy will utilize soil excavation, on-site consolidation and capping, and off-site disposal, in conjunction with institutional control components, along with wetland restoration or replication if necessary, and long-term monitoring; to address unacceptable risks from direct exposure, inhalation, and/or incidental ingestion of contaminated soil at the Site. The soil at the Site is not considered to be a principal threat waste; rather it is considered low-level threat waste.

The remedy for the WSA – OU2, will be conducted under EPA's remedial process. The remedy for the ESA – OU1, will also be conducted under EPA's remedial process, for all properties within the ESA, with the exception of 45 Water Street. The excavation of contaminated soil at 45

[4] The media described as Riverbank soil is characterized as such to more accurately describe the media collected. The primary objective of the Riverbank soil sampling performed for the remedial investigations was to characterize the soil along the banks of the Crane River associated with the Site parcels in OU1 and OU2 that visitors to the area would be likely to contact while walking along the river bank (not wading in the river). The Riverbank soil was considered to be an extension of the soil present inland of the river bank, rather than media from within the river channel. The samples were generally collected from locations near or above the high tide line, sometimes inundated at high tide. In the ESA, samples were collected primarily from the top of the marsh shelf and the vertical face of the shelf. In the WSA, samples were collected from localized depositional soil shelfs and banks along the western side of the Crane River.

Water Street will be completed under EPA's removal authority under CERCLA. More specifically, EPA issued a Removal Action Memo dated on September 20, 2018, memorializing the decision to expedite cleanup on this residential parcel, and including off-site disposal of excavated soil rather than consolidated onsite as part of the selected remedy for this area. Additional pre-removal soil sampling will be conducted to determine the final volume of contaminated soil to be addressed. As noted above in Section B.2, in 2012 EPA conducted a removal action to address contaminated soil at another residential area located at 33 Water Street. See Appendix E of this ROD for a copy of the 2018 Removal Action Memorandum.

Pre-design studies will include additional soil sampling to refine the vertical and lateral extent of soil contamination and will determine the volume of non-hazardous waste to be consolidated onsite. Variables such as slope stability for the consolidation area, footprint of the consolidation area, volume soil to be consolidated, implementation sequencing, and available funding may result in offsite disposal of additional non-hazardous soil from the residential and riverbank areas rather than consolidating this material onsite. Should such a change occur, EPA may issue another decision document.

E. SITE CHARACTERISTICS

The Creese Site is located in the Town of Danvers in northeastern Massachusetts. The Town of Danvers was incorporated in 1752 and is located approximately 24 miles northeast of Boston, with a population of approximately 27,909 (2016 Census) within the Town's 14.1 square miles. The Site in situated in an area that currently includes a mix of commercial, waterfront and residential uses. It is bounded to the north by Massachusetts Route 128 and residential properties, and to the east, west, and south by residential and commercial properties. The Crane River bisects the Site.

The sources of contamination, release mechanisms, exposure pathways to receptors for the ESA - OU1 and the WSA - OU2, as well as other site-specific factors, are discussed further below and are diagrammed in a Conceptual Site Model (CSM), which forms the basis for the risk assessments and response actions described in this Selected Remedy.

The CSM is a three-dimensional "picture" of Site conditions that illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors. It documents current and potential future site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. The risk assessments and response actions for the contaminated soil for the ESA - OU1 and WSA - OU 2, are based on this CSM.

Sections 1.5.1 and 1.5.2, of the September 2018 Feasibility Study for the Site contains a more detailed discussion of the nature and extent of contamination for the ESA and WSA, respectively. The significant findings of the ESA and WSA Remedial Investigation are summarized below.

ESA Characteristics, including Geology, Hydrogeology and Areas of Historical and Archaeological Importance

The following sections summarize the conclusions of the ESA RI property features including topography, surface water, floodplains, site features and areas of archaeological or historical importance.

The ESA is generally flat and slopes slightly to the west and south toward the Crane River. Surface drainage is generally towards the Crane River or into stormwater catchment basins. The Crane River is a freshwater tributary to the Danvers River estuary. The Crane River is tidally influenced and is a significant factor in shallow groundwater flow in the area. All of the ESA parcels are zoned for residential use; however, only 33 and 45 Water Streets are developed for current and future residential use. The area is served by a public water supply.

The 33 and 45 Water Street parcels contain residential condominium buildings, landscaped lawn and plantings, and paved parking areas. The 35 Water Street property is a small parcel with landscaped lawn, overgrown vegetation, and two historical markers. The 12 Cheever Street property, occupied by the Polish Club, is covered almost entirely with buildings and paved parking areas. The MBTA ROW is overgrown with brush, partly obscuring the abandoned railroad tracks that remain along the length of the parcel. The 20 Cheever Street property is undeveloped and overgrown with small trees and dense brush and contains wetlands and floodplains. See Figure 2 in Appendix A of this ROD, which depicts the ESA and WSA properties.

Subsurface utilities are located throughout the ESA, especially at 33 Water Street. The three occupied parcels, 12 Cheever Street, 33 Water Street, and 45 Water Street, all have underground gas, fiber-optic cable, electric, sewer, and water lines. Active sewer line trunks run beneath much of the length of the MBTA ROW.

Intertidal wetlands are present along the eastern shoreline of the Crane River (the western border of the ESA). Wetlands also occupy a significant portion of the 20 Cheever Street and 45 Water Street parcels. The 100-year flood zone of the Crane River extends over much of the ESA, including all of 20 Cheever Street and a large part of 45 Water Street and the MBTA ROW. The 100-year floodplain that extends onto the ESA is based on a flood elevation of 10 ft mean sea level (MSL) (Federal Emergency Management Agency [FEMA], 2014). Although there is no formal delineation of the 500-year floodplain by FEMA, the 500-year flood elevation that extends onto the ESA is estimated to be 12.5 ft NGVD[5]. Portions of the ESA are situated within the estimated extent of the 500-year floodplain. (See Figure 7 in Appendix A of this ROD)

Ecological features of the ESA are discussed below and in Section G of this ROD (Ecological

[5] FEMA allows the use of 1.25 x the Base Flood Elevation, per Technical Fact Sheet No. 1.6, *Designing for Flood Levels Above the BFE*, which is a part of the FEMA Technical Fact Sheet FEMA P-449, *Home Builder's Guide to Coastal Construction* (December 2010).

Risk Assessment) and are grouped into 4 areas: The three Water Street parcels; the MBTA ROW; 20 Cheever Street and a fringe salt marsh along the shoreline of the Crane River. Salt marsh habitat is characterized as Vulnerable (S3) habitat in Massachusetts due to a restricted range, relatively few occurrences (often 80 or fewer), limited acreage, or miles of stream, recent and widespread declines, or other factors making it vulnerable to extirpation from the state. With the exception of the salt marshes adjacent the Crane River proper, no other "priority natural communities" listed in MDFW's Natural Heritage program occur on the properties of Creese & Cook East Study Area. No endangered, threatened, or special concern species or supporting habitat were identified specifically for the Creese & Cook East Study Area, although the Crane River and its associated salt marsh in the vicinity of the Site is expected to provide habitat for the rare but recently delisted Osprey (Swain et al., 2012).

The surface geology in the ESA generally consists of fill, underlain by a clay/silt unit, except in a limited area where a subsurface layer of sand underlies the fill. Bedrock was not encountered during field investigations, but surface geophysics and regional mapping suggest that the bedrock surface is at least 35 feet below ground surface (bgs), with an estimated maximum depth of more than 90 ft bgs in the southern portion of 33 Water Street.

Shallow materials at the ESA consist primarily of heavily reworked fill, most likely from unknown off-site locations and includes industrial and construction debris mixed with coal ash and sandy soil. The depth of fill varies but is generally about 4 to 5 feet bgs throughout the ESA, except for most of 20 Cheever Street, where it is generally less than 2 feet thick. Several soil borings uncovered evidence of leather scraps. Most of the native soil below the fill layer is composed of extremely dense clay/silt, which is relatively free of subsurface layers of sand along the northern portion of the ESA. The central portion of 33 Water Street and areas to the south, however, include interbedded layers of sand of varied thickness below the surface.

The other primary native material encountered was a fine to medium sand, interspersed with varied amounts of coarser material and silt. The sand layer was generally encountered within the clay and silt layers except near 35 Water Street where this sand layer was much more extensive and may represent a former buried river channel.

The primary constraint on groundwater flow at the ESA is the extremely dense silt/clay layer, which begins at less than 8 feet bgs throughout most of the area and acts as a flow barrier. Monitoring wells installed in this area have extremely poor recharge. Hydraulic conductivities, which is a measure of how easily water can move through soil or rock, ranged from 0.007 feet/day to 16.6 feet/day. The hydraulic conductivity was less than 1 foot/day in six of the eight wells tested. The maximum hydraulic conductivity was observed in the only well where sand was present throughout the boring. The large variation in hydraulic conductivity across the ESA suggests that groundwater flow is strongly influenced by the sand deposits.

Shallow groundwater flow is primarily toward the southwest and the Crane River. Groundwater in the peninsula at the south end of the ESA also appears to radially flow to the southeast. Most of the groundwater flow is along the top of the silt/clay layer and near 35 Water Street.

In addition, 33 Water Street has an extensive network of subsurface utilities which may act as conduits for groundwater migration. A few of the central monitoring wells close to the edge of the Crane River were tidally influenced. The daily tidal cycle, more than 5 feet per tide, may cause groundwater to migrate away from the river.

Three historic assets associated with the ESA are listed in the inventory of *Historic and Archaeological Assets of the Commonwealth* (MHC, 2006). These assets are identified as the Israel Hutchinson Monument on 35 Water Street, the Creese & Cook footbridge that crosses the Crane River to connect the former tannery properties on the east and west sides of the river, and the entire Danversport Area where the ESA is located. Additionally, there is a high potential for pre-Contact (Native American) settlements to have occurred in the area. A reconnaissance-level archaeological survey performed for the RI concluded that undisturbed, undeveloped areas on 35 Water Street, 45 Water Street, 20 Cheever Street, the MBTA ROW, and the eastern bank of the Crane River are areas of high archaeological potential, where historical and/or pre-Contact archaeological resources may remain. Figure 10 in Appendix A of this ROD depicts areas of high archaeological potential on the ESA.

Nature and Extent of Contamination

The nature and extent of contamination for OU1 and OU2 was delineated by comparing contaminant concentrations in soil and groundwater to risk-based criteria and to background levels (soil only). The soil background levels are the values identified in the MassDEP Draft Technical Update: *Historic Fill/Anthropogenic Background Levels In Soil* (MassDEP, 2016)[6], which established background concentrations for metals and PAHs in "natural soil" (natural soil background levels) and in "soil containing coal ash or wood ash associated with fill material" (ash fill background levels). EPA determined that use of the MassDEP soil background values for these site contaminants, rather than site-specific background values, was appropriate for the Site evaluations and for establishing preliminary remediation goals (PRGs) because both natural and man-made conditions combine to make it difficult for EPA to define an appropriate sampling strategy for obtaining representative background concentrations of contaminants in Site soil. The ash fill background levels were used in the evaluation of ESA soils because of the extensive presence of historic fill containing ash in ESA soil. The natural soil background levels were used for evaluation of WSA soil. See further discussion in Administrative Record memo entitled, *Rationale for Selection of Background Chemical Concentrations in Soils at the Creese & Cook Tannery (formerly) Superfund Site, Danvers, MA, dated September 28, 2018.*

[6] Note that Table 1 of the 2016, MassDEP Draft Technical Update: *Historic Fill/Anthropogenic Background Levels In Soil,* dated May, 2016, is identical to Table 1 of the MassDEP *Technical Update, Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in soil,* dated May, 2002.

Sampling also established the location of two contaminants (arsenic and lead) where levels exceed the Massachusetts Upper Concentration Limits (UCLs) which will be addressed as part of the selected remedy.[7]

ESA Nature and Extent of Contamination

Remedial investigations for the ESA began in June 2014. Both soil and groundwater were tested by extracting the following samples for analysis: soil samples from 67 soil borings; groundwater from 13 groundwater monitoring wells EPA installed on the ESA of the Site; and Riverbank soil from 15 locations along the east area above the mean high tide mark of the Crane River. Groundwater was sampled for a full range of potential contaminants on a quarterly basis for one year. In addition, a tidal study of the Crane River was conducted to determine groundwater flow patterns and how the tidally influenced Crane River interacts with contaminants at the Site. Over 350 soil samples, over 60 groundwater samples and 15 Riverbank soil samples were collected during the ESA RI and analyzed for a full range of potential contaminants.

Contaminants were detected in ESA soil, groundwater, and Riverbank soil. TCLP testing conducted on investigation derived waste did not indicate hazardous waste, and low concentrations of contaminants were detected in groundwater. Given those results, soils are not likely to be characterized as RCRA hazardous waste, but will be characterized prior to consolidation and disposal. The nature and extent of contamination observed in these media are summarized below.

Groundwater

Several contaminants in ESA groundwater, including arsenic, dioxins/furans, and semi-volatile organic compounds (SVOC) exceeded one or more risk-based screening levels considered in the ESA RI. The RI used a conservative assessment approach comparing contaminant concentrations to a variety of screening criteria, including EPA standards for drinking water (EPA Maximum Contaminant Levels [MCLs] and Regional Screening Levels [RSLs]) as well as State and EPA standards for prevention of groundwater impacts to surface water (MCP GW-3 standards) and potential vapor intrusion impacts to occupants of the overlying buildings (EPA vapor intrusion screening levels [VISLs]).

Groundwater was sampled every three months for a year. VOCs were detected sporadically, infrequently and at low concentrations within the ESA. There is no apparent VOC plume on the former 33 Water Street tannery property; however, two VOCs were detected in groundwater at concentrations above Vapor Intrusion Screening Levels (VISLs), each in separate wells in the center and south of the ESA. The extent of contamination in both areas appears to be limited, the concentrations are generally low and decreasing, and VISLs were slightly and sporadically exceeded in only two locations.

[7] Upper Concentration Limits are limits used by MassDEP as part of its Method 3 risk assessment process in accordance with the MCP. EPA follows its federal risk assessment process to determine site risks.

Four metals (cadmium, chromium, lead, and zinc) were detected at concentrations exceeding MCP GW-3 standards for protection of surface water in ESA groundwater; however, the exceedances were infrequent and occurred primarily in one monitoring well located in the interior of the ESA (not along the shoreline).

Deep overburden groundwater has not been evaluated at the ESA, but based on several lines of evidence, significant contamination in deeper groundwater is unlikely. Additionally, because groundwater in the area has low use and value, it is not considered a potential source of drinking water. The lines of evidence supporting the conclusion that significant contamination in the deeper groundwater is unlikely include: relatively low concentrations of contaminants present in shallow groundwater (sporadic exceedance of PALs); primarily non-volatile (metals, dioxins/furans, PAHs) groundwater contaminants strongly associated with contaminants in fill materials present in the southern part of the East Study Area; limited presence of chlorinated VOCs in soil or groundwater; and absence of significant contaminant source material that would indicate presence of potential DNAPL or other source of deep groundwater contamination. The groundwater results indicate that contaminant levels in groundwater discharging to the river are generally and on average below the GW-3 standards and do not pose a threat to surface water.

Dichlorofluoromethane was detected only in MW-08, located in the parking lot at 12 Cheever Street (the Polish Club); it was detected during all four rounds of sampling, but generally at concentrations below both residential and commercial VISLs. None of the results exceeded the commercial VISL of 56 µg/L based on an HQ of 1.0; the commercial VISL is applicable to the current property use. The residential VISL based on an HQ of 1.0 was exceeded in only one of four sampling events.

Soil

Contaminated soil is the largest and most significant mass to be addressed in the ESA. Most of the soil contamination is within the top four feet of the surface, although high concentrations of metals and polycyclic aromatic hydrocarbons (PAHs) were detected in some areas deeper than four feet bgs at 33 Water Street, the original tannery property.

The soil contaminants of potential concern (COPC), identified based on contaminant distribution, concentrations relative to risk-based soil screening levels, and potential tannery-related sources are listed in Tables G-1 to G-3 in Appendix G of the ROD. Shown below is a subset of the COPCs, which have been identified as contaminants of concern (COCs) and include carcinogens and non-carcinogens. The other COCs for the ESA are generally co-located with arsenic except for lead that exceeds state UCLs, which is detected in a limited area on 20 Cheever Street. Therefore, by addressing unacceptable risks from arsenic, unacceptable risks from the other COCs will also be addressed. The lead exceeding the state UCLs will be addressed separately.

SOIL COCs for ESA only
Arsenic
Dioxin/Furan – Toxic Equivalent
Hexavalent Chromium
Benzo(a)pyrene
Benzo(a)anthracene
Benzo(b)fluoranthene
Dibenz(a,h)anthracene
Indeno(1,2,3-cd)pyrene
COC for 20 Cheever Street Only
Lead

The table below summarizes the minimum, maximum and average concentrations, of Site related COC for the ESA:

Contaminant of Concern	**units**	**East Study Area Soil**		
		Minimum Detected Concentration	**Maximum Detected Concentration**	**Average Detected Concentration**
Arsenic	mg/kg	2.9	1,530	37.2
Lead	mg/kg	5.8	24,000	287
Hexavalent Chromium	mg/kg	0.79	580	21.3
Dioxin TEQ	ng/kg	0.00715	1,340	72.3
Benzo(a)pyrene	ug/kg	5.3	150,000	2,860
Benzo(a)anthracene	ug/kg	3.8	170,000	3,060
Benzo(b)fluoranthene	ug/kg	4.6	200,000	4,020
Dibenz(a,h)anthracene	ug/kg	1.6	22,000	564
Indeno(1,2,3-cd)pyrene	ug/kg	3.5	79,000	1,640

The primary areas where high concentrations of these contaminants were detected are described below. Additional discussion and figures detailing the areas and volumes of soil contamination are included in Section 3.1 of the September 2018 FS.

- **33 Water Street/MBTA ROW property boundary area** – High concentrations of metals (notably arsenic, chromium, and hexavalent chromium), PAHs, and dioxins/furans were detected in surface and subsurface samples from this area (Nobis, 2018a).

- **33 Water Street** – High concentrations of arsenic, chromium, hexavalent chromium, and benzo(a)pyrene were detected in both surface and subsurface samples from sample locations in several areas of this property. The highest concentrations were generally detected in borings near the western border of the parcel and along the eastern side, beneath the former tannery footprint (Nobis, 2018a).

- **45 Water Street** – High concentrations of arsenic and dioxins/furans were detected primarily in surface soil from sample locations in several areas of the property. High concentrations of dioxins/furans and PAHs were identified in limited subsurface soil samples (Nobis, 2018a).

- **MBTA ROW** – High concentrations of arsenic and PAHs were detected in surface soils along the entire length of the ROW. Contaminants were generally not detected in subsurface soils, except in the area of the ROW adjacent to 33 Water Street.

- **Southern region of 20 Cheever Street and adjacent slope of the MBTA ROW** – High concentrations of several metals (most notably arsenic and lead) in surface and subsurface soils, and moderate concentrations of PAHs in surface soils were detected in these areas, and anthropogenic debris (glass, metal, wood, coal slag fragments) was encountered in soil borings (Nobis, 2018a). The ten highest lead concentrations detected in ESA soil samples were detected in the historic dumping/landfilling area on 20 Cheever Street. Sampling on 20 Cheever Street revealed a hot spot with concentrations exceeding the state UCL for lead.

For Riverbank soil, arsenic and chromium were detected in nearly every Riverbank soil sample. Arsenic concentrations consistently exceeded the risk-based screening levels and MassDEP background concentrations, whereas chromium concentrations generally exceeded only the background concentrations. Hexavalent chromium was detected in roughly half the riverbank soil samples, at concentrations exceeding the risk-based screening levels based on residential exposure (Nobis, 2018a). PAHs were detected extensively in riverbank soil. Benzo(a)pyrene consistently exceeded both risk-based screening levels. The highest PAH concentrations were detected in samples from the northwest portion of 20 Cheever Street and the segment of the MBTA ROW adjacent to 33 Water Street (Nobis, 2018a). Dioxins/furans were detected in every riverbank soil sample for which they were analyzed, consistently exceeding one or both risk-based screening levels. The locations of the highest dioxins/furans in Riverbank soil were similar to those of PAHs, especially in the vicinity of the southern MBTA ROW parcel (Nobis, 2018a).

Soil contamination is present in several areas identified as having potential historical or archaeological significance, including west of the Israel Hutchinson Monument on 35 Water Street, near the Creese & Cook footbridge, and in undeveloped areas of 35 Water Street, 45 Water Street, 20 Cheever Street, the MBTA ROW, and the eastern bank of the Crane River which are areas of archaeological potential in the ESA.

ESA – OU1 Conceptual Site Model

The CSM is based on information known about the Site through investigations conducted for the ESA and WSA. However, as studies are completed, including pre-design investigations and the future OU3 investigations, the CSM for ESA OU1 may be further revised.

Known Sources

Historical property uses in the East Study Area included tannery facilities (33 Water Street), a railroad right-of-way and associated station (MBTA ROW and 35 Water Street), and an undeveloped parcel used as a dumping area (20 Cheever Street). These land uses and associated waste disposal practices likely contributed to contamination in surface and subsurface soils, River bank soil, and groundwater in the East Study Area.

Contaminants associated with past tannery processes (including pre-tanning, tanning, finishing, and power generation) include arsenic, chromium, hexavalent chromium, dioxins/furans, and PAHs. These contaminants may be present in site media as a result of direct discharge or land disposal of liquid or solid tannery wastes; incidental spills of chemicals and fuels; emission of combustion byproducts from the tannery power plant; and disposal of coal ash from power generation. Contaminants associated with past railroad construction or railroad operations include PAHs, dioxins/furans, lead, arsenic, and other heavy metals. These contaminants may be present in site media as a result of leaching of chemicals from treated railroad ties; application of chemical herbicides and pesticides along the tracks; emission of combustion byproducts from railroad engines; and incidental spills of chemicals and fuels.

Other potential sources of contamination include dumping of solid wastes (including coal, ash, and slag) on 20 Cheever Street; and deposition of combustion byproducts from a fire that partially destroyed the Creese & Cook Tannery building in 1983. Contaminants and solid waste/debris present in soils at 33, 35, and 45 Water Street were likely redistributed during redevelopment of those parcels to their current use as residential condominium complexes (33 and 45 Water Street) with a small landscaped area (35 Water Street).

Soil Contamination

Most of the soil contamination is within the top four feet, although some high metal concentrations have been detected below this at 33 Water Street. Based on TCLP sampling of IDW and concentrations found in groundwater, contamination detected in soil is not leaching to groundwater. However, given that this contamination is close to the ground surface and most of the ESA is unpaved, the soils may be easily eroded by run-off and may become accessible to the residents and visitors to the area. In addition, soil close to the Crane River is subject to erosion from storm surge, high tides, and upstream flooding. Arsenic, chromium, PAHs and dioxin/furans were detected frequently and at concentrations exceeding levels in ESA Riverbank soil.

The HHRA evaluated the following exposure routes through which receptors may be exposed to soil contaminants:

- incidental ingestion of contaminated soils
- dermal contact with contaminated soils
- inhalation of dust and volatiles from soils

Groundwater

The contaminants detected in ESA groundwater are primarily non-volatile (metals, Polycyclic Aromatic Hydrocarbons (PAHs), and dioxins/furans) and tend to sorb to metals such as iron and aluminum oxides (present in high concentrations in construction debris and coal ash, which is present in the fill in within the ESA) and to aquifer materials, such as the silty clays and thin lenses of organic-rich silts. These contaminants may accumulate some distance away from the original source if they are dissolved in groundwater and encounter these subsurface materials. Groundwater beneath the Site has been determined by MassDEP to have low use and value and is not a current or potential future drinking water source; therefore, use of groundwater as potable water is not a potential exposure route for the Site. However, because groundwater in this area is shallow, people could be exposed to contaminants in shallow groundwater through direct contact with groundwater in excavation trenches or inhalation of contaminants that may volatilize into excavation trenches or future indoor air spaces.

The HHRA evaluated the following exposure routes through which receptors may be exposed contaminants in groundwater:

- inhalation of volatile contaminants in groundwater that may volatilize into excavation trenches
- incidental ingestion of shallow groundwater in excavation trenches
- dermal contact with shallow groundwater in excavation trenches
- inhalation of volatile contaminants in groundwater that may volatilize into indoor air spaces through vapor intrusion

Receptors

Residents at the condominium complexes could be exposed to surface soils during play or yard work. Recreational visitors could be exposed to surface soil at the MBTA ROW and 35 Water Street properties or the 20 Cheever Street property and soil along the eastern banks of the Crane

River. Construction workers could be exposed to soils at the condominium complexes, shallow groundwater, and vapors in excavation trenches. Residents could potentially contact contaminants in shallow groundwater through inhalation of volatiles in indoor air through vapor intrusion. Residents and construction workers could potentially contact subsurface soil brought to the surface during re-development or construction work. Future residents, commercial/ industrial workers, or construction/utility workers at 12 Cheever Street could potentially contact subsurface soil following or during future redevelopment of the property.

The SLERA focuses on the receptors that are ecologically significant, of high societal value, highly susceptible, and/or representative of broader groups. The following is a list of communities and representative target receptors evaluated in the SLERA.

Terrestrial Habitat – Soils of 33, 35 and 45 Water Street, MBTA ROW, and 20 Cheever Street:

- Soil – direct exposure
  - Vegetative community
  - Soil infaunal invertebrate community
- Soil – indirect exposure (dietary exposure)
  - Small mammal community
    - Invertivores – Northern short-tailed shrew
  - Avian community
    - Invertivores – American robin

Wetland and Aquatic Habitat – Soil along the riverine fringe at the base of the ROW slope along the Crane River and soil in wetlands on 20 Cheever Street:

- Soil – direct exposure
  - Vegetative community
  - Benthic community
- Soil – indirect exposure
  - Avian community
  - Invertivore/Piscivore – Great blue heron (Note that the dietary exposure to the heron is limited to the predation of marsh invertebrates. Exposure from the predation of fish will be evaluated in a future assessment of the Crane River.

See Figure 8 in Appendix A of this ROD, which depicts the CSM for the ESA. (See also Figure 4-1 of the ESA HHRA and Figure 2-2 of the ESA SLERA for the human health and ecological risk CSMs.)

WSA Characteristics, including Geology, Hydrogeology and Areas of Archaeological or Historical Importance

The following sections summarize the conclusions of the WSA, RI property features including topography, surface water, flood plains, site features and area of archaeological or historical importance.

The WSA is generally characterized as an upland area with topographical high points along the western regions, most notably on 55 Clinton Avenue. Most of the WSA area slopes gradually toward the Crane River to the north and east. The final slopes down to the banks of the Crane River are significantly steeper in the northern half of the WSA, whereas the slope down to the River is much more gradual in the southern half of the study area, including 27 Clinton Avenue. The southwest end of the 15 Pleasant Street parcel is generally flat and gently slopes down to the banks of the Crane River to the south. The central and northeast parts of the property are more steeply sloping. Just north of the parcel, topography rises quickly over 20 feet up to Massachusetts Route 128.

A majority of the 55 Clinton Avenue parcel is overgrown with low-lying shrubs and thick brush vegetation. The demolished remains of the tannery beamhouse remain in the center of the property. The former tannery building area and other identified contaminant source areas are surrounded by chain-link fence installed to prevent exposure to highly contaminated surface soils. The 27 Clinton Avenue parcel is also overgrown with low-lying shrubs and small trees. The former radio station building and collapsed radio tower remain on 27 Clinton Avenue in disrepair and there is evidence of fire and vandalism to the former building. The 15 Pleasant Street parcel remains undeveloped and overgrown with thick brush. The property is situated at the base of the Route 128 highway embankment, with no other roadway frontage.

Subsurface utilities are present on 55 Clinton Avenue and along the roadway west of 27 Clinton Avenue. No utilities are believed to be present on 15 Pleasant Street. A water line and an active sewer main run along Clinton Avenue and continue along the southwest side of 55 Clinton Avenue to the former building location. The water line terminates near the southern corner of the former beamhouse. The sewer main continues past the former beamhouse and makes a 90-degree bend northeast toward the Crane River. The sewer main then continues across the Crane River, along the path of the former railroad spur. Additional utilities may be present.

Estuarine Intertidal Emergent wetlands (also referred to as salt marshes) are present on the shoreline of the Crane River on both 55 and 27 Clinton Avenue. The 100-year flood zone of the Crane River extends along the eastern shoreline of 55 Clinton Avenue, and occupies more than half of 27 Clinton Avenue and all of 15 Pleasant Street. Although there is no formal delineation of the 500-year floodplain, the 500-year flood elevation that extends onto the Site is estimated to be 12.5 ft NGVD[8] Portions of the WSA are situated within the estimated extent of the 500-year floodplain. (See Figure 1-5 of the FS)

The ecological features of the WSA are discussed in Section G of this ROD (Ecological Risk Assessment) and are grouped into two areas: The two Clinton Avenue parcels; and a fringe saltmarsh along the shoreline of the Crane River. This salt marsh is expected to support the same fauna, aquatic life and small mammals as that described for the ESA fringe salt marsh and is also habitat characterized as Vulnerable (S3) habitat in Massachusetts. No endangered, threatened, or special concern species or supporting habitat were identified specifically for the WSA.

WSA geologic units can be divided into two broad categories: anthropogenic fill; and apparent native materials, indicative of the area. These materials are located in distinct areas and may represent different deposition as well as potential sources of contamination.

Overburden materials at the WSA consist primarily of fine to coarse sand and gravel. These materials include native soils, fill (that typically contains brick fragments, glass, ash/coal, possible byproduct material [precipitate], or/or leather scraps), and reworked soils (native and/or imported). Reworked soils are difficult to distinguish from native materials because they may have been brought in from excavations/leveling nearby and are similar to native materials. Several areas are known to be reworked or filled based on historical aerial photographs and other information evaluated for the RI. Some of the surface materials may be reworked contaminated materials from the historical source areas during past response actions. Native materials in the WSA include sand-gravel mixes, relatively clean sands, sand/silt mixtures and silt/clay units with minimal coarse material. The sand and sand/gravel units were much more extensive than in the ESA, with maximum depths of up to 28 feet.

Fill at the WSA is a mix of anthropogenic materials, including brick fragments, glass, ash/coal, byproduct materials, leather scraps, and reworked soil. Any zones with anthropogenic material and any material above these zones are considered to be fill, and/or fill from off-site unknown off-site locations. Fill depths ranged from 0.5 to 16 feet bgs. Tannery waste and leather scraps were encountered in only two borings. Animal hair or other tannery materials were not identified. Buried leather scraps were encountered within the upland pile area and the former Landfill Area B, and leather scraps were also observed on the ground surface at former Landfill Areas A and B. All of which are fenced off to prevent exposure. Other miscellaneous anthropogenic debris found included glass, poly sheeting, and metal scraps including nails.

The apparent native material encountered in the WSA was more varied than the material in the ESA. Material included sand-gravel mixes, relatively clean sands, sand/silt mixtures and silt/clay units with minimal coarse material. This location was historically a farm and the sand and gravel

[8] FEMA allows the use of 1.25 x the Base Flood Elevation, per Technical Fact Sheet No. 1.6, *Designing for Flood Levels Above the BFE*, which is a part of the FEMA Technical Fact Sheet FEMA P-449, *Home Builder's Guide to Coastal Construction* (December 2010).

units were much more extensive than those found underneath the ESA, with maximum depths of up to 28 feet observed.

The study area hydrogeology is strongly influenced by the variation in native materials (clay/silty/clay to sand) and tidal impacts. Overburden material at the WSA is predominately sandy soil, except for in the south end of 55 Clinton Ave and the area south of the former beamhouse.

Hydraulic conductivities range from 1.9 feet/day to 105 feet/day. The lowest hydraulic conductivities were observed north of the former beamhouse, in an area extending to the northern railroad bridge. Groundwater flow at the WSA is to the southeast and generally toward the Crane River. Groundwater in the WSA is also tidally influenced.

Historic assets located on the WSA are listed in the inventory of *Historic and Archaeological Assets of the Commonwealth*, include the Endicott and Russell family cemeteries. The Creese & Cook footbridge, described in the ESA Characteristics section above, also extends to the WSA. Additionally, there is a high potential for pre-Contact (Native American) settlements to have occurred in the WSA, as well as within the ESA. The reconnaissance-level archaeological survey performed for the RI concluded that undisturbed and undeveloped areas of 55 and 27 Clinton Avenue include areas of high archaeological potential because historical and/or pre-Contact archaeological resources may remain onsite. Figure 11 in Appendix A of this ROD depicts the areas of high archaeological potential, on the WSA of the Site.

WSA – Nature and Extent of Soil Contamination

Starting in November of 2015, the soil, groundwater, and Riverbank soil were tested in the WSA and a tidal study of the Crane River was also completed to determine groundwater flow patterns over time.

Groundwater samples were collected quarterly (every three months) for one year from the 14 WSA groundwater monitoring wells. Soil samples were collected from 88 soil borings and 15 riverbank soil sample locations. More than 575 soil samples, over 57 groundwater samples, and 15 riverbank soil samples were collected during the WSA RI investigations and analyzed for a full range of potential contaminants. Contaminants were detected in WSA soil, groundwater, and riverbank soil. Sampling results from the debris testing where the former tannery building was located on 55 Clinton Avenue, confirmed the presence of non-friable asbestos in roofing materials mixed-in with the building debris in the area.

As part of the RI, TCLP testing conducted on investigation derived waste did not indicate hazardous waste. Given those results and low concentrations of contaminants detected in WSA groundwater, most of the WSA soils are not likely to be characterized as RCRA hazardous waste but will be characterized prior to consolidation and disposal. For costing purposes the FS assumed that 15% of excavated soil may be classified as hazardous waste. The nature and extent of contamination observed in these media are summarized below.

Groundwater

Groundwater sampling was conducted every three months over a one-year period of time. SVOCs, VOCs, and dioxins/furans were detected sporadically, infrequently and generally at low concentrations.

Several contaminants in WSA groundwater, including arsenic, chromium, dioxins/furans, and a few VOCs exceeded one or more risk-based screening levels. The screening levels considered in the RI included EPA standards for drinking water (EPA MCLs and RSLs) as well as State and EPA standards for prevention of groundwater impacts to surface water (MCP GW-3 standards) and potential vapor intrusion impacts to occupants of the overlying buildings (EPA VISLs).

Arsenic and chromium were the only analytes detected in groundwater at concentrations exceeding the MCP GW3 criteria for protection of surface water and the exceedances were infrequent and inconsistent. All exceedances of MCP GW-3 standards occurred in samples from two wells: arsenic exceeded the MCP GW-3 standard in one of four samples from MW-20 (located within the Landfill Area B footprint) and chromium exceeded the criteria in two of four samples from MW-17 (located between the former beamhouse building and former Sludge Lagoon Area C) (Nobis, 2018c). The groundwater results indicate that contaminant levels in groundwater discharging to the river are generally below the MCP GW-3 standards and do not pose a threat to surface water.

Three analytes (naphthalene, bromodichloromethane, and chloroform) were detected at concentrations exceeding VISL criteria; however, the exceedances were infrequent and inconsistent. Each analyte exceeded the criteria in only 2 of 44 samples collected during the RI sampling events and the exceedances occurred in only a few monitoring wells, distributed across the WSA. Naphthalene concentrations exceeded the VISL at one location (MW-20) during three of four sampling events; bromodichloromethane exceeded the GW-3 criteria once at each of two locations (MW-21, and BH-12/MW-8), and chloroform exceeded the criteria once at each of three locations (MW-15, MW-21, and BH-12/MW-8) (Nobis, 2018c). The groundwater results indicate that contaminant levels in WSA groundwater are generally below the VISL standards for potential vapor intrusion impacts to occupants of overlying buildings and there is no VOC plume in the WSA groundwater.

Three analytes (arsenic, chromium, and selenium) were detected at concentrations exceeding EPA MCLs, but the exceedances were spatially inconsistent and sporadic across sampling events. As noted above, Site groundwater has been determined by MassDEP to have low use and value and not a current or potential drinking water source. Therefore, drinking water standards are not directly applicable to Site groundwater.

Based on a review of historic and current groundwater data from the wells located in the vicinity of the existing waste containment cell on 55 Clinton Avenue, it appears that no leaching of contaminants from the cell into groundwater is occurring.

Soil

The most significant contamination detected in the WSA, and the largest contaminant mass, is associated with WSA soils. Most of the contamination is found within the top 2 feet of surface soil; in subsurface soil associated with the former Landfill Areas A and B; and in several identified soil piles on 55 Clinton Avenue, north of the former beamhouse.

The soil COPCs, identified based on contaminant distribution, concentrations relative to risk-based screening levels, and potential tannery-related sources are listed in Tables G-4 and G-5 in Appendix G of the ROD. Shown below is a subset of the COPCs which have been identified as contaminants of concern (COCs) and include both carcinogens and non-carcinogens:

SOIL CONTAMINANTS OF CONCERN
COCs For WSA
Arsenic
Dioxin/Furan - Toxic Equivalent
Hexavalent Chromium
Benzo(a)pyrene

The COCs for the WSA are generally collocated with arsenic. Therefore, by addressing unacceptable risks from arsenic, unacceptable risks from the other COCs will also be addressed.

The following table below summarizes the minimum, maximum and average concentrations, of Site related COC for the WSA:

Contaminant of Concern	**units**	**West Study Area Soil**		
		Minimum Detected Concentration	**Maximum Detected Concentration**	**Average Detected Concentration**
Arsenic	mg/kg	3	14,400	98.1
Hexavalent Chromium	mg/kg	0.47	68	5.36
Dioxin TEQ	ng/kg	0.287	14,700	547
Benzo(a)pyrene	ug/kg	0.35	4,500	217

Arsenic was the most widespread contaminant present at high concentrations in WSA soil. The primary areas where high concentrations of the WSA COCs were detected are described below. Additional discussion detailing the areas and volumes of soil contamination are provided in Section 3.1, of the FS.

- **55 Clinton Avenue** – Elevated concentrations of arsenic were widespread in surface soil. A hot spot area of UCL exceedance for arsenic was identified in the northeast corner of this parcel. Subsurface soil contamination was found primarily in identified historical contaminant waste disposal/source areas. High arsenic and dioxin/furan concentrations were detected in surface and subsurface soil in the former Landfill Area A, former Landfill Area B, former Sludge Lagoon Area C, and Upland Soil Pile Area. Elevated arsenic concentrations were also found in surface and subsurface soil north and west of the Endicott and Russell family cemeteries, including another large fill pile. Some of the deepest contamination (8 – 12 ft bgs) was observed within the two fill piles and former Landfill Areas A and B. Soil beneath the existing concrete slab of the former beamhouse was not sampled; however, it is expected that similar contaminants are likely present beneath the building and they will be fully characterized during pre-design investigations.

- **27 Clinton Avenue** – Elevated arsenic concentrations, above MassDEP Background Levels for natural soils, were identified in surface soils in the northeastern region of the property. Other COC concentrations were relatively lower than those found farther north on 55 Clinton Avenue.

- **15 Pleasant Street** – Elevated concentrations of arsenic, chromium, and lead were identified in soil samples collected within the top four feet of soil. Dioxin/furans were detected at moderate concentrations (less than the EPA Industrial RSL value) in the one sample from 15 Pleasant Street analyzed for dioxin/furan.

In WSA Riverbank soil, arsenic concentrations exceeded EPA RSLs for residential and industrial/commercial exposure in all 19 samples and exceeded the MassDEP Background natural soil criterion in 15 of 19 samples. Dioxins and furans were detected in a majority of riverbank soil samples for which they were analyzed. Five of six samples exceeded the Residential RSL and four of six exceeded the dioxin/furan toxic equivalent (TEQ) commercial/industrial RSL. The highest dioxins and furans in WSA riverbank soil were found in the vicinity of former Landfill Area B. PAHs were detected frequently but as relatively lower concentrations. No samples exceeded the commercial/industrial RSL or MassDEP Background value for natural soils. The highest PAH concentrations were detected in samples directly downgradient of former Landfill Areas A and B (Nobis, 2018c). PCBs, pesticides and VOCs were detected infrequently and at low concentrations in riverbank sol and are not COCs in WSA riverbank soils (Nobis, 2018c).

Building debris from the demolished former beamhouse building on 55 Clinton Avenue was also sampled. Asbestos was detected in roofing tar/mastic that was sampled as part of a Hazardous Materials Building Survey in December 2015. Only 5 of the 78 samples contained asbestos. The roofing/tar mastic was observed co-mingled with the beamhouse demolition debris to the extent that it would be technically impractical to attempt to separate the asbestos containing materials (ACM) from the building debris. ACM is not a COC for the remediation of soil for the WSA. It is a concern only with regard to handling and disposal of former beamhouse building debris. Building material samples were analyzed for lead based paint and PCBs; none were detected.

Additionally, universal waste (i.e., gaskets, oils, insulation, or other potentially hazardous/regulated material/installed building components such as fluorescent light tubes/ballasts, storage tanks, and transformers) were not identified.

Soil contamination is present at or near several areas identified as having potential historical or archaeological significance, including near the Creese & Cook footbridge; areas immediately south, east and north of the Russell and Endicott family cemeteries; in the historically undeveloped areas of 27 and 55 Clinton Avenue, and along the western bank of the Crane River. The RI sampling results indicate that most of soils are likely not RCRA hazardous waste, although they will be characterized for disposal. Areas of high historical and archaeological potential in the WSA are depicted on Figure 11 in Appendix A of this ROD.

No soil samples have been collected for chemical analysis from within the Endicott and Russell family cemeteries. However, during the early site investigation phase for the NPL listing of the Site (December 2011), soil samples were collected from areas immediately adjacent to the cemeteries to help establish appropriate background conditions in the area. Metals, including arsenic, were detected in these samples at concentrations below the MassDEP background soil concentrations for arsenic and below arsenic concentrations found in surface soil across most of the 55 Clinton Avenue property.

According to the Archaeological Reconnaissance Survey conducted for the RI, the granite wall surrounding the Endicott family cemetery was erected prior to the construction of the former tannery building and numerous headstones are present that mark both the Endicott and Russell burial grounds. The cemeteries are located at a similar or slightly higher elevation than the former tannery facility. Based on the background sampling results, topography, and clear demarcation identification of the Endicott cemetery with a continuous granite wall, as well as review of historical aerial photographs, it is believed that no significant contamination (i.e. from deposition of tannery wastes) is present within the cemeteries.

Conceptual Site Model – WSA – OU2

The CSM is based on information known about the Site through investigations conducted for the ESA and WSA. However, as studies are completed, through pre-design investigations, the CSM for WSA OU1 may change.

Known Sources

Creese & Cook tannery operations were conducted at the western tannery facility on 55 Clinton Avenue beginning in 1914. Solid wastes from the tanning process were disposed of in two on-site landfills. Liquid wastes were processed through an on-site lagoon system located approximately 150 feet east of the former beamhouse building; suspended solids settled from the liquid effluent and accumulated as sludge in the lagoons, and the liquid effluent was discharged directly into the Crane River until 1975 and then to the municipal sanitary sewer system. Based on conversations with area residents familiar with past Site operations, liquid wastes from the lagoons may have sometimes overflowed, flowed overland following the topography of the land, and impacted the area south and southeast of the lagoons, which included the northern portion of 27 Clinton Avenue.

Potential subsurface contamination sources in the WSA include tannery waste, construction/demolition debris, coal/ash, and other buried material, which may have been imported or deposited locally to fill low spots, most notably in observed fill piles and former waste disposal areas identified in previous environmental investigations. Surface-only arsenic and PAH impacts along the railroad spur north of the former beamhouse may be from railroad operations, including preservatives used for railroad ties, ash/slag deposited during rail operations, train exhaust, and weed control. Surficial contamination north of the Endicott and Russell cemeteries and east of the waste containment cell may be attributed to the reworking or grading of contaminated fill material.

No specific releases or discharges have been identified that would serve as a continuing source of groundwater contamination, but the subsurface soil contamination may impact groundwater where deep enough. The primary sources of riverbank soil contamination are from riverbank erosion of fill/contaminated soil and re-deposition of contaminated sediment along the river, specifically near the former Landfill Areas A and B (Nobis, 2018c).

Soil Contamination

Most of the soil contamination is found within the top two feet of soil, and in subsurface soils in the former tannery waste source areas (former Landfill Areas A and B, former Sludge Lagoon Area C, Upland Soil Pile Area). The WSA has a generally higher surface elevation than the ESA, and the depth to the water table is up to 20 feet bgs.

Arsenic is the most widespread contaminant present at high concentrations in WSA soil. The highest concentrations of most contaminants were detected near the former Landfill Area B. The highest soil concentrations tend to be located within the unsaturated zone and have less potential to leach to groundwater. However, given that extremely high concentrations of metals such as arsenic are located close to the ground surface and most of the WSA is unpaved, the soils may be easily eroded by run-off and may be accessible to the visitors to the area. In addition, soil close to the Crane River is subject to erosion from storm surge, high tides, and upstream flooding.

Arsenic and dioxins/furans were the contaminants detected most frequently in riverbank soil at concentrations exceeding screening levels. PAHs were detected frequently in WSA riverbank soil, but at relatively lower concentrations. See Tables 4-11a-f of the WSA RI for a summary of riverbank soil/sediment results.

The HHRA evaluated the following exposure routes through which receptors may be exposed to WSA soil contaminants:

- incidental ingestion of contaminated soils

- dermal contact with contaminated soils
- inhalation of dust and volatiles from soils

Groundwater

Study area hydrogeology is strongly influenced by the variation in native materials and tidal impacts. The results of the hydraulic conductivities ranged from 1.9 feet/day to 105 feet/day in different areas within the WSA. Groundwater was encountered at depths ranging from 6.5 to 24.7 ft bgs in wells on the Clinton Avenue properties and its flow from the WSA is generally east toward the Crane River; however, the daily tidal cycle may cause groundwater to migrate back from the river, especially close to the Crane River. Depth to groundwater varies greatly on the WSA due to the changes in topography of this area. Utilities are not expected to be significant preferential pathways for contamination through most of the WSA because they are primarily limited to the shallow overburden along the western edge of the study area. The sewer line that crosses the northern portion of the study area is relatively shallow (to cross the river via northern railroad bridge) and not expected to change groundwater flow in the area.

Groundwater beneath a large part of the WSA is shallow (less than 15 ft bgs). Groundwater contaminants are primarily non-volatile; however, two VOCs (chloroform, bromodichloromethane) were detected at concentrations above VISLs in WSA wells. VOCs in shallow groundwater may volatilize into future indoor air spaces at the Study Area through VI. This pathway is based on the scenario that as part of daily living, a receptor is surrounded by an airspace that contains volatile organic vapors originating from contaminated media (groundwater) in the source areas. Exposure of the receptor occurs upon inhalation of the indoor air. Based on the limited number and extent of VOC detections and low concentrations, only occasionally exceeding VISLs, volatilization and migration of VOC vapors are not anticipated to be significant; however, this exposure pathway was evaluated and determined not to pose an unacceptable risk.

The HHRA evaluated the following exposure routes through which receptors may be exposed to WSA groundwater contaminants:

- inhalation of volatile contaminants in groundwater that may volatilize into indoor air spaces through vapor intrusion

Receptors

Receptors may come into direct contact with soil contaminated by the release of chemicals from the source areas. During the receptor's period of contact, the individual may be exposed via inadvertent ingestion of a small amount of soil or via dermal absorption of certain contaminants in the soil. Receptors may come into contact with soil particulates and vapors contaminated by the release of chemicals from the soil through inhalation of dust and soil vapors, particularly when there is no vegetative cover.

Groundwater beneath a large part of the Study Area is shallow. Contaminants in shallow groundwater may volatilize into future indoor air spaces at the Study Area through vapor intrusion. Receptors may come into contact with the contaminants via inhalation of indoor air.

Rather than attempt to evaluate the potential adverse effects to every plant, animal, or community present and potentially exposed at a site, the SLERA focuses on the receptors that are ecologically significant, of high societal value, highly susceptible, and/or representative of broader groups. The following is a list of communities and representative target receptors evaluated in this SLERA.

Terrestrial Habitat – Soils of 27 and 55 Clinton Avenue:

- Soil – direct exposure
  - Vegetative community
  - Soil Infaunal invertebrate community

- Soil – indirect exposure (dietary exposure)
  - Small mammal community
    - Invertivores – Northern short-tailed shrew (Blarina brevicauda)
  - Avian community
    - Invertivores – American robin (Turdus migratorius)

Wetland and Aquatic Habitat –along the riverine fringe along the Crane River and soil in wetlands on 27 and 55 Clinton Avenue:

- Soil – direct exposure
  - Vegetative community
  - Benthic community
- Soil – indirect exposure
  - Avian community
    - Invertivore/Piscivore – Great blue heron (*Ardea herodias*) Note that the dietary exposure to the heron in this SLERA is limited to the predation of marsh invertebrates. Exposure from the predation of fish will be evaluated in a future assessment of the Crane River proper.

See Figure 9 in Appendix A of this ROD, which depicts the CSM for the WSA. (See 4-1 of the WSA HHRA and Figure 2-2 of the WSA SLERA for the human health and ecological risk CSMs.)

<u>No Principal Threat Wastes Identified</u>

No principal threat waste was identified for OU1 and OU2. Principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Wastes generally considered to be principal threats are liquid, mobile, and/or highly-toxic source material.

Although EPA has not established a threshold level of toxicity/risk to identify a principal threat waste, generally where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater, the source material is considered principal threat waste. With respect to Site soil, total cancer risk levels in all areas evaluated in the ESA and WSA Human Health Risk Assessments are below 10^{-3}, soil contaminant concentrations generally do not significantly exceed the reference dose levels for non-cancer risks, and with the exception of a small area on 20 Cheever Street, lead soil concentrations are below levels that would result in blood lead levels of concern. Additionally, the source area contaminants on the Site are not highly mobile, as demonstrated by the relatively low and infrequently detected Site related COCs in groundwater.

Site soil is characterized as low-level threat waste. The selected response actions will address low-level threat wastes at the Site through excavation, on-site consolidation and capping, off-site disposal actions and through implementation of institutional controls. The small area of lead that exceeds UCLs on 20 Cheever Street will be excavated and disposed offsite.

No PCB Remediation Waste at the Site

EPA regulations at 40 C.F.R. Part 761 implementing the Toxic Substances Control Act ("TSCA") establish cleanup and disposal requirements for *PCB remediation waste*.

By definition at 40 C.F.R. § 761.3:

> "Polychlorinated Biphenyls *(PCB's) remediation waste* means waste containing PCBs as a result of a spill, release, or other unauthorized disposal, at the following concentrations: Materials disposed of prior to April 18, 1978, that are currently at concentrations ≥ 50 ppm PCBs, regardless of the concentration of the original spill; materials which are currently at any volume or concentration where the original source was ≥ 500 ppm PCBs beginning on April 18, 1989, or ≥ 50 ppm PCBs beginning on July 2, 1979; and materials which are currently at any concentration if the PCBs are spilled or released from a source not authorized for use under this part...."

The RI sampling results indicate that PCB concentrations in soil at the Site are well below 50 ppm and industrial operations pre-date 1978. In addition, there is no evidence of post-1978 spills or releases on the property. Based on these facts, PCB-contaminated soil does not meet the definition of a *PCB remediation waste* and therefore would not be regulated for cleanup and disposal under 40 C.F.R. Part 761.

F. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The current and reasonably anticipated future land uses(s) of the ESA and WSA Site properties, as well as the surrounding areas, was considered by evaluating local zoning requirements and records at the Town Hall of Danvers and through discussions with Town of Danvers officials, property owners, the community and MassDEP representatives.

Current Land Uses and Reasonably Anticipated Future Land Uses - ESA – OU1

The current land uses and the reasonably anticipated future land uses, and the current Town of Danvers zoning requirements for each parcel within the ESA of the Site, are identified as follows:

- 33 Water Street –This parcel currently contains 28 residential condominium units located in four separate buildings. The ground units have small decks and the rest of the parcel includes a combination of grassy areas (lawns) and paved driveways and parking lots. The parcel is currently zoned for residential use. The reasonably anticipated future land use is expected to remain residential.

- 35 Water Street – This parcel currently contains the Colonel Hutchinson Memorial historical marker surrounded by the grass/lawn and is used for recreation by nearby residents. It is currently zoned for residential use. However, a supplemental HHRA evaluation was conducted for the FS, including a screening-level risk evaluation for future residential use of this area to evaluate and support the need for Institutional Controls to restrict consideration of any possible future residential use. The reasonably anticipated future land use is expected to remain passive/recreational.

- 45 Water Street – This parcel currently contains five residential condominium units located in a single building. The condominium building is surrounded by a combination of gassy areas (lawns), driveway and parking lots. It is used as a residential condominium complex with lawn and paved parking areas and is currently zoned for residential use. The reasonably anticipated future land use is expected to remain residential.

- MBTA ROW – This parcel of land is a former railroad line Right of Way, with active sewer trunk lines underneath portions of the property. The property is not being actively used as a railroad and the tracks are in disrepair/degraded; current use is passive recreational. It is currently zoned as residential and Waterfront Village, which allows for mixed commercial and residential use. The reasonably anticipated future land use is expected to remain passive/recreational because of its location and physical features, which include wetlands, floodplains, underground sewer lines and limited accessibility. Future residential development is considered highly unlikely and was not evaluated in the baseline HHRA. However, a supplemental HHRA evaluation was conducted for the FS, including a screening-level risk evaluation for future residential use of this area to evaluate and support the need for Institutional Controls to restrict consideration of any possible future residential use.

- 20 Cheever Street – This parcel is currently undeveloped, approximately half covered by wetlands, and located totally within the 100- and 500-year floodplains. It is currently zoned for residential use, although it is currently undeveloped and only used by trespassers/recreational. Due to its location in an area that features both wetlands and floodplains, future residential development is considered highly unlikely and was not evaluated in the baseline HHRA. However, a supplemental HHRA evaluation was conducted for the FS, including a screening-level risk evaluation for future residential use of this area to evaluate and support the need for Institutional Controls to restrict consideration of any possible future residential use. The reasonably anticipated future land use is expected to remain passive/recreational because of its location, as described above, and limited accessibility.

- 12 Cheever Street – This parcel is currently owned and operated by the Polish Club. It includes a building, paved parking areas and is currently zoned as residential and Waterfront Village, which allows both mixed commercial and residential use. The future reasonably anticipated land use is expected to remain Waterfront Village.

Land use in areas that are adjacent to, or proximate to the ESA include:

- Residential neighborhoods.
- Commercial properties, i.e., daycare facility, restaurants laundromat.

Current Land Uses and Reasonably Anticipated Future Land Uses - WSA – OU2

The current and reasonably anticipated future land uses and the current Town of Danvers zoning requirements for each parcel within the WSA of the Site are identified as follows:

- 27 Clinton Avenue – This parcel of land is currently undeveloped and zoned for residential use. There are no existing usable commercial, industrial, or residential structures on this property. However, burnt remnants of the former radio station building and tower from a 1960's local radio station, remain. Current use is passive recreational from trespassers only. The reasonably anticipated future land use for this parcel is expected to remain residential.

- 55 Clinton Avenue - This parcel of land is currently undeveloped and zoned for residential use. There are no existing usable commercial, industrial, or residential structures on this property. A capped consolidation cell, constructed as part of previous response actions by the property owner, is located on the northwestern portion of 55 Clinton Avenue and Route 128. Construction debris, which contains non-friable asbestos containing materials from the demolition of the former tannery building, also remains on 55 Clinton Avenue, surrounded by a chain-link fence. An active homeless camp, occupied by two to three people, was present throughout and following the RI investigations, and represents current use of the property. Evidence of several former homeless camps has also been observed. The reasonably anticipated future land use south of the beamhouse is residential. The reasonably anticipated future land use north of the beamhouse will be restricted by the remediation and by the presence of the historic cemeteries.

- 15 Pleasant Street – This parcel is currently an undeveloped slip of land located within an area containing wetlands and floodplains and is currently zoned for residential use. There are no commercial, industrial, or residential structures on this property, which is located adjacent to Route 128. Evidence of former homeless camps was observed and represents current use of the property. The reasonably anticipated future land use is expected to remain passive/recreational/homeless because of its inaccessible location, as well as the presence of wetlands and floodplains. Future residential development is considered highly unlikely and was not evaluated in the baseline HHRA. However, a supplemental HHRA evaluation was conducted for the FS, including a screening-level risk evaluation for future residential use of this area to evaluate and support the need for Institutional Controls to restrict future residential use, however unlikely.

Land use in areas that are adjacent and proximate to the WSA currently include:

- Residential neighborhoods on 55 Clinton Avenue and on nearby streets.
- Commercial properties, i.e., daycare facility, movie theater, wholesale club, supermarket, and restaurants.

An estimated 775 people live within a quarter mile of the Site, 3,200 people live within a half mile of the Site, and 12,000 people live within a mile of the Site.

Current and Future Groundwater Use - ESA - OU1 & WSA - OU2

Groundwater at the Site and in surrounding areas is not used for drinking water purposes. The Town of Danvers provides potable drinking water to the areas. Further, there are no public drinking water wells within one mile of the Site and no private wells located within 500 feet of the Site. Based on a well search conducted as part of the Groundwater Use and Value Determination that MassDEP conducted, it was determined that there are no wells, either for potable or non-potable use located within the ESA or WSA areas.

In August 2015, at the request of EPA, MassDEP conducted a Groundwater Use and Value Determination to establish whether the aquifer beneath the Site should be considered of "high", "medium", or "low" value. The evaluation was performed in accordance with criteria for groundwater classification promulgated in the MCP. The classification contained in the MCP considers criteria similar to those recommended in EPA's Use and Value Guidance.

The evaluation concluded that groundwater beneath the Site has a "low" use and value and is not considered a current or potential future drinking water source. The aquifer itself is generally considered to be of low to moderate yield; however, it is not considered a suitable drinking water source now or for the future because of the surrounding commercial land usages and high salinity of the groundwater due to its close proximity to the ocean. The 2015 MassDEP Groundwater Use and Value Determination is included in Appendix F of this ROD.

In addition, discussions with the Town of Danvers Board of Health indicated that any potable water well must be installed to a depth greater than 100 ft bgs and would require authorization prior to any well installation. Potable water wells cannot be installed in or near septic systems, in associated leach fields, or within municipal easements.

A risk evaluation was conducted to determine if the low and sporadic levels of contaminants in shallow groundwater could pose a risk to construction workers from direct contact and a preliminary screening was conducted to determine if contaminants in shallow groundwater could volatilize and enter existing or future buildings through basements and/or sump pumps, via indoor air. Potential future construction workers could be exposed to vapor from groundwater in construction trenches, therefore this scenario was also evaluated. The results of the preliminary screening confirmed that there are no unacceptable risks to residents living at 33 or 45 Water Street and/or to future residents that may reside at 55 and 27 Clinton Avenues, or to construction workers or occupants of 12 Cheever Street from a vapor intrusion pathway or, based on a risk evaluation, to construction workers from direct contact with shallow groundwater.

G. SUMMARY OF SITE RISKS

This section summarizes the baseline human health risk assessments, the screening level ecological risk assessments (SLERA); and a supplemental human health risk assessment for both OUs. A more complete discussion of these risk assessments can be found in the following documents in the administrative record: Final Human Health Risk Assessment (HHRA) for the Creese and Cook Tannery (Former) Superfund Site – East Study Area, dated September 2017; Final HHRA for the Creese and Cook Tannery (Former) Superfund Site – West Study Area, dated September 2018; Supplemental Human Health Risk Evaluations for the Creese and Cook Tannery (Former) Superfund Site, dated September 2018; Final SLERA for the Creese and Cook Tannery (Former) Superfund Site – East Study Area, dated September 2017; and the Final SLERA for the Creese and Cook Tannery (Former) Superfund Site – West Study Area, dated September 2018.

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial actions were to be taken. It provides the basis for taking remedial action and identifying the contaminants and exposure pathways that need to be addressed by the remedy. The human health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances which, given the specifics of the Site, were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances; and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates. A summary of components of the human health and ecological risk assessments which support the need for remedial action are discussed below.

1. Human Health Risk Assessment

a. Hazard Identification

Data collected for soil, groundwater, and riverbank soil at the Site were used to identify contaminants by media. Approximately 30 of the more than 100 chemicals detected at the Site were selected for evaluation in the human health risk assessment as chemicals of potential concern. The chemicals of potential concern were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment and can be found in the HHRA - East Table 3-1 and HHRA - West Table 3-1. From this, a subset of the chemicals were identified in the Feasibility Study as presenting a significant current or future risk and/or were identified at the Site in excess of the appropriate chemical specific ARAR value and are referred to as the chemicals of concern (COCs) in this ROD. These COCs include dioxin/furans, arsenic, hexavalent chromium, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Tables numbers G-1 through G-8, which are attached in Appendix G to this ROD, contain the exposure point concentrations used to evaluate the reasonable maximum exposure scenarios in the baseline risk assessments for the COCs in soil, shallow groundwater and Riverbank soil. Estimates of exposure point concentrations for all chemicals of potential concern in all media evaluated can be found in the HHRA - East Appendix A, Tables A-3-1 through A-3.5, HHRA - West Appendix A, Tables A-2.1 through A-2.3, and Supplemental Human Health Risk Evaluations, Tables B-2.4b through B-2.4d.

b. Exposure Assessment

Exposures to chemicals of concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure scenarios. Exposure scenarios were developed considering the nature and extent of contamination, the location of the Site, current and future potential Site use, and identification of potential receptors and exposure pathways. The Site includes the West Study Area (WSA) and East Study Area (ESA).

The following is a brief summary of just the exposure pathways that were found to present a significant risk assuming a reasonable maximum exposure scenario. A more thorough description of all exposure pathways evaluated in the HHRA – East including estimates for an average exposure scenario, can be found in the HHRA – East Section 4. A more thorough description of all exposure pathways evaluated in the HHRA – West, can be found in HHRA – West Section 4. A description of additional residential exposure pathways evaluated in the Supplemental Evaluations, can be found in the Supplemental Human Health Risk Evaluations - Section 5.

33 and 45 Water Street: Surface soil - Dermal contact and incidental ingestion of soil, and inhalation of dust were evaluated for current child (ages 1-6 years) residents who may be exposed 350 days per year for 6 years and current lifetime residents who may be exposed 350 days per year for 26 years.

MBTA Properties: Surface soil - Dermal contact and incidental ingestion of soil, and inhalation of dust were evaluated for current child (ages 1-6 yrs) recreational visitors who may be exposed 78 days per year for 6 years.

20 Cheever Street: Surface soil - Incidental ingestion of soil was evaluated using the EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model for a conservative estimate of current child recreational visitor exposure to lead. The model assumes residential exposures for young children ages 1 to 6 years old.

East Side Riverbank: Surface soil - Dermal contact and incidental ingestion of soil were evaluated for current child (ages 1-6 years) recreational visitors who may be exposed 78 days per year for 6 years.

55 and 27 Clinton Avenue: Surface soil - Dermal contact and incidental ingestion of soil, and inhalation of dust were evaluated for current homeless adult trespassers who may be exposed 350 days per year for 10 years and current adolescent trespassers (ages 6-16 years) who may be exposed 78 days per year for 10 years.

West Side Riverbank: Surface soil - Dermal contact and incidental ingestion of soil, and inhalation of dust were evaluated for future child (ages 1-6 years) residents who may be exposed 350 days per year for 6 years and future lifetime residents who may be exposed 350 days per year for 26 years.

33 and 45 Water Street, 20 Cheever Street, MBTA Property, 55 Clinton Avenue and 15 Pleasant Street: Aggregate soil (0-10 ft) - Dermal contact and incidental ingestion of soil, and inhalation of dust were evaluated for future child (ages 1-6 years) residents who may be exposed 350 days per year for 6 years and future lifetime residents who may be exposed 350 days per year for 26 years. For contaminated aggregate soil (0-10 ft) at 55 Clinton Avenue, dermal contact and incidental ingestion of soil, and inhalation of dust were also evaluated for future commercial/industrial workers who may be exposed 225 days per year for 25 years and future construction workers who may be exposed 130 days per year for one year.

c. <u>Toxicity Assessment</u>

EPA assessed the potential for cancer risks and non-cancer health effects in the human health risk assessment.

Carcinogenic Effects

The potential for carcinogenic effects is generally described by two factors: a statement reflecting the degree of confidence that the compound causes cancer in humans, and a potency estimate indicating how potent the chemical may be at causing cancer, with the general assumption that every exposure has some probability of resulting in cancer. The descriptor reflecting the degree of confidence that the compound causes cancer in humans may be either an alpha-numeric value or a narrative. Both are closely tied to the nature and extent of information available from human and animal studies. The cancer potency estimate is a quantitative measure of a compound's ability to cause cancer and is generally expressed as either an oral cancer slope factor (CSF) or an inhalation unit risk (IUR) value. Cancer slope factors and unit risk values are toxicity estimates developed by EPA based on epidemiological and/or animal studies and they reflect a conservative "upper bound" of the potency of the carcinogenic compound. That is, the true potency is unlikely to be greater than the potency described by EPA. Table G-9, which is included in Appendix G of this ROD, presents these cancer toxicity values and cancer classifications for the COCs for the ingestion and dermal pathways. Table G-10, which is included in Appendix G of this ROD, presents these cancer toxicity values and cancer classifications for the COCs for the inhalation pathway.

Dioxins were evaluated through use of dioxin toxicity equivalents (TEQs). The toxicity of one specific dioxin compound, 2,3,7,8 tetrachloro dibenzo p dioxin (2,3,7,8 TCDD), has been studied more than other known dioxins and furans. The toxicities of all other dioxins and furans are expressed in relation to 2,3,7,8 TCDD. Toxicity equivalency factors (TEFs) were used to convert concentrations of individual dioxin and furan congeners to TEQs of 2,3,7,8 TCDD. Concentrations of individual dioxins and furans were multiplied by their TEFs to yield 2,3,7,8 TCDD equivalent concentrations. These values were then totaled to yield total dioxin TEQs for each sample. Cancer risks from dioxin TEQs were then evaluated using the CSF and IUR for 2,3,7,8-TCDD.

EPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposures to Carcinogens (EPA, 2005) was followed when assessing carcinogens that act with a mutagenic mode of action. EPA's Age-Dependent Adjustment Factors (ADAFs) were used to assess the increased susceptibility of children to carcinogens in scenarios including children and adolescents.

Non-Carcinogenic Effects and Non-Linear Carcinogenic Effect

For addressing non-carcinogenic effects and effects of carcinogenic compounds which exhibit a threshold, it is EPA's policy to assume that a safe exposure level exists, which is described by the reference dose (RfD) or reference concentration (RfC). RfDs and RfCs have been developed by EPA as estimates of a daily exposure that is likely to be without an appreciable risk of an adverse health effect when exposure occurs over the duration of a lifetime. RfDs and RfCs are derived from epidemiological and/or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The RfDs relevant to this Site are presented in **Table G-11**, which is attached to this ROD in Appendix G. The RfCs relevant to this Site are presented in **Table G-12**, which is attached to this ROD in Appendix G. The TEQ approach used to address cancer effects was also used to evaluate non-cancer effects from exposures to dioxin using the RfD and RfC for 2,3,7,8-TCDD.

d. Risk Characterization

The risk characterization combines the exposure estimate with the toxicity information to estimate the probability or potential that adverse health effects may occur if no action were to be taken at a site. A separate characterization is generated depending on the nature of the adverse effect. Cancer risks are generally expressed as a probability whereas the potential for adverse non-cancer effects (and carcinogenic effects resulting from non-linear mode of action compounds) are described in terms of what is thought to be a safe exposure level.

For exposure to most known or potentially carcinogenic substances, EPA believes that as the exposure increases, the cancer risk increases. In characterizing risk to these types of carcinogenic compounds, a chemical-specific exposure level is generally multiplied with the cancer potency factor or inhalation unit risk to estimate excess lifetime cancer risk as a result of exposure to site contaminants. Typically, the resulting cancer risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} or 1E-06 for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure (as defined) to the compound at the stated concentration.

To the extent that EPA has deemed that data are sufficient to apply the provisions of the 2005 Children's Supplemental Cancer Risk Guidelines, special consideration of the increased susceptibility to carcinogenic effects that children may have, was included in the risk characterization. The 2005 Children's Supplemental Cancer Guidelines were used to describe any such heightened susceptibility among potentially exposed children.

All risks estimated represent an excess risk of cancer from exposures to contamination originating from the Site. These are risks above and beyond that which we face from other causes such as from cigarettes or ultra-violet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. EPA generally views site related cancer risks in excess of 10^{-6} to 10^{-4} as unacceptable. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

In assessing the potential for adverse non-carcinogenic effects (and carcinogenic effects resulting from non-linear MOA compounds), a hazard quotient (HQ) is calculated by expressing the exposure dose (or the exposure concentration in the case of air exposures) as a ratio of the reference value (RfD or RfC). A HQ ≤ 1 indicates that a receptor's exposure to a single contaminant is less than the safe value and that adverse effects are unlikely. Conversely, a HQ >1 indicates that adverse effects as a result of exposure to the contaminant are possible. To account for additive effects resulting from exposure to more than one compound, a Hazard Index (HI) is generated by adding the HQs for all chemicals of concern that have the same or a similar mechanism or mode of action. As a conservative measure and a common practice, HQs are often added for all compounds of concern that affect the same organ or system (i.e. liver, nervous system) since the mechanism or mode of action is not always known. A HI < 1 indicates that adverse effects are unlikely, whereas a HI >1 indicates adverse effects are possible. Generally, EPA views HI values based on site-related exposure in excess of unity as unacceptable. It should be noted that the magnitude of the HQ or HI is not proportional to the likelihood that an adverse effect will be observed.

The following is a summary of the media and exposure pathways that were found to present a significant risk exceeding EPA's cancer risk range (10^{-6} to 10^{-4} or E-06 to E-04) and non-cancer threshold (HI of 1). Only those exposure pathways deemed relevant to the remedy being proposed are presented in this ROD. Readers are referred to Section 8 of the Final HHRA for the Creese and Cook Tannery (Former) Superfund Site – East Study Area, dated September 2017, Section 8 of the Final HHRA for the Creese and Cook Tannery (Former) Superfund Site – West Study Area, dated September 2018, and Section 5.5 of the Supplemental Human Health Risk Evaluations for the Creese and Cook Tannery (Former) Superfund Site, dated September 2018, for a more comprehensive risk summary of all exposure pathways evaluated for all chemicals of potential concern.

<u>Residential exposures at 33 and 45 Water Street</u>

- Non-cancer (for a child HI = 7) and cancer risks for current residents exposed to surface soil (3×10^{-4}).
- Non-cancer (for a child HI = 8) and cancer risks for future residents exposed to aggregate soil (0 to 10 ft bgs) (4×10^{-4}).
    - **Table G-13**, which is attached to this ROD in Appendix G, depicts the *carcinogenic* risk summary for the chemicals of concern in surface soil at 33 and 45 Water Street evaluated to reflect current (adult and child) resident exposure via incidental ingestion, dermal contact, and inhalation pathways corresponding to the reasonable maximum exposure (RME) scenario. *For the current resident (adult and child), carcinogenic risk from surface soil exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}.* Major contributors to risk are hexavalent chromium, arsenic, dioxin/furans, and carcinogenic PAHs.

- **Table G-14**, which is attached to this ROD in Appendix G, depicts the *non-carcinogenic* risk summary for the chemicals of concern in surface soil at 33 and 45 Water Street evaluated to reflect *current* child resident exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the current young child resident, non-carcinogenic risk from surface soil exceeded the EPA target organ HI of 1 for the reproductive, dermal, and cardiovascular systems.* The exceedances are primarily due to dioxin/furans and arsenic. Non-carcinogenic risks for future adult residents were below the HI of 1.

- **Table G-15**, which is attached to this ROD in Appendix G depicts the *carcinogenic* risk summary for the chemicals of concern in aggregate soil (0-10 ft) at 33 and45 Water Street evaluated to reflect potential future lifetime resident (adult and child) exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future lifetime resident (adult and child), carcinogenic risk from aggregate soil exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}.* Major contributors to risk are carcinogenic PAHs, arsenic, hexavalent chromium, and dioxin/furans.

- **Table G-16,** which is attached to this ROD in Appendix G, depicts the *non-carcinogenic* risk summary for the chemicals of concern in aggregate soil (0-10 ft) soil at 33 and 45 Water Street evaluated to reflect current and potential future child resident exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future young child resident, non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the reproductive, dermal, and cardiovascular systems.* The exceedances are primarily due to dioxin/furans and arsenic. Non-carcinogenic risks for future adult residents were below the HI of 1.

- Calculated human health risks were within or below EPA target levels for non-cancer and cancer risks for construction workers exposed to aggregate soil. See Appendix B-1.1 of the 2018 Feasibility Study.

<u>Recreational visitor exposures to surface soil at the MBTA Properties</u>

- Non-cancer (for a child HI = 3) and cancer risks (3×10^{-4}) for recreational child visitor exposed to surface soil.

  - **Table G-17,** which is attached to this ROD in Appendix G, depicts the *carcinogenic and non-carcinogenic* risk summary for the chemicals of concern in surface soil at the MBTA properties evaluated to reflect current and potential future child and adult recreational exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future young child recreational visitor, carcinogenic risk exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4} and non-carcinogenic hazards from surface soil exceeded the EPA target organ HI of 1 for the reproductive system.* Major contributors to cancer risk are hexavalent chromium, arsenic, dioxin/furans, and carcinogenic PAHs. The HI exceedance is primarily due to dioxin/furans. Carcinogenic and non-carcinogenic risk for adult recreational visitors did not exceed EPA's cancer risk range or a HI of 1.

<u>Recreational visitor exposures to surface soil at the ESA Riverbank</u>

- Non-cancer risk (for a child HI = 4) for recreational visitor exposed to riverbank soil.
    - **Table G-18,** which is attached to this ROD in Appendix G, depicts the *non-carcinogenic* risk summary for the chemicals of concern in surface soil at the east riverbank evaluated to reflect current child recreational exposure via ingestion and dermal pathways corresponding to the RME scenario. *For the current young child recreational visitor, non-carcinogenic hazards from surface soil exceeded the EPA target organ HI of 1 for the reproductive, dermal, and cardiovascular systems.* The exceedances are primarily due to dioxin/furans and arsenic. Non-carcinogenic risk for adult recreational visitors were below the HI of 1.
    - Calculated human health risks are within or below EPA target levels for cancer risks for adult and child recreational visitors exposed to riverbank soil. See Appendix B-1.1 of the Feasibility Study.

<u>Homeless adult trespasser exposures to surface soil at 27 and 55 Clinton Avenue</u>

- Non-cancer (HI = 20) and cancer risks (3 x 10^{-4}) for current homeless adult trespassers exposed to surface soil.
    - **Table G-19,** which is attached to this ROD in Appendix G, depicts the *carcinogenic* risk summary for the chemicals of concern in surface soil at 27 and 55 Clinton Avenue evaluated to reflect current homeless adult trespassers exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the current homeless adult trespassers, carcinogenic risk from surface soil exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}.* Major contributors to risk dioxin/furans, arsenic, and hexavalent chromium.

- **Table G-20,** which is attached to this ROD in Appendix G, depicts the non-carcinogenic risk summary for the chemicals of concern in surface soil at 27 and 55 Clinton Avenue evaluated to reflect current homeless adult trespassers exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the current homeless adult trespassers, non-carcinogenic hazards from surface soil exceeded the EPA target organ HI of 1 for the reproductive, dermal, and cardiovascular systems.* The exceedances are primarily due to dioxin/furans and arsenic.

<u>Adolescent trespasser exposures to surface soil at 27 and 55 Clinton Avenue</u>

- Non-cancer (HI = 3) risks for current adolescent trespassers exposed to surface soil.

    - **Table G-21,** which is attached to this ROD in Appendix G, depicts the non-carcinogenic risk summary for the chemicals of concern in surface soil at 27&55 Clinton Avenue evaluated to reflect current adolescent trespassers exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the current adolescent trespassers, non-carcinogenic hazards from surface soil exceeded the EPA target organ HI of 1 for the reproductive system.* The HI exceedance is primarily due to dioxin/furans.

    - Calculated human health risks are within or below EPA target levels for cancer risks for current adolescent trespassers exposed to surface soil. See Appendix B-1.2 in the Feasibility Study.

<u>Residential exposures to aggregate soil at 55 Clinton Avenue</u>

- Non-cancer (child HI=43; adult HI=4) and cancer risks (9×10^{-4}) for future residents exposed to aggregate soil at 55 Clinton Avenue.

    - **Table G-22,** which is attached to this ROD in Appendix G, depicts the *carcinogenic* risk summary for the chemicals of concern in aggregate soil (0-10 ft) at 55 Clinton Avenue evaluated to reflect potential future lifetime resident (child and adult) exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future lifetime resident (child and adult), carcinogenic risk from aggregate soil exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}.* Major contributors to risk are arsenic, dioxin/furans, hexavalent chromium, and benzo(a)pyrene (a carcinogenic PAH).

- **Tables G-23 and G-24,** which are attached to this ROD in Appendix G, depict the *non-carcinogenic* risk summaries for the chemicals of concern in aggregate soil (0-10 ft) soil at 55 Clinton Avenue evaluated to reflect potential future child resident and potential future adult resident exposure to aggregate soil (0-10 ft) at 55 Clinton Avenue via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future child resident, non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the all systems evaluated. For the future adult resident, non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the reproductive system.* The exceedance for the reproductive system is primarily due to dioxin/furans.

<u>Exposure to aggregate soil at 27 Clinton Avenue</u>

- Calculated human health risks are within or below EPA target levels for non-cancer and cancer risks for future residents, construction workers, and commercial/industrial workers exposed to aggregate soil at 27 Clinton Avenue. See Appendix B-1.2 of the Feasibility Study.

<u>Commercial/industrial worker exposures to aggregate soil at 55 Clinton Avenue</u>

- Non-cancer (HI=3) and cancer risks (2×10^{-4}) for future commercial/industrial workers exposed to aggregate soil at 55 Clinton Avenue.

    - **Table G-25,** which is attached to this ROD in Appendix G, depicts the *carcinogenic* risk summary for the chemicals of concern in aggregate soil (0-10 ft) at 55 Clinton Avenue evaluated to reflect potential future commercial/industrial worker exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future commercial/industrial worker, carcinogenic risk from aggregate soil exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}.* Major contributors to risk are arsenic and dioxin/furans.

    - **Table G-26,** which is attached to this ROD in Appendix G, depicts the *non-carcinogenic* risk summary for the chemicals of concern in aggregate soil (0-10 ft) soil at 55 Clinton Avenue evaluated to reflect potential future commercial/industrial worker exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future commercial/industrial worker, non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the reproductive system.* The exceedance is primarily due to dioxin/furans.

Construction worker exposures to aggregate soil at 55 Clinton Avenue

- Non-cancer risks (HI=8) for future construction workers exposed to aggregate soil at 55 Clinton Avenue **Table G-27,** which is attached to this ROD in Appendix G, depicts the *non-carcinogenic* risk summary for the chemicals of concern in aggregate soil (0-10 ft) soil at 55 Clinton Avenue evaluated to reflect potential future construction worker exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future construction worker, non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the reproductive, dermal, and cardiovascular systems.* The exceedances are primarily due to dioxin/furans and arsenic.

- Calculated human health risks are within or below EPA target levels for cancer risk for future construction workers exposed to aggregate soil at 55 Clinton Avenue. See Appendix B-1.2 of the Feasibility Study.

Residential exposures to aggregate soil at 20 Cheever Street

- Non-cancer (for a child HI =11) and cancer risks for hypothetical future resident exposed to aggregate soil (3×10^{-4}).

  - **Table G-28**, which is attached to this ROD in Appendix G, depicts the *non-carcinogenic* risk for the hypothetical future child resident *and carcinogenic* for the hypothetical future lifetime resident (age 0-26 years) risk summary for the chemicals of concern in aggregate soil (0-10 ft) at 20 Cheever Street evaluated to reflect exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the hypothetical future child resident, the non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the cardiovascular and dermal systems. For hypothetical future lifetime residents (ages 0-26 years), carcinogenic risk from aggregate soil exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}.* The HI exceedance is primarily due to arsenic. Major contributors to cancer risk are hexavalent chromium, arsenic, dioxin/furans, and benzo(a)pyrene (a carcinogenic PAH).

  - Calculated human health risk are within or below EPA's target levels for non-cancer and cancer risks for recreational visitors exposed to surface soil. See Appendix B-1.1 of the Feasibility Study.

Residential exposures to aggregate soil at the MBTA properties

- Non-cancer (for a child HI = 11) and cancer risk for hypothetical future resident exposed to aggregate soil (1×10^{-3}).

    - **Table G-29**, which is attached to this ROD in Appendix G depicts the *non-carcinogenic* risk for the hypothetical future child resident *and carcinogenic* risk for the hypothetical future lifetime resident (age 0-26 years) summary for the chemicals of concern in aggregate soil (0-10 ft) at the MBTA properties evaluated to reflect exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the hypothetical future child resident, non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the reproductive, cardiovascular, and dermal systems. For future hypothetical lifetime residents (age 0-26 years), carcinogenic risk from aggregate soil exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}.* The HI exceedance is primarily due to dioxin/furans and arsenic. Major contributors to cancer risk are hexavalent chromium, arsenic, dioxin/furans, and carcinogenic PAHs.

<u>Residential exposures to aggregate soil at 15 Pleasant Street</u>

- Non-cancer (for a child HI = 13) for hypothetical future resident exposed to aggregate soil.

    - **Table G-30**, which is attached to this ROD in Appendix G, depicts the *non-carcinogenic* risk for the hypothetical future child resident *and carcinogenic* risk for the hypothetical future lifetime resident (age 0-26 years) summary for the chemicals of concern in aggregate soil (0-10 ft) at 15 Pleasant Street evaluated to reflect exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the hypothetical future child resident, non-carcinogenic hazards from aggregate soil exceeded the EPA target organ HI of 1 for the cardiovascular and dermal systems.* The HI exceedance is primarily due to arsenic.

    - Carcinogenic risk to hypothetical future lifetime resident was at the high end but within EPA's cancer risk range. See Appendix B-2 of the Feasibility Study.

    - Calculated human health risks are within or below EPA target levels for non-cancer and cancer risks for current adult and adolescent trespassers exposed to surface soils. See Appendix B-1.2 of the Feasibility Study.

<u>Residential exposures to surface soil at the West Riverbank</u>

- Non-cancer (for a child HI =9) and cancer risks for hypothetical future resident exposed to surface soil (3×10^{-4}).

- **Table G-31,** which is attached to this ROD in Appendix G, depicts the *non-carcinogenic risk for hypothetical future child resident and carcinogenic* risk for the hypothetical future lifetime resident (age 0-26) summary for the chemicals of concern in surface soil at the WSA riverbank evaluated to reflect exposure via ingestion, dermal, and inhalation pathways corresponding to the RME scenario. *For the future child, non-carcinogenic hazards exceeded the EPA target organ HI of 1 for the cardiovascular and dermal systems. For the hypothetical future lifetime resident (age 0-26 years), carcinogenic risk exceeded the EPA acceptable risk range of* 10^{-6} *to* 10^{-4}. The HI exceedance is primarily due to arsenic. Major contributors to cancer risk are arsenic, dioxin/furans, and benzo(a)pyrene (a carcinogenic PAH).

- Calculated human health risks are within or below EPA target levels for non-cancer and cancer risks for current and future recreational (adult or child) visitors to riverbank soil. See Appendix B-1.2 and Section 1.7.2.1 of the Feasibility Study.

<u>Exposure to aggregate soil at 12 Cheever Street</u>

- No unacceptable cancer or non-cancer risks to future child or adult residents, construction, or commercial/industrial workers from aggregate soil at 12 Cheever Street. See Appendix B-1.1 and section 1.7.1.1 of the Feasibility Study.

The above risks and hazards combine risks from exposures to soil via ingestion and dermal pathways, as well as inhalation of dust where appropriate. All receptors evaluated in the HHRA with potential for exposures to multiple media were found to have acceptable risk levels. Therefore, no risks from multiple media are presented in this ROD.

Lead

Risks from lead exposure are not evaluated using the same methodology as other contaminants.

The Integrated Exposure and Uptake Biokinetic (IEUBK) model and the Adult Lead Methodology (ALM) for lead is used to assess exposures to lead. These models estimate blood lead concentrations. Blood lead concentration is the most used index of internal lead body burdens associated with potential adverse health effects of lead. Studies indicate that infants and young children are most susceptible to adverse effects from exposure to lead. Considerable behavioral and developmental impairments have been noted in children with elevated blood lead levels. Evaluation of the young child in a residential scenario is considered protective of adults, including pregnant women, and children in a less frequent exposure scenario, including recreational visitors. The IEUBK model was used to evaluate the potential hazards resulting from exposure to lead for young children less than 7 years of age as the most sensitive receptor group. EPA uses the Adult Lead Methodology to estimate the fetal blood lead concentrations in women exposed to lead-contaminated soil in non-residential scenarios. It is EPA Region I policy to protect 95% of the sensitive population against blood lead levels in excess of the target level of concern of 5 μg/dL blood.

Lead was not identified as a COPC in surface soil in yards at 33 and 45 Water Street condominiums complexes; therefore, lead is not a concern to current residents at 33 and 45 Water Street condominiums complexes. Lead was also not identified as a COPC in aggregate soil at 27 Clinton Avenue; therefore, lead is not a concern to future residents at 27 Clinton Avenue.

Potential future residential child exposure to lead in aggregate soil at 33 and 45 Water Street, in surface soil at 20 Cheever Street, in surface soil at the MBTA properties, and in aggregate soil at the 55 Clinton Avenue property were evaluated using the IEUBK model. Based on the model, future potential exposures to lead in aggregate soil at the 33 and 45 Water Street condominium complexes and the 55 Clinton Avenue property do not exceed EPA's target level of concern for child residents.[9] For evaluation of recreational child exposures to surface soil at 20 Cheever Street, EPA's IEUBK model was adjusted to eliminate site contributions to indoor air (dust) and eliminate maternal blood, diet, and drinking water default contributions to total lead exposures. A GSD of 1.6 was assumed. An average lead concentration of 1,389 mg/kg in soil was used as the exposure point concentration. The outcome of the model revealed that 18 percent of exposed recreational child visitors (aged 0 to 84 months) is predicted to have blood lead levels greater than 10 μg/dL.

Exposures to lead in surface soil at 55 Clinton Avenue and 27 Clinton Avenue by homeless adult trespassers, in surface soil at 15 Pleasant Street by homeless adult trespassers, and in aggregate soil at 55 Clinton Avenue by future commercial industrial workers and construction workers were evaluated by use of the ALM. The results of the ALM indicate that adverse effects are not anticipated for fetuses of pregnant homeless adult trespassers exposed to lead in surface soil at the 55 Clinton Avenue and 27 Clinton Avenue properties, future adult commercial industrial workers exposed to lead in aggregate soil at the 55 Clinton Avenue property, or future adult construction workers exposed to lead in aggregate soil at the 55 Clinton Avenue property. Adverse effects are possible for fetuses of pregnant homeless adult trespassers exposed to lead in surface soil at the 15 Pleasant Street property; however, these results reflect the exposure frequency and enhanced ingestion rates considered for the homeless adult trespasser scenario. A re-evaluation of homeless adult trespasser exposures to lead in surface soil at the 15 Pleasant Street property using reduced exposure frequencies indicates that homeless adult trespasser exposures at the 15 Pleasant Street property of up to 250 days per year would result in blood lead levels below EPA's target level of concern. Because of the location and physical characteristics of the property, exposures of 250 days per year or more are considered unlikely.

For evaluation of potential hypothetical residential child exposures to aggregate soil at 20

[9] The target level used in the ESA risk assessment was 10 ug/dL. As noted above, EPA's current target level is now 5 ug/dL. Since the average lead concentration was only 94 mg/kg, even with a target of 5 ug/dL, the levels would be below 5 ug/dL.

Cheever Street, the MBTA properties, and 15 Pleasant Street, maximum concentrations were compared to a screening level of 200 mg/kg established by EPA Region I. Maximum lead concentrations for aggregate soil at 20 Cheever Street, the MBTA properties, and 15 Pleasant Street were 24,000 mg/kg, 3,100 mg/kg, and 2,410 mg/kg, respectively. The outcome of the evaluations revealed that maximum concentrations at each of these locations were well above the screening level indicating that blood lead levels for a potential hypothetical residential child would exceed the target level of concern.

For evaluation of current child recreational visitors and potential hypothetical residential child exposures to surface soil at the east riverbank and at the west riverbank, maximum concentrations were compared to a screening level of 200 mg/kg established by EPA Region I. Maximum lead concentrations for surface soil at the east and west riverbank were 652 mg/kg and 914 mg/kg, respectively. The outcome of the evaluations revealed that maximum concentrations at each of these locations were above the screening level; however, average concentrations of lead in east and west riverbank surface soil were 171 mg/kg and 179 mg/kg, below the screening level; indicating that child recreational visitors and potential hypothetical residential child exposures to lead at the east and west riverbanks would not exceed the target level of concern.

Additional detailed discussion can be found in Section 6 of the ESA-OU1 Risk Assessment, Section 6 of the WSA-OU1 Risk Assessment, and the Supplemental Human Health Risk Evaluations.

Groundwater and Vapor Intrusion

EPA did not conduct a risk assessment on the use of groundwater as drinking water. MassDEP's Groundwater Use and Value Determination concluded that groundwater beneath the Site has a "low" use and value and is not considered a current or potential future drinking water source. The aquifer itself is generally considered to be of low to moderate yield; however, it is not considered a suitable drinking water source now or for the future because of the surrounding commercial land usages and high salinity of the groundwater due to its close proximity to the ocean. In addition, discussions with the Town of Danvers Board of Health indicated that any potable water well must be installed to a depth greater than 100 ft bgs and would require authorization prior to any well installation. In addition, potable water wells cannot be installed in or near septic systems, in associated leach fields, or within municipal easements. The 2015 MassDEP Groundwater Use and Value Determination is included in Appendix F of this ROD.

A risk evaluation was conducted to determine if the low and sporadic levels of contaminants in shallow groundwater could pose a risk to construction workers from direct contact and a preliminary screening was conducted to determine if contaminants in shallow groundwater could volatilize and enter existing or future buildings through basements and/or sump pumps, via indoor air. Potential future construction workers could be exposed to vapor from groundwater in construction trenches, therefore this scenario was also evaluated. The results of the preliminary screening confirmed that there are no unacceptable risks to residents living at 33 or 45 Water Street and/or to future residents that may reside at 55 and 27 Clinton Avenues, or to construction workers or occupants of 12 Cheever Street from a vapor intrusion pathway or, based on a risk evaluation, to construction workers from direct contact with shallow groundwater.

Additional detailed discussion can be found in Section 6 of the ESA OU1 Risk Assessment and the WSA-OU1 Risk Assessment.

Uncertainties

Although there are various sources of uncertainty throughout the risk assessments, assumptions were made to provide conservative estimates that are protective of public health such that the risk estimates are unlikely to underestimate potential risks. The following uncertainties are worthy of note.

- Background concentrations were not used to eliminate COPCs. However, comparison of maximum soil concentrations at the ESA to MassDEP background concentrations for coal ash fill within the state of Massachusetts, indicates that several of the selected COPCs, including several COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and hexavalent chromium) are present near or below these state background levels in some portions of the Study Area. Risks from these contaminants may be attributable to background conditions.

- Sampling at 15 Pleasant Street was very limited; therefore, per risk assessment guidance, maximum detected concentrations were used as exposure point concentrations (EPCs)to evaluate potential risks. Use of maximum detected concentrations is likely to overestimate risks.

- The residential RME estimates for the MBTA properties, 20 Cheever Street, and 15 Pleasant Street were performed in the Supplemental Evaluation for the FS to help ensure that the remedial alternatives developed for the Site are protective. However, residential RME risk estimates for these areas are believed to be overly conservative because the areas are entirely or largely located within the 100-year floodplain and the intertidal zone of the Crane River, intertidal wetlands cover significant parts of these areas, and these areas have other physical characteristics that would interfere with residential development (i.e. lack of street frontage, small size, narrow shape).

- The IEUBK lead model used to evaluate potential lead exposures to surface soil at 20 Cheever Street indicates lead exposures may exceed EPA's target level of concern; however, the model is overly conservative for the recreational scenario being considered at this location and results are driven primarily by high concentrations in a localized area. This scenario was re-evaluated for the FS to determine whether soils outside the hot spot of UCL exceedance for lead area would exceed target levels. Re-evaluation of lead in surface soil with data from the hot spot area removed indicated that lead exposures would not exceed EPA's level of concern following removal of soils from the identified lead hot spot area. The planned excavation and removal of soil from the hot spot area is expected to address lead concerns for both potential recreational and future residential scenarios and remove the hot spot of lead.

G.2. Ecological Risk Assessment

Screening level baseline ecological risk assessments (SLERA) were conducted for ESA-OU1 (2017) and ESA-OU2 (2018). A summary of components and results of the ecological risk assessments support the need for remedial action are discussed below for the ESA and WSA.

East Study Area SLERA (ESA – OU1)

Based on the ecological habitats present in the ESA (well-maintained lawns, upland terrestrial habitat, upland floodplains, salt marsh fringe) and the existing soil data from May 2011 through June 2015, current evidence does not support the finding of no significant impact for any of the areas evaluated in the ESA. In most cases, the occurrence of adverse effects is undetermined; that is, hazard quotients (HQs) may indicate a potential effect, but the uncertainties and conservatism associated with the risk assessment process and the concentrations found in background confound the results.

Four exposure areas were evaluated in the ESA SLERA:

- Water Street Condominium Complex (WSCC) – The three Water Street parcels (33, 35, and 45 Water Street) were considered together because the properties are contiguous and have similar vegetation. Habitat associated with the WSCC is limited to well-maintained lawns, adjoining ornamental gardens, and the occasional tree or shrub interspersed throughout. The western edge of these properties borders an abandoned rail line right of way (ROW). Early to mid-successional trees and shrubs along the ROW provide wooded edge habitat to birds and mammals foraging the lawns.

- The MBTA ROW represents an approximately 0.4-mile long area of 40 to 50 foot buffer between the adjacent lawns and the downslope to the Crane River and the fringing marsh. The plant community on the ROW represents early- to mid-successional terrestrial habitat dominated largely by saplings and advanced-growth trees as well as a variety of shrubs. This edge habitat provides excellent habitat for foraging birds and is sufficiently dense in areas to provide cover for small mammals.

- The 20 Cheever Street property is an undeveloped parcel of approximately 2 acres. This property includes both upland floodplain habitat as well as salt marsh habitat with a small tidal creek. At low water, the drainage and the receiving mudflat serve as foraging areas for a variety of shorebirds including gulls, heron, ibis, ducks and sandpipers. The vegetative community of the transitions from low marsh to high marsh and eventually to an upland woodland. Many of the bird and mammal species identified for the MBTA ROW are also expected to occur on the Cheever St. property. At the northern end of the 20 Cheever Street property, a small stream conveys freshwater from an area upland of the MBTA ROW to the river.

- Fringing salt marsh habitat, approximately 15 to 30 feet wide, is present along the shoreline of the Crane River (an estuarine tidal creek with a typical tidal range of 8 to 10 ft) from 20 Cheever St. downstream to the southern portion of 45 Water Street. In these areas, the land slopes steeply 5 to 6 ft toward the eastern shoreline of the Crane River where fringing salt marsh habitat is present. Under normal astronomical conditions, this narrow marsh is inundated at high water during the semidiurnal, flooding tide. During periods of extreme tides which may occur as a result of coastal storms, the marsh may be flooded for extended periods. Average tidal range appears to be on the order of 8 to 10 ft as measured at the Crane River entrance from the Danvers River. At low tide, the Crane River is largely a mudflat with a narrow tidal channel that occurs predominantly on the western side of the river. Note that in the assessment, the mudflats are considered as part of the Crane River proper, which is not included in the study area for this SLERA. Although the fringing marsh is limited in size, it nevertheless is expected to support typical salt marsh fauna including a variety of invertebrates such as insects, amphipods, mud snails, periwinkles, crabs, and mussels, among others. At high tide, small fish are expected to be present, as well as young-of year and juvenile fish for species that use this area as both a nursery and a refugium. Wading birds are often conspicuous feeders on the invertebrates and fish inhabiting the marsh. Small mammals are also common foragers of marsh grasses as well as prey inhabiting the marsh.

Ecological risks from exposure to soil and riverbank soil in the salt marsh fringe along the Crane River were evaluated as part of the ESA SLERA. Tables SLERA-1 through SLERA-20 in Appendix G of this ROD summarize the following SLERA components. (Note that only elemental metals not typically associated with tannery operations were of concern for the ESA salt marsh habitat; therefore, tables are not presented for that exposure area)..

- Samples used in the ESA SLERA (Table SLERA-1);
- Summary statistics for the potential ecological COCs per exposure area (Tables SLERA-2 through SLERA-4);
- Assessment and Measurement Endpoints (Table SLERA-5);
- COPEC Screening (Tables SLERA-6 through SLERA-8);
- Toxicity Values (Tables SLERA-9 through SLERA-11); and
- Hazard Quotients (Tables SLERA-12 through SLERA-20).

Conclusions for each of the areas evaluated are presented separately below. See Section 3.3 of the ESA SLERA for further discussion of these conclusions.

- **Water Street Condominium Complex (WSCC)** – The Contaminants of Potential

Ecological Concern (COPECs) of most concern with possible adverse effects are likely arsenic (soil invertebrates), chromium (insectivorous birds), and mercury (terrestrial plants) (Nobis, 2017b).

- **MBTA ROW** – The COPECs of most concern with possible adverse effects are likely dioxins/furans (invertivorous mammals), arsenic (soil invertebrates), barium (plants), chromium (invertivorous birds and mammals), mercury (plants), selenium (plants and invertivorous mammals), and zinc (invertivorous mammals) (Nobis, 2017b).

- **20 Cheever Street** – The COPECs of most concern with possible adverse effects are likely arsenic (soil invertebrates), barium (plants), chromium (invertivorous birds), lead (invertivorous birds and mammals), selenium (invertivorous mammals), and zinc (invertivorous mammals) (Nobis, 2017b).

- **Riverbank/Salt Marsh Fringe** – The COPECs of most concern with possible adverse effects are likely barium, beryllium, and selenium (aquatic plants); and mercury (piscivorous birds) (Nobis, 2017b).

West Study Area (WSA – OU2)

Based on the ecological habitats present in the WSA (uplands, salt marsh fringe) and the existing data from May 2011 through March 2016, current evidence does not support the finding of no significant impact for any of the areas evaluated in the WSA SLERA. In most cases, the occurrence of adverse effects is undetermined; that is, HQs may indicate a potential effect, but the uncertainties and conservatism associated with the risk assessment process and the concentrations found in background confound the results. Given the location and small size of the 15 Pleasant Street property, the ecological habitat is considered to be small and was not specifically evaluated in the SLERA.

Two exposure areas were evaluated in the WSA SLERA:

- 27 and 55 Clinton Avenue parcels were combined into one upland exposure area. The habitat of this area varies with past uses of the site. Disturbed open areas, mounded soils, and landscape scars occur where either previous remediation or building demolition in advance of remediation has been conducted. These open areas exhibit poor vegetative habitat dominated by ruderal grasses, forbs and shrubs. It is assumed that vegetative growth is inhibited by poor soil quality in this area. These clearings range from 0.8 acres to less than 0.25 acres. Two historical burial grounds, the Russell family and Endicott family cemeteries, of approximately 0.25 acres, occur in the northern portion of the site. For the most part, the plant community of the upland portion of the WSA represents early- to mid-successional terrestrial habitat dominated largely by saplings and advanced-growth trees as well as a variety of shrubs. The absence of any mature wood stand reflects the previous industrial use. This edge habitat provides excellent habitat for foraging birds and is sufficiently dense in areas to provide cover for small mammals.

- Fringing salt marsh habitat is present along the Crane River. At the river's edge the Site is fringed by salt marsh of various width depending on the topography of the site. An approximately 1-acre portion of marsh occurs along the western shoreline of the Crane River from the vicinity of the steam pipe conveyance to just upriver of the old MBTA crossing. The average width of the marsh in this area is approximately 80 ft and ranges from 10 to 100 ft. In addition to this area, a narrow fringe marsh 5 to 10 ft in width resulting from a steep slope from the upland occurs along the western shoreline from just above the steam pipe conveyance on the site to just below Route 128. Along this shoreline, the land slopes steeply 5 to 6 ft toward the Crane River where fringing salt marsh habitat is present. The extreme northern edge of the Site occurs just upstream of an old railroad crossing. This area is cove-like and the shoreline vegetation is characteristics of brackish water habitat. During periods of extreme tides which may occur as a result of coastal storms, the marsh may be flooded for extended periods. At low tide, the Crane River is largely a mudflat with a narrow tidal channel that occurs predominantly on the western side of the river. Note that in the assessment, the mudflats are considered as part of the Crane River proper, which is not included in the study area for this SLERA. Expected species are the typical salt marsh fauna, wading birds, and small mammals noted for the salt marsh fringe in the ESA.

Ecological risks from exposure to soil and riverbank soil in the salt marsh fringe along the Crane River were evaluated as part of the WSA SLERA. Tables SLERA-21 through SLERA-33 in Appendix G of this ROD summarize the following SLERA components.

- Samples used in the WSA SLERA (Table SLERA-21);
- Summary statistics for the potential ecological COCs per exposure area (Tables SLERA-22 and SLERA-23);
- Assessment and Measurement Endpoints (Table SLERA-24);
- COPEC Screening (Tables SLERA-25 and SLERA-26);
- Toxicity Values (Tables SLERA-9 through 11 and SLERA-27); and
- Hazard Quotients (Tables SLERA-28 through SLERA-33).

Conclusions for each of the areas evaluated are presented separately below. See Section 3.3 of the WSA SLERA for further discussion of these conclusions.

- **27 and 55 Clinton Avenue** – The COPECs of most concern with possible adverse effects are likely dioxins/furans (invertivorous mammals) and chromium (invertivorous birds and mammals) (Nobis, 2018e).

- **Salt Marsh Fringe** – The COPECs of most concern with possible adverse effects are likely barium (aquatic plants), cadmium (benthic invertebrates), and chromium (piscivorous birds) (Nobis, 2018e).

G.3. Basis for Response Action

The baseline human health and screening ecological risk assessments revealed that the following receptors potentially exposed to chemicals of concern in soil in the noted parcels may present unacceptable risks:

Human Health (ingestion, dermal, and inhalation pathways)

- current and future residents at 33 & 45 Water Street;
- current recreational visitors at 20 Cheever Street, the MBTA properties and the east riverbank;
- future residents at 55 Clinton Avenue, 20 Cheever Street, the MBTA ROW, the MBTA property located at 35 Water Street, and 15 Pleasant Street;
- future commercial/industrial workers at 55 Clinton Avenue; and
- future construction workers at 55 Clinton Avenue.

Ecological

- soil invertebrates via direct contact in the WSCC, MBTA ROW, and 20 Cheever Street;
- insectivorous birds via dietary exposure in the WSCC, MBTA ROW, 20 Cheever Street, 27 and 55 Clinton Avenue; and
- insectivorous mammals via dietary exposure in the MBTA ROW, 20 Cheever Street, and 27 and 55 Clinton Avenue.

Unacceptable human health risk was based on cancer risks exceeding the EPA acceptable risk range of 10^{-6} to 10^{-4}, non-carcinogenic hazards exceeding the EPA HI of 1, and/or predicted child blood lead levels greater than 5 µg/dL in more than 5% of the population exposed. Unacceptable ecological risk was based on soil concentrations exceeding soil invertebrate toxicity benchmarks and estimated daily intakes by insectivorous birds and mammals exceeding reproductive or growth endpoint-based toxicity reference values.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. For this reason, soils are the focus of remedial actions for this Site.

H. REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are media-specific cleanup goals for a selected remedial action. Based on preliminary information about types of contaminants, environmental media of concern, and potential exposure pathways, RAOs were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to both human health and the environment.

The RAOs for the selected remedial actions for ESA-OU1 and WSA-OU2 at the Site are:

- Prevent direct human exposure through incidental ingestion, inhalation and dermal contact with soil containing identified Site-specific COCs in concentrations exceeding EPA's target risk range of a total excess lifetime cancer risk of 10^{-4} to 10^{-6} and/or a noncancer Hazard Index greater than 1.0 or exceeding the levels in the *MassDEP Draft Technical Update, Historic Fill/Anthropogenic Background Levels in Soil,* May 2016, whichever is higher.

- Prevent exposure by ecological receptors to contaminants in soil that result in potential adverse impacts.

Soil cleanup levels can be found in Section M (Selected Remedy) of this ROD.

I. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

B. Technology and Alternative Development and Screening

CERCLA and the National Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for the Site.

The FS developed a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long term management. This range also included alternatives that treat the principal threats posed by the Site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or institutional controls; and a no action alternative.

As discussed in Section 4.3 of the September 2019 FS, soil treatment technology options were identified, assessed and screened based on implementability, effectiveness, and cost. These technologies were combined into source soil alternatives for the ESA – OU1 and the WSA – OU2 areas of the Site. Section 5.0 of the FS presents the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated in detail in Section 6.0 of the FS.
In summary, of the initial 28 remedial technologies that were screened, 11 were retained as possible options for the cleanup of the Site, see Section 3.3 of the September 2018 FS. The technologies retained through the initial screening were then combined and assembled into 20 potential remedial alternatives for the Site (13 for the ESA; 7 for the WSA). These alternatives were then screened against EPA's nine criteria, e.g., for effectiveness, implementability, and cost and then 15 alternatives were selected for detailed analysis (11 for ESA; 4 for WSA).

The alternatives considered and those screened out are listed below:

ESA - OU1 – Residential Alternatives

- Alternative ESA Residential-1 – No Action

- Alternative ESA Residential-2A – Soil Excavation (0-3 ft bgs) and On-Site Consolidation, Soil Cover, and Institutional Controls. *(This is EPA's Selected Alternative.)*

- Alternative ESA Residential-2B – Soil Excavation (0-3 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls

- Alternative ESA Residential-3A – Soil Excavation (0-8 ft bgs) and On-Site Consolidation, and Institutional Controls

- Alternative ESA Residential-3B – Soil Excavation (0-8 ft bgs) and Off-Site Disposal, and Institutional Controls

- Alternative ESA Residential-4 – In-Situ Treatment (0-8 ft bgs) using Solidification/Stabilization and Institutional Controls

- Alternative ESA Residential-5 – Soil Excavation (0-8 ft bgs), Ex-Situ Treatment, and On-

Site Reuse

Alternatives ESA Residential-4 and 5 were screened out because the effectiveness of processes for treating the varied contaminants at the Site is uncertain. Additionally, implementing a multi-process treatment system would be difficult because of technical challenges of integrating multiple treatment processes, treatment system spatial constraints near residential buildings, and the presence of subsurface utilities. All alternatives are located in floodplains; however, ESA Residential-4 and -5, as a result of the treatment processes which would add volume, also likely require off-site disposal of some of the treated waste in order maintain the original grade of the area and avoid occupancy and modification of the floodplains, adding to the costs of these two alternatives. The high cost of treatment, the challenge of implementation, and an expectation that these alternatives would be no more protective than the less challenging and less expensive excavation and disposal options also factored into the screening process.

ESA - OU1 - MBTA Area Alternatives

- Alternative ESA MBTA-1 – No Action
- Alternative ESA MBTA-2 – Soil Cover and Institutional Controls
- Alternative ESA MBTA-3 – Soil Excavation (0-3 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls. (*This is EPA's Selected Alternative.*)

No alternatives were screened out for the MBTA ROW and 35 Water Street (MBTA property) areas.

ESA – OU 1 – Riverfront Area Alternatives

- Alternative ESA Riverfront -1 – No Action
- Alternative ESA Riverfront-2A – Soil Excavation (0-2 ft bgs) and On-Site Consolidation, Soil Cover, and Institutional Controls. (*This is EPA's Selected Alternative.*)
- Alternative ESA Riverfront-2B – Soil Excavation (0-2 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls

No alternatives were screened out for the ESA Riverfront Area.

WSA – OU2 Alternatives

- Alternative WSA-1 – No Action
- Alternative WSA-2 – Comprehensive Excavation South of Former Beamhouse, Surface

Excavation (0-3 ft bgs) of Remaining Area, On-Site Consolidation, soil Cover, Cap, and Institutional Controls. (*This is EPA's Selected Alternative.*)

- Alternative WSA-3 – Comprehensive Excavation South Sewer Easement, Surface Excavation (0-3 ft bgs) of Remaining Area, On-Site Consolidation, Soil Cover, Cap, and Institutional Controls

- Alternative WSA-4 – Comprehensive Excavation, On-Site Consolidation, and Institutional Controls

- Alternative WSA-5 – In-Situ Treatment using Solidification/ Stabilization, Soil Cover, and Institutional Controls

- Alternative WSA-6 – Comprehensive Excavation, Ex-Situ Treatment, and On-Site Reuse

- Alternative WSA-7 – Comprehensive Excavation, Removal of Existing Solidified Waste Containment Cell, and Off-Site Disposal

Screening of WSA – OU2 - Alternatives

Through screening, similar to the ESA Residential alternatives 4 and 5, Alternatives WSA-5, WSA-6, and WSA-7 were eliminated due to the variety of contaminants that would need to be addressed and the multi-stage treatment processes that would be required for treatment of those contaminants, the questionable effectiveness of some of those treatment trains for certain contaminants, spatial restraints, and the estimated total costs of those alternatives. All alternatives are located in floodplains; however, WSA-5 and -6, as a result of the treatment processes which would add volume, also likely require offsite disposal in order maintain the original grade of the area and avoid occupancy and modification of the floodplains, adding to the costs of the alternatives. In addition, WSA-7 would pose significant short-term risks to the community and to workers during excavation given that the material is in a solidified state and must be excavated and handled again for offsite disposal. The large volume of this waste combined with the rest of the waste on-site going off-site result in significant volume, traffic and costs as well as an expectation that this alternative would be no more protective than the less challenging and less expensive excavation and disposal options also factored into the screening process.

J. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary for each of the source control remedial alternatives retained following screening and evaluated in the detailed analysis section of the ESA -- OU1 and WSA -- OU2 report. These alternatives were developed by combining response actions and technologies to address the estimated exposure risks to human health and the environment.

The alternatives were also developed, to the extent practical, to represent a range of effectiveness, duration of time required to achieve the RAO, and cost to implement.

Costs for each alternative were determined through a present value analysis that produces a single figure representing the estimated amount of money that, if invested at a particular rate of return in the base year - usually the present year - and dispersed as needed, would cover all costs associated with the alternative. In other words, the present value figure represents a single estimated cost number to capture all capital costs (that is, construction costs), future operation and maintenance costs, sampling costs, and five-year reviews.

Each of the alternatives retained after the screening evaluation for the ESA-Residential, MBTA ROW, ESA Riverbank and WSA area are summarized below. A more detailed discussion of each alternative can be found in Section 5.0, Detailed Description and Analysis of Remedial Alternatives, of the September 2018 FS.

<u>Common Elements</u>

Prior to completing the Remedial Design, each alternative, except for the No Action alternatives, includes a Pre-Design Investigation and various surveys such as a detailed utility survey for developed parcels, a wetland delineation (use and value evaluation), and a soil investigation to confirm existing disposal assumptions and volume of hazardous waste soil. An archeological survey will be conducted at the MBTA ROW, ESA Riverbank, and WSA areas. Other common elements include temporary fencing and signage, construction of temporary access roads, construction of temporary staging and decontamination areas (20 Cheever Street for ESA alternatives; 55 Clinton for the WSA alternatives), and the use of erosion control measures. No soil will be staged or stockpiled at the ESA Residential area or the staging area at 20 Cheever Street.

For all alternatives, except No Action alternatives, excavated hazardous waste and excavated waste that exceeds state UCLs of 500 ppm for arsenic and 6,000 ppm for lead will be disposed of offsite at an appropriately licensed facility.[10]

For all alternatives, construction of a soil cover following excavation of contaminated soil shall include placement of a non-woven geotextile warning/separation layer beneath the fill/cover to help limit exposure, inhibit the upward migration of stones from the existing soil due to freeze/thaw, discourage root penetration into the contaminated soils, and be a visible barrier in the event of backfill/cover damage/erosion or the need to perform additional remediation. The consolidation area will include a protective RCRA D cap and associated groundwater monitoring wells to ensure consolidation activities do not cause leachate migration. Because contamination will be left in place, five-year reviews are included for each of these alternatives.

[10] UCLs are also based on a statistical average of data points (see 310 CMR 40.0996).

Each alternative also includes Institutional Controls (ICs), which may be in the form of land use controls, as appropriate, to protect the remedy where unrestricted use standards are not achieved. These ICs will prohibit future residential development on certain parcels, prevent future exposure to remaining contaminated soil, if any, and prohibit other activities that could damage the remedy or pose an unacceptable risk. EPA, in conjunction with MassDEP, will implement the IC process. Once in place, ICs will be enforced in accordance with federal and state law.

ESA - OU1 – Residential Alternatives

<u>Alternative ESA Residential-1 – No Action</u>

As a baseline to compare against other alternatives, for this alternative, no action would be taken to address soil contamination at 33 or 45 Water Streets. No construction would take place, and RAOs would not be achieved. The capital cost for this alternative is $0, the Present Value Operation & Maintenance (O&M) cost is $48,000, for a total Present Value Cost of $48,000.

<u>Alternative ESA Residential-2A – Soil Excavation (0-3 ft bgs) and On-Site Consolidation, Soil Cover, and Institutional Controls. (*This is EPA's Selected Alternative.*)</u>

This alternative includes the excavation of soil up to 3 ft bgs in areas of 33 and 45 Water Street where COCs exceed CLs. Any CL exceedances below 3 ft bgs or beneath buildings will be left in place, covered with a soil cover, and protected through long-term monitoring and maintenance and by institutional controls. The excavated soil would be transported to the WSA, properly managed to reduce dust emissions, stockpiled, sampled, spread, and compacted in a newly constructed on-site consolidation area located on the northern portion of 55 Clinton Avenue. Any hazardous waste will be separately staged, stockpiled and transported offsite. The capital cost for this alternative is $2,476,000, the Present Value O&M cost is $181,000, for a total Present Value Cost of $2,657,000. More specifically, this alternative includes:

- Excavation of soil that exceed CLs up to 3 ft bgs, including paved areas
- No excavation beneath buildings
- Confirmatory sampling and testing
- Install warning layer at bottom of excavation
- Backfill and install soil cover over contaminated soil left in place below 3 ft bgs
- Seed and/or asphalt excavated areas
- Transfer excavated materials (routes and method will be evaluated during the Remedial Design) to on-site consolidation area on 55 Clinton Avenue for staging, characterization, and consolidation[11]

[11] If the volume of soil for consolidation on 55 Clinton Avenue is greater than anticipated and the on-site consolidation area cannot accommodate the additional volume or if there is significant delay in performance of the work at OU2, cleanup work in the ESA may be accelerated through a removal or remedial action that includes off-site disposal for some or all of the excavated soil on one or more parcels and EPA may issue another decision document.

- Off-site disposal of hazardous waste
- Wetlands restoration

(See Figure 3 in Appendix A of this ROD.)

Alternative ESA Residential-2B – Soil Excavation (0-3 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls

This alternative includes the excavation of soil up to 3 ft bgs in areas of 33 and 45 Water Street where COCs exceed CLs. Any soil below 3 ft exceeding CLs and soil beneath buildings will be left in place, covered with a soil cover, and protected through long-term monitoring and maintenance and by institutional controls. The excavated soil will be transported to the WSA (routes and method, will be evaluated during the Remedial Design), stockpiled, sampled, loaded, and transported for off-site disposal at a licensed disposal facility. The capital cost for this alternative is $3,156,000 the Present Value O&M cost is $181,000, for a total Present Value Cost of $3,337,000. More specifically, this alternative includes:

- Excavation of soils that exceed CLs up to 3 ft bgs, including paved areas
- No excavation beneath buildings
- Confirmatory sampling and testing
- Install warning layer at bottom of excavation
- Backfill and install soil cover over contaminated soil left in place below 3 ft bgs
- Seed and/or asphalt excavated areas
- Transfer excavated material to 55 Clinton Avenue for staging, characterization, and off-site disposal
- Wetlands restoration

Alternative ESA Residential-3A – Soil Excavation (0-8 ft bgs) Soil Cover and On-Site Consolidation, and Institutional Controls

This alternative includes the excavation of soil up to 8 ft bgs (or to the water table, whichever is encountered first) in areas of 33 and 45 Water Street where COCs exceed CLs. Any CL exceedances, including beneath buildings, will be left in place and protected through a soil cover, long-term monitoring and maintenance and by institutional controls. The excavated soil will be transported (routes and method will be evaluated during the Remedial Design) to the WSA, stockpiled, sampled, spread, and compacted in a newly constructed on-site consolidation area on 55 Clinton Avenue. Any hazardous waste will be separately staged, stockpiled and transported offsite. The capital cost for this alternative is $4,204,000 the Present Value O&M cost is $163,000, for a total Present Value Cost of $4,367,000. More specifically, this alternative includes:

- Excavation of soils that exceed CLs up to 8 ft bgs (or to the water table, whichever is encountered first), including paved areas

- No excavation beneath buildings
- Confirmatory sampling and testing
- Install warning layer at bottom of excavation
- Backfill, soil cover, and seed/asphalt excavated areas
- Transfer excavated material to on-site consolidation area on 55 Clinton Avenue for staging, characterization, and consolidation
- Off-site disposal of hazardous waste soil
- Wetlands restoration

Alternative ESA Residential-3B – Soil Excavation (0-8 ft bgs) Soil Cover and Off-Site Disposal, and Institutional Controls

This alternative includes the excavation of soil up to 8 ft bgs (or to the water table, whichever is encountered first) in areas of 33 and 45 Water Street where COCs exceed CLs. Any CL exceedances, including beneath buildings, will be left in place and protected through a soil cover and long-term monitoring and maintenance and by institutional controls. The excavated soil will be transported to the WSA (routes and method will be evaluated during the Remedial Design), stockpiled, sampled, loaded, and transported for off-site disposal at a licensed off-site disposal facility. The capital cost for this alternative is $5,655,000 the Present Value O&M cost is $163,000, for a total Present Value Cost of $5,818,000. More specifically, this alternative includes:

- Excavation of soils that exceed CLs up to 8 ft bgs (or to the water table, whichever is encountered first), including paved areas
- No excavation beneath buildings
- Confirmatory sampling and testing
- Install warning layer at bottom of excavation
- Backfill, soil cover, and seed excavated areas
- Transfer excavated material to 55 Clinton Avenue for staging, characterization, and off-site disposal
- Wetlands restoration

ESA - OU1 - MBTA Area Alternatives

Alternative ESA MBTA-1 – No Action

As a baseline to compare against other alternatives, for this alternative no action would be taken to address soil contamination at the MBTA ROW or at 35 Water Street. No construction would take place and this alternative would not achieve RAOs. The capital cost for this alternative is $0, the Present Value O&M cost is $48,000, for a total Present Value Cost of $48,000.

Alternative ESA MBTA-2 – Soil Cover and Institutional Controls

This alternative includes the placement of a soil cover in areas of MBTA right-of-way (ROW) and 35 Water Street where COCs exceed CLs. Any CL exceedances beneath buildings or monuments will be protected through long-term monitoring and maintenance and by institutional controls. The soil cover will consist of a geotextile warning layer, 16-inches of clean soil, and a vegetative layer. To compensate for the loss of approximately 1,600 cubic yards (CY) of floodplain capacity, this alternative includes the excavation, grading, and off-site disposal of 1,600 CY of soil to be excavated from another area within the ESA to maintain flood storage capacity. The capital cost for this alternative is $1,946,000 the Present Value O&M cost is $293,000, for a total Present Value Cost of $2,239,000. More specifically, this alternative includes:

- Archaeological survey
- Remove and recycle railroad tracks
- Grade area of soils that exceed CLs to prepare for cover placement
- Excavation and off-site disposal of approximately 1600 CY of soils to maintain flood zone capacity
- Construct soil cover consisting of geotextile warning layer and 16-inches of soil and vegetative cover
- Wetlands restoration

Alternative ESA MBTA-3 – Soil Excavation (0-3 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls. (*This is EPA's Selected Alternative.*)

This alternative includes the excavation of soil up to 3 ft bgs in areas of MBTA ROW and 35 Water Street where COCs exceed CLs. Any CL exceedances below 3 ft bgs or beneath buildings or monuments will be left in place, covered with a soil cover and protected through long-term monitoring and maintenance and by institutional controls. The excavated soil will be transported to the WSA (routes and method will be evaluated during the Remedial Design), stockpiled, sampled, loaded, and transported off-site for disposal at a licensed off-site disposal facility. Any hazardous waste will be separately staged, stockpiled and transported offsite. The capital cost for this alternative is $5,202,000 the Present Value O&M cost is $149,000, for a total Present Value Cost of $5,351,000. More specifically, the alternative includes the following:

- Archaeological survey
- Remove and recycle railroad tracks
- No excavation beneath monuments
- Excavation of soils that exceed CLs up to 3 ft bgs
- Confirmatory sampling and testing
- Install warning layer at bottom of excavation
- Install soil cover over contaminated soil left in place below 3 ft bgs
- Seed and or asphalt excavated areas

- Wetlands restoration
- Transfer excavated material to 55 Clinton Avenue for staging, characterization, and off-site disposal

(See Figure 4 in Appendix A of this ROD.)

ESA – OU 1 – Riverfront Area Alternatives

Alternative ESA Riverfront -1 – No Action

As a baseline to compare against other alternatives, for this alternative no action would be taken to address soil contamination at the ESA Riverfront Areas. No construction would take place and this alternative would not achieve RAOs. The capital cost for this alternative is $0, the Present Value O&M cost is $48,000, for a total Present Value Cost of $48,000.

Alternative ESA Riverfront-2A – Soil Excavation (0-2 ft bgs) and On-Site Consolidation, Soil Cover, and Institutional Controls. (*This is EPA's Selected Alternative.*)

This alternative includes the excavation of riverbank soil up to 2 ft bgs where COCs exceed CLs, from the banks of the Crane River, generally above the mean high tide mark, along the MBTA ROW, 20 Cheever Street, and 45 Water Street parcels. Soil that exceeds the state UCL for lead at 20 Cheever Street will be excavated to 4 ft bgs. The eastern or inland excavation extent would be from approximately the base of the adjacent slope (at approximately 5 ft mean sea level (MSL)) and extending west toward the river along the nearshore shelf to the approximately mean high tide line (at approximately 2 ft MSL). Any CL exceedances below 2 ft bgs will be left in place, covered with a soil cover, and protected through long-term monitoring and maintenance and by institutional controls. The excavated soil will be transported to the WSA (routes and method will be evaluated during the Remedial Design), stockpiled, sampled, spread, and compacted in a newly constructed on-site consolidation area and cover located on 55 Clinton Avenue. Any hazardous waste and waste that exceeds the state UCL for lead will be separately staged, stockpiled and transported offsite. The capital cost for this alternative is $2,596,000 the Present Value O&M cost is $188,000, for a total Present Value Cost of $2,784,000. More specifically, this alternative includes:

- Archaeological survey
- Dewater riverbank area using cofferdams
- Excavation of soils that exceed CLs up to 2 ft bgs
- Excavate and offsite disposal of soils that exceed UCL at 20 Cheever St
- Confirmatory sampling and testing
- Install warning layer at bottom of 2 ft excavation
- Install soil cover over contaminated soil left in place below 2 ft bgs
- Restore excavated areas/wetlands restoration

- Transfer excavated material to on-site consolidation area on 55 Clinton Avenue for staging, characterizing, and onsite consolidation and covering[12]
- Off-site disposal of hazardous waste soil and soil exceeding UCL

(See Figure 5 in Appendix A of this ROD.)

<u>Alternative ESA Riverfront-2B – Soil Excavation (0-2 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls</u>

This alternative includes the excavation of soil up to 2 ft bgs where COCs exceed CLs from the banks of the Crane River, generally above the mean high tide mark, along the MBTA ROW, 20 Cheever Street, and 45 Water Street parcels. The eastern or inland excavation extent would be from approximately the base of the adjacent slope (at approximately 5 ft MSL) and extending west toward the river along the nearshore shelf to the approximately mean high tide line (at approximately 2 ft MSL). Any CL exceedances below 2 ft bgs will be left in place, covered with a soil cover, and protected through long-term monitoring and maintenance and by institutional controls. The excavated soil will be transported to the WSA, stockpiled, sampled, loaded, and transported for off-site disposal at a licensed off-site disposal facility. The capital cost for this alternative is $2,596,000 the Present Value O&M cost is $188,000, for a total Present Value Cost of $2,784,000. More specifically, this alternative includes:

- Archaeological survey
- Dewater riverbank area using cofferdams
- Excavation of soils that exceed CLs up to 2 ft bgs
- Excavate soils that exceed UCL at 20 Cheever St
- Confirmatory sampling and testing
- Install warning layer at bottom of excavation
- Install soil cover over contaminated soil left in place below 2 ft bgs
- Restore excavated areas/wetlands restoration
- Transfer excavated material to 55 Clinton Avenue for staging, characterization, and off-site disposal

WSA – OU2 Alternatives

<u>Alternative WSA-1 – No Action</u>

As a baseline to compare against other alternatives, for this alternative no action would be taken to address soil contamination at the WSA Areas. No construction would take place and this

[12] If the volume of soil for consolidation on 55 Clinton Avenue is greater than anticipated and the on-site consolidation area cannot accommodate the additional volume or if there is significant delay in performance of the work at OU2, cleanup work in the ESA may be accelerated through a removal or remedial action that includes off-site disposal for some or all of the excavated soil on one or more parcels and EPA may issue another decision document.

alternative would not achieve RAOs. The capital cost for this alternative is $0, the Present Value O&M cost is $48,000, for a total Present Value Cost of $48,000.

Alternative WSA-2 – Comprehensive Excavation South of Former Beamhouse, Surface Excavation (0-3 ft bgs) of Remaining Area, On-Site Consolidation, Soil Cover, Cap, and Institutional Controls. *(This is EPA's Selected Alternative.)*

This alternative includes the excavation of soils where COCs exceed CLs to allow for future unrestricted use (estimated up to 4 ft bgs) from the southern boundary of the WSA (27 and 55 Clinton Avenues) up to southern edge of beamhouse footprint. The remainder of the WSA area (not including the existing consolidation and cemetery areas) would be excavated up to 3 ft (or up to 10 ft to address UCL exceedance of arsenic) and covered with a soil cover. The excavated soil will be consolidated in a newly constructed on-site consolidation area on the northern portion of the WSA (except for soil that exceeds UCL or is classified as hazardous waste which will be disposed of off-site) and a protective RCRA D cap will be installed over the consolidation area. This alternative will create an area with unrestricted future use for approximately 50% of the WSA; the remaining half of the WSA will have restricted future use. Long-term monitoring and maintenance, including groundwater monitoring around the capped consolidation area, will be conducted and institutional controls will restrict land uses. (See Figure 6 in Appendix A of this ROD. The capital cost for this alternative is $12,976,000 the Present Value O&M cost is $517,000, for a total Present Value Cost of $13,493,000. More specifically, this alternative includes:

- Archaeological survey
- Excavation of soils that exceed CLs to allow for unrestricted use south of the beamhouse building footprint (estimated up to 4 ft bgs), backfill with clean fill
- Excavation of remainder of contaminated soil in the WSA (except for the proposed consolidation and cemetery areas) to 3 ft bgs
- Excavate soils that exceed UCL (up to 10 ft bgs)
- No excavation in cemetery areas
- Dewatering may be necessary
- Confirmatory sampling and testing
- Former beamhouse building debris will be consolidated on-site
- Backfill with clean fill the areas excavated to unrestricted future use
- Install warning layer at bottom of excavation
- Install soil cover over contaminated soil left in place below 3 ft bgs
- Seed/restore excavated areas
- Construct on-site consolidation area on 55 Clinton Avenue
- Consolidate excavated WSA (and any stockpiled ESA material) soils and former beamhouse building debris
- Cover consolidation area with a protective RCRA D cap
- Off-site disposal of UCL and hazardous waste
- Construct storm water controls

- Wetlands restoration

Alternative WSA-3 – Comprehensive Excavation South Sewer Easement, Surface Excavation (0-3 ft bgs) of Remaining Area, On-Site Consolidation, Soil Cover, Cap, and Institutional Controls

This alternative includes the excavation of soil where COCs exceed CLs to allow for future unrestricted use (estimated up to 3 ft bgs) from the southern boundary of the WSA (27 and 55 Clinton Avenue) up to and including the sewer easement. The remainder of the WSA area (not including consolidation area and cemetery areas) would be excavated up to 3 ft (or up to 10 ft to address UCL exceedance for arsenic) and covered with a soil cover. The excavated soil will be consolidated in a newly constructed on-site consolidation area on the northern portion of the WSA (except for soil that exceeds UCL and soil classified as hazardous waste which will be disposed of off-site) and a permeable protective RCRA D cap will be installed over the consolidation area. This alternative will create an area with unrestricted future use for approximately 67% of the WSA; the remaining third of the WSA will have restricted future use. Long-term monitoring and maintenance, including groundwater monitoring around the consolidation area, will be conducted and institutional controls will restrict land uses that pose a risk. The capital cost for this alternative is $15,461,000 the Present Value O&M cost is $517,000, for a total Present Value Cost of $15,978,000. More specifically, this alternative includes:

- Archaeological survey
- Excavation of soil, including waste stockpiles, that exceed CLs to allow for unrestricted use up to and including the sewer easement
- Excavation of reminder of contaminated soil in the WSA area (except for the proposed consolidation and cemetery areas) to 3 ft bgs
- Excavate soils that exceed UCL (up to 10 ft bgs)
- No excavation in cemetery areas
- Dewatering may be necessary
- Former beamhouse building debris will be consolidated on-site
- Backfill with clean fill the areas excavated to unrestricted future use
- Install warning layer at bottom of excavation
- Install soil cover over contaminated soil left in place below 3 ft bgs
- Seed/restore excavated areas
- Construct on-site consolidation area on 55 Clinton Avenue
- Consolidate excavated WSA (and any stockpiled ESA material) and former beamhouse building debris
- Cover with a permeable protective RCRA D cap
- Off-site disposal of UCL and hazardous waste
- Confirmatory sampling and testing
- Wetlands restoration

Alternative WSA-4 – Comprehensive Excavation, On-Site Consolidation, and Institutional Controls

This alternative includes the excavation of soils where COCs exceed CLs and UCLs to allow for future unrestricted use (up to 15 ft bgs) throughout the WSA, except for the consolidation and cemetery areas. The excavated soil will be consolidated in a newly constructed on-site consolidation area on the northern portion of the WSA (except for soil that exceeds the state UCL for arsenic or is classified as hazardous waste which will be disposed of off-site) and a permeable protective RCRA D cap will be installed over the consolidation area. This alternative will create an area with unrestricted future use for approximately 75% of the WSA; the remaining quarter of the WSA will have restricted future use. Long-term monitoring and maintenance, including groundwater monitoring around the consolidation area will be conducted and institutional controls will restrict land uses that pose a risk. The capital cost for this alternative is $15,882,000 the Present Value O&M cost is $508,000, for a total Present Value Cost of $16,390,000. More specifically, this alternative includes:

- Archaeological survey
- Excavation of soil, including waste stockpiles, that exceed CLs that allows for unrestricted use throughout the WSA (except for the proposed consolidation and cemetery areas)
- Excavate soils that exceed the state UCL
- No excavation in cemetery areas
- Dewatering may be necessary
- Former beamhouse building debris will be consolidated on-site
- Install warning layer at bottom of excavation
- Backfill with clean fill, the areas excavated to unrestricted future use
- Seed/restore excavated areas
- Construct on-site consolidation area on 55 Clinton Avenue
- Consolidate excavated WSA (and any stockpiled ESA material) and former beamhouse building debris
- Cover with permeable protective RCRA D cap
- Off-site disposal of UCL and hazardous waste soil
- Construct storm water controls
- Confirmatory sampling and testing
- Wetlands restoration

K. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the soil alternatives using the nine evaluation criteria in order to select a Site remedy. The detailed analysis is presented in Section 5.0 of the September 2018 FS. The comparative analysis of alternatives was presented in Section 6.0 of the FS. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These criteria are summarized as follows:

<u>Threshold Criteria</u>

The two threshold criteria described below <u>must</u> be met for the alternatives to be eligible for selection, in accordance with the NCP:

1. **Overall protection of human health and the environment** addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked. Please refer to Appendix H of this ROD for the complete set of ARARs tables for this Site (chemical specific, action specific, and location specific).

<u>Primary Balancing Criteria</u>

The following five criteria are utilized to compare and evaluate the elements of one alternative to another, that meet the threshold criteria:

3. **Long-term effectiveness and permanence** address the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility or volume, including how treatment is used to address the principle threats posed by the Site.

5. **Short term effectiveness** addresses the time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital and Operation and Maintenance (O&M), as well as present worth costs.

<u>Modifying Criteria</u>

The following two modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives described in the Proposed Plan and RI/FS, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS.

The detailed analyses and comparative analysis of the alternatives provide information necessary to facilitate the selection of a specific remedy or combination of remedies by evaluating each individual remedial alternative against each of the above listed nine criteria and then comparing the relative performance of the alternatives on each of the evaluation criteria. This comparison assists in the selection of a remedy by identifying the advantages and disadvantages of each alternative relative to the other alternatives for each of the evaluation criteria. See Tables 5-1, 5-3, 5-5 and 5-7 of the FS for the detailed analysis of the ESA and WSA alternatives. The comparative analysis of alternatives, presented in Section 6.0 of the FS, is summarized below.

Discussed briefly below are the relative strengths and weaknesses of the alternatives considered for ESA – OU1 and WSA – OU2 compared against each other using the list of nine evaluation criteria described above. Of these, the criteria for State Acceptance and Community Acceptance were evaluated after the public comment period.

Comparative Analysis of Source Soil Remedial Alternatives

The detailed analysis of the source area soil alternatives is intended to provide sufficient information for EPA to select the appropriate components of the remedy for ESA – OU1 and WSA – OU2. The cleanup objectives for the ESA and WSA are to 1) prevent unacceptable risks to human exposure posed by contaminated soil through direct contact, inhalation, and incidental ingestion; and 2) prevent adverse impacts on ecological receptors.

<u>**ESA – OU1 Alternatives**</u>

Threshold Criteria

<u>**Overall Protection of Human Health and the Environment**</u>

ESA Residential Alternatives

Alternative ESA Residential-1 does not provide any protection of human health or the environment because no action would be taken to address the unacceptable risks posed by contaminated soil and therefore does not meet RAOs. This alternative does not provide overall protection of human health and the environment.

Under current use conditions, ESA Residential-2A, 2B, -3A and -3B are equally protective of human health and the environment because all would address surface soils (0-3 ft bgs) by excavation and removal of contaminated soils from the ESA. Clean backfill and soil and/or asphalt covers would prevent human and ecological receptors from risks through direct contact, incidental ingestion, and inhalation of soil or dust and will prevent transport of contaminated soil from the area. ESA Residential Alternatives 2A and 2B would include long-term maintenance and monitoring of the soil/asphalt covers and institutional controls to ensure long-term restricted access to contaminated soils remaining deeper than three feet and below buildings. Alternatives ESA Residential-3A and -3B are both protective of human health and the environment in the long-term by removing deeper soil with contaminants exceeding cleanup levels to a depth of 8 ft bgs, rather than relying on adequate monitoring and maintenance of the soil cover and institutional controls to prevent exposure to deeper soils. Institutional controls would still be used to prevent future exposure to contaminated soil beneath buildings.

ESA Residential alternatives 2A and 3A include on-site disposal of the excavated non-hazardous soil in a consolidation area on the WSA capped with a permeable protective RCRA D cap that will prevent exposure to contaminated soil. Alternatives 2B and 3B include off-site disposal of all excavated contaminated soils in appropriately permitted/licensed disposal facilities. (All four alternatives include offsite disposal of hazardous material and that exceeding state upper concentration levels.) Human health and the environment are protected by either on-site consolidation (ESA Residential-2A and -3A alternatives) or off-site disposal (ESA Residential--2B and -3B alternatives) of the excavated soils with proper maintenance of the capped areas on the WSA, or, if off-site, to an appropriately licensed facility.

ESA-MBTA

Alternative ESA MBTA-1, No Action, does not prevent unacceptable risks posed by exposure to contaminated soil because no action would be taken. This alternative does not provide overall protection of human health and the environment.

ESA MBTA-2 provides protection through the installation of a 16-inch thick soil cover over areas where contaminants exceed cleanup levels. The ESA MBTA-3 alternative provides protection through excavation and off-site disposal of surface soil (0-3 ft bgs) where contaminated soil exceeds cleanup levels. Institutional controls in the form of land use restrictions would be used to ensure long-term restricted access to contaminated soil remaining beneath the soil cover under ESA MBTA-2, and for ESA MBTA-3, in limited areas utilizing a similar soil cover where contaminants exceed cleanup levels in soil deeper than 3 ft bgs.

Alternative MBTA-3 also offers protection of human health and/or the environment because a mass of contaminated soil would be removed from the area, leaving less residual contamination in place, and the excavated area would be backfilled, then the soil cover installed to bring the area to the original grade. The ESA MBTA-2 alternative does not remove a significant mass of contaminated soils exceeding cleanup levels and does not have the benefit of backfilled clean material under the soil cap. In addition, ESA MBTA-3 removes significant volume and mass not only from the ESA MBTA area but from the Site through offsite disposal of the excavated material at a licensed facility; whereas, ESA MBTA-2 leaves a greater amount of contaminated material onsite under a protective cover.

ESA – Riverfront

Alternative ESA Riverfront-1, No Action, does not prevent unacceptable risks posed by exposure to contaminated soil because no action would be taken. This alternative does not provide overall protection of human health and the environment.

Alternatives ESA Riverfront-2A and -2B both protect human health and the environment from exposure to contaminated soil by excavating riverbank soil (0-2 ft bgs) with contaminants exceeding cleanup levels and 20 Cheever Street hot spot of UCL exceedance for lead (0-4 ft bgs), removing the excavated soil from the ESA Riverfront, and restoring the excavated areas to match original conditions (including wetland/saltmarsh and upland habitat). Institutional controls in the form of land use restrictions would restrict activities that would allow exposure to contaminated soil remaining beneath the excavated depths. Both alternatives address the same areas and depths and include the same restoration, and both alternatives would include soil covers which, if properly monitored and maintained, would be protective. Excavated soil would be consolidated on-site under ESA Riverfront-2A but would be disposed of off-site under ESA Riverfront-2B.

Compliance with ARARS

ESA - Residential

There is no ARARs analysis for alternative ESA Residential-1 since no action will be taken under this alternative and it will not meet federal or state identified ARARs.

Alternatives ESA Residential-2A, -2B, -3A, and -3B, will comply with all chemical, action, and location specific ARARs, including requirements of the Massachusetts solid waste regulations and guidance for construction of protective soil covers over contaminated soil that remains in place. All of these alternatives will include unavoidable work in wetlands to address contaminated soil, and any damaging impacts will be minimized and mitigated to the extent practicable. Impacted wetlands will be restored or replicated within the nearby vicinity if necessary. Excavated areas will be backfilled to original grade to avoid loss of storage capacity. ESA Residential 2A and 2B involve less excavation of contaminated soil, resulting in less disturbance of wetlands and floodplains.

Pursuant to the federal and state historic preservation and archaeological laws, because certain areas along the shoreline of 45 Water Street were identified to potentially contain pre-contact archaeological sites that could potentially be adversely impacted, both tribal and state historic contacts have been notified and will be consulted with prior to work occurring in these areas. Mitigation measures, if needed, will be developed in consultation with the SHPO and THPO.

To comply with action-specific ARARs, best management practices will be implemented to control wastewater discharges, if any, during remediation activities. Air monitoring will be employed to minimize any dust emissions during soil excavation. Hazardous waste, if found, will be properly handled and disposed off-site.

<u>ESA – MBTA</u>

There is no ARARs analysis for ESA MBTA-1 alternative since no action will be taken under this alternative and it will not meet federal or state identified ARARs.

Alternatives ESA MBTA-2 and -3 will comply with all chemical, action, and location specific ARARs. The ESA MBTA-2 alternative would result in the loss of compensatory flood storage capacity within both the 100 and 500-year floodplain because of the installation of the 16" in-place soil cover. As a result, approximately 1,600 cubic yards of replacement flood storage capacity would need to be replicated at another location within the floodplain of the Crane River to comply with ARARs. The ESA MBTA-3 alternative, however, includes the excavation and removal of contaminated soil and backfilling/installation of a soil cover to match the existing grade, resulting in only temporary occupancy of and impacts to the floodplain. As these alternatives will include unavoidable work in wetlands to address contaminated soil, any damaging impacts will be minimized and mitigated to the extent practicable. Impacted wetlands will be restored or replicated within nearby vicinity if necessary. Excavated areas will be backfilled to original grade to avoid loss of storage capacity.

To comply with action-specific ARARs for ESA MBTA-2 and -3, best management practices will be implemented to control wastewater discharges, if any, during remediation activities. Air monitoring will be employed to minimize any dust emissions during soil excavation. The soil cover for Alternative MBTA-2 will meet the performance standards consistent with state guidance for a protective soil cover. Hazardous waste, if found, will be properly handled and disposed off-site.

Since 35 Water Street contains a historic monument, and because certain areas were also identified to potentially contain pre-contact archaeological sites that could potentially be adversely impacted, both tribal and state historic contacts have been notified and will be consulted prior to work occurring in these areas. Mitigation measures, if necessary will be developed in consultation with the SHPO and THPO.

ESA – Riverfront

There is no ARARs analysis for ESA MBTA-1 alternative because no action would be taken, and it will not meet federal or state identified ARARs.

Alternatives ESA Riverfront-2A and 2B will comply with all chemical, action, and location specific ARARs. These alternatives both involve identical plans for soil excavation and will include unavoidable work in wetlands to address contaminated soil. For both alternatives, any damaging impacts will be minimized and mitigated to the extent practicable. Wetlands will be restored or, if necessary, replicated within the same vicinity. Work in floodplains will result in temporary occupancy and modification of the floodplain, but upon completion, the area will be backfilled to the original grade to avoid loss of storage capacity. To the extent practicable, native vegetation will be used for restoration.

Installation of temporary sheet pile walls to dewater contaminated shoreline soil for excavation will be designed to comply with Section 404 of the Clean Water Act. Such measures may include conducting work during low tide cycles and collecting dewatering and either discharging to a POTW (after pre-treatment if necessary), discharging to the River (with treatment, if necessary) or collection and offsite disposal.

To comply with action-specific ARARs, water generated from decontamination and other remediation measures will be sampled, treated (if necessary) and discharged in compliance with state and federal regulations. Air monitoring will be employed to minimize any dust emissions during soil excavation. The soil cover will meet the performance standards of state guidance for construction of protective soil covers over the contaminated soil that remains in place. Hazardous waste, if found, will be properly handled and disposed off-site.

Pursuant to the federal and state historic preservation and archaeological laws, because certain areas along the Riverfront shoreline were identified to potentially contain pre-contact archaeological sites that could potentially be adversely impacted, both tribal and state historic contacts have been notified and will be consulted with prior to work occurring in these areas. Mitigation measures, if needed, will be developed in consultation with the SHPO and THPO.

Primary Balancing Criteria

Long-term Effectiveness and Permanence

ESA -- Residential

For Alternative ESA Residential-1, the no action alternative does not provide long term effectiveness and permanence because the residual risk remains high and there are no institutional controls to prevent exposure to contaminated soil.

Each alternative, except the No Action alternative, provides some degree of long-term protection. Alternatives 3A and 3B increase in effectiveness of assuring protection against potential exposure as additional depth of soil is removed from the area. The effectiveness and permanence of these alternatives is dependent upon the adequacy of maintenance of the soil covers and the enforcement of land use controls. Although the inherent hazard remains for soil under Alternatives ESA Residential-2A and -2B, institutional controls to prevent exposure and actions required to maintain the controls would be included as part of these alternatives. Alternatives ESA Residential-3A and 3B provide the greatest degree of long-term effectiveness and permanence through the removal of soil above the water table (0-8 ft bgs) where contaminants exceed cleanup levels. Residual risks would remain for all alternatives because contaminants exceeding cleanup levels will remain beneath buildings; contaminants would also remain beneath soil covers under ESA Residential-2A and -2B. Because contaminants in soil are not leaching to groundwater, with long-term monitoring and maintenance and effective enforcement of land use controls, alternatives that remove soil down to 3 feet are more implementable, will have less short-term impacts to residents (because removing less soil), and provides long-term protectiveness. Five-year reviews will be required for all alternatives because contamination will remain on-site.

<u>ESA -- MBTA</u>

For alternative ESA MBTA-1, the no action alternative does not provide long term effectiveness and permanence because the residual risk remains high and there are no institutional controls to prevent exposure to contaminated soil. Therefore, the no action alternative was not chosen for the remedy.

Alternatives ESA MBTA-2 and ESA MBTA-3 would both provide significant risk reduction and protection of human health and the environment by preventing the potential for exposure to or transport of accessible contaminated soil. MBTA-2 by placing a 16-inch soil cover over the contaminated soils and ESA MBTA-3 by excavating and removing contaminated soils to a depth of 3 ft bgs (9600 cubic yards) and backfilling the excavated area with clean fill. Both alternatives would include placement of a non-woven geotextile warning/separation layer and soil cover in areas where contaminated soil exceeding CLs will remain on site (a much larger area for MBTA-2 than MBTA-3). Both alternatives include institutional controls to prevent exposure to any remaining soil exceeding CLs, and actions required to monitor and maintain the soil cover. These controls are only effective if adequately monitored and enforced.

Among the alternatives, Alternative ESA MBTA-3 would provide a greater degree of long-term effectiveness and permanence given the excavation of a significant volume of soil exceeding CLs under ESA MBTA-3 versus use of a soil cover to prevent exposure to contaminated soil under ESA MBTA-2. Most of the contaminated soil exceeding CLs on the MBTA properties is present at less than 3 ft bgs; deeper contaminated soils are present in only two small areas along the MBTA ROW. Under ESA MBTA-3, soils exceeding CLs would remain only in those two small areas, at depth below 3 feet. Under MBTA-2, all soils exceeding CLs would remain, under a 16-inch thick cover. Therefore, the long-term effectiveness of the MBTA-2 alternative remedy is significantly more dependent on the effectiveness of cover design and construction, quality of monitoring, and enforcement of controls.

<u>ESA -- Riverfront</u>

For alternative ESA Riverfront-1, the no action alternative does not provide long term effectiveness and permanence because residual risk remains high and there are no institutional controls to prevent exposure to contaminated soil.

Both ESA Riverfront-2A and -2B would reduce current risks to acceptable levels by excavating and removing riverbank soil (0-2 ft bgs) and hot spot area exceeding UCL for lead (0-4 ft bgs) from the ESA with contaminants exceeding cleanup levels, covering the excavated areas with soil cover, and restoring the surfaces to match original conditions. The two alternatives would incorporate the same ICs for preventing future exposure risks at the ESA following excavation. Overall, the two alternatives would provide the same level of long-term effectiveness and permanence regarding contaminant exposure in the ESA Riverfront Areas provided the institutional controls are adequately monitored and enforced. Riverfront 2B does not provide any additional protectiveness.

<u>Reduction of Contaminant, Toxicity, Mobility, or Volume through Treatment</u>

<u>ESA – Residential, Riverfront and MBTA</u>

None of the alternatives apply active treatment but all, except the no action alternative, require excavation and capping with a soil cover which will reduce mobility of any remaining contaminated soil at depth, from erosion and tidal surges. Otherwise, since no active treatment will be applied under any of the ESA Residential alternatives, there will be no reduction in toxicity, mobility, or volume.

<u>Short-term Effectiveness</u>

The short-term effectiveness of the remedial alternatives has been evaluated from five perspectives: risks to the community during implementation, risks to onsite workers during implementation, short-term environmental impacts, short-term sustainability, and the time until remedial action objectives are achieved.

<u>ESA -- Residential</u>

ESA Residential-1, the no action alternative, has the least short-term impacts in all categories compared to the other alternatives because no construction activities would be performed for ESA Residential-1 and there would be little disruption to the residents of 33 and 45 Water Streets or the nearby community. The remaining alternatives all include excavation and transport of contaminated soils, which will have some short-term impacts, as described below.

All the remaining alternatives could be accomplished using routine construction methods, and asphalt paving could be performed using the materials and equipment typically used for routine road construction. However, there would be similar impacts on the community and workers and all involve some disruption to the local residents as well as exposure of workers to contamination during excavation activities. Impacts may include fugitive dust emissions, noise, physical safety, inconvenience, and increased traffic. ESA Residential- 2A and -2B impacts would be more moderate than those from ESA Residential-3A and -3B given that these alternatives involve removal and transport of more than twice the volume of contaminated soil than 2A and 2B. Excavation depths and backfill volume would be greater for 3A and 3B, prolonging work on the ESA properties. Impacts can be mitigated through the use of engineering controls; careful planning of excavation in phases, materials staging, transport routes, work schedule, and other project details; and coordination with community stakeholders.

ESA Residential-2A, -2B, -3A, and -3B would all pose some short-term risk to on-Site workers with risk slightly greater from alternatives 3A and 3B given the higher volume of soil to be excavated and transported for disposal. Risks to workers can be minimized for all alternatives through compliance with a comprehensive Health and Safety Plan; use of engineering controls (water, fencing, covers, monitoring) to reduce fugitive dust and airborne contaminants. In addition, air monitoring and use of proper personal protective equipment would be used to prevent exposures to contaminant-laden dusts (for both workers and the surrounding residents).

Impacts to the environment would be similar for the four alternatives. Impacts to wetlands and floodplains will be minimized as much as possible and wetlands restored or replicated, as necessary. Excavated areas in floodplains will be restored to the original levels to avoid impacted flood storage capacity. General environmental impacts include emissions and fuel usage from on-site equipment and trucks for transport of the excavated soil and delivery of the backfill and cover materials. These impacts would be somewhat greater for the alternatives that require more excavation (ESA Residential-3A and -3B). Transport of excavated soil to off-site disposal facilities (ESA Residential-2B and -3B) would also result in greater emissions and fuel use. Similar to the general environmental impacts, the relative sustainability of the four alternatives is most affected by the excavation and backfill volume and distance to the ultimate disposal location; these factors will be the most important variables in the amount of energy expended and materials required to implement the remedial action.

Time to achieve RAOs is directly correlated with the amount of contaminated soil that is addressed in each alternative. ESA Residential-2A and -2B would take approximately 6 months to implement in the field, excluding time for pre-design investigations, remedial design, and preparation of plans. ESA Residential-3A and -3B would take approximately 10 months to implement in the field.

<u>ESA -- MBTA</u>

ESA MBTA-1, the no action alternative, has the least amount of short-term impacts since no action will be taken and there would be no disruption to the residents of 33 and 45 Water Street. The remaining alternatives both include actions that will have some short-term impacts, as described below.

Both remaining alternatives, MBTA-2 and MBTA-3, would have similar impacts on the community and workers and will involve some disruption to local residents as well as exposure of workers to contamination during excavation activities. Impacts may include fugitive dust emissions, noise, physical safety, inconvenience, and increased traffic. Short-term impacts from MBTA-2 would be lower and more moderate than those from MBTA-3 given that this alternative involves removal and transport of less volume of contaminated soil than MBTA-3. 2A and 2B. However, impacts can be mitigated through use of engineering controls; careful planning of excavation in phases, materials staging, transport routes, work schedule, and other project details; and coordination with community stakeholders.

Similarly, short-term risk to on-site workers would be somewhat greater for ESA MBTA-3 than for ESA MBTA-2 because of additional disturbance of contaminated soil and additional handling of a larger total volume of materials (excavated soils and clean soil cover materials). As with impacts to the community, risks to workers can be minimized for both alternatives through compliance with a comprehensive site operations, Health and Safety Plan, use of engineering controls to reduce fugitive dust and airborne contaminants, air monitoring, and use of proper personal protective equipment and engineering controls (water, covers and monitoring) to prevent exposures to contaminant-laden dusts from becoming airborne.

Short-term impacts to the environment from both alternatives would include emissions from on-site equipment, trucks delivering clean soil backfill and cover materials, and trucks transporting excavated material offsite (ESA MBTA-3). The most significant short-term impacts to the environment posed by the MBTA Area alternatives are the impacts to the floodplain and a small area of wetlands. Placement of the 16-inch thick soil cover along the MBTA ROW in MBTA-2 without removal of a sufficient amount of contaminated soil would reduce floodplain capacity. This impact would be mitigated by providing compensatory floodplain volume nearby, within the floodplain of the Crane River. Creation of additional flood storage capacity for MBTA-3 is unnecessary since a sufficient amount of contaminated soil will be removed so that placement of a soil cover would not result in occupancy or modification of the floodplain. Impacted wetlands in both alternatives will be restored to their original conditions or wetland replication will be performed, if necessary, near the impacted area.

Like the general environmental impacts, the relative sustainability of ESA MBTA-2 and -3 is most affected by the volume of materials to be handled (excavation, cover, backfill, grading, transport) and distance to the ultimate disposal location; these factors are the most important variables in the amount of energy expended and materials required to implement the remedial action.

The time to achieve RAOs is directly correlated with the amount of soil to be handled (excavation, cover/backfill, grading) in each alternative. Alternative ESA MBTA-2 would be the faster of the two action alternatives (approximately 5 months), as it requires significantly less soil handling; alternative ESA MBTA-3 would take more than twice as long (approximately 10 months) to achieve RAOs. However, ESA MBTA-3 does not impact the 100- or 500-year floodplain storage and does not require creation of impacted flood storage capacity which will require monitoring for a minimum of up to three years to ensure seeding regrowth.

Implementability

ESA -- Residential

ESA Residential-1, the no action alternative, would not require any action and therefore does not present any implementability issues.

Although the construction work for the four active ESA Residential alternatives would be routine, implementation at this Site would be more difficult because the remediation area is in close proximity to residential condominium buildings and there is limited space available for material stockpiles, equipment storage, and efficient work operations.

Implementing any of the ESA Residential alternatives is also challenging due to the presence of subsurface utilities. In particular, alternatives ESA Residential-3A and 3B, which include deeper excavation, raise the likelihood of more potential encounters with subsurface utilities. Furthermore, the excavation of a larger volume of soil under ESA Residential-3A and 3B will require more stockpiled clean material and more soil storage space around the proposed excavation areas would be needed. This will be challenging because of the limited open area and presence of occupied residential buildings and parking areas on the ESA residential properties.

The four active ESA Residential alternatives result in adverse impacts to wetlands and floodplains which would need to be addressed by minimizing their impacts, to the extent possible, and mitigation measures to address unavoidable impacts. Given the space restraints in the ESA Residential and surrounding area, finding suitable areas for restoration or replication presents some challenges.

No issues are anticipated in coordinating with area landowners to implement land use controls.

ESA -- MBTA

The no action alternative, ESA MBTA-1, would not require any action and therefore does not present any implementability issues.

Both ESA MBTA-2 and ESA MBTA-3 involve routine construction work and are readily implementable. Both of these alternatives result in adverse impacts to wetlands and floodplains, with ESA MBTA-2 also resulting in permanent occupation and modification of the floodplain. Such impacts would need to be minimized to the extent practicable. This alternative would also require mitigation measures to address unavoidable wetland/floodplain impacts, including creation of additional flood storage capacity, as appropriate for ESA MBTA-2.

Coordination with historic and archaeological stakeholders would be required under these alternatives if (during remedial design or remedial action) it is determined that the remedial action may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data. It is anticipated that land use controls will include restricting the property to recreational use, but this must be coordinated with the property owner.

<u>ESA -- Riverfront</u>

ESA Riverfront-1, the no action alternative, would not require any action to be taken and therefore does not present any implementability issues.

ESA Riverfront-2A and ESA Riverfront-2B are similar since they both rely on conventional construction work and both are easily implementable. Both ESA Riverfront-2A and -2B incorporate shallow soil excavation (0-2 ft bgs), a remedial technology that is readily available and generally simple to execute. Both alternatives rely on comparable heavy equipment to implement that is easy to contract. Both alternative excavations are equally reliable in reducing soil exposure risk.

Coordination with historic and archaeological stakeholders would be required under these alternatives if (during remedial design or remedial action) it is determined that the remedial action may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data. It is anticipated that land use controls will include restricting the property to recreational use, but this must be coordinated with the property owner.

<u>Costs</u>

The costs for the all alternatives are presented in Appendix G, Table 1 of this ROD. Note that for ESA Residential 2A and 2B, and ESA Riverfront 2A and 2B, the only difference in cost is associated with onsite versus offsite disposal of excavated soils. As described earlier in this ROD, if the on-site consolidation area at 55 Clinton Avenue cannot accommodate larger volumes of soil than anticipated or if there's significant delay in performance of the work under OU2, cleanup work on one of the ESA Residential parcels may be accelerated by performance of a removal or remedial action that includes off-site disposal (for example, at 45 Water Street, for which EPA has already signed an Action Memorandum), more soil may need to be disposed offsite under ESA Residential 2A and ESA Riverfront 2B than anticipated, thereby reducing the ultimate cost differential between the 2A and 2B alternatives.

<u>ESA -- Residential</u>

Present worth costs for No Action is $48,000. Present worth costs for the action-based alternatives range from $2,657,000 - $4,367,000 for ESA-Residential 2A and 3A with on-site consolidation; and from $3,337,000 - $5,818,000 for ESA Residential 2B and 3B with off-site disposal.

ESA -- MBTA

Present worth costs for No Action is $48,000. Present worth costs for MBTA-2 with little excavation and soil cover is $2,239,000; for MBTA-3 with additional excavation, soil cover and offsite disposal is $5,351,000.

ESA -- Riverfront

Present worth costs for No Action is $48,000. Present worth costs for ESA Riverfront-2A with on-site consolidation is $2,784,000; for Riverfront-2B with off-site disposal is $3,188,000.

WSA – OU2 Alternatives

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative WSA-1, the no action alternative, does not provide any protection from exposure to unacceptable health risks posed by contaminated soil since no cleanup actions would be taken and the RAOs would not be met. This alternative does not provide overall protection of human health and the environment.

Alternatives WSA-2, -3, and -4 are all protective of human health and the environment by excavating soil with contaminants exceeding cleanup levels from the WSA and consolidating the excavated soil on-site in the WSA consolidation area under a protective RCRA D cap, thereby preventing the potential for exposure to or transport of accessible contaminated soils. Areas where soil exceeding cleanup levels remain in place will have a soil cover to prevent exposure. Where contaminated soil is left in place, institutional controls in the form of land use restrictions would be used to prohibit activities that would interfere with the remedy or allow residential use.

WSA-2 includes the least excavation, allowing for unrestricted use of the southern 50% of the WSA. WSA- 3 allows for unrestricted use of the southern 67% of the WSA. WSA-4 includes the most excavation, allowing for unrestricted use, of approximately 75% of the WSA, except for the historical cemetery areas and existing consolidation/cap area. Alternative WSA-2, WSA-3 and WSA-4 are all protective of human health and the environment and will require long-term monitoring and maintenance of soil covers.

All of the active alternatives include on-site disposal of the excavated non-hazardous soil in a consolidation area on the WSA capped with a permeable protective RCRA D cap that will prevent exposure to contaminated soil. Groundwater monitoring around the consolidation area will be included to ensure contaminants in the consolidated waste is not migrating through potential leachate. (All four alternatives include offsite disposal of hazardous material and that exceeding state upper concentration levels.) All four alternatives also include long-term monitoring and maintenance of the capped and covered areas.

Under WSA-2, WSA-3 and WSA-4, human health and the environment will be equally protected with adequate monitoring and proper maintenance and enforcement of institutional controls to prevent exposure and prohibited uses of the area.

Compliance with ARARs

There is no ARARs analysis for WSA-1 alternative since no action will be taken under this alternative. Impacted soils remain in place and exposure pathways are not controlled; RAOs will not be met.

Alternatives WSA-2, -3, and -4 will comply with all chemical, action, and location specific ARARs, including requirements of Massachusetts solid waste regulations, as well as guidance for construction of a protective permeable protective RCRA D cap at the on-site consolidation area and for soil covers placed over contaminated soil that remain in place. Long-term groundwater monitoring will be implemented around the consolidation area to ensure there are no impacts to groundwater by potential leachate from the consolidated waste. Dust suppression and air monitoring will be conducted during excavation activities. Additional wetting and other dust control measures will be used, as necessary, during removal and consolidation of asbestos-containing material from the building debris area in accordance with the Clean Air Act. Discharges resulting from dust controls activities, including from decontamination and dewatering, will be collected and either treated to pre-treatment standards prior to discharge to sewers, or containerized and disposed of off-site. Storm water controls and measures to prevent erosion will be designed in accordance with the Clean Water Act to ensure any discharges to the River do not degrade surface water. Hazardous waste, if found, will be properly handled and disposed off-site.

Alternatives WSA-2, -3, and -4 will have unavoidable impacts to the wetlands, and any damaging impacts will be minimized and mitigated to the extent practicable. The location of the consolidation area included in these alternatives is outside of the 100-yr and 500-yr floodplains. Work, however, which includes the construction of temporary access roads within the floodplains, will occur with each alternative and will result in temporary occupancy and modification of the floodplain. Upon completion, the roads will be removed, and the area will be backfilled to the original grade and condition, to the extent practicable, to avoid loss of storage capacity. WSA-2 includes less soil excavation and associated disruption to wetlands. Excavated materials will not be discharged to wetlands or water but will be sent to the consolidation area in the northwest corner of the WSA. Implementation of WSA-2, -3, and -4 will be unlikely to impact coastal resources; however, potential impacts will be considered during remedial design and minimized, if necessary.

Installation of temporary sheet pile walls to dewater contaminated shoreline soil for excavation will be designed to comply with Section 404 of the Clean Water Act. Such measures may include conducting work during low tide cycles and collecting dewatering and either discharging to a POTW (after pre-treatment if necessary), discharging to the River (with treatment, if necessary) or collection and offsite disposal.

Areas of potential historical and archaeological significance have been identified in parts of the WSA proposed for remedial action and will potentially be adversely impacted. To comply with federal and state archaeological and historical preservation requirements, state and tribal contacts have been notified and will be consulted prior to remediation. Mitigation measure, if necessary, will be implement in consultation with the SHPO and THPO.

Primary Balancing Criteria

Long-term Effectiveness and Permanence

Alternative WSA-1, the no action alternative, does not provide long-term effectiveness and permanence because the residual risk remains high and there are no institutional controls to prevent exposure to contaminated soil

Each alternative, except the no action alternative, provides some degree of long-term protection. WSA-3 increases in effectiveness of assuring against potential exposure over WSA-2 as additional depth and lateral extent of soil is removed from the area. Alternative WSA-4 would provide the greatest degree of long-term effectiveness and permanence given the greatest removal of volume and mass of contaminants from the largest areal extent on the WSA.

Conversely, this results in consolidation of more material in the on-site consolidation area and a larger permeable cap. Residual risks would remain for all alternatives because contaminants exceeding cleanup levels will remain beneath the cap. All include long-term monitoring and maintenance and institutional controls to prevent exposure and actions required to maintain the controls would be included as part of these alternatives. The effectiveness and permanence of these alternatives is dependent upon the adequacy of maintenance of the soil covers and the enforcement of land use controls.

Five-year reviews will be required for all alternatives because contamination will remain on-site.

Reduction of Contaminant, Toxicity, Mobility, or Volume through Treatment

None of the alternatives apply active treatment but all, except the no action alternative, require excavation and capping with either a soil cover or permeable protective RCRA D cap which will reduce mobility of contaminated soil, to some extent, from current conditions of erosion and tidal surges. Since no treatment will be applied under any of the WSA alternatives, there will be no reduction in toxicity, mobility, or volume through treatment.

Short-Term Effectiveness

The short-term effectiveness of the remedial alternatives has been evaluated from five perspectives: risks to the community during implementation, risks to onsite workers during implementation, short term environmental impacts, short-term sustainability, and the time until remedial action objectives are achieved.

WSA-1, the no action alternative, has the least amount of short-term impacts since no action will be taken and therefore no disruption to the community or impacts to workers. The remaining alternatives include actions that will have some short-term impacts as described below. All of the remaining alternatives will include consolidation of material stockpiled and staged from excavations conducted through the ESA alternatives.

Alternatives WSA-2, -3, and -4 would have similar impacts on the community and workers and will involve some disruption to the community as well as exposure of workers to contamination during excavation and consolidation activities. Impacts may include fugitive dust emissions, noise, physical safety, inconvenience and increased traffic. Short-term impacts from WSA-2 would be more moderate than those from WSA-3 and 4 given that this alternative involves removal and consolidation of less volume of contaminated soil than WSA-3 and 4. Alternatives WSA-3 and -4 address very similar soil volumes and therefore pose similar risks to the community, workers, and the environment. The short-term impacts may be slightly higher for WSA-4 because of slightly more volume of material excavated and handled. However, these impacts for all alternatives can be mitigated through the use of engineering controls; careful planning of excavation in phases, materials staging, transport routes, work schedule, and other project details; and coordination with community stakeholders.

Similarly, short-term risk to on-site workers would be somewhat greater for WSA-3 and 4 than for WSA-2 because of additional disturbance of contaminated soil and additional handling of a larger total volume of materials (excavated soils and clean soil cover materials). As with impacts to the community, risks to workers can be minimized for these alternatives through compliance with a comprehensive site operations, Health and Safety Plan; use of engineering controls to reduce fugitive dust and airborne contaminants; air monitoring; and use of proper personal protective equipment, and engineering controls (water, covers and monitoring) to prevent exposures to contaminant-laden dusts from becoming airborne.

Short-term environmental impacts are considerable on the WSA but are similar for all alternatives evaluated. These include emissions from on-site equipment, trucks delivering clean soil cover and/or capping materials, and transport of excavated material to the onsite consolidation area. A majority of the current upland habitat and a smaller area of wetland will be destroyed during remediation activities to regardless of which alternative is selected. Following excavation, the upland and wetland areas would be restored to match original conditions.

Similar to the general environmental impacts, the relative sustainability of the three alternatives is most affected by the volume of materials to be handled (excavation, backfill, grading, consolidation); these factors are the most important variables in the amount of energy and fuel expended and materials required to implement the cleanup.

Of the three active remedial action alternatives the fastest time to achieve RAOs is Alternative WSA-2, addressing approximately 39,000 CY (including debris), approximately 33 months, followed by Alternative WSA-3, which would address 46,000 CY (including debris), approximately 38 months. The longest implementation time would be Alternatives WSA-4, excavating all soil above cleanup levels which are not beneath the consolidation cell, roughly 48,000 CY (including debris), approximately 39 months.

Implementability

WSA-1, the no action alternative, would not require any actions to be taken at the Site and therefore does not present any implementability issues. WSA-2, and -3 are relatively comparable given that they involve routine construction work. Demolition of the former Creese building debris, that was located at 55 Clinton Avenue, and associated asbestos-containing material, while requiring special handling, is also conventional and available technology.

WSA-4 is comparatively the most difficult to implement compared to WSA-2 and -3 because it requires managing and consolidating the greatest amount of waste and presents more height and slope challenges during construction of the cap. Although the on-site consolidation area is not within a wetland or floodplains, all three of these alternatives would result in impacts to wetlands and floodplains during excavation activities (and for some, placement of soil covers); such impacts would need to be minimized to the extent possible and mitigation for unavoidable floodplain/wetland impacts would be required.

Coordination with historic and archaeological stakeholders would be required under these alternatives if (during remedial design or remedial action) it is determined that the remedial action may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data. No issues are anticipated in coordinating with area landowners to implement land use controls.

Cost

Estimated costs for the WSA alternatives are summarized in Table 1 in Appendix G of this ROD.

Present worth cost for the No Action Alternative (WSA-1) is $48,000; however, the alternative would not achieve Site RAOs. Similar to time to achieve RAOs, the alternative costs are directly correlated with the amount of contaminated soil that is addressed in each alternative. The most expensive action alternative is Alternative WSA-4 with a present worth of $16,390,000, which ultimately produces the most unrestricted land area on the WSA and removes the most amount of soil. The second most expensive alternative is WSA-3 with a present worth of $15,978,000, and the least costly alternative is WSA-2 with a present worth of $13,493,000.

Modifying Criteria with Respect to Both ESA – OU1 and WSA – OU2 Alternatives

State Acceptance

The State of Massachusetts, through its lead agency, the Massachusetts Department of Environmental Protection (MassDEP), has expressed its support for EPA's preferred alternatives presented in the October 2018, Proposed Plan and concurs with the selected remedy outlined in this

ROD. See Appendix C of this ROD for the State concurrence letter.

Community Acceptance

EPA's extensive community engagement efforts at the Site included the publication of a Proposed Plan in October 2018, and the occurrence of multiple public meetings which are described in further detail above in Part II, Section, C of this ROD.

A public informational meeting was held at the Riverside Elementary School in Danvers, MA, on October 25, 2018, and was immediately followed with the Public Hearing. A transcript was created for this hearing and has been made part of the Administrative Records for this Record of Decision. In addition to the oral comments received at the hearing, a number of written comments were also provided. A summary of the comments specific to the proposed alternative for OU1 and OU2 is included in The Responsiveness Summary, Part 3 of this ROD.

L. PRINCIPAL THREAT WASTES

The National Contingency Plan at 40 CFR Section 300.430 (a)(1)(iii) states that EPA expects to use "treatment to address the principal threats posed by a site, wherever practicable and engineering controls, such as containment, for waste that poses a relatively low long-term threat to achieve protection of human health and the environment. In general, "principal threat wastes are those source materials considered to be highly toxic or highly mobile, which generally cannot be contained in a reliable manner or would pose significant risks to human health or the environment should exposure occur." Low-level threat wastes "are source materials that generally can be reliably contained and that would present only a low risk in the event of exposure (EPA, 1997)."

The concept of principal threat and low-level threat wastes is applied on a site-specific basis when characterizing source material. Source material is defined as material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, to surface water, to air, or acts as a source for direct exposure.

Although EPA has not established a threshold level of toxicity/risk for identifying a principal threat waste, generally where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater, the source material is considered to be a "principal threat waste."

In the each of the OU-1 and OU-2 areas, ESA Residential, ESA MBTA, ESA Riverfront, and WSA, the contaminated soil and riverbank soil are identified as source material that is not a "principal threat waste," but rather a "low-level threat waste". With respect to the toxicity of this source material (soil), total cancer risk levels in all areas evaluated in the ESA and WSA Human Health Risk Assessments are below 10^{-3}. More specifically, soil contaminant concentrations generally do not significantly exceed the reference dose levels for non-cancer risks, and with the exception of a small area on 20 Cheever Street which will be removed and disposed off-Site because concentrations exceed UCLs, the Site lead soil concentrations are below blood levels of concern. Additionally, Site source area contaminants are not highly mobile, as demonstrated by the relatively low and infrequently detected Site related COCs in groundwater and risk assessment conclusions.

The selected response actions will address low-level threat wastes at the Site through excavation, on-site consolidation and capping, and/or off-site disposal actions and through implementation of institutional controls.

M. THE SELECTED REMEDY

1. Summary of the Rationale for the Selected Remedy

The selected remedy is a comprehensive remedy that utilizes source control components to address unacceptable risks from exposure to soil and Riverfront soil contamination at the Site for ESA - OU1 and WSA – OU2. See Appendix A, Figure 2 in Appendix A of this ROD which depicts the Site and the study areas. The following FS alternatives, divided into two principle areas addressed under OU1 and OU2, comprise the selected remedy, as follows:

- ESA Residential areas (33 and 45 Water Street) – Alternative 2A
- ESA MBTA Right of Way including 35 Water Street – Alternative 3
- ESA Riverfront Soil including 20 Cheever Street – Alternative 2A
- WSA Soil (55 and 27 Clinton Avenue and Riverfront soil) – Alternative 2

The remedy includes source control measures to address contaminated soil and protect human health and the environment by eliminating, reducing, or controlling exposures to human and environmental receptors from direct contact, incidental ingestion, or inhalation of contaminated soil through the following activities: excavation; consolidation and capping of excavated soil at 55 Clinton Avenue; placing clean soil coverings on excavated areas; off-site disposal of a portion of the contaminated soil, as defined; operation and maintenance of these activities; and placement of institutional controls. In addition, the remedy will prevent migration of contaminants to surface water and/or sediments of the Crane River. It is estimated that approximately 85 percent of the excavated soil will likely be characterized as non-hazardous waste which could appropriately be consolidated on-site; the remaining 15 percent is estimated to be characterized as hazardous waste and will be disposed of off-site at an appropriately licensed facility.

The Selected Remedy does not include treatment or management of migration for groundwater. The Commonwealth of Massachusetts has determined that the groundwater beneath the Site has a low use and value and is not considered a current or potential future drinking water source. The aquifer itself is generally considered to be of low to moderate yield; however, it is not considered a suitable drinking water source now or for the future because of the surrounding commercial land usages and high salinity of the groundwater due to its close proximity to the ocean. EPA conducted a risk assessment on shallow groundwater and found it did not present unacceptable

Site risks.

The Selected Remedy requires long-term monitoring and review, to be conducted every five years after completion of the remedial action, to ensure that the remedy remains protective over time.

Overall, the Selected Remedy provides the best balance of tradeoffs with respect to CERCLA's remedy selection criteria. See Tables 5-1, 5-3, 5-5 and 5-7 of the FS for the detailed analysis of the ESA and WSA alternatives.

The estimated present value of total cost of the selected remedy is $24.3 million. The cost analyses include an estimation of the capital costs and annual operation and maintenance costs. In addition, the cost estimate is based on a present worth analysis by discounting to a base year or current year using a 7 percent discount rate.

2. Detailed Description of Remedial Components

The following is a detailed description of each of the components of the selected remedy. The final selected source control remedy for OU1 and OU2 is consistent with alternatives described in the September 2018 FS and with EPA's preferred alternatives outlined in the October 2018 Proposed Plan.

The selected remedy may change somewhat as a result of the remedial design and construction processes. More specifically, pre-design studies will include additional soil sampling to refine the vertical and lateral extent of soil contamination and will determine the volume of non-hazardous waste to be consolidated on-site. Variables such as slope stability for the consolidation area, footprint of the consolidation area, volume of soil to be consolidated, implementation sequencing, and available funding may result in off-site disposal of additional non-hazardous soil excavated from the ESA Residential and Riverfront areas, rather than consolidation of this material on-site. Changes to the remedy described in the ROD will be documented using a technical memorandum in the Administrative Record, an ESD, or ROD amendment, as appropriate.

The Selected Remedy comprises multiple areas throughout the two operable units and includes elements that are common across the areas, as well as actions that are unique to each area, as described below. Many of the details outlined above are conceptual in nature and the actual details and methods will be developed as part of remedial design.

Common Elements for each Component of the Remedy

The selected remedy will require pre-design investigations ("PDI") to establish existing Site conditions including soil borings to establish the vertical and lateral extent of contamination, characterization of waste for disposal, the location of existing utilities, and for delineation of wetland and floodplain areas. A utility survey will identify potential utilities to avoid interference or damage during excavation and consolidation activities. Appendix D of the FS includes the PDI plan. Pre-design activities will also include the development of a monitoring well decommissioning plan to identify, properly abandoned, and decommission any existing monitoring wells that are located in the excavation areas.

Mobilization and demobilization of construction equipment, material, and personnel will occur at various stages of the project based on project needs and progress. In preparation for remedial construction activities, clearing of trees, brush and vegetation will occur, temporary erosion controls will be used, and fencing and signage will be placed within work areas so that they are clearly identified, as needed. As described in more detail below, temporary access roads and temporary staging areas will be constructed to conduct the remediation.

Each staging area will also include temporary decontamination areas, with pads, where vehicles and heavy equipment will be decontaminated. The decontamination process involves high pressure steam-cleaning to prevent spread of contaminated soil to clean areas. Steam cleaning will be supplemented, as needed, with additional scrubbing to remove encrusted materials from equipment. Vehicles will be decontaminated before they leave excavation/staging areas to travel on public roads or clean areas of the Site. The decontamination pad will include a slope so that wastewater will flow towards a sump pump where it will be collected, containerized, sampled, treated (if necessary), and either discharged to the local POTW or disposed of off-site. No decontamination water is to be discharged to the river.

Although excavation will vary depending on the current and future use of the parcel, excavation, backfilling and the installation of clean soil covers will occur at all parcels to some degree. After excavation of the contaminated soil is completed, the subgrade surface will be smoothed and compacted, and an as-built excavation extent and depth survey will be performed. The survey will be to the 1-foot topographical contours, and would document the excavation extents, depths, and subtle differences for any future site work. A brightly-colored non-woven geotextile fabric layer will be placed at the bottom of each excavation to delineate clean fill from the remaining (possibly contaminated) soil and serve as a "warning layer" for future intrusive activities, should they occur. The excavated area will be backfilled with clean fill to within 0.5 feet below the initial grade, compacting soil in 1 ft lifts. The remaining depth will be filled with topsoil (in landscaped/vegetated areas) or subgrade and pavement (in currently paved areas) to match the pre-excavation grade and restore the area to its original condition.

To prevent and mitigate potential dust emissions during implementation of the selected remedy, engineering controls will be used during excavation, staging, consolidation, loading and disposal activities. Such measures include physical covering of stockpiled material, water sprays and mists to control dust and odor, dust suppression products and real-time air monitoring of particulates.

Site specific plans such as for health and safety, air monitoring, surface water protection, construction management activities and quality assurance/quality control plan will also be prepared.

Onsite consolidation of waste at 55 Clinton Avenue from both excavations at the ESA and WSA areas is implemented pursuant to the "Area of Contamination" policy as described in EPA guidance and the preamble to the NCP regulations. Accordingly, ARARs related to RCRA Land Disposal Restrictions and other RCRA requirements (such as the minimum technology requirements related to landfills) do not apply to such consolidation.

Additional common components of the remedy also include long-term operation and maintenance (O&M) activities, which includes but is not limited to annual inspections and maintenance, as needed, of the low-permeability cap and clean soil covers and of the paved and landscaped areas. Maintenance activities could include mowing of grass on the caps, inspecting and repairing eroded cap soil, and controlling animal activity in the consolidation and/or soil cap areas. For areas with restored wetlands, inspections will be conducted frequently following restoration activities and then periodically over an extended period of time.[13] Inspection reports outlining findings will be prepared and will recommend corrective actions, if any. Maintenance and/or corrective actions will be required as concerns are identified.

The actual methods, plans, and specific details of the above common elements will be refined during remedial design process.

Institutional Controls (ICs), including land use controls, as appropriate, will be required as identified below to protect the selected remedy where wastes are left in place and/or unrestricted use standards are not achieved. ICs will prevent future exposure to contaminated soil that remains above cleanup levels and prohibit activities that could damage the remedy and other restricted activities that could pose an unacceptable risk. For certain areas noted below, future residential use will be prohibited. ICs will be implemented in accordance with federal and state law.

Because this remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, and because land use restrictions are necessary, a statutory Five-Year Review of the remedy will be conducted five years after the start of the remedial actions to ensure that the selected remedy continues to provide adequate protection of human health and the environment. Five-year reviews will continue as long as waste remains at the Site and unlimited use is restricted.

Specific Actions for Each Area

In addition to the common components listed above, there are unique components specific to

[13] The FS assumed inspections would be conducted weekly for the first two months following restoration; monthly for the next six months following restoration; semi-annually for the next four years following restoration; and annually for the next 25 years following restoration. Wetland area maintenance includes hydroseeding, topsoil replacement, and vegetation replacement, which was assumed would be completed for 30% of the wetland area during year 1, 20% for year 2, 10% for year 3, 5% for years 4 and 5, and 1% for years 6-30. The inspection and maintenance requirements will be further evaluated and finalized during the remedial design.

ESA Residential Areas

To construct the remedy at 33 and 45 Water Streets, access and haul roads will be constructed on and just outside these residential areas. In general, the road will run parallel to the MBTA ROW, connecting 33 Water Street, 45 Water Street, and the equipment and materials staging area that will be located on 20 Cheever Street, see figure 5-1B of FS. This area (the ESA staging area) will be used only for equipment and material staging activities.

Soil exceeding soil cleanup levels (shown on Figure 5-1A of the FS, and as further delineated by the PDI) will be excavated up to 3 ft below the ground surface (bgs) from unpaved and paved areas of the residential area (approximately 4,330 CY). Excavation around residential structures will include any accessible soil or soil that could become accessible in the foreseeable future (including beneath decks and beneath paved walkways and driveways); however, no soil will be excavated from beneath buildings and closely associated hardscapes, including masonry steps and concrete patios between structures. For costing purposes, the FS assumed confirmation samples will be collected from the sidewalls of the excavated areas (approximately every 30 linear feet [LF]). The confirmation samples will be collected to delineate the lateral extent of the excavations. No confirmation samples will be collected from the bottom of the excavation.

A second staging area will be constructed at 55 Clinton Avenue in the WSA portion of the Site. Excavated soil from the residential area in the ESA will be loaded directly into lined dump trucks and the material will be moved to the WSA staging area. Based on the sampling results of the PDI, soil will be managed as either non-hazardous waste or hazardous waste and segregated accordingly. Most of the excavated soil is expected to have characteristics suitable for on-site consolidation. The excavated non-hazardous soil will be loaded directly into lined dump trucks. Hazardous soil will be transported in lined and covered dump trucks in accordance with state hazardous waste regulations (310 CMR 30.400). The hazardous waste will ultimately be disposed of offsite at an appropriately licensed facility; the non-hazardous waste will be consolidated under a protective RCRA D cap in the consolidation area of the WSA. (See the WSA Soil discussion below for more details about the WSA staging and consolidation areas.) As previously described, dust suppression methods will be incorporated, as needed, to prevent soils from becoming airborne during excavation and transport and an air quality management and monitoring program will be established that includes real-time monitoring of dust particulates.

Once the excavated area is backfilled and a soil or asphalt cover installed, the ground surface in previously landscaped areas will be seeded and/or planted to restore the areas to their original conditions. In areas where pavement was removed to access contaminated soil, pavement will be restored to its previous state. Appropriate pavement subgrade and at-grade utility equipment (i.e. manholes) will be reinstalled. Bituminous concrete and associated curbing will be reinstalled. Traffic and parking paint will be applied to restore the area to match original conditions.

A small area of wetlands may be present in the proposed excavation area on 45 Water Street. The presence and potential wetland impacts will be determined based on the results of the PDI investigations. Should this area be impacted or destroyed, the wetlands will be restored to its original conditions. For costing purposes, it is assumed that wetland restoration or replication, if necessary, is performed in a small area on 45 Water Street (see Figure 5-1B of the FS).

Long-term monitoring and maintenance of the soil covers, land use controls, and five-year reviews are included for the residential area remediation as described in the above common elements section.

MBTA ROW Areas

This component of the selected remedy includes an archaeological survey as part of the PDI activities. The survey will be performed to further evaluate potential areas of archaeological significance previously identified in a reconnaissance-level survey conducted (Donohue, 2017) to determine whether any significant areas are present that could be impacted by the proposed remedial action. If cultural artifacts or significant areas are identified through this process, an Avoidance and Protection Plan (APP) would be developed to describe measures that would have to be taken to prevent such damage or impacts. Details of the proposed archaeology surveys are presented in Appendix F of the FS with areas of potential archaeological significance shown on Figure 1-7 of the FS.

Prior to the start of remedial action in this area, existing fencing (approximately 5,450 linear feet) and all railroad ties and tracks will be removed and recycled/scrapped off-site. Although the MBTA ROW and 35 Water Street can be accessed through existing roadways, work will be performed using the same temporary access and haul roads that will be constructed for the residential area remediation, with some modifications as shown on Figure 5-3B of the FS. Use of these temporary roads will minimize cross-contamination within and around the construction zone. Equipment, materials and personnel to carry out the work in this area will also utilize the ESA staging area on 20 Cheever Street. Due to the larger area that will potentially be disturbed by excavation and grading than the residential areas, more extensive temporary erosion controls may be required along the perimeters of work areas as shown in Figure 5-3B of the FS to prevent sediment transport out of the work zones and protect sensitive areas including the river, wetlands, and storm drains.

Soil excavation and handling will be the same as that described for the residential area, with soil exceeding cleanup levels up to 3 feet bgs (shown on Figure 5-4A of the FS, and as further delineated by the PDI) removed along the MBTA ROW and 35 Water Street (approximately 9,630 CY). Confirmatory sampling, loading of non-hazardous and hazardous waste, and transport to the WSA staging area at 55 Clinton Avenue will also be the same as described for the residential area, except that all excavated soil will ultimately be disposed of off-site after staging and characterization of the material at the WSA staging area. It is assumed that dewatering will not be required because excavation is not proposed to extend below the water table. This assumption will be confirmed during the PDI. Decontamination of equipment will also be conducted as described for the residential area.

There are no buildings on the MBTA ROW area, and it is not anticipated that paved areas will be impacted by the remedial actions; if they are, the paved surfaces will be restored as described for the residential area. Once the soil cover is installed, the ground surface in previously landscaped areas, if any existed, will be seeded and/or planted to restore the areas to its original conditions. Excavation activities will impact or destroy some wetland areas located on the western side of the MBTA ROW parcel, estimated to be approximately 320 square feet in size. These wetlands areas will be restored to their original condition and monitored over time to ensure wetland restoration or replication efforts, if necessary or these two small wetland areas will be constructed on MBTA ROW, conceptually in areas adjacent to the eastern boundary of 20 Cheever Street (see Figure 5-4A of the FS). The actual methods, plans, and specific details of the above common elements will be refined during remedial design process.

Long-term monitoring and maintenance of the soil cover will be annually for the first five years as described in the common elements above; however, it may be reduced to every five years. Post wetland restoration or replication inspections will be consistent with the timing set out in the common elements section as will the placement and enforcement of institutional controls. For this area, land use controls will include a restriction against residential use of MBTA ROW and 35 Water Street. Five-year reviews will also be conducted to ensure long-term protectives of the remediation.

ESA Riverfront Soil

Both a topographical and archaeological survey will be included in the PDI activities for this area. The topographical survey will be used to determine the location of the mean-high water line which will, among other things, mark the general western extent of excavation for this selected remedy. (Areas below the high tide line will be addressed as part of the Crane River study and remediation (OU3) for the Site.) In addition to soil borings needed to further define the vertical and lateral extent of contamination, soil borings will be taken to provide information for engineering of the coffer dam that will be installed as part of the excavation activities. The archaeological survey will be performed as described in the MBTA ROW soil description above.

Mobilization for remediation of this area will be coordinated with the ESA Residential area mobilization. The same temporary access and haul roads constructed on the MBTA ROW, 35, and 45 Water Street, and 20 Cheever Street for the residential and MBTA ROW areas will also be used to accomplish this area's remediation with slight modifications as shown on Figure 5-5B of the FS. The staging areas at 20 Cheever Street and 55 Clinton Avenue will also be used for this area's remediation.

Prior to excavation activities, a temporary cofferdam or equivalent system will be installed to allow dewatering of the excavation area. The cofferdam will be installed in the Crane River, just offshore of the riverbank areas to be excavated (from the northern part of 20 Cheever Street, south to the southern end of 45 Water Street) to keep surface water out of the excavation area (Figure 5-5A of the FS). The use of a cofferdam will minimize the tidal constraints to work periods; will facilitate the draining of saturated riverbank soils; will protect the area during excavation, backfilling, and wetland restoration or replication if necessary; and will serve as erosion/sedimentation controls to prevent sediment transport into the river during construction. The cofferdam, or equivalent system, will be removed at the completion of the excavation activities. The actual methods, plans, and specific details will be refined during remedial design process.

Riverbank soil exceeding soil cleanup levels (shown on Figure 5-5A, and as further delineated by the PDI) will be excavated from 0-2 feet bgs. The total volume of riverbank soil to be excavated is approximately 2,650 CY. Additional soil will be excavated from the UCL exceedance of lead hot spot area on 20 Cheever Street from 0-4 ft bgs (see Figure 5-5A of the FS). The total volume of soil to be excavated from the lead hot spot area is approximately 400 CY.

Soil excavation along the riverbank will occur behind a cofferdam system. Soil exceeding cleanup levels up to 3 feet bgs (shown on Figure 5-5A of the FS, and as further delineated by the PDI) will be removed along the riverbank area of 20 Cheever Street, the MBTA ROW and 45 Water Street (approximately 2,650 CY) and from the lead UCL hot spot area within 20 Cheever Street. Handling and staging of riverbank and UCL hot spot area will be the same as that described for the residential area. The cofferdam system used for riverbank excavations should effectively dewater the riverbank soils prior to excavation; but if the soils are wet when excavated, they will be either placed in the lined drying bed portion of the WSA staging area once transported there and allowed to drain, or the soil will be stabilized using kiln dust, or another appropriate material, to prevent any free-flowing liquid prior to its transport to the WSA consolidation area, or a combination of both methods may be used to stabilize the soil, if necessary. Surface water pumped during dewatering and any leachate from dewatering of excavated soils will be collected, analyzed, and treated, as necessary, prior to disposal. Discharge options for the water collected during dewatering will depend on the quality of treated effluent, and may include direct discharge to downstream portions of Crane River, to the local POTW, or disposed of offsite. Confirmatory sampling, loading of non-hazardous and hazardous waste, and transport to the WSA staging area at 55 Clinton Avenue will also be the same as described for the residential area except that in addition to offsite disposal of hazardous waste, excavated soil from the lead hot spot area will also be disposed of offsite after transport to the staging area at 55 Clinton Avenue.

Implementation of the soil cover will be slightly different than for the residential and MBTA ROW soil area. It is estimated that approximately half of the UCL hotspot excavation area and the entire riverbank excavation area is wetland/saltmarsh. The areas to be excavated and the extent and characteristics of existing wetlands will be delineated during the PDI. Because wetlands will be impacted or destroyed through excavation, restoration (with long term monitoring) or mitigation will be required. The riverbank area excavation will be backfilled with 2 ft of cover soil selected to match existing wetland/saltmarsh soils (details on soil type to be used to be determined during PDI). The riverbank soil cover areas will be hydroseeded with an indigenous wetland mix and planted with indigenous wetland plant plugs (spaced in a grid, approximately 2 ft on center) selected to match the existing conditions. In order to protect the vulnerable shoreline area from erosion, a loosely woven, geotextile fabric (such as a 0.5-inch x 0.5-inch woven coconut matting) will be used in the revegetated riverbank area to provide erosion protection while the plants become established. Other erosion controls, such as a "living shoreline" type buffer consisting of coir logs, or similar will also be installed along the face of the riverbank excavation area to protect the restored area from the daily tidal influx of surface water. The buffer system will be anchored into place and will be seeded/planted to help establish the natural shoreline buffer to protect the excavated wetland/saltmarsh area until the plants are re-established. The UCL lead hot spot excavation area on 20 Cheever Street will also be restored to match the original conditions. If new wetlands are required, they will be created in or near the impacted area(s).

Once soil excavation, soil cover installation, and wetland restoration or replication, of area plantings have been completed, long-term monitoring and maintenance will be initiated. Similar to the MBTA ROW soil area, inspections will be conducted annually for the first five years and then every five years thereafter. Inspection of the wetland areas will be conducted as described in the residential area. Every year for the first 5-years, a comprehensive inspection of nearby "reference areas" of comparable vegetation and estuarine structure, established during the PDI, will also be evaluated. Identification of differences or similarities to the reference areas will facilitate evaluation of the success of the ESA Riverfront area restoration.

Institutional controls and five-year reviews will be implemented as described in the common elements section above. Residential use will be prohibited on 20 Cheever Street and along the shoreline of the MBTA ROW and 45 Water Street.

WSA Soil Area

The PDI activities for this area of the selected remedy include geotechnical investigations and a land survey to provide data needed for design of the Consolidation Area, as well as a survey of the existing sewer utility line on 55 Clinton Avenue. In addition, a drainage analysis will be conducted to provide data for design of the stormwater controls and, as part of the environmental investigations, the high tide line along the eastern border of this area will be established. An archaeological survey consistent with that described above for the MBTA ROW area will also be included in the PDI.

Prior to conducting PDI activities within the former beamhouse footprint, existing beamhouse debris along with all potential asbestos containing material (PACM) present, will be relocated and consolidated along the northeastern edge of the former beamhouse to provide drilling access to the underlying slab. The beamhouse debris and potential asbestos containing materials will ultimately be consolidated with the contaminated soil and placed under the RCRA-D cap. Debris and PACM will be managed using heavy equipment and misting to control any fugitive dust during the relocation process. The consolidated beamhouse debris will be temporarily encapsulated and anchored in place. Environmental sampling beneath the beamhouse slab will be performed by drilling through the slab. The sampling will attempt to delineate any potential soil contamination beneath the slab. Additional details regarding the consolidation of the beamhouse debris are included in Appendix D of the FS (Pre-Design Investigation Details).

Temporary access and haul roads will also be constructed on the WSA; the locations and details will be refined during remedial design process. The existing fencing around the beamhouse footprint, former Landfill Area A, former Landfill Area B, and former Sludge Lagoon Area C, an upland pile area (approximately 2,200 LF), and approximately 600 linear feet of old railroad ties and tracks, will be removed prior to any remedial actions.

A soil staging area, approximately 1 acre in size, will be constructed on 55 Clinton Avenue to temporarily store and characterize soil excavated from 27 and 55 Clinton Avenue parcels as well as excavated soil from the ESA. Within the staging area, see figure 5-7A of FS, a separate hazardous waste and non-hazardous waste stockpile areas will be constructed. Soil will be transported from the various excavation areas as either non-hazardous or hazardous waste based on the sampling conducted during the PDI and placed in 400 cubic yard stockpiles where confirmatory testing will be conducted. The hazardous waste stockpile areas will be clearly marked and will include a drying bed area, which will be lined with a low-permeability barrier, surrounded by berms and erosion controls to prevent the migration of contaminants in the event of precipitation, and constructed on a slope so that any leachate will flow into a sump where it will be collected for analysis prior to disposal. Stockpiles will be wetted frequently and/or covered in polyvinyl sheeting. The stockpiled hazardous soil will be sampled at a rate of one sample per 400 CY of soil or as required by the receiving facility. Each sample will be analyzed for VOCs, SVOCs, Pesticides/PCBs, metals, TCLP metals, and disposal characteristics. The staging area is illustrated in Figure 5-7A, of the FS.

Soil with COCs exceeding CLs (estimated 0-4 feet bgs but extending to the water table if necessary) would be excavated from the southern boundary of the WSA Soil Area up to the southern edge of the beamhouse footprint (as shown on Figure 5-6 of the FS and as further delineated by the PDI). Soil exceeding CLs in the remainder of the WSA Soil Area would be excavated up to 3 feet bgs (or to 10 feet to address state UCL exceedances – approximately 32,707 CY). No soil will be excavated from the cemetery areas or from the consolidation footprint. Both cemeteries are improved with perimeter fences and no additional signage or fencing is anticipated to be added to that area. In addition to confirmation samples collected from the sidewalls of the excavated areas (approximately every 30 linear feet) as is anticipated for excavations in the other areas of the selected remedy, confirmation samples also will be collected from the bottom of the excavation areas where excavation will provide for unrestricted future use. Dewatering may be needed when addressing the wetland soil on the border of the 55 and 27 Clinton Avenue properties. A sump pump will be placed in the excavation area, or excavated soils drained, as needed, following excavation activities. Leachate water will be collected, containerized, sampled, analyzed, and discharged to a POTW, the Crane River, or disposed of off-site pending the sample results and in accordance with applicable ARARs. Loading of non-hazardous and hazardous waste and transport to the staging area at 55 Clinton Avenue will be the same as described for the residential area.

After excavation and backfilling/installation of soil cover, the ground surface in previously vegetated areas will be seeded with a mixture of grasses to establish a grass surface. It is not anticipated that paved areas will be impacted by the remedial actions; if they are, the paved surfaces will be restored as described above, for the residential area. Excavation activities will impact or destroy about 0.32 acres of wetlands located on the eastern side of the WSA soil excavation area on both 55 and 27 Clinton Avenue. To mitigate these impacts, the wetland areas will be restored in the original location or, if necessary, replicated in another area on the 27 and 55 Clinton Avenue parcels. (See Figure 5-6 of the FS).

After characterization of waste is completed at the staging area, identified hazardous waste and waste that exceeds state UCLs will be transported to an off-site disposal facility via lined and covered roll-off containers/trucks to a licensed disposal facility.

Excavated soil that is non-hazardous will be placed in a newly constructed consolidation area located in the northern portion of 55 Clinton Avenue for long-term containment. The FS evaluated and estimated costs of two alternative soil volumes for consolidation, summarized below. The specific details of the two alternatives will be refined during remedial design process. See Figures 5-8A through 5-8D of the FS for additional details.

> Alternative 1 (estimated minimum volume) is designed primarily with a 5 to 1 slope, with the consolidation area approximately 0 to 14 feet above the existing terrain. This alternative allows for consolidation of approximately 34,250 CY of compacted waste materials excavated from the ESA and WSA. The final volume of consolidated waste will depend on the physical properties of the excavated soil. Plan and cross-section views of the proposed consolidation area (minimum estimated volume) are shown on Figures 5-8A and 5-8C of the FS.

> Alternative 2 (estimated maximum volume) is designed primarily with a 3 to 1 slope, with the consolidation area approximately 0 to 22 feet above the existing terrain. This alternative allows for consolidation of approximately 51,500 CY of compacted waste materials excavated from the ESA and WSA. The final volume of consolidated waste will depend on the physical properties of the excavated soil, as shown in Figure 5-8B of the FS. Plan and cross-section views of the proposed consolidation area (maximum estimated volume) are shown on Figures 5-8B and 5-8D of the FS.

When preparation of the consolidation area is completed, the non-hazardous soil to be consolidated on-site will be transported in lined trucks from the WSA staging area to the consolidation area. The soil will be spread across the prepared area and compacted. In addition, stockpiled beamhouse debris will be transported from the staging area on WSA to the consolidation area and also spread and compacted in the prepared area.

The cover system for the consolidation area will consist of a permeable cap compliant with RCRA Subtitle D requirements (Figures 5-8C and 5-8C of the FS). The cover design will include the following layers:

- A 6-inch foundation layer of homogeneous sand or fill installed directly above consolidated waste material to act as a buffer layer between the consolidated material and the geotextile layer (detailed below). The foundation layer will also provide flexibility with final grading of the cell.

- A warning layer, consisting of brightly colored non-woven geotextile material, will be placed to serve as a "warning layer" for future intrusive activities should they occur at the Site. The warning layer will be installed on top of the compacted contaminated soil and foundation layer. The warning layer will extend laterally across the entire consolidation area.

- The warning layer will be covered by 18 inches of clean fill that will be compacted to a permeability of less than 10^{-5} centimeters per second (cm/sec).

- The top surface of the consolidation area will be covered with 6 inches of topsoil and a vegetative cover.

Appropriate stormwater controls will be installed surrounding the consolidation cell, channeling stormwater runoff north and east to a topographical low east of the cemeteries where the former Landfill Area B is currently located. The stormwater runoff channels will be lined with a geotextile fabric and covered with rip-rap to minimize erosion. The final width and slope of the stormwater channels will be determined based on stormwater calculations to be performed during the remedial design. Following closure of the consolidation area, an as-built survey will be performed to document the final depth and extent of the consolidated soil and consolidation area cover.

Ten monitoring wells will be installed around the perimeter of the consolidation area to verify that the added weight and volume of contaminated materials in the consolidation area is not causing leaching of metals or other contaminants from the current containment cell or from the newly constructed consolidation area. Groundwater monitoring for potential leaching of metals will be developed during remedial design.

Once all the soil has been excavated, the property has been backfilled and seeded, wetlands have been restored, and the consolidation area is complete, long-term monitoring and maintenance will begin. This includes inspection and maintenance of the vegetated areas and consolidation area cover. Site inspections will be conducted annually (years 1-30). Groundwater monitoring will also be included in long-term monitoring and will be performed at a minimum as required by RCRA D requirements (or more frequently as needed based on groundwater results) to verify that leaching is not occurring. It is assumed that monitoring would be performed quarterly for the first 2 years and then annually thereafter. Groundwater samples will be collected from the ten newly installed wells and analyzed for VOCs, SVOCs, and metals.

Institutional controls will be placed on areas of the WSA where contaminants exceeding soil cleanup levels remains under the soil cover (55 Clinton Avenue, 27 Clinton Avenue).

The institutional controls will restrict activities that would damage the soil cover or consolidation area cap and also prohibit residential use on any portion of 55 Clinton Avenue where waste remains in place (generally north of the former beamhouse). Institutional controls preventing residential use will be placed on 15 Pleasant Street.

3. Summary of the Estimated Remedy Costs

The estimated total present value cost of the cleanup proposal, which includes capital costs (construction) and the estimated present value cost of long-term operation and maintenance ("O&M"), for OU1 and OU2 is $24.3 million.

The estimated costs of the remedy and the individual OUs, are as follows:

Component of Remedy	Capital	O&M – Present Value – 30 yrs.	Total Cost - Present Value
ESA – OU 1[14] Residential - 2A	$2,476,000	$181,000	$2,657,000
ESA – OU 1[15] MBTA - 3	$5,202,000	$149,000	$5,351,000
ESA – OU 1[16] Riverfront - 2A	$2,596,000	$188,000	$2,784,000
WSA – OU 2 WSA - 2	$12,976,000	$517,000	$13,493,000
2019 ROD Totals	**$23,250,000**	**$1,035,000**	**$24,285,000**

The information in the above summary of estimated costs of the selected remedy is based on the best available information regarding the anticipated scope of the remedial alternatives that were developed in the FS. Additional details and how these costs were broken down for OU1 and OU2 are provided in Appendix E of the September 2018 FS. A comparative cost summary is included as Table 1 in Appendix G of this ROD

[14] The consolidation activities that are attributed to the ESA Residential-2A/ESA Riverfront-2A/ESA MBTA-3 alternative costs only include the transporting of ESA waste to the consolidation area, sampling of the ESA waste stockpiles, and spreading and compacting the ESA waste within the consolidation area. Costs associated with the consolidation area are included in the WSA alternatives.

[15] Ibid.

[16] Ibid.

Potential sources of uncertainty that are associated with the cost estimate include additional volume/additional extent of soil contamination, and/or encountering additional soil at concentrations that would classify it as hazardous waste. EPA will mitigate these uncertainties by developing and conducting additional sampling and verification that will be part of Pre-Design Investigations (PDI's), before implementing the remedial design. The FS provided a PDI plan and also assumed costs associated with the PDI in the FS costing information. In addition, the FS cost estimate assumed that 15% of the soil volume might be deemed as hazardous wastes and need to be transported and properly disposed of off-site.

Changes in the cost elements are likely to occur as a result of new information and data collected during Pre-Design Investigations and/or the engineering design of the remedial alternatives. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

4. Expected Outcomes of the Selected Remedy

The expected outcome of the selected remedy is that soil from ESA – OU1 and WSA - OU2 will no longer present an unacceptable risk to human health and the environment via direct contact, inhalation, or incidental ingestion of contaminated soil. Another expected outcome of the selected remedy is to allow for future reuse of various properties at the Site and revitalized wetland areas. If remediation on the ESA and WSA are implemented simultaneously, all excavation, capping and soil covers, along with demobilization activities will be completed in approximately three years. Wetland restoration activities may take as long as 7 to 10 years to be fully restored.[17]

The residential area is currently occupied by residential condominium townhouse buildings with associated paved and landscaped areas; this residential use is not expected to change in the future. It is anticipated that site-related contamination in soils at all of 27 Clinton Avenue and the southern portion of 55 Clinton Avenue will be removed allowing for unrestricted use, including residential use. The selected remedy will also address site-related contamination at the MBTA ROW area to allow for recreational use. It is anticipated that the selected remedy will also provide socioeconomic and community revitalization impacts such as increased property values, jobs created, increased tax revenues due to redevelopment of now vacant land, enhanced human uses of ecological resources and the protection of local wildlife.

a) Soil Cleanup Levels

Cleanup levels are media-specific numeric standards that are established to achieve the RAOs. Cleanup levels are typically based on either the site-specific estimated exposure risk calculations or numeric cleanup standards established by ARARs. ARARs were not considered in the development of site cleanup levels because there are no identified chemical-specific ARARs for

[17] This estimate represents the best-case scenario and assumes full funding for the work prior to the start of remedial design.

soil. EPA guidance (TBC) was considered but there are no applicable EPA criteria for use in development of soil cleanup levels for the selected COCs. In determining the appropriate soil cleanup levels, risk management was part of the process of selecting cleanup levels at the Site. At Superfund sites, cleanup levels are generally not set at concentrations below naturally occurring background levels or anthropogenic background concentrations.

Potential risk-based preliminary remedial goals (PRGs) were calculated for all potential exposure scenarios evaluated in the HHRA (residential, construction worker, recreational visitor, homeless trespasser, and commercial/industrial worker). These values were compared and the risk-based values for the residential exposure scenario were selected for use because they are the most protective values; all parcels are either in current residential use or are located very close to residential properties; and the zoning of all parcels allows for residential use. The selected risk-based PRG for each COC is the lower of the risk-based values protective of a cancer risk of $1x10^{-6}$ and a non-cancer HQ of 1, or (for lead only) a BLL of 5 µg/dL. If the background concentration for a given contaminant is greater than the risk-based concentration representing the 10^{-6} point of departure, the background concentration (MassDEP, 2016) was selected as the cleanup level (and used as the PRG). Background values are considered in the selection of soil cleanup levels because it is impractical to clean up areas to levels lower than the background concentrations in surrounding areas. The recommended cleanup levels for all COCs except dioxin/furan TEQ (which were based on risk) were selected based on the background values. (Table 2-1 of the FS presents the risk-based values and the background concentrations.)

Consideration of appropriate background levels at Creese & Cook was needed, due to the Site's historical industrial uses, and the levels of naturally occurring metals, such as arsenic, which are also present in the area. In addition, the remedial investigation studies determined that much of the ESA soil contains fill material including ash, construction debris and burnt wood (man-made or anthropogenic). Although similar material is not present in the WSA, naturally occurring metals and off-site fill materials, along with historical industrial uses, are all evident in the WSA soil.

Given the site-specific conditions identified above, EPA utilized the soil concentrations in the *MassDEP Draft Technical Update, Historic Fill/Anthropogenic Background Levels in Soil*, May 2016 ("MassDEP Technical Update"), as representative background concentrations for arsenic, PAHs and hexavalent chromium at the Site. As a result, the soil cleanup levels for the ESA residential, MBTA ROW soil area, and the Riverfront soil area are those background levels for arsenic, PAHs, and hexavalent chromium in the MassDEP Technical Update for soil containing coal ash or wood ash associated with fill material. The soil cleanup levels for the WSA soil area are those concentrations of arsenic, PAHs, and hexavalent chromium in the MassDEP Technical Update for natural soils (fill that does not contain ash). Soil cleanup levels were selected to meet acceptable risk range with consideration of Site background levels. Soil cleanup levels based on background may result in an elevated risk to receptors since cleanup levels cannot be established below background. The remedy selected in this ROD, however, employs actions to reduce risk to certain acceptable levels or to comply with typical background levels found in fill for the surrounding area. The selected remedy eliminates exposure pathways through land use controls to prohibit future use that is inconsistent with the soil cleanup levels and uses engineering controls, including the removal of contaminated soil and installation of protective soil covers and a protective RCRA D cap at the consolidation area. It should be noted that the soil remediation at this Site addresses contaminants related to the Site only. See FS Appendix B, Tables B-3.1, B-3.2, B-3.3, B-3.4, and B-3.5 for additional details of development of cleanup levels.

After all soil cleanup levels (as shown in the below Table) have been met as determined by EPA consistent with Agency guidance, EPA will perform a risk assessment which considers additive risk from remaining COCs considering all potential routes of exposure to document the residual risk based on exposure to Site-related contaminants in the soil at the Site. The residual risk assessment will document the potential risk associated with the concentrations of the COCs remaining in soil at the Site, if detected.

The table below lists soil cleanup levels for the Site, including the basis for selection.

Contaminant of Concern	**Soil Cleanup Levels for East Study Area**		**Soil Cleanup Levels for West Study Area**	
	Concentration	**Basis**	**Concentration**	**Basis**
Arsenic*	**20 mg/Kg**	Background[1]	**20 mg/Kg**	Background [2]
Dioxin TEQ*+	**51 ng/Kg**	Risk-based (HQ=1)	**51 ng/Kg**	Risk-based (HQ=1)
Hexavalent Chromium	**40 mg/Kg**	Background[1]	**30 mg/Kg**	Background [2]
Benzo(a)pyrene	**7000 µg/Kg**	Background[1]	**2000 µg/Kg**	Background [2]
Benzo(a)anthracene	**9000 µg/Kg**	Background[1]	--	Not a COC for this area
Benzo(a)fluoranthene	**8000 µg/Kg**	Background[1]	--	Not a COC for this area
Dibenz(a,h)anthracene	**1000 µg/Kg**	Background[1]	--	Not a COC for this area
Indeno(1,2,3-cd)pyrene	**3000 µg/Kg**	Background[1]	--	Not a COC for this area
Lead[3]	**600 mg/Kg**	Background[1]	--	Not a COC for this area

__Notes__:

mg/Kg = milligrams per kilogram; ng/Kg = nanograms per kilogram µg/Kg - micrograms per kilogram
HQ = Hazard Quotient for non-cancer risks
COC = Contaminant of Concern. COCs are contaminants that are major contributors to the actionable human health risks identified for the East and West Study Areas.
"—" = Not applicable/no criterion

1. MassDEP Ash fill background levels. Historic Fill / Anthropogenic Background Levels in Soil, Draft Technical Update. (MassDEP, May 2016).
2. MassDEP Natural background levels. Historic Fill / Anthropogenic Background Levels in Soil, Draft Technical

Update. (MassDEP, May 2016).
3. Lead is a COC for the 20 Cheever Street Lead Hot Spot area only.
* = Primary COC - COC that most frequently exceeds PRGs and drives soil volume estimates. Other COCs are often co-located with the primary COCs.
\+ = The risk-based PRG for dioxins/furans was developed based on the EPA 2012 non-cancer reference dose (RfD) for 2,3,7,8 TCDD (IRIS, 2012) because EPA considers this to be the best available value RfD for use at Superfund sites. EPA anticipates that cleanup levels developed based on this RfD will be within the EPA target cancer risk range of 10^{-6} to 10^{-4}

In summary, cleanup levels were developed for surface and subsurface soil exhibiting Site-specific contaminants where concentrations exceeded EPA's target risk range of a total excess lifetime cancer risk of 10^{-4} to 10^{-6} and/or a noncancer Hazard Index greater than 1.0 or exceeded the levels in the *MassDEP Draft Technical Update, Historic Fill/Anthropogenic Background Levels in Soil*, May 2016, whichever is higher. This approach is consistent with risk assessment guidance and EPA policy indicating that cleaning up contaminants to levels below background levels is not warranted.

N. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Creese & Cook Tannery (Former) Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, will comply with ARARs and is cost effective. In addition, the selected remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable. The remedy does not satisfy the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element.

1. The Selected Remedy is Protective of Human Health and the Environment

The selected remedy will adequately protect human health and the environment by eliminating, reducing, or controlling exposures to human and environmental receptors through excavation, engineering controls, long term monitoring, and institutional controls.

More specifically, soil excavation with a combination of on-site consolidation under a protective RCRA D cap, and off-site disposal and the use of soil covers would be highly protective of human health and the environment. This remedy will prevent direct contact, incidental ingestion and inhalation of contaminated soil and will prevent erosion and runoff of contamination into nearby surface water. The soil covers and protective RCRA D cap will be designed to maintain their integrity over time while functioning with minimum maintenance.

The selected remedy will reduce potential human health risk levels such that they do not exceed EPA's target risk range of a total excess lifetime cancer risk of 10^{-4} to 10^{-6} and/or a noncancer Hazard Index greater than 1.0 or exceed the levels in the *MassDEP Draft Technical Update, Historic Fill/Anthropogenic Background Levels in Soil*, May 2016, whichever is higher. It is assumed that unacceptable ecological risks, will be adequately addressed by cleaning up areas at the Site which currently present unacceptable risks to human health.

2. The Selected Remedy Complies with ARARs

The selected remedy will comply with all federal and any more stringent state ARARs identified for the Site. The selected remedy will also incorporate procedures and processes identified by a number of policies, advisories, criteria, and guidance documents (TBCs). These ARARS and TBCs are identified in the tables in Appendix H of this ROD. These tables also include a description on how the selected remedy will attain each requirement. A discussion of more significant ARARs issues is included below.

Issuance of this ROD embodies specific ARARs determinations made by the Regional Administrator, or her delegee, pursuant to CERCLA. More specifically, as defined by Section 404(b) of the Clean Water Act and regulations promulgated under the Act at 40 C.F.R. Parts 230, 231 and 33 C.F.R. Parts 320-323 the Regional Administrator, or her delegee, determined, with the issuance of this ROD, that the selected remedial action is the Least Environmentally Damaging Practicable Alternative (LEDPA) for protecting federal jurisdictional wetlands and aquatic ecosystems at OU1 and OU2 under these standards. The selected remedy provides the best balance of addressing contaminated soil/debris within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands. EPA will minimize potential harm and avoid adverse impacts to wetlands by using Best Management Practices (BMPs) during excavation to minimize harmful impacts on the wetlands, wildlife or habitat, and by restoring these areas consistent with federal and state wetlands protection laws. Any wetlands affected by remedial work will be restored to its original condition as a wetland area if practicable, or a new wetland area created within the same vicinity and any restoration or replacement efforts will be monitored over time. Mitigation measures will be used to protect wildlife and aquatic life during remediation, as necessary. In compliance with standards within relevant and appropriate Wetland Protection and Floodplain Management regulations (44 C.F.R. Part 9), EPA solicited public comment on its LEDPA finding within the Proposed Plan. EPA's responses to general comments regarding wetland issues are located in Part III, The Responsiveness Summary, of this ROD.

Further, the Regional Administrator solicited public comment, under 44 C.F.R. Part 9, on its determination that there is no practicable alternative to temporarily occupy and/or temporarily modify portions of the floodplains within the ESA and WSA. To address remedial measures that may affect floodplain resources, waste located within the floodplain will be excavated and backfilled with clean fill and then restored to its original grade so that the current flood storage capacity of these areas and any adjacent wetlands will not be diminished after completion of the proposed remedial actions. BMPs will be used during construction, which include erosion control measures, proper regrading, and restoration and monitoring of impacted areas. EPA's responses to general comments regarding floodplain issues are located in the in Part III, The Responsiveness Summary, of this ROD.

The consolidation area will be covered with a protective cap that meets or exceeds RCRA D standards, including a non-woven geotextile material and 18 inches of clean fill under 6 inches of topsoil. Although investigations determined that leaching from the soil to groundwater is not occurring, the capped area will be surrounded by monitoring wells to ensure that the additional consolidation of wastes and the added weight of the consolidation area is not causing leaching of metals or other contaminants from the existing containment cell or new consolidation area. Groundwater monitoring for potential leaching of metals will be developed during remedial design. This cap will also meet the cover requirements in the Clean Air Act that apply to the consolidation of the asbestos-containing material from the beamhouse debris.

The Site has several areas of historic significance, including two cemeteries and the Israel Hutchinson Monument. Areas of archaeological significance have also been preliminarily identified and will be refined during PDI activities. The National Historic Preservation Act, and the state equivalent law, require that prior to work taking place, a federal agency consider the effects of its undertakings on historic properties. EPA must consult with the state historic preservation officer (SHPO) as well as any interested tribal historic officers (THPO) in making determinations and findings concerning the effects of its undertakings on historic property.

EPA initiated consultation with the Massachusetts Historical Commission (SHPO); the Wampanoag Tribe of Gay Head (Aquinnah) (THPO); and the Mashpee Wampanoag Tribe (THPO), in 2014. The findings of an archaeological reconnaissance survey, conducted in 2016 during the remedial investigation, was shared with the consulting parties in June 2017. The Proposed Plan was shared with the consulting parties in December 2018. EPA will continue to consult with the SHPO and THPOs during the PDI to determine whether implementation of the remedy will adversely impact historic or cultural resources eligible for, or already listed on, the National Register of Historic Places. If any such adverse impacts cannot be avoided, EPA will work with the SHPO and THPOs to develop a set of activities to mitigate those impacts, which will be memorialized in a Memorandum of Agreement between the parties.

Dust suppression, air monitoring, and stormwater and erosion controls are also included in the remedy in accordance with the federal and state air regulations and those protecting wetlands and waterways.

3. **The Selected Remedy is Cost-Effective**

The selected remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (40 C.F.R. Section 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (*i.e.*, that are protective of human health and the environment and comply with all federal and any more stringent ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria -- long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative then was compared to the alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

From this evaluation, EPA has determined that Alternatives ESA Residential 2A, ESA Riverfront 2, and WSA-2 are cost effective, as they meet both threshold criteria and are reasonable given the relationship between the overall effectiveness afforded by other alternatives and costs compared to other available options. Although MBTA 3 is the most expensive, the other alternatives would not meet ARARs and would remove floodplain capacity storage, thus requiring construction of compensatory flood storage. Refer to Tables 5-1, 5-3, 5-5 and 5-7 of the FS for the detailed analysis of the ESA and WSA remedial alternatives.

The estimated present worth cost of the various source areas and media that comprise the selected soil remedy is $24.3 million.

4. **The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable**

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives.

OU1 & OU2, consists of low-level threat wastes that can be reliably managed in the long-term using permanent solutions consisting of managing wastes through excavation and offsite disposal of hazardous waste and waste exceeding state UCL standards, containment under a protective RCRA D cap for excavated non-hazardous soil, soil covers over contaminated soil that remains in place, and the use of long-term monitoring and institutional controls to prevent potential exposures. See Tables 5-1, 5-3, 5-5 and 5-7 of the FS for the detailed analysis of the ESA and WSA remedial alternatives.

5. **The Selected Remedy Does Not Satisfy the Preference for Treatment Which Permanently Reduces the Toxicity, Mobility and Volume of Hazardous Substances as a Principal Element**

The selected remedy does not satisfy the preference for treatment which permanently reduces the toxicity, mobility and volume of hazardous substances as a principal element. Both in-situ and ex-situ treatment options were evaluated in the FS and were screened out because they require multiple treatment stages to address all Site related COCs, and the likely effectiveness of treatment technologies is questionable. In addition, the mixture of coal ash, building debris, burnt cinders and construction debris in the existing fill material would need to be removed prior to treatment. Lastly, in-situ and/or ex-situ treatment of soil would require extensive confirmatory sampling prior to backfilling the treated soil.

6. **Five-Year Reviews of the Selected Remedy are Required**

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a Five-Year Review will be conducted five years after the start of the remedial actions, to ensure that the remedy continues to provide adequate protection of human health and the environment. Five-year reviews will continue as long as waste remains at the Site and unlimited use is restricted.

O. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA presented the Creese & Cook Proposed Plan for remediation of OUs 1 and 2 to the public for review and comment on October 2, 2018. The Plan described the alternatives considered and EPA's preferred alternatives for the selected remedy. The preferred alternatives included soil excavation, on-site consolidation and capping of non-hazardous waste, the use of soil covers for waste remaining in place, and off-site disposal of non-hazardous waste. Institutional controls in the form of land use restrictions, along with wetland restoration or replication if necessary, and long-term monitoring, were also included.

Pre-design studies will include additional soil sampling to refine the vertical and lateral extent of soil contamination and will determine the volume of non-hazardous waste to be consolidated onsite. Variables such as slope stability for the consolidation area, footprint of the consolidation area, volume soil to be consolidated, implementation sequencing, and available funding may result in offsite disposal of additional non-hazardous soil rather than consolidating this material on-site. Should such a change occur, EPA may issue another decision document.

EPA reviewed all hand delivered, written and verbal comments submitted during the public comment period, which began on October 9, 2018, and ended on November 9, 2018. Based upon a review of the comments, EPA determined that no significant changes to the remedy, as originally identified in the October 2018, Proposed Plan, were necessary.

P. STATE ROLE

The State of Massachusetts, through the Massachusetts Department of Environmental Protection (MassDEP), has reviewed the various alternatives and has indicated its support for the selected remedy. MassDEP has also reviewed the Remedial Investigations, Human Health and Ecological Risk Assessments and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State environmental and facility siting laws and regulations. MassDEP concurs with the selected remedy for the Creese and Cook Tannery (Former) Superfund Site. With its concurrence, pursuant to 310 CMR 40.0111, MassDEP deems the response action at a disposal site subject to CERCLA adequately regulated for the purposes of compliance with the MCP (310 CMR 40.0000). A copy of the declaration of the MassDEP's concurrence is attached as Appendix X of this ROD.

PART 3: RESPONSIVENESS SUMMARY

A. STAKEHOLDER ISSUES AND EPA RESPONSES

EPA published the notice of availability of the draft Proposed Plan and Administrative Record in the Salem News and the Boston Globe on October 9, 2018 and released the final Proposed Plan to the public by posting a publicly accessible link on EPA's website. In addition, EPA mailed out over 1200 post cards to the surrounding area residents and businesses, and to local officials, and provided it to the Peabody Institute Library located at 15 Sylvan Street, in Danvers, MA.

From October 9, 2018, through November 9, 2018, EPA held a thirty-day public comment period to accept public comments on the alternatives presented in the Feasibility Study and the Proposed Plan, and on any other documents previously released to the public. On October 25, 2018, EPA held a public informational meeting, immediately followed by the Public Hearing, to describe EPA's Proposed Plan and to accept any oral or written comments.

Outlined below is a summary of comments received from the public, other interested parties, and from the State of Massachusetts during the public comment period along with EPA's responses to these comments. Similar comments have been summarized and grouped together. The full text of all written and oral comments received during the comment period has been included in the Administrative Record for the Site.

<u>Community Comments and EPA Responses</u>

1. **Comment:** Several commenters referenced the historical presence of other tanneries in the town of Danvers and asked about EPA's future plans to address the potential health and environmental impacts of these former tanneries. During the Public Meeting, one commenter submitted a historical map from 1872 identifying the potential location of other former tannery operations in Danvers.

   EPA Response: The additional tanneries identified by the commenters do not appear to be related to the operations and environmental conditions associated with the Creese & Cook Superfund Site ("Creese Site" or "Site"). The Creese Site, as identified in the Record of Decision for the remedy, is specifically defined to include certain parcels of land, and EPA is authorized under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (the Superfund law) to address those properties and adjacent areas where contaminants from the Creese Site may have come to be located. Pursuant to the process of adding the Creese Site to the National Priorities List of Superfund Sites approved for remediation, the boundaries of the Site were identified. The remedy selected pursuant to this process specifically targets only the Creese Site, as described above. EPA does not have the authority to investigate other potentially contaminated properties that are not part of the Site definition and/or directly included in the Record of Decision for the Creese Site. Such investigations would need to be explored under a separate Superfund process, if warranted, or through investigations conducted at the state or local level.

2. **Comment:** Several commenters asked if a cancer study had been done in the Danversport Area and if so, where? These commenters also asked if there were plans to conduct such studies in the future.

   EPA Response: EPA is not aware of a previous or planned federal or state cancer study associated with the Danversport Area of Danvers. In response to this question raised at the Creese Site Public Meeting, on November 29, 2018, EPA's remedial project manager spoke with a representative from the Massachusetts Department of Public Health (MDPH) to discuss the above question and provided MDPH with the Proposed Cleanup Plan for the Creese Site as well as a copy of the 1872 Danvers map submitted by a commenter during the Public Meeting. MDPH indicated they would review the information and follow up directly with the Town of Danvers regarding the issue.

3. **Comment**: One commenter asked if more testing would be done in the basements of residential homes with sump pumps located on the Creese Site to be sure that groundwater contamination is not entering homes when flooding occurs.

   EPA Response: No additional testing of East Study Area (ESA) groundwater, sump pumps, or basements is deemed necessary at this time because the Remedial Investigation (RI) and Human Health Risk Assessment (HHRA) concluded that ESA shallow groundwater does not pose an unacceptable human health risk from vapor intrusion based on the results of a risk assessment conducted as part of the baseline human health risk assessment. More specifically, as part of the HHRA, over 115 groundwater samples were collected from monitoring wells located throughout the Site every three months over a one-year period. Groundwater contaminants, including Volatile Organic Compounds (VOCs), were detected infrequently and at low concentrations, typically well below risk-based criteria, and determined not to pose a health risk from vapor intrusion in the event of basement flooding.

4. **Comment:** One commenter asked if the excavation work planned in the river will increase the risk of flooding in the nearby floodplains and if this will lead to more flooding of basements?

   EPA Response: Excavation of the Crane River and/or sediments is not part of this ROD for the Site. Riverbank soil above the mean high tide mark, along the ESA and WSA will be remediated by this ROD. EPA will address the investigation and potential cleanup of the Crane River as a separate operable unit for this Site at a later date. The planned remedial actions included as part of this ROD are not expected to increase flooding in the floodplain or in nearby homes. The excavation and removal of contaminated soil along the riverbank and elsewhere within the floodplain on the east and west sides of the Crane

River will be conducted above the mean high tide level. After excavation, these areas will be backfilled with clean fill, and restored to their original elevation to the extent practicable. Therefore, there will be no reduction in the existing flood storage capacity. The remedial actions will be designed to have no long-term impact on flood storage capacity or flood flow within the floodplain.

5. **Comment:** Several commenters asked what quality control measures will be applied to the clean fill that is brought in to replace the contamination?

   EPA Response: The clean fill that will be brought on-site to replace excavated soil will be required to meet MassDEP standards for residential or recreational use (the current and future anticipated use). In addition, the clean fill will be sampled prior to placement on the Site.

6. **Comment:** Several commenters expressed concern about the use of Clinton Avenue as an access road for trucks carrying contaminated soils and other supplies to/from the West Study Area due to concern that the truck traffic may create health hazards, including from airborne contaminants, as they drive by local residences located on Clinton Avenue. The commenters asked that EPA seek to use an alternative access road for transportation of contaminated materials from the Creese Site.

   EPA Response: EPA will consider the possibility of using alternate access routes for truck traffic during the remedial design process. Regardless of which final routes are selected, waste handling and transportation protocols will be developed and followed to ensure safety during performance of the remedial actions and to minimize potential impacts to residents living near the Site as well as to the general public. Measures typically applied for use of trucks to transport waste through residential neighborhoods include: consideration of timing, adjustment of routes and the number of trucks so as to reduce traffic impacts to the extent possible; application of dust stabilization products; and air particulate monitoring of dust that is generated during excavation or transport. In addition, contaminated soil that is transported on local roadways will be placed in truck beds or roll-off containers that have synthetic liners. The liners are placed inside the truck bed or container, filled with soil/waste, and sealed before being transported off-site. The liners are designed to contain the wastes and prevent leaking of any fluids that may drain from the soils. Lastly, a Site-specific Health and Safety Plan will be designed and implemented to protect residents and Site workers.

7. **Comment:** Several commenters expressed concern that the remedial work would cause contaminants to become airborne, or spread by rainwater, dust, or other means and thereby pose a health hazard.

   EPA Response: Before the remedial actions begin, the contractor will develop a Site-Specific Health and Safety Plan and a Quality Assurance and Quality Control Plan to mitigate these concerns. For example, engineering controls will be used during excavation, handling, and storage of contaminated soils to minimize the potential for contaminant migration. Controls will include measures such as water sprays and mists to suppress dust and use of synthetic liners and covers to contain and prevent leaching and erosion of contaminants from stockpiled soil. The specific measures to be used to contain contaminated materials will be identified during the remedial design process. A dust monitoring air quality program will also be employed during performance of the work. All activities during Site remediation will be controlled and closely monitored during soil excavation, stockpiling, transportation, and consolidation so as to minimize unacceptable impacts to local residents of the Site and surrounding areas and those working at the Site.

8. **Comment:** Several commenters inquired about the stockpile soil locations and staging details.

   EPA Response: Stockpiles will be staged at a designated portion of the West Study Area (WSA) for the temporary storage of excavated soil prior to on-site consolidation at the northwestern portion of 55 Clinton Avenue or, if appropriate, off-site disposal. Separate hazardous waste and non-hazardous waste stockpile areas will be constructed. The hazardous waste stockpile areas will be clearly marked, lined, covered, and sloped to capture any precipitation. Dust suppression methods will be incorporated to prevent soils from becoming airborne during storage and transport. An air quality management and monitoring program will be established including real-time monitoring of dust for up and down-wind air quality. The final design of the stockpile locations, size, dust suppression methods, and storm water/drainage water management plans will be determined during the Remedial Design.

9. **Comment:** One commenter noted that people are worried about disturbing the soil on 33 Water Street and asked whether EPA had considered leaving the contaminated materials alone, as the materials have been there a long time and, to the commenter's knowledge, had not caused ill health.

   EPA Response: EPA's Human Health Risk Assessment identified unacceptable human health risks from potential exposure to Site contaminants under current or potential future land use scenarios for, among other areas, 33 Water Street. EPA evaluated a range of potential remedial alternatives to address the contaminated materials and determined that the remedy proposed in this ROD – shallow excavation and removal of the contaminated soil and installation of a soil cover is the preferred alternative for best addressing the identified risks. In addition, long-term monitoring and maintenance of the covers, along with land use controls will ensure the remedy remains protective. As described earlier and in the selected remedy in the ROD, measures will be taken to minimize short-term impacts of the remedial actions to people living and working on and near the Site.

10. **Comment:** Multiple commenters expressed concern about how sensitive historical/archeological features, notably the Endicott and Russell Cemeteries, will be protected and preserved during remedial activities.

EPA Response: Pursuant to the National Historic Preservation Act requirements, EPA has consulted with the Tribes, as well as state and local historical representatives, and provided them with a copy of the archaeological survey. The proposed remedial actions do not include any excavation or other intrusive actions within the cemeteries. The areas outside the currently defined cemetery boundaries will be further evaluated in the archaeological survey(s) described below. Measures to prevent impacts, such as grading and storm water conveyances for the proposed consolidation area on 55 Clinton Avenue, will be designed to divert storm water run-off away from the cemeteries and avoid interfering with the integrity of the cemeteries or surrounding wall/fencing. Measures will be taken to ensure that the cemeteries are accessible to visitors following completion of the Remedial Action. Access to the cemeteries during remedial construction may be restricted to ensure public health and safety.

EPA notes the historical importance of both the Endicott and Russell Cemeteries, as well as other historical and archaeological site features at the Site. As part of the PDI activities, an additional archeological survey of Site areas previously identified as having high historical/archaeological potential will be performed prior to the remedial design. The PDI work may include an intensive locational survey to identify the presence of archaeological remains and the approximate boundaries of any identified archaeological sites (areas where cultural artifacts or other potential archaeologically significant data are found). If the archaeological survey identifies areas of high archaeological significance that may be impacted by the proposed remedial action, EPA will re-engage with the relevant stakeholders to make a further determination about potential impacts to these areas. If EPA determines adverse impacts may occur, through consultation with the stakeholder, measures such as an Avoidance and Protection Plan (APP) would be developed to prevent damage or avoid impacts to areas of high archaeological significance. The requirements of an APP will be incorporated into the remedial design and remedial action work plans.

11. **Comment:** Commenters expressed concern about how sensitive natural features (wetlands, ecological habitat, trees) will be protected and preserved.

    EPA Response: The remedial action will be designed and performed to minimize adverse impacts to sensitive natural features including wetlands, ecological habitats and floodplains. Clearing of trees and vegetation in excavation and staging areas will be necessary; however, cleared areas will be restored to match original conditions to the extent feasible. Any wetlands that are impacted or destroyed as part of the remedial action will be restored to their original conditions, if possible. If wetland restoration in the impacted area is not possible, wetland replication if necessary, will be performed elsewhere on Site, as close as possible to the impacted area. Erosion and sedimentation controls will be installed along the outer perimeters of work areas to prevent sediment transport out of the work zones and protect sensitive areas including the river, wetlands, and storm drains.

12. **Comment:** Multiple commenters noted that the Town is interested in possibly extending their walking path Rail Trail system along the Crane River on the East Study Area once clean-up is completed. They requested that EPA consider supporting restoration of the MBTA ROW after remediation with a stone dust surfaced walking trail.

    EPA Response: During negotiations with the property owner, the MBTA, and as part of remedial design, EPA will consider how best to restore the ROW property in consideration of likely future recreational use.

13. **Comment:** The public would like to be updated about future meetings. Multiple commenters requested to be included on the Site mailing list.

    EPA Response: EPA provides hard copy notification of meetings to residents and property owners who own, reside on, and abut the Creese Site. In addition, EPA has established and will continue to update an email list to help inform those that might not receive a hard copy notification of upcoming participation opportunities.

14. **Comment:** Several commenters expressed concern that the remedy for the Creese Site, as described in this ROD, will not be fully funded and are concerned about the resulting impact if the remedy is not fully completed.

EPA Response: It is anticipated that the project will be fully funded. The project may be funded in phases if it's not fully funded at the start. EPA will also seek contribution from potentially responsible parties under the Superfund law. Also note the ROD recognizes that EPA has issued an Action Memorandum to accelerate removal of soil at 45 Water Street.

In addition, pre-design studies will include additional soil sampling to refine the vertical and lateral extent of soil contamination and will determine the volume of non-hazardous waste to be consolidated onsite. Variables such as slope stability for the consolidation area, footprint of the consolidation area, volume soil to be consolidated, implementation sequencing, and available funding may result in offsite disposal of additional non-hazardous soil rather than consolidating this material on-site. Should such a change occur, EPA may issue another decision document.

15. **Comment:** Several commenters inquired about when the cleanup work is scheduled to start and be completed?

    EPA Response: The PDI work is anticipated to start within one year after the ROD is signed. Then approximately one to two years would be required for completion of the PDI and remedial design, procurement of remediation contractors, and preparation of remedial action work plans. Remedial construction is expected to begin within approximately two to three years after the ROD. Remedial action is expected to be completed four years after the completion of the remedial design phase.

16. **Comment:** A commenter inquired about when the cleanup work is scheduled to start and be completed? When will the properties be returned to the original owners (if they will)?

    EPA Response: See the above response regarding the schedule for work to begin at the Site. EPA does not intend to pursue an ownership interest in any of the Site properties during performance of the remedy set forth in the ROD. EPA will seek to obtain access to the Site properties, as allowed under Section 104 of CERCLA, in order to implement the remedy selected in this ROD. As the remedy is implemented, EPA will need to control physical access to impacted properties in order to ensure both safety and proper implementation of the remedy. EPA will coordinate with owners and tenants of the Site properties to minimize impacts and inconvenience to the extent possible. Once remedial work is completed on an impacted property, EPA will notify owners and tenants of any restrictions or safety precautions that are no longer needed. Note that institutional controls will be required on the Site properties in order to protect the remedy. Institutional controls are non-engineered instruments such as administrative and legal controls in the form of land use restrictions that help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy. In addition, EPA will continue to evaluate Site conditions through its five-year reviews to ensure the remedy remains protective of human health.

17. **Comment**: Some commenters requested that EPA factor the two active sewer pipelines, owned by South Essex Sewerage District (SESD), that run parallel to or through the proposed ESA excavation areas into the development of all ongoing and future investigations and remedial actions.

    EPA Response: EPA is aware of the presence of the sewer pipelines and will consider the pipelines in the planning and implementation of future investigations, excavation and remedial actions. As part of the WSA soil area PDI, a survey of these pipelines will be conducted.

18. **Comment:** A commenter inquired about the extent of contaminated soil in SESD's sewer pipe easements [on the ESA] and about the extent of contaminated soil proposed for removal within the District sewer pipe easements?

    EPA Responses: EPA anticipates that the following soil excavation in and around the SESD sewer pipeline easements will occur:

    - Soil along approximately 760 feet of the sewer easement on the MBTA ROW will be excavated from 0-2 feet bgs. Contaminated soil exceeding cleanup levels is not expected to remain following excavation.

- Soil along approximately 70 feet of the sewer easement soil on the ESA residential properties will be excavated from 0-2 feet bgs, leaving some contaminated soil exceeding SCLs to a depth up to 8 feet.

- Soil along approximately 88 feet of the sewer easement on the ESA residential properties will be excavated from two to three feet (the top one foot of soil is anticipated to have contaminant levels below soil cleanup levels; that soil would be removed, stockpiled, and used as backfill). Contaminated soil exceeding SCLs would remain to a depth of up to 8 feet.

- The lateral extent of excavation within the SESD easements is to be determined based on the PDI results.

19. **Comment**: A commenter inquired if the presence of contaminated soil in the SESD easements affect the ability to maintain the sewer pipelines?

    EPA Response: Yes. As part of the remedy, Institutional Controls (ICs), including land use controls, as appropriate, will be placed on properties where contaminants remain at concentrations exceeding soil cleanup levels which includes portions of the sewer easement. The ICs will specify how future excavation or other disturbances should be performed and what notifications EPA and MassDEP will require in order to protect the remedy and site workers.

    If maintenance work is required below grade within the SESD easements prior to remedy implementation, then a soil management plan is required, and the work must be approved by EPA and MassDEP prior to any excavation. The soil management plan will set forth steps to protect human health and the remedy such as placing all excavated soil in lined and covered stockpiles, and decontamination of all equipment and tools used during invasive work prior to leaving the Site.

    During the remedial design phase, EPA will work with the SESD to ensure safe access to the easement, as needed, both during and after completion of the excavation and/or remedial actions. Where possible, EPA will seek to create clean corridors of soil within the easement and at manhole locations.

20. **Comment:** A commenter inquired if contaminated soil will remain adjacent to the SESD sewer pipes following the proposed remedial action?

    EPA Response: Yes, at depth. In the ESA, the sewer is identified as being located between approximately 6 to 14 feet below ground surface (ft bgs), and the proposed remediation pursuant to the ROD will address soils at between 0-3 ft bgs. Contaminated soil is believed to be present to a depth of 6 to 8 feet in some areas along the SESD easement. Since the remedy does not involve removing soil beyond 3 feet bgs, because 3 feet is assumed for potential exposure, there will be some areas adjacent to the sewer lines where contamination will remain, at depth. Institutional Controls in the form of land use restrictions are included in the selected remedy and engineering controls such as a soil cover will help minimize the potential for human exposure to contamination greater than 3 ft bgs and/or protect the integrity of the remedy.

Detailed utility surveys will be conducted during the remedial design at both the ESA and WSA areas and a post-construction survey will be conducted to provide specific information regarding the final elevations of clean soil covers and the location/depth of contaminated soil left in place. This survey will be placed in the site file for the public and a copy will be provided to the SESD and a soil management plan will be devised if necessary to protect future utility and/or construction workers.

21. **Comment**: A commenter inquired if any specialized regulatory requirements are required during maintenance, repair, or replacement of the sewer pipes within the District's easements following the proposed remedial action?

    EPA Response: The specialized requirements will be determined during the remedial design and specified in the ICs and a soil management plan, if one is appropriate. During the remedial design phase EPA will work with the SESD to ensure that restrictions still allow for necessary sewer repair or replacement while maintaining adequate protectiveness to both workers and residents.

22. **Comment:** A commenter inquired about the type of construction staging activities that will occur over the SESD sewer pipe because the SESD may need to protect the pipe or manholes in these areas prior to/during remediation.

    EPA Response: The types and locations of construction and staging activities occurring over the SESD sewer pipes on the ESA and WSA will be determined during the remedial design. It is not expected that materials would be staged over the sewers. EPA will consult with the SESD during the remedial design once site plans and layouts are drafted and prior to starting the remedial actions.

23. **Comment:** SESD requested inclusion of specific information regarding the two active SESD sewer pipes in all future contract documents for investigation and construction. The specified information includes plan view and elevation view locations of the sewer lines on plans, requirements to avoid damaging or interfering with the sewer infrastructure, notes regarding the existence of permanent easements allowing SESD access needed to maintain the pipelines, and notes requiring 14 days' notice to SESD prior to beginning any future investigations.

    EPA Response: Comments noted. EPA recognizes the needs of the SESD to protect the infrastructure of the sewer lines and the specified information will be included, as applicable, in contract plans and language for pre-design investigations and the remedial design/remedial actions so the contractor is aware of the locations of the sewer lines at the Site. In addition, a utility survey and other necessary investigations will be conducted as part of the PDI, prior to excavation activities. EPA or our contractor will provide the SESD with a copy of the work schedule (subject to be revised) and provide adequate prior notification before beginning future work on or within the area of the active sewer lines.

MassDEP Comments per 11/9/18 Letter from G. Waldeck

24. **Comment:** MassDEP encourages EPA to evaluate applying the ESA Residential Alternatives to all ESA Residential properties including 20 Cheever Street, 12 Cheever Street, MBTA ROW, and 35 Water Street. These properties are zoned residential and there is no physical barrier preventing residential use on one of these properties encroaching on the next.

    EPA Response: Following EPA guidance, all of these properties were evaluated in the HHRA based on the reasonably anticipated future use of the for each individual property, which comprises the Site.

    Due to the presence of wetlands and floodplains over large portions of the properties, as well as the other physical characteristics and access considerations, future residential development of 20 Cheever Street and the MBTA ROW is considered highly unlikely and was not evaluated in the baseline HHRA. Additionally, the size, shape, sewer easements and location of the MBTA ROW and 35 Water Street properties significantly restrict options for future residential development. The 20 Cheever Street property is located wholly within the 100-yr floodplain, is largely covered by wetlands, partly in the intertidal zone, and has no street frontage, all of which significantly restricts options for future development and make residential use highly unlikely.

    The 12 Cheever Street property was evaluated in the HHRA for potential future residential use and no site-related risks exceeded the EPA target risk range. Additional details regarding the HHRA can be found in Section 1.7 of the Final FS Report.
    In accordance with CERCLA guidance, the remedial action objectives and proposed remedial alternatives for the Site were developed to address the identified risks associated with the Reasonable Maximum Exposure (RME) scenarios for the reasonably anticipated future property uses. In addition, as part of the remedy, EPA proposes to record ICs to prohibit activities or residential land use which may pose unacceptable risk and/or damage the remedies.

25. **Comment:** MassDEP (and other commenters) suggested sampling of the Crane River be done as soon as possible to identify or rule out any imminent hazards since this area is accessible to the Public and used for recreation.

    EPA Response: Comment noted. EPA plans to conduct a separate remedial investigation and human health and ecological risk assessments on sediment and surface water of the Crane River as a separate operable unit once funding has been received and the contract for this work is awarded.

26. **Comment:** The Proposed Plan indicated EPA will explore methods to expedite portions of the cleanup in residentially inhabited areas within the ESA. Please describe how any removal action, such as the one described in the EPA Action Memo dated September 20, 2018, will interact or affect any selected remedy.

    EPA Response: Any removal actions taken to expedite cleanup of the residentially inhabited areas within the ESA will be consistent with the proposed remedial actions for the target areas presented in the Proposed Plan. A removal action is planned for the 45 Water Street parcel, as described in the September 20, 2018 Action Memorandum, to include the excavation, removal, and soil cover components of the selected remedy for the ESA residential area which includes 45 Water Street. The only difference is that the Action Memorandum calls for all of the excavated soil at 45 Water Street to be disposed of offsite rather than on-site consolidation of the non-hazardous waste at the consolidation area on the west side. The longer-term components of this alternative, such as institutional controls (ICs), long monitoring, and future Five-Year Reviews, will be performed pursuant to the ROD for the Site. See also response to comment No. 14 above.

27. **Comment:** EPA's preferred alternative for the ESA Riverfront states that Institutional Controls (ICs) will be placed where needed to limit future excavations and other activities. What type of ICs will be placed on the ESA Riverfront and what "other activities" need to be controlled?

    EPA Response: Details for the Institutional Controls (ICs) will be developed during the remedial design. EPA anticipates that a land use control in the form of ICs will be recorded for the property(s) that include measures to limit future excavation and other activities that could pose unacceptable risk(s) or exposures, prohibit future residential use and/or development, and/or limit land use to passive/recreational.

28. **Comment:** The Massachusetts Contingency Plan (MCP) specifies that Upper Concentration Limits (UCLs) are applicable to 15 feet below ground surface; not limited to 10 feet below ground surface. Please clarify if soils with concentrations greater than UCLs are expected to remain below 10 feet.

    EPA Response: No, soil exceeding UCLs are not expected to remain below 10 ft bgs. The maximum depth of the identified UCL hot spots was 4 ft in the ESA and 10 feet in the WSA. This will be confirmed through additional soil sampling during PDI activities planned for both operable units.

29. **Comment:** The Proposed Plan does not present an alternative for addressing 15 Pleasant Street. EPA's responses to MassDEP comments on the HHRA and RI indicate that ICs are needed for this property. Please clarify what ICs are proposed for 15 Pleasant Street.

    EPA Response: The human health risk evaluations performed for 15 Pleasant Street concluded that the risks are within or below EPA's acceptable risk range for current homeless adult and adolescent trespassers, which is the most conservative, reasonably anticipated future land use for the parcel. Due to the parcel's small size, shape, inaccessible location immediately adjacent to Route 128, and lack of street frontage, future development and/or residential use of this property is highly unlikely. However, because the property is currently zoned by the town of Danvers for residential use, a supplemental risk evaluation was performed to evaluate a hypothetical (though unlikely) future residential use scenario. The supplemental evaluation identified potential unacceptable risks above target levels if the parcel was used for residential redevelopment in the future, but confirmed that risks are within the target risk range for the current and reasonably anticipated future use. Although the risk evaluation confirms that there isn't a basis to justify the need for soil excavation on this parcel as part of the overall Site remedy, land use restrictions are warranted as a conservative measure to prevent future residential uses. As a result, the selected remedy for this area includes recording of ICs on 15 Pleasant Street to prohibit future residential development.

30. **Comment:** EPA's Preferred Alternatives state that confirmation sampling will occur after excavation. However, the FS states that no confirmatory soil samples will be obtained from the bottom of excavations. Please clarify that samples will be obtained from the bottom of each excavation to document conditions left in place, as this may be important information to inform the types and locations of ICs.

    EPA Response: The selected remedy includes a PDI which includes additional soil sampling to further refine soil removal volumes and also includes confirmatory soil sampling from the bottom of excavations in the WSA Soil Area. EPA believes that confirmation samples in other areas are not needed where the maximum excavation depth is pre-determined and not based on the actual extent of contaminants exceeding cleanup levels. The existing data are believed to be sufficient to document the soil conditions at the bottom of these excavations. However, EPA may consider collection of a limited number of confirmatory samples at the bottom of excavations, as part of the remedial design if it is deemed necessary, to supplement the existing dataset.

31. **Comment:** The Proposed Plan, on Page 3, in the Section on ESA Soil, describes EPA's preferred soil cleanup alternative, ESA Residential-2A Soil Excavation (0-3 ft.) as including, "Off-site disposal of hazardous waste and potentially any soil exceeding UCLs." It is unclear whether this means if any soil exceeding the UCLS may potentially be taken off-site for disposal; or, whether it means any soil exceeding the UCLs, which may potentially be present at the Site, will be taken off-site for disposal. Please clarify this statement to clarify whether any soil with documented UCL exceedances will remain on site after the cleanup.

EPA Response: We believe the comment is asking whether there are any other areas of UCL exceedances on the parcel that haven't been identified. Through extensive soil boring investigations, EPA believes it has identified all areas where lead and arsenic exceed state UCLs for those metals. Additional sampling will occur during remedial design. Any soil that, when sampled, that is determined to exceed UCL criteria, will be taken off-site for disposal. The RI data supports that there are limited locations and volume of soil where UCLs were exceeded, e.g., on 20 Cheever Street and a limited area on the northeastern portion of 55 Clinton Avenue.

32. **Comment:** EPA's preferred alternative for WSA states that ICs will be placed where needed to limit future excavations and "other activities." Please describe these other activities.

    EPA Response: The purpose of requiring institutional controls is to prevent damage to the WSA Consolidation Area, the soil covers, and to restrict excavation and residential land use in areas where contaminants remain at concentrations exceeding soil cleanup levels. Details concerning the Institutional Controls will be developed during remedial design.

33. **Comment:** The WSA alternative states that groundwater will be monitored as part of long-term Operation and Maintenance (O&M). Please identify the chemicals that will be monitored and describe the data quality objectives for this monitoring, as there is no groundwater remedy proposed for the Site.

    EPA Response: Monitoring of groundwater in the WSA will be performed to verify that the added materials and weight of the consolidation area does not cause leaching of metals or other contaminants from the current containment cell. Groundwater monitoring for potential leaching of metals will be developed during the remedial design and will include identification of sampling locations, number of samples, as well as sampling parameters and frequency and parameters.

34. **Comment:** As presented on page 12 [of the October 2018 Proposed Plan], with respect to 27 & 55 Clinton Ave, it is not clear if the subsequent text [regarding current and future use of the parcels] applies to both 27 and 55 Clinton Ave or to one of them. Please clarify which properties have exceeded their risk range more clearly.

    EPA Response: Both 55 Clinton Avenue and the northern area of 27 Clinton Avenue exceed EPAs acceptable risk range of 10-4 to 10-6. The "Current Land Use" bullets included on the Proposed Plan page 12, refer to both 55 and 27 Clinton Avenue. The surface soils dataset for the two contiguous properties were combined to due to similar conditions on the two properties – undeveloped, unfenced, with no clearly defined boundaries. The "Future Land Use" bullets apply to the individual properties, as noted. See the tables in Appendix G of this ROD for details of the human health risk assessments.

35. **Comment:** How will remedial alternatives be determined for any additional property identified during the PDI?

    EPA Response: The PDI data will be evaluated along with existing data to determine the lateral extent of the proposed excavation areas. If contamination is found to extend beyond the current Site boundaries, (for example, properties adjacent to the MBTA ROW), the data will be evaluated, and a risk assessment performed, if appropriate, to determine if further action is warranted in such area. EPA will consult with MassDEP in the event of such an occurrence. If action is required, a further decision document may be required, such as a fact sheet, an ESD or a ROD Amendment, depending on the magnitude of the change to the selected remedy.

36. **Comment:** On page 13 of the Proposed Plan, it is stated that there were no unacceptable risks identified for 12 Cheever St. While there has been limited sampling on this property, a PDI will determine if there is contamination is on this property extending from 33 Water St or the MBTA ROW. This property is zoned residential; please clarify if the same risk assessment criteria applied to 33 Water St. will apply to this property.

    EPA Response: EPA refers the commenter to Section G of the ROD which discusses the risk assessment in more detail. Briefly, although the anticipated future use of the two properties is different, a risk assessment was conducted for future residential use for each parcel. Based on a supplemental risk evaluation for future residential use at 12 Cheever, it was determined there is no unacceptable risk to a hypothetical resident. Further investigations will be performed during design. Based on the results of those investigation, EPA will review and consider whether further risk analysis is warranted.

37. **Comment:** As part of MassDEP Review, the MassDEP Wetlands Program provided the following comment regarding State jurisdictional wetland resource areas at the Creese & Cook Site: Based on review of the Draft Remedial Investigations and the Draft Feasibility Study and some searching of GIS and other on-line mapping, it appears that the following state jurisdictional wetland resource areas are present either within the proposed work areas or close by: Land Under Water, Bank, Salt Marsh, Bordering Vegetated Wetlands (BVW), Bordering Land Subject to Flooding (BLSF), and/or Land Subject to Coastal Storm Flowage (LSCSF), and Riverfront Area. In addition, the 100-foot Buffer Zone, which is an area subject to regulation, is associated with Bank, Salt Marsh and BVW. However, it would be overlain by Riverfront Area except in any areas where RA is not present.

    EPA Response: Comment Noted. The presence of these wetland resource areas were identified by MassDEP during the RI/FS process and are identified as ARAR. The selected remedy, which will adversely impact some of these resource areas, includes measures to avoid and minimize impacts whenever possible and, if not possible, to restore or replicate impacted wetlands in the vicinity of the impacted areas.

38. **Comment:** In the Principal Threat Waste discussion, please include what arsenic, lead, and chromium concentration would correspond to a one-in-one thousand (10-3) risk level and discuss if those concentrations have been found onsite.

EPA Responses:

With respect to Principal Threat Waste:

- Arsenic concentration resulting in 10^{-3} risk= 680 mg/kg.
- Hexavalent Chromium concentration resulting in 10^{-3} risk = 310 mg/kg.
- Lead does not have a 10-3 risk concentration as the risk is driven by blood lead levels and not cancer risk. An analogous value may be the MCP UCL concentration for lead (6000 µg/kg). Other than a small area on 20 Cheever Street, soil lead concentrations do not exceed this level.

The maximum concentrations detected on the ESA are:

- Arsenic at 1530 mg/kg (ESA, SS-01C (2-3 ft bgs)).
- Hexavalent Chromium at 580 mg/kg (ESA, SS-24A (1-1.5 ft bgs)).
- Lead at 24,000 mg/kg (ESA, 20CH-SS11-0001-062014X-MAX) within UCL hotspot area.

The maximum concentrations detected on the WSA are:

- Arsenic at 14,400 mg/kg (WSA, 55CL-SB18-0507-111715X) within UCL hotspot area.
- Hexavalent Chromium at 68 mg/kg (WSA, 55CL-SB66-1416-111015X).
- Lead at 3,960 mg/kg (WSA, 55CL-SB18-0204-111715X) within UCL hotspot area.

Note that even though the 10^{-3} concentration has been detected/exceed in a small number of samples on the Site, that does not trigger a Principal Threat Waste condition since the total cancer risk levels from all contaminants in each area result in a total risk level less than 10^{-3}. Additionally, the source area contaminants on Site are not highly mobile, as demonstrated by the relatively low and sporadic concentrations of Site contaminants in groundwater. As a result, Site soils are not considered to be Principal Threat Wastes. Additional details on the Principal Threat Waste discussion can be found in Section 4.1.1 of the Final FS Report.

39. **Comment:** The DRAFT MassDEP Historic Fill guidance is (a) not final and (b) not applicable to fill generated on-site. Please provide information as to why EPA considers this guidance applicable for the ESA.

EPA Response: EPA determined that use of the MassDEP soil background values for metals and PAHs, rather than site-specific background values, were the most appropriate reference values for use in the RI and for developing preliminary remediation goals

(PRGs) because the combination of both natural and man-made conditions at the Site made it difficult for EPA to define an alternative sampling strategy for obtaining representative background concentrations of contaminants in Site soil.

The DRAFT MassDEP Historic Fill guidance for soil that contains ash in historic fill was considered appropriate for use to determine appropriate background levels for the ESA soil cleanup levels because of the long history of industrial use of the Site, including: the use of coal-fired boilers to power the tannery and coal-powered steam locomotives on the MBTA ROW; the reported 1983 fire that burned a portion of the former tannery building at 33 Water Street; the extensive presence of off-site fill, brought to the Site from unknown locations (containing brick fragments, rebar, partially burned wood); and the presence of extensive ash throughout the ESA.

The DRAFT MassDEP Historic Fill guidance for soil that does not contain ash in historic fill was considered appropriate for use to determine background levels for the WSA soil cleanup levels because of the long history of industrial use of the area, and the extensive presence of off-site fill from unknown locations and placed within the WSA.

For a more extensive discussion on background assumptions for the Site, please see: *Rationale for Selection of Background Chemical Concentrations in Soils*, Creese & Cook, dated, 9/28/2018. A copy of this memorandum is included into the Administrative Record for the Proposed Plan and a copy was sent to MassDEP on October 2, 2018, via electronic mail.

40. **Comment:** The Preferred Alternative ESA Riverfront-2A states that up to two feet of soil will be removed in areas where Site contaminants exceed Proposed Cleanup Levels (PCLs); however, the figure only shows a strip along the river and an UCL hot spot area being removed from this residential zoned property. Please clarify if ESA Riverfront 2A includes ICs being placed on the remainder of 20 Cheever St. If so, what would the ICs be?

    EPA Response: Excavation is proposed on 20 Cheever Street only along the riverbank and in the UCL lead hot spot area. The remainder of the parcel will not be excavated as part of this remedy. Institutional controls, including land use controls as appropriate, will be placed on 20 Cheever Street to prohibit potential future residential development or other use that is inconsistent with the current land use zoning. The specific details for the planned Institutional Controls will be developed during the remedial design.

41. **Comment:** Alternative WSA-2 states that Site contaminants that exceed soil cleanup levels will be excavated up to 4 feet below ground surface. Please clarify that if the PDI indicates the presence of deeper contamination, it will be excavated as well.

    EPA Response: WSA-2 includes excavation of contaminated soil south of the former beamhouse to levels that allow for unrestricted use, i.e. residential. The estimated maximum depth of contaminants requiring excavation is 4 feet. WSA-2 does not include excavation of soil below the water table, which is 8-9 ft bgs. If the PDI indicates the presence of soil contamination that is deeper than 4 feet but above the water table in this area, the remedial design will include excavation of this additional soil.

42. **Comment:** With respect to page 30 of the Proposed Plan, ESA Residential, please list the ESA residential properties to which this section applies.

    EPA Response: ESA Residential applies to the 33 Water Street and 45 Water Street residential properties.

43. **Comment:** With respect to page 31, ESA Riverfront, please list the properties to which this section applies.

    EPA Response: ESA Riverfront applies to the entire 20 Cheever Street property and only the riverbank areas of the MBTA ROW, 33 Water Street and 45 Water Street parcels. The ESA Riverbank soil generally means soil situated above the mean high tide line. Soil below the mean high tide line will be evaluated and address, if required, as part of the third operable unit which includes the Crane River.

44. **Comment:** When designing the PDI in the area of 33 Water St and 12 Cheever St, MassDEP encourages EPA to look at past EPA removal data from 33 Water St.

    EPA Response: Comment Noted.

45. **Comment:** There is limited available space for soil in the proposed onsite consolidation cell located at 55 Clinton Ave. PDIs may identify more soil volume to be excavated. Please clarify that all soil above Proposed Cleanup Levels (PCLs) will be excavated and any excavated soil above Proposed Cleanup Levels that cannot fit into the proposed consolidation cell will be disposed of offsite at a licensed facility.

    EPA Response: We believe that adequate space is available on 55 Clinton Avenue to consolidate significantly more contaminated soil than the volume anticipated for excavation under WSA-2. As a result, if the PDIs identify more soil volume to be excavated, the design of the onsite consolidation cell at 55 Clinton Ave could be adjusted and the cell redesigned for the increased volume. The selected remedy includes two options for construction of the consolidation area, depending on the ultimate volume of soil to be consolidated at that location.

APPENDICES

Table 1
Comparative Cost Summary
OU1 and OU2 FS Remedial Alternatives
Creese & Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

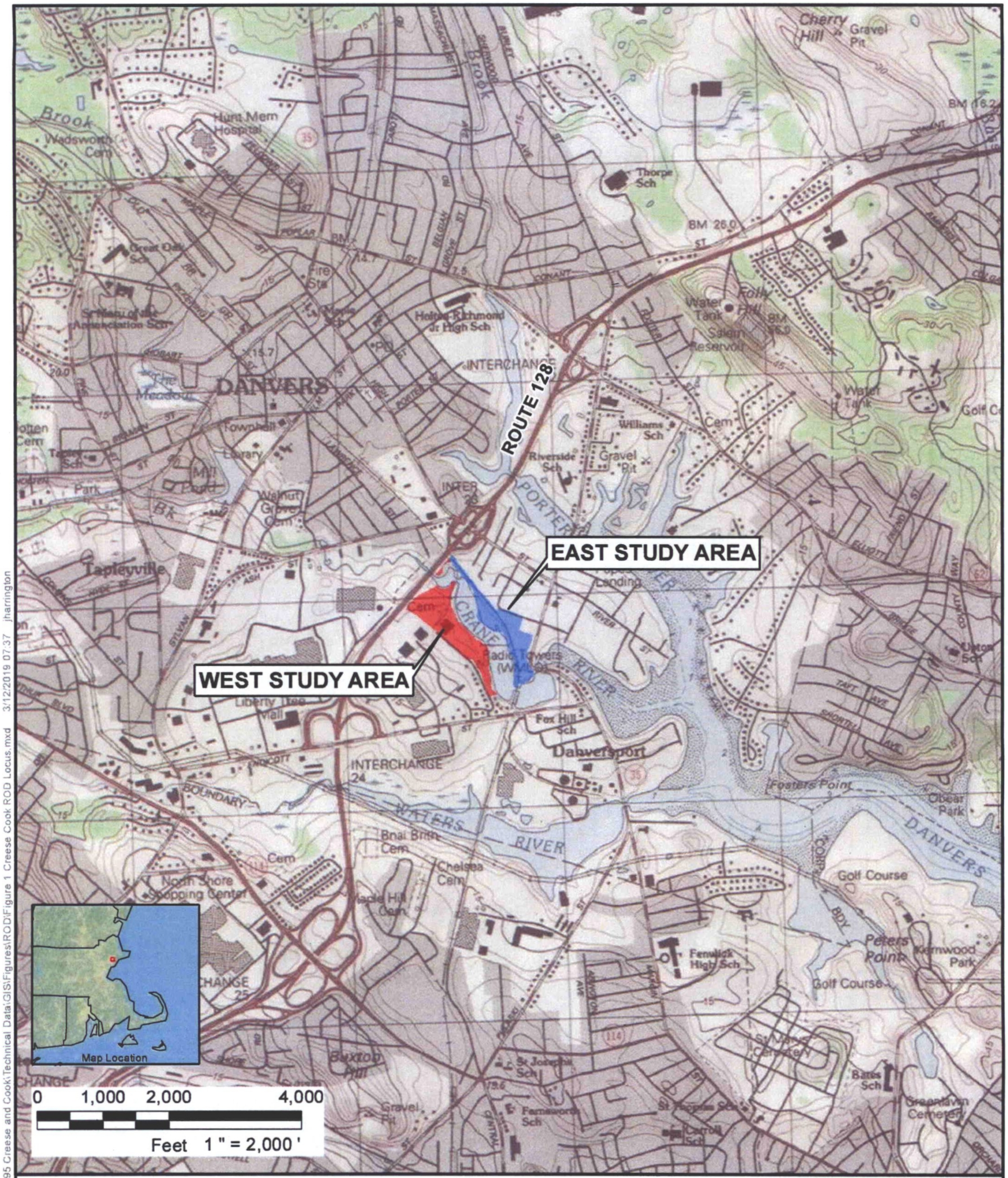
Alternative[4]	Cost Factors: Capital	Cost Factors: Total Present Value O&M	Cost Factors: Total Present Value (First 30 Years)	Months to Achieve RAOs
ESA - Residential				
1	$ -	$ 48,000	$ 48,000	NA
2A	$ 2,476,000	$ 181,000	$ 2,657,000	5.6
2B	$ 3,156,000	$ 181,000	$ 3,337,000	5.6
3A	$ 4,204,000	$ 163,000	$ 4,367,000	9.2
3B	$ 5,655,000	$ 163,000	$ 5,818,000	9.2
ESA - MBTA				
1	$ -	$ 48,000	$ 48,000	NA
2	$ 1,946,000	$ 293,000	$ 2,239,000	4.5
3	$ 5,202,000	$ 149,000	$ 5,351,000	9.5
ESA - Riverfront				
1	$ -	$ 48,000	$ 48,000	NA
2A	$ 2,596,000	$ 188,000	$ 2,784,000	4.2
2B	$ 3,000,000	$ 188,000	$ 3,188,000	4.2
WSA				
1	$ -	$ 48,000	$ 48,000	NA
2	$ 12,976,000	$ 517,000	$ 13,493,000	33.2
3	$ 15,461,000	$ 517,000	$ 15,978,000	38.0
4	$ 15,882,000	$ 508,000	$ 16,390,000	38.9

Notes:

1. Time to Achieve RAOs includes time required for implementation of alternative. Time for pre-design and remedial design phase activities is not included in the time estimates.
2. NA - No Action Alternative will not achieve RAOs.
3. Total present value O&M cost presented is total cost for 30 years, including costs for Five-Year Reviews and a discount rate of 7% per EPA 540-R-00-002, OSWER 9355.0-75, July 2000, p. 4-5.
4. Alternatives referenced include:

ESA Residential-1: No Action
ESA Residential-2A: Soil Excavation (0-3 ft bgs) and On-Site Consolidation, Soil Cover, and Institutional Controls
ESA Residential-2B: Soil Excavation (0-3 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls
ESA Residential-3A: Soil Excavation (0-8 ft bgs), On-Site Consolidation, and Institutional Controls
ESA Residential-3B: Soil Excavation (0-8 ft bgs), Off-Site Disposal, and Institutional Controls
ESA MBTA-1: No Action
ESA MBTA-2: Soil Cover and Institutional Controls
ESA MBTA-3: Soil Excavation (0-3 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls
ESA Riverfront-1: No Action
ESA Riverfront-2A: Soil Excavation (0-2 ft bgs) and On-Site Consolidation, Soil Cover, and Institutional Controls
ESA Riverfront-2B: Soil Excavation (0-2 ft bgs) and Off-Site Disposal, Soil Cover, and Institutional Controls
WSA-1: No Action
WSA-2: Comprehensive Excavation South of Former Beamhouse, Surface Excavation (0-3 ft bgs) of Remaining Area, On-Site Consolidation, Soil Cover, and Institutional Controls
WSA-3: Comprehensive Excavation South of Sewer Easement, Surface Excavation (0-3 ft bgs) of Remaining Area, On-Site Consolidation, Soil Cover, and Institutional Controls
WSA-4: Comprehensive Excavation, On-Site Consolidation, and Institutional Controls

APPENDIX A



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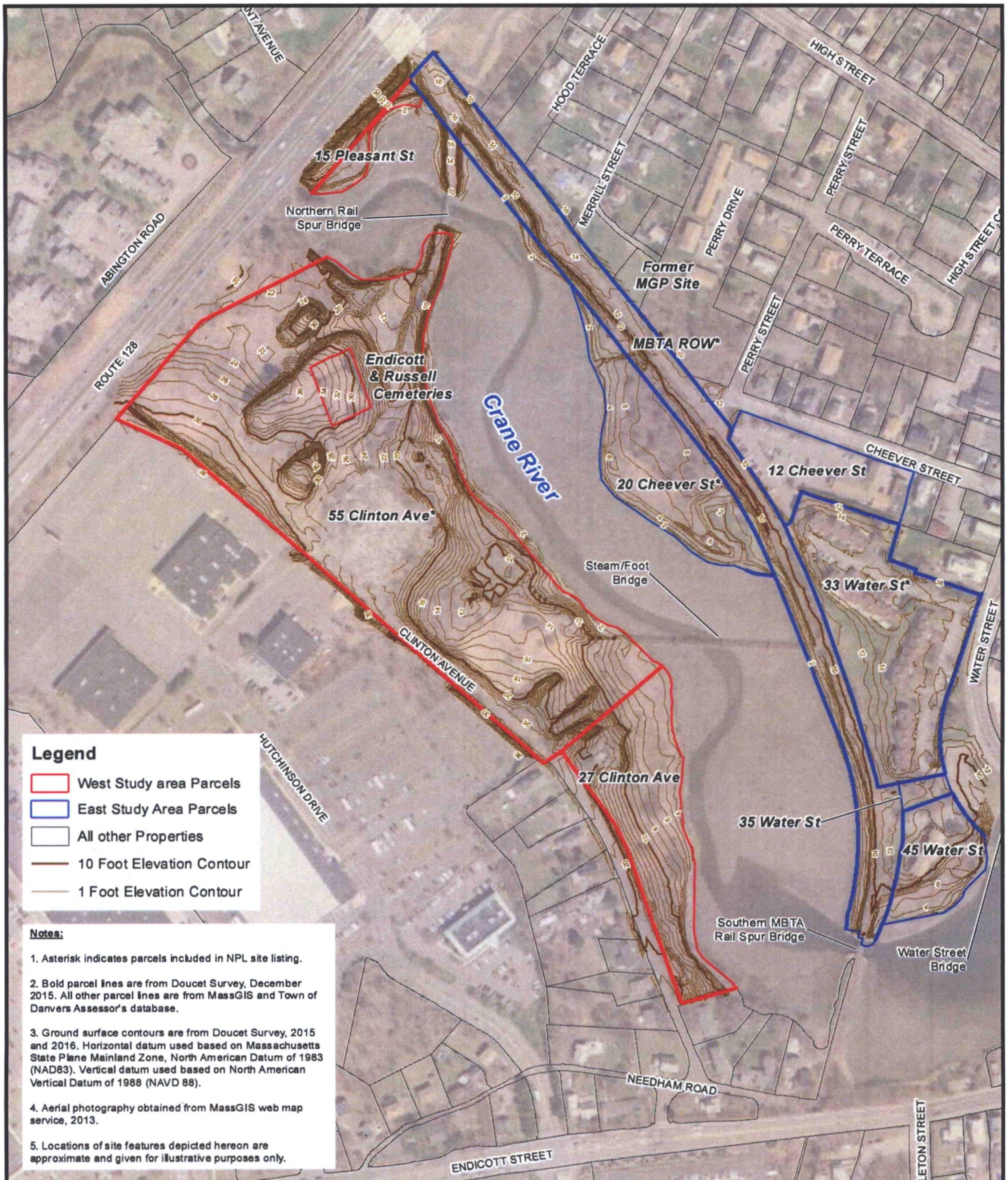
USGS Topographic Map
Salem, Massachusetts
Revised 1985

FIGURE 1

LOCUS MAP
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE ROD STUDY AREAS
DANVERS, MASSACHUSETTS

R:\80000 Task Orders\80095 Creese and Cook\Technical Data\GIS\Figures\ROD\Figure 1 Creese Cook ROD Locus.mxd 3/12/2019 07:37 jharrington



0 150 300 600

Feet

1 inch = 300 feet

N

FIGURE 2

SITE PLAN
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE ROD
DANVERS, MASSACHUSETTS

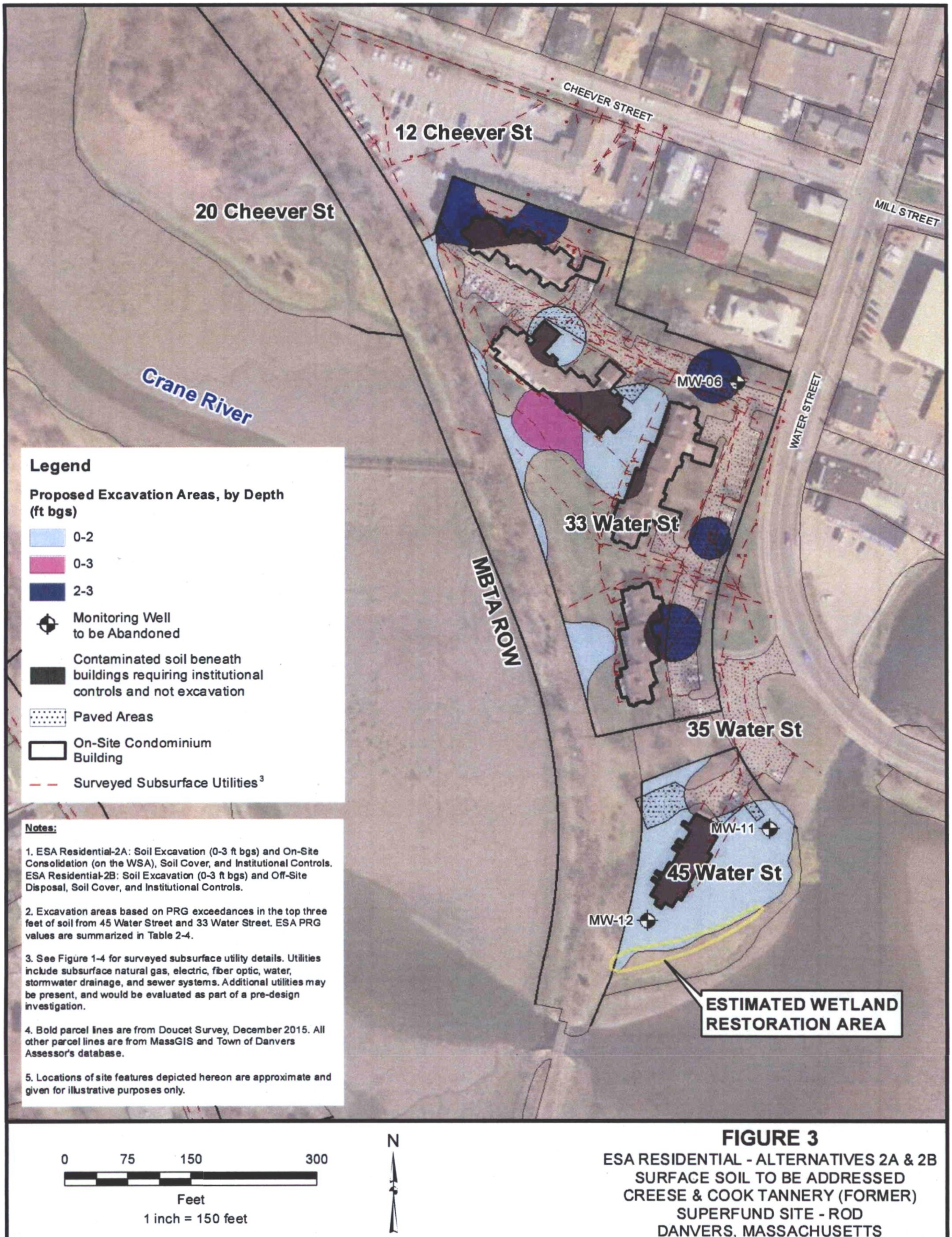


FIGURE 3
ESA RESIDENTIAL - ALTERNATIVES 2A & 2B
SURFACE SOIL TO BE ADDRESSED
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS

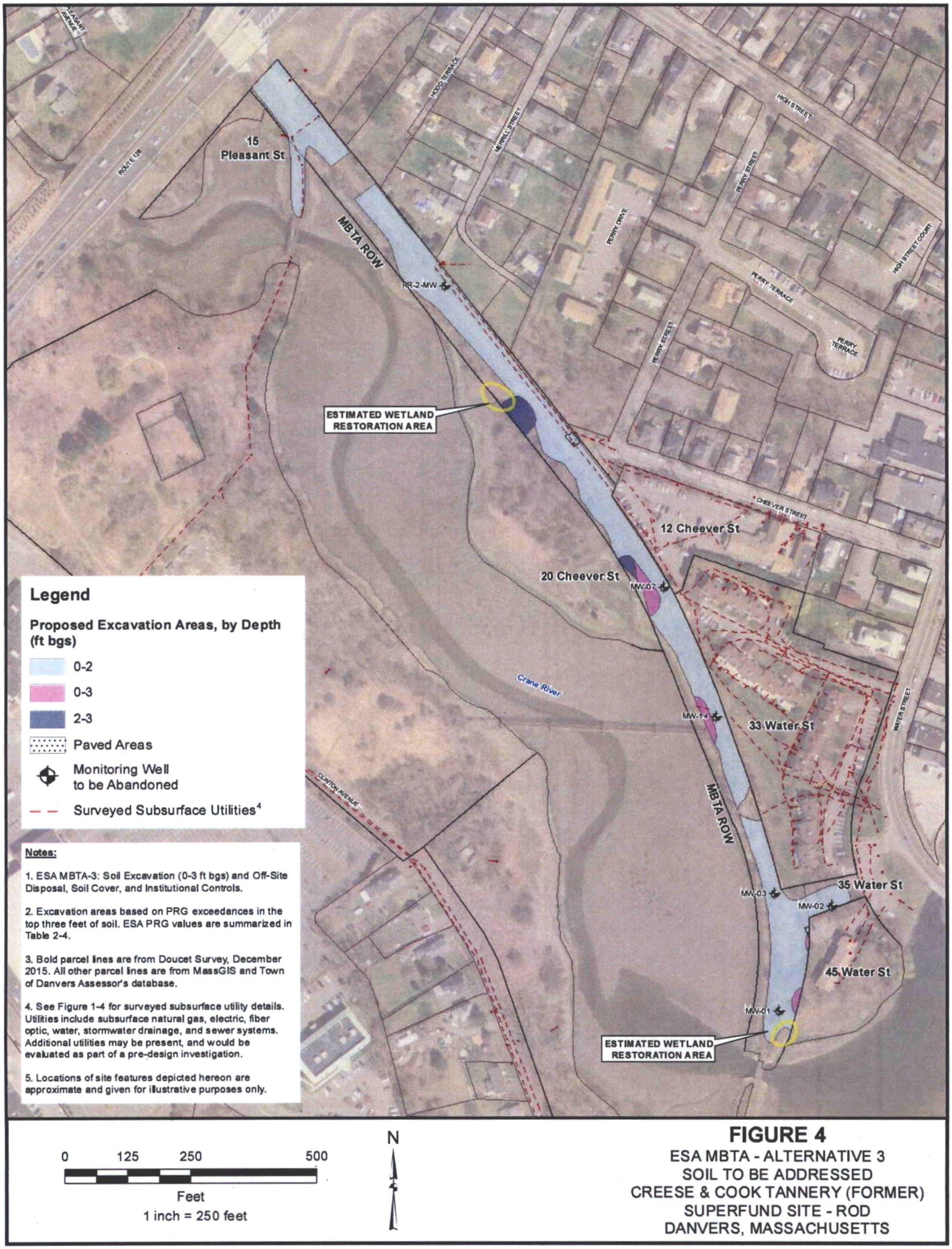


FIGURE 4
ESA MBTA - ALTERNATIVE 3
SOIL TO BE ADDRESSED
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS

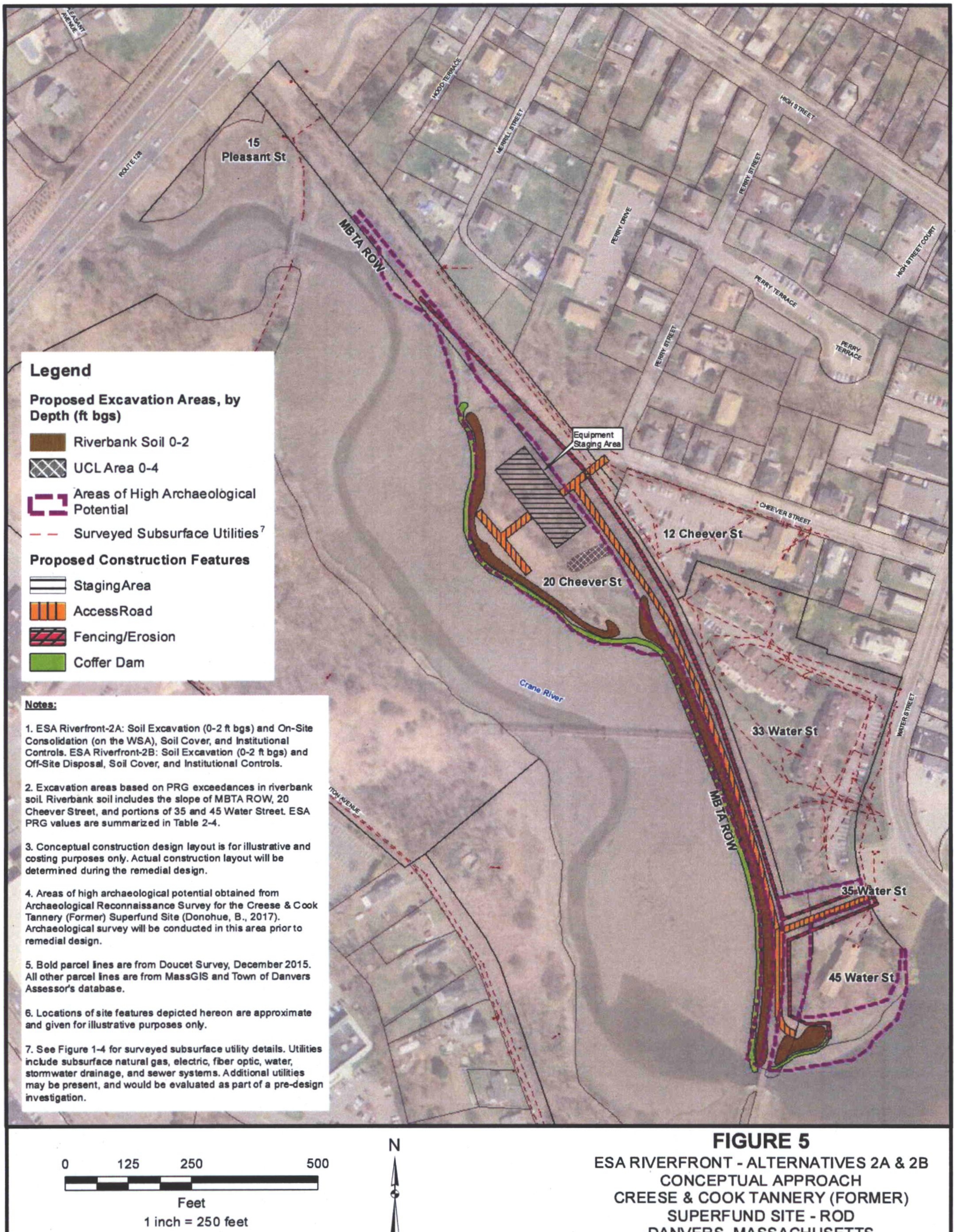
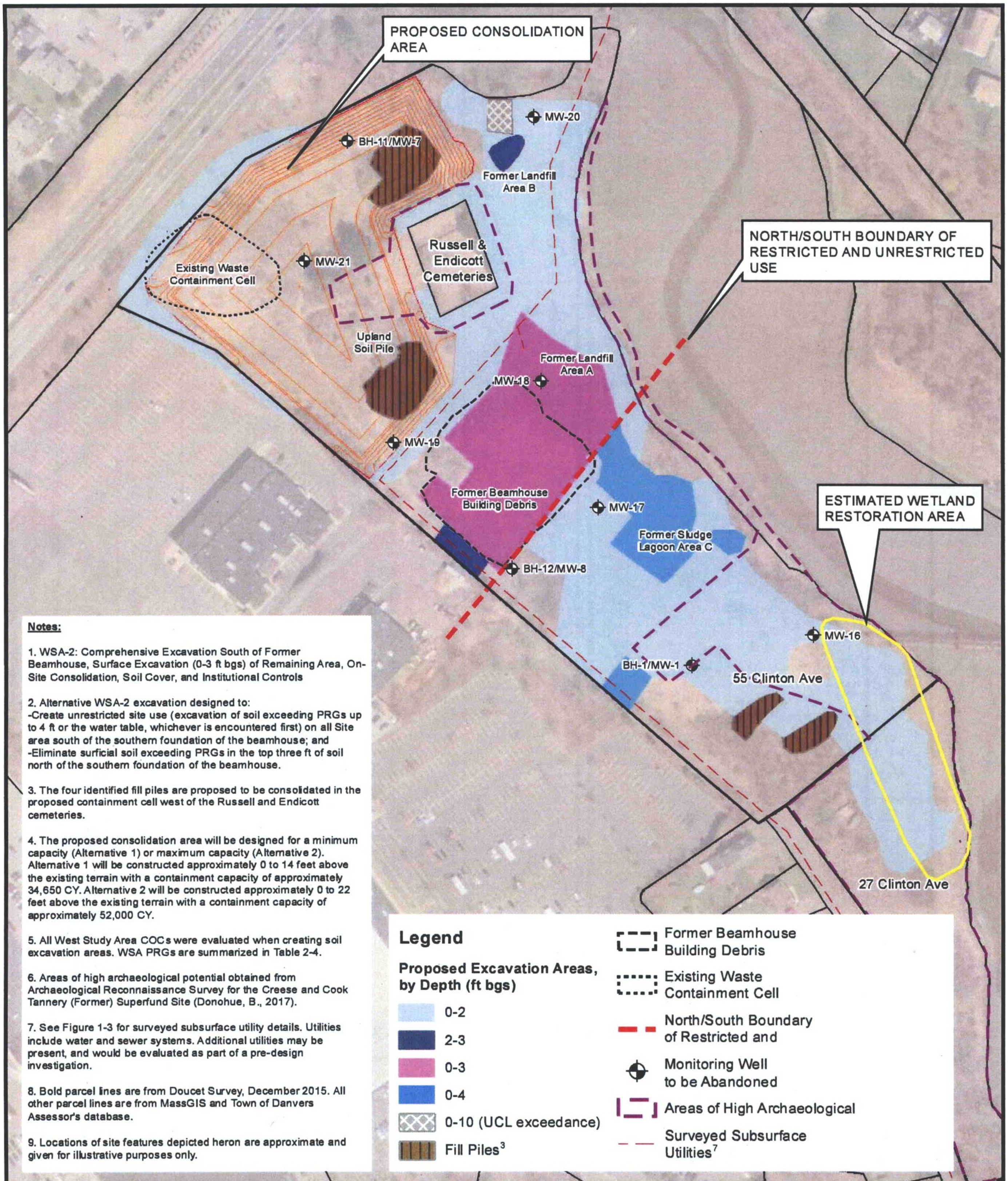


FIGURE 5

ESA RIVERFRONT - ALTERNATIVES 2A & 2B
CONCEPTUAL APPROACH
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS



0 100 200 400

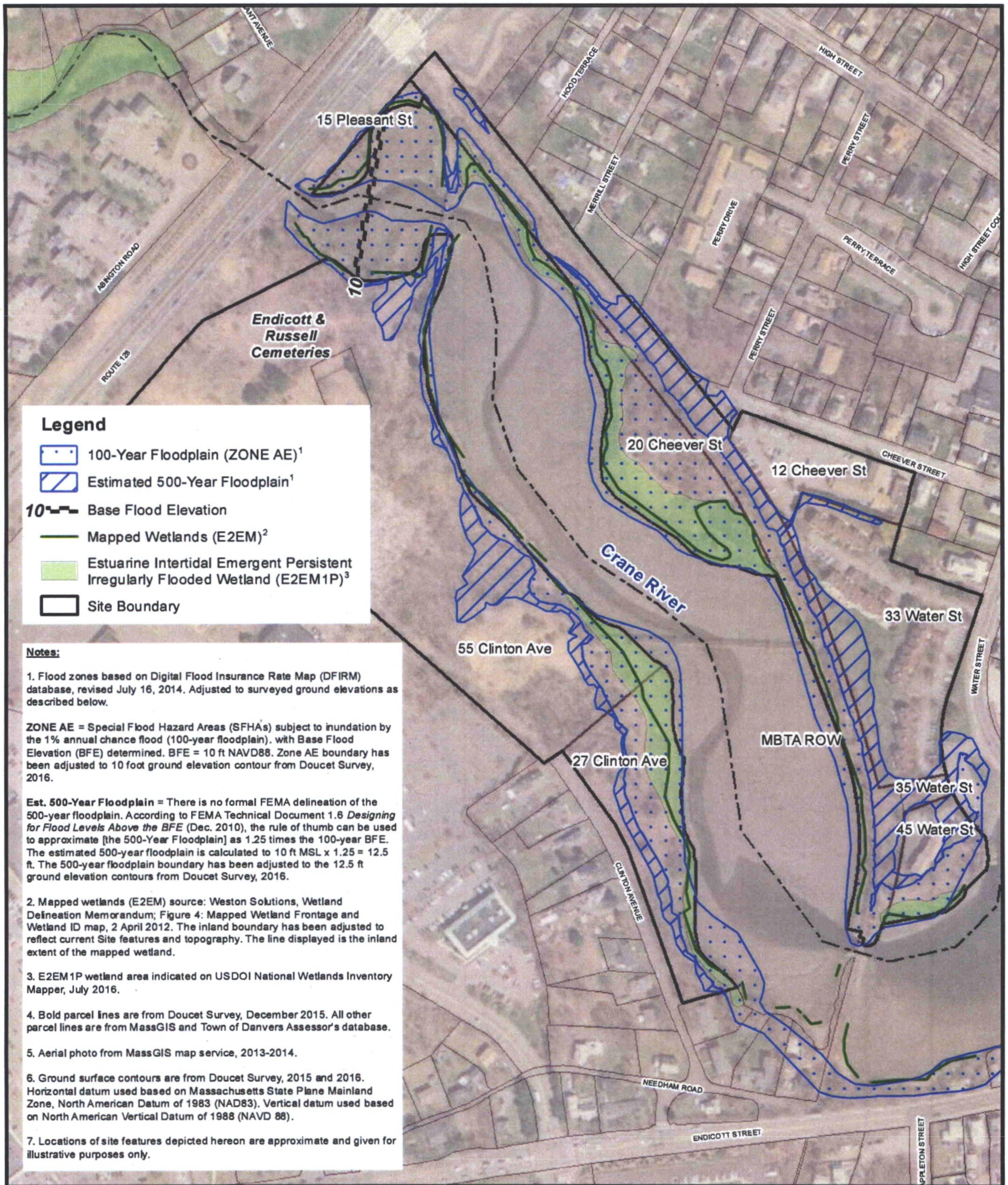
Feet

1 inch = 200 feet

N

FIGURE 6

WSA - ALTERNATIVE 2
SOIL TO BE ADDRESSED
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS



Notes:

1. Flood zones based on Digital Flood Insurance Rate Map (DFIRM) database, revised July 16, 2014. Adjusted to surveyed ground elevations as described below.

ZONE AE = Special Flood Hazard Areas (SFHAs) subject to inundation by the 1% annual chance flood (100-year floodplain). with Base Flood Elevation (BFE) determined. BFE = 10 ft NAVD88. Zone AE boundary has been adjusted to 10 foot ground elevation contour from Doucet Survey, 2016.

Est. 500-Year Floodplain = There is no formal FEMA delineation of the 500-year floodplain. According to FEMA Technical Document 1.6 *Designing for Flood Levels Above the BFE* (Dec. 2010), the rule of thumb can be used to approximate [the 500-Year Floodplain] as 1.25 times the 100-year BFE. The estimated 500-year floodplain is calculated to 10 ft MSL x 1.25 = 12.5 ft. The 500-year floodplain boundary has been adjusted to the 12.5 ft ground elevation contours from Doucet Survey, 2016.

2. Mapped wetlands (E2EM) source: Weston Solutions, Wetland Delineation Memorandum; Figure 4: Mapped Wetland Frontage and Wetland ID map, 2 April 2012. The inland boundary has been adjusted to reflect current Site features and topography. The line displayed is the inland extent of the mapped wetland.

3. E2EM1P wetland area indicated on USDOI National Wetlands Inventory Mapper, July 2016.

4. Bold parcel lines are from Doucet Survey, December 2015. All other parcel lines are from MassGIS and Town of Danvers Assessor's database.

5. Aerial photo from MassGIS map service, 2013-2014.

6. Ground surface contours are from Doucet Survey, 2015 and 2016. Horizontal datum used based on Massachusetts State Plane Mainland Zone, North American Datum of 1983 (NAD83). Vertical datum used based on North American Vertical Datum of 1988 (NAVD 88).

7. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

FIGURE 7

WETLANDS & FLOODPLAINS
CREESE & COOK TANNERY
(FORMER) SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS

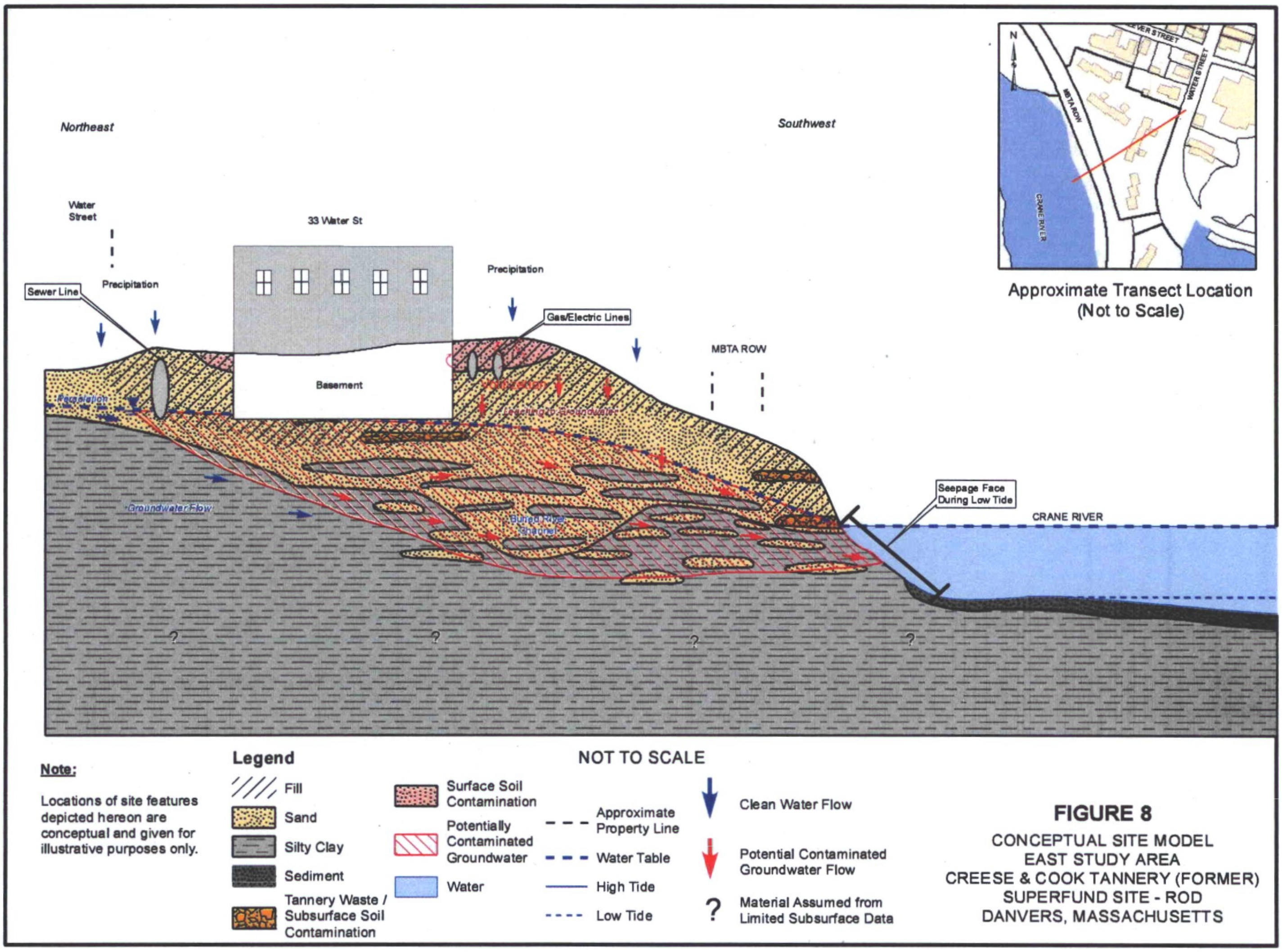
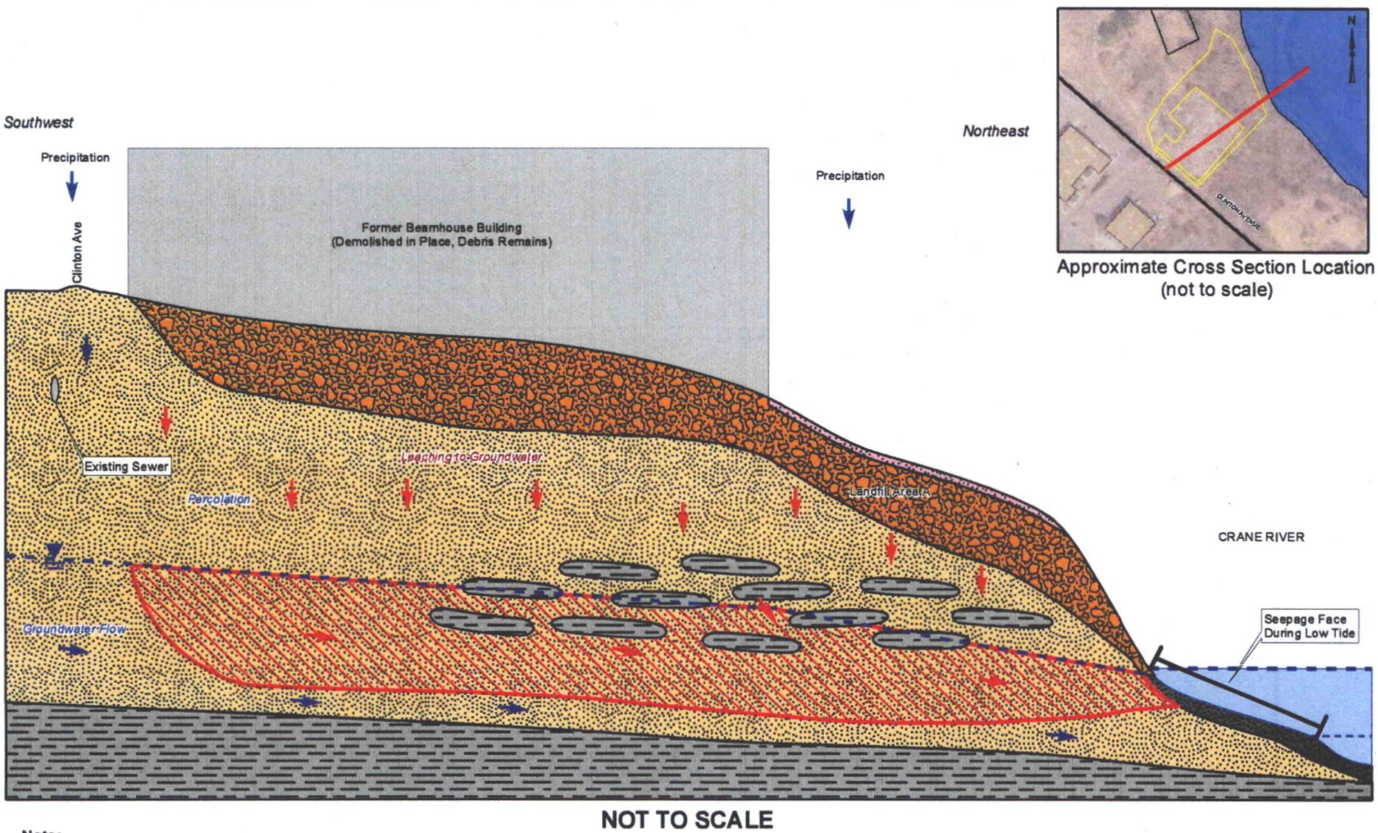


FIGURE 8

CONCEPTUAL SITE MODEL
EAST STUDY AREA
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS



Note:

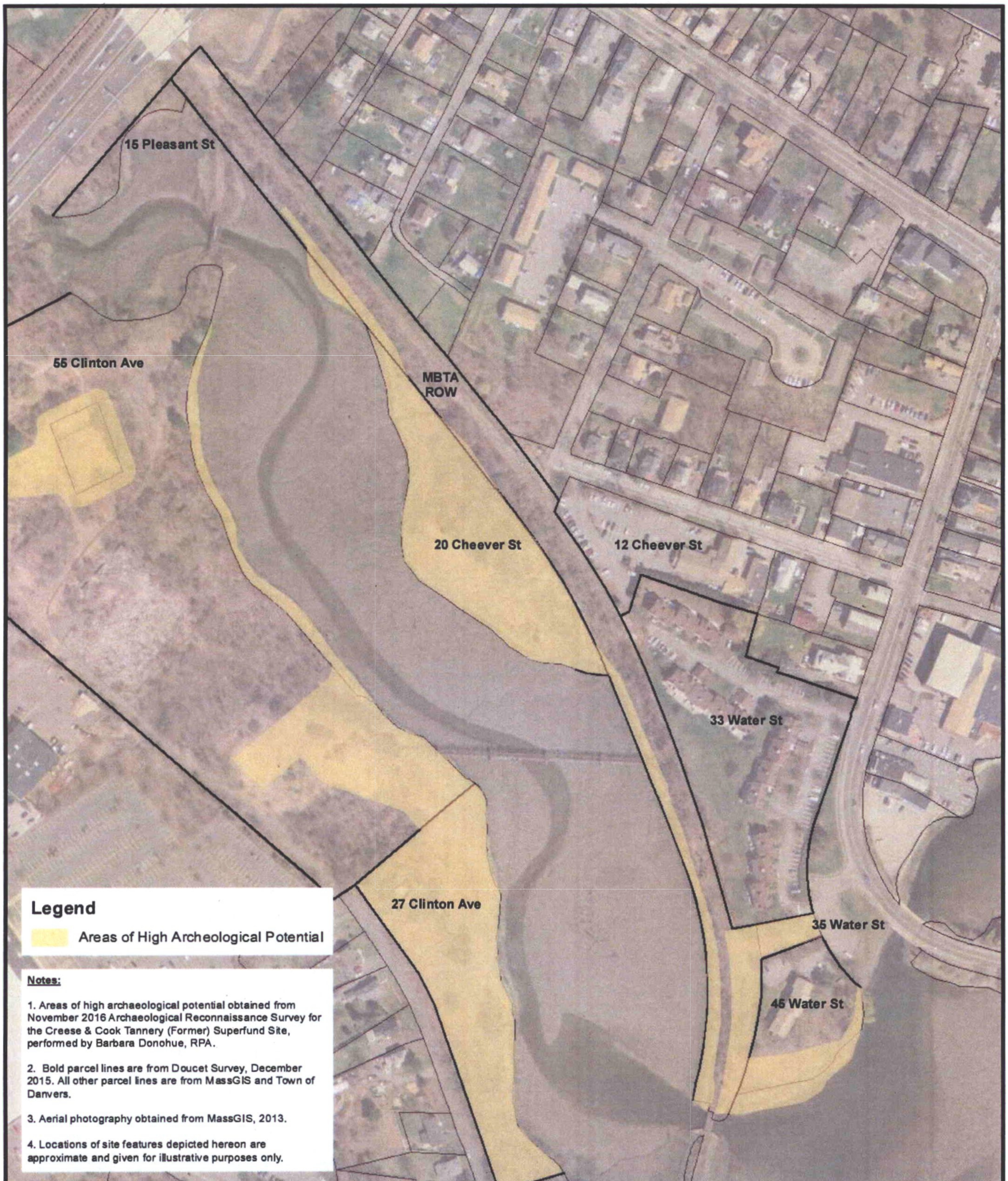
Locations of site features depicted hereon are conceptual and given for illustrative purposes only.

Legend

- Water Table
- High Tide
- Low Tide
- Surface Contamination
- Former Building Location
- Silty Sand
- Potential Subsurface Soil Contamination
- Clay/Silt
- Potentially Contaminated Groundwater
- Water
- Sediment
- Clean Water Flow
- Contaminated Water Flow

FIGURE 9

CONCEPTUAL SITE MODEL
WEST STUDY AREA
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS



Notes:

1. Areas of high archaeological potential obtained from November 2016 Archaeological Reconnaissance Survey for the Creese & Cook Tannery (Former) Superfund Site, performed by Barbara Donohue, RPA.

2. Bold parcel lines are from Doucet Survey, December 2015. All other parcel lines are from MassGIS and Town of Danvers.

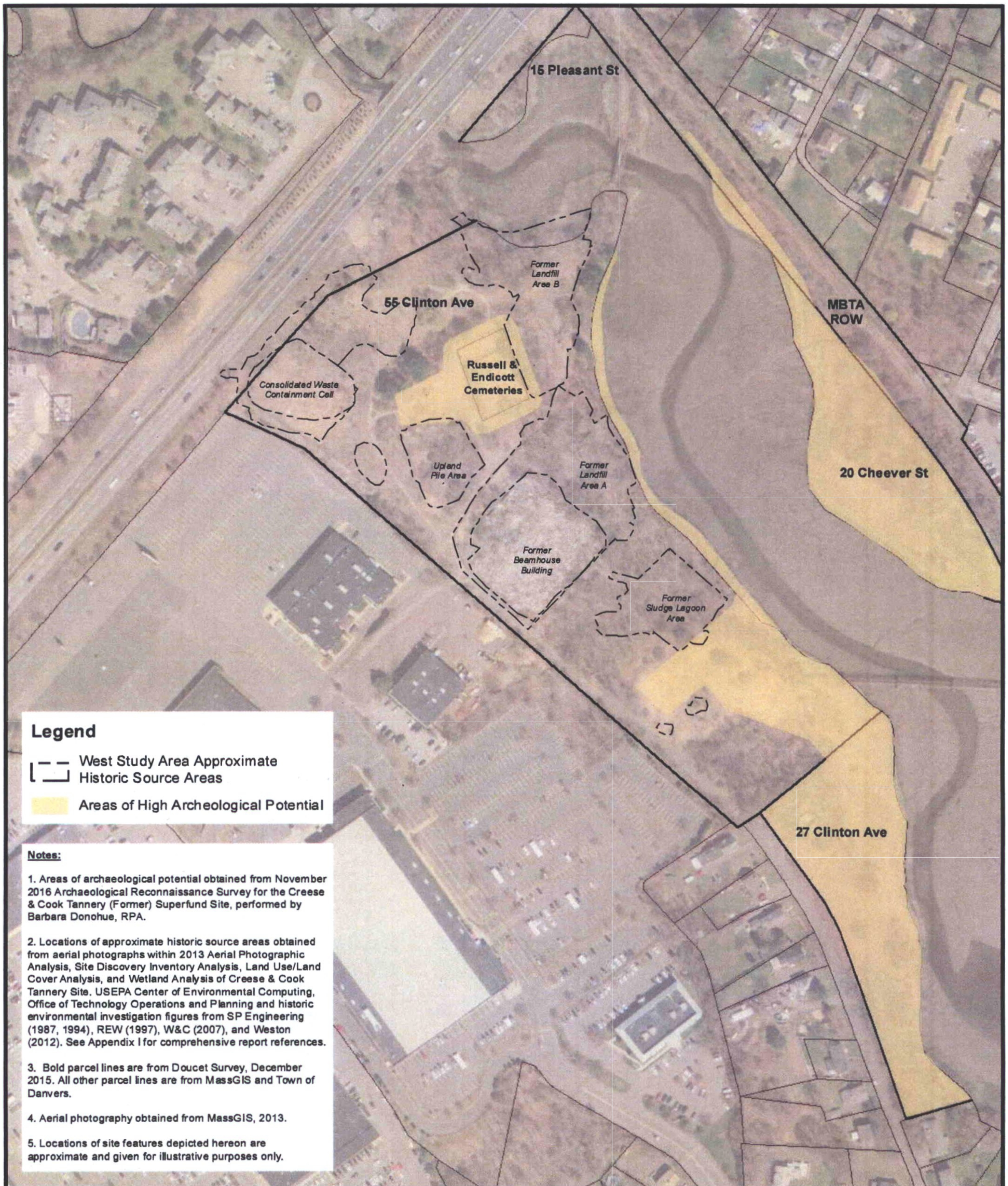
3. Aerial photography obtained from MassGIS, 2013.

4. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

0 125 250 500
Feet
1 inch = 250 feet

N

FIGURE 10
AREAS OF HIGH ARCHAEOLOGICAL POTENTIAL
EAST STUDY AREA
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS



Notes:

1. Areas of archaeological potential obtained from November 2016 Archaeological Reconnaissance Survey for the Creese & Cook Tannery (Former) Superfund Site, performed by Barbara Donohue, RPA.

2. Locations of approximate historic source areas obtained from aerial photographs within 2013 Aerial Photographic Analysis, Site Discovery Inventory Analysis, Land Use/Land Cover Analysis, and Wetland Analysis of Creese & Cook Tannery Site. USEPA Center of Environmental Computing, Office of Technology Operations and Planning and historic environmental investigation figures from SP Engineering (1987, 1994), REW (1997), W&C (2007), and Weston (2012). See Appendix I for comprehensive report references.

3. Bold parcel lines are from Doucet Survey, December 2015. All other parcel lines are from MassGIS and Town of Danvers.

4. Aerial photography obtained from MassGIS, 2013.

5. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

0 125 250 500

Feet

1 inch = 250 feet

N

FIGURE 11

AREAS OF HIGH ARCHAEOLOGICAL POTENTIAL
WEST STUDY AREA
CREESE & COOK TANNERY (FORMER)
SUPERFUND SITE - ROD
DANVERS, MASSACHUSETTS

APPENDIX B

Region	Document ID	Attributes	Activity Type	Access Control	Title	Document Date	Page Count
1	635729	Administrative Record		UCTL(Uncontrolled)	LETTER REGARDING MA DEPT OF ENVIRONMENTAL PROTECTION (MASSDEP) COMMENTS ON RECORD OF DECISION (ROD)	6/14/2019	3
1	635086	Administrative Record		UCTL(Uncontrolled)	LETTER RESPONDING TO 12/31/2019 LETTER, NATIONAL HISTORIC PRESERVATION ACT - SECTION 106 CONSULTATION	5/13/2019	4
1	635082	Administrative Record		UCTL(Uncontrolled)	LETTER REQUESTING ADDITIONAL INFORMATION FOR COMMENT ON ELIGABILITY FOR NATIONAL REGISTER (07/14/2017 LETTER AND ELIGABILITY FOR NATIONAL REGISTER FORM ATTACHED)	12/31/2018	5
1	635083	Administrative Record		UCTL(Uncontrolled)	LETTER PROVIDING UPDATE ON SITE, NHPA SECTION 106 CONSULTATION	12/3/2018	3
1	631480	Administrative Record		UCTL(Uncontrolled)	EMAIL TRANSMITTING FORMAL PETITION AND COMMENT ON CLEANUP PROPOSAL (10/29/2018 COMMENT EMAIL ATTACHED)	11/9/2018	4
1	632594	Administrative Record		UCTL(Uncontrolled)	TRANSCRIPT OF 10/25/2018 PUBLIC HEARING	11/9/2018	19
1	631476	Administrative Record		UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL (MAPS OF CREESE & COOK PROPERTIES ATTACHED)	11/8/2018	4
1	631478	Administrative Record		UCTL(Uncontrolled)	LETTER REGARDING TECHNICAL COMMENTS ON PROPOSED PLAN (EMAIL TRANSMITTAL ATTACHED)	11/8/2018	8
1	631400	Administrative Record		UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL	11/2/2018	1
1	631474	Administrative Record		UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON PROPOSED PLAN	11/2/2018	4
1	100010576	Administrative Record		UCTL(Uncontrolled)	HANDWRITTEN LETTER REGARDING PUBLIC COMMENT ON CLEAN UP PLAN (1872 MAP OF TANNERIES AND SHOE FABRICATION FACILITIES ATTACHED)	11/1/2018	4
1	631193	Administrative Record		UCTL(Uncontrolled)	NEWS ARTICLE: EPA PLAN CALLS FOR $24M CLEANUP OF DANVERS NEIGHBORHOOD'S CONTAMINATED SOIL	10/30/2018	3
1	631196	Administrative Record		UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL	10/30/2018	1
1	631402	Administrative Record		UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL	10/27/2018	1

1	631188 Administrative Record, Published	UCTL(Uncontrolled)	PUBLIC MEETING PRESENTATION: REMEDIAL INVESTIGATION (RI) SUMMARY AND PROPOSED CLEANUP PLAN	10/25/2018	53
1	631407 Administrative Record, Published	UCTL(Uncontrolled)	PRESENTATION POSTER BOARDS FROM PUBLIC MEETING	10/25/2018	6
1	630992 Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING CLEANUP AROUND ENDICOTT BURIAL GROUND (EMAIL HISTORY AND 11/18/2016 ARCHAEOLOGICAL RECONNAISSANCE SURVEY ATTACHED)	10/12/2018	4
1	631198 Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL (PROPOSED PLAN ATTACHED)	10/12/2018	50
1	630994 Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING PHONE CALL DISCUSSIING CLEANUP AROUND ENDICOTT BURIAL GROUND (EMAIL HISTORY AND 10/02/2018 PROPOSED PLAN ATTACHED)	10/11/2018	4
1	630986 Administrative Record	UCTL(Uncontrolled)	FACEBOOK POST REGARDING NEWS ARTICLE: EPA ANNOUNCES CLEANUP PLAN FOR TANNERY SITE	10/9/2018	1
1	631187 Administrative Record	UCTL(Uncontrolled)	POSTAGE STATEMENT - US POSTAL SERVICE (USPS) MARKETING MAIL	10/9/2018	7
1	630983 Administrative Record, Published	UCTL(Uncontrolled)	PRESS RELEASE: EPA PROPOSES CLEANUP PLAN FOR THE CREESE & COOK TANNERY SUPERFUND SITE IN DAVERS, MA	10/5/2018	2
1	630984 Administrative Record	UCTL(Uncontrolled)	NEWS ARTICLE: EPA ANNOUNCES CLEANUP PLAN FOR TANNERY SITE	10/5/2018	3
1	625467 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 15 PLEASANT STREET	10/4/2018	2
1	629340 Administrative Record, Published	UCTL(Uncontrolled)	PROPOSED PLAN	10/1/2018	49
1	629395 Administrative Record	UCTL(Uncontrolled)	MEMO REGARDING RATIONALE FOR SELECTION OF BACKGROUND CHEMICAL CONCENTRATIONS IN SOILS (2016 MASS DEP GUIDANCE ATTACHED)	9/28/2018	17
1	630975 Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON DRAFT FINAL FEASIBILITY STUDY (FS)	9/20/2018	4
1	630977 Administrative Record	UCTL(Uncontrolled)	EMAIL RESPONDING TO COMMENTS ON REMEDIAL INVESTIGATIONS (RI) AND HUMAN HEALTH RISK ASSESSMENTS (HHRA) (EMAIL HISTORY ATTACHED)	9/20/2018	7

1	630921	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING RESIDENTIAL RISK AND INSTITUTIONAL CONTROL (IC) ISSUES (EMAIL HISTORY ATTACHED)	9/11/2018	2
1	630945	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING REVISED MINI-RISK TABLES (EMAIL HISTORY ATTACHED)	9/10/2018	5
1	630951	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING PROPERTIES WITH PROPOSED INSTITUTIONAL CONTROLS (IC) (EMAIL HISTORY ATTACHED)	9/6/2018	2
1	629394	Administrative Record	UCTL(Uncontrolled)	REMEDIAL INVESTIGATION (RI), WEST STUDY AREA (09/28/2018 TRANSMITTAL LETTER ATTACHED)	9/1/2018	1401
1	630917	Administrative Record	UCTL(Uncontrolled)	FIGURE: HISTORIC PROPERTY LAYOUT AND EXCAVATION AREAS (09/18/2018 TRANSMITTAL EMAIL ATTACHED)	9/1/2018	2
1	630971	Administrative Record	UCTL(Uncontrolled)	FEASIBILITY STUDY (FS), EAST AND WEST STUDY AREAS	9/1/2018	921
1	100010381	Administrative Record	UCTL(Uncontrolled)	FINAL HUMAN HEALTH RISK ASSESSMENT (TRANSMITTAL DATED 09/19/2018 ATTACHED)	9/1/2018	286
1	630937	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) QUESTIONS	8/27/2018	2
1	630915	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) QUESTION	8/22/2018	1
1	635728	Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING EPA RESPONSE TO MA DEPT OF ENVIRONMENTAL PROTECTION (MASSDEP) COMMENTS ON EAST STUDY AREA HUMAN HEALTH RISK ASSESSMENT (HHRA), EAST STUDY AREA FINAL REMEDIAL INVESTIGATION (RI), WEST STUDY AREA DRAFT HHRA, AND WEST STUDY DRAFT RI REPORT	8/16/2018	14
1	630919	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING PROPOSED ALTERNATIVE TITLE REVISIONS	7/20/2018	5
1	630935	Administrative Record	UCTL(Uncontrolled)	TABLE OF VOLUMES OF ESTIMATED EXCAVATION SOIL QUANTITIES FOR FEASIBILITY STUDY (FS)	6/19/2018	2

1	630943	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING INFORMATION ON INDUSTRI-PLEX CAP (EMAIL HISTORY AND INDUSTRI-PLEX 100% DESIGN REPORT ATTACHED)	5/25/2018	263
1	630903	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING 500 YEAR FLOODPLAIN - EXECUTIVE ORDER 13690 REVOKED (EMAIL HISTORY ATTACHED)	5/24/2018	1
1	635763	Administrative Record	UCTL(Uncontrolled)	REDACTED EMAIL REGARDING FOLLOW UP ON OUTSTANDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) ISSUES (EMAIL HISTORY ATTACHED	5/22/2018	1
1	630959	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING FOLLOW UP ON OUTSTANDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) ISSUES (EMAIL HISTORY ATTACHED	5/22/2018	6
1	100010166	Administrative Record, Published	UCTL(Uncontrolled)	LETTER REGARDING MA DEPT OF ENVIRONMENTAL PROTECTION (MADEP) COMMENTS ON EAST SIDE HUMAN HEALTH RISK ASSESSMENT (HHRA), EAST SIDE REMEDIAL INVESTIGATION (RI), WEST HUMAN HEALTH RISK ASSESSMENT (HHRA), AND WEST SIDE REMEDIAL INVESTIGATION (RI)	5/10/2018	4
1	630905	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING FLOODPLAIN COMPENSATORY STORAGE VOLUME, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) UPDATE	5/10/2018	1
1	630913	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING DIOXING GUIDANCE, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR)	5/8/2018	36
1	630939	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) QUESTIONS (EMAIL HISTORY AND ASBESTOS WASTE MANAGMENT GUIDE ATTACHED)	5/3/2018	41
1	630927	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT (HHRA) EVALUATIONS (04/27/2018 EMAIL TRANSMITTAL ATTACHED)	4/1/2018	16
1	630929	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING PROPOSED EXPEDITED SITE SCHEDULE	3/26/2018	2

1	630941 Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING HUMAN HEALTH RISK, LEAD EVALUATIONS FOR 15 PLEASANT STREET (EMAIL HISTORY ATTACHED)	3/12/2018	6
1	630925 Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING SITE VISIT - STORM RECONNAISSANCE 03/05/2018 (IMAGE ATTACHED)	3/6/2018	2
1	630967 Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING RATIONALE FOR USING MA DEPT. OF ENVIRONMENTAL PROTECTION (MA DEP) ARSENIC BACKGROUND GUIDANCE (EMAIL HISTORY ATTACHED)	3/6/2018	8
1	630923 Administrative Record	UCTL(Uncontrolled)	FIELD REPORT - SITE RECONNAISSANCE (03/06/2018 TRANSMITTAL EMAIL ATTACHED)	3/5/2018	5
1	630931 Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING WASTE DISPOSITION FLOW CHART	2/28/2018	2
1	630909 Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	HUMAN HEALTH RISK BASIS BY PROPERTY (02/07/2018 EMAIL TRANSMITTAL ATTACHED)	2/6/2018	6
1	630961 Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING MA DEPT. OF ENVIRONMENTAL PROTECTION (MA DEP) UPPER CONCENTRATION LIMITS (UCL) ISSUE (EMAIL HISTORY ATTACHED)	1/30/2018	3
1	630955 Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING MA DEPT. OF ENVIRONMENTAL PROTECTION (MA DEP) PRELIMINARY COMMENT ON 15 PLEASANT STREET HUMAN HEALTH RISK ASSESSMENT (HHRA) (EMAIL HISTORY ATTACHED)	1/26/2018	1
1	630957 Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING FOLLOW UP LETTER FROM MASHPEE WAMPANOAG TRIBE (EMAIL HISTORY ATTACHED)	1/22/2018	2
1	630965 Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING QUESTION ON CONSTRUCTION WORKER SCENARIO (EMAIL HISTORY ATTACHED)	11/21/2017	1
1	630974 Administrative Record	UCTL(Uncontrolled)	FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT (SLERA) - WEST STUDY AREA (09/25/2017 TRANSMITTAL LETTER ATTACHED)	9/1/2017	417
1	635084 Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON ARCHAEOLOGICAL RECONNAISSANCE SURVEY DATED 11/18/2016	7/14/2017	1

1	635085 Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON ARCHAEOLOGICAL RECONNAISSANCE SURVEY DATED 11/18/2016	7/14/2017	2
1	621244 Administrative Record, Published	UCTL(Uncontrolled)	LETTER REGARDING ARCHAEOLOGICAL RECONNAISSANCE SURVEY (MAIL RECEIPT ATTACHED)	6/21/2017	4
1	621245 Administrative Record, Published	UCTL(Uncontrolled)	LETTER REGARDING ARCHAEOLOGICAL RECONNAISSANCE SURVEY (MAIL RECEIPT ATTACHED)	6/21/2017	4
1	595615 Administrative Record, Published	UCTL(Uncontrolled)	ARCHAEOLOGICAL RECONNAISSANCE SURVEY	11/18/2016	82
1	594848 Administrative Record, Published	UCTL(Uncontrolled)	FACT SHEET	10/1/2016	4
11	196702 Administrative Record, Published	UCTL(Uncontrolled)	VAPOR INTRUSION SCREENING LEVEL (VISL) CALCULATOR V3.5.1	5/1/2016	1
11	190145 Administrative Record, Published	UCTL(Uncontrolled)	OSWER TECHNICAL GUIDE FOR ASSESSING AND MITIGATING THE VAPOR INTRUSION PATHWAY FROM SUBSURFACE VAPOR SOURCES TO INDOOR AIR	6/1/2015	267
1	564340 Administrative Record	UCTL(Uncontrolled)	MASHPEE WAMPANOAG TRIBE SECTION 106 REVIEW CONSULTATION RESPONSE FORM	9/2/2014	1
1	552845 Administrative Record	UCTL(Uncontrolled)	LETTER REVIEWING MASSACHUSETTS HISTORICAL COMMISSION RESEARCH INTO HISTORIC STATUS OF SITE	8/22/2014	2
1	635081 Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING NOTIFICATION OF REMEDIAL INVESTIGATION / FEASABILITY STUDY (RI/FS) (APRIL 2014 SITE UPDATE ATTACHED)	8/5/2014	6
11	190670 Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING HUMAN HEALTH EVALUATION MANUAL, SUPPLEMENTAL GUIDANCE: UPDATE OF STANDARD DEFAULT EXPOSURE FACTORS	2/6/2014	7
11	177112 Administrative Record, Published	UCTL(Uncontrolled)	Determining Groundwater Exposure Point Concentrations, Supplemental Guidance: Groundwater Exposure Point Concentrations, OSWER Directive 9283.1-42	2/1/2014	17
1	539271 Administrative Record	UCTL(Uncontrolled)	FINAL REPORT FOR SITE REASSESSMENT	8/8/2012	240
1	539272 Administrative Record	UCTL(Uncontrolled)	FINAL REPORT FOR SITE INSPECTION (SI)	7/29/2012	350
11	190593 Administrative Record, Published	UCTL(Uncontrolled)	HIGHLIGHTS OF THE EXPOSURE FACTORS HANDBOOK	10/1/2011	72

11	140530 Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND VOLUME I: HUMAN HEALTH EVALUATION MANUAL (RAGS) PART F, SUPPLEMENTAL GUIDANCE FOR INHALATION RISK ASSESSMENT	1/1/2009	68
11	196792 Administrative Record	UCTL(Uncontrolled)	Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment	6/1/2008	92
11	190078 Administrative Record, Published	UCTL(Uncontrolled)	33 CFR PART 332 - COMPENSATORY MITIGATION FOR LOSSES OF AQUATIC RESOURCES	4/10/2008	43
11	175344 Administrative Record, Published	UCTL(Uncontrolled)	SHORT SHEET - ESTIMATING THE SOIL LEAD CONCENTRATION TERM FOR THE INTEGRATED EXPOSURE UPTAKE BIOKINETIC (IEUBK) MODEL - OSWER 9200.1-78	9/1/2007	11
11	196788 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Selenium. Interim Final.	7/1/2007	180
11	196787 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs). Interim Final.	6/1/2007	446
11	196791 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Zinc. Interim Final.	6/1/2007	808
11	190615 Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR DEVELOPING ECOLOGICAL SOIL SCREENING LEVELS (ECO-SSLS): EXPOSURE FACTORS AND BIOACCUMULATION MODELS FOR DERIVATION OF WILDLIFE ECO-SSLS	4/1/2007	111
11	196780 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for DDT and Metabolites. Interim Final.	4/1/2007	134
11	196781 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Dieldrin. Interim Final.	4/1/2007	87
11	196784 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Manganese. Interim Final.	4/1/2007	311
11	196786 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Pentachlorophenol. Interim Final.	4/1/2007	116
11	196785 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Nickel. Interim Final.	3/1/2007	133
11	196779 Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Copper. Interim Final.	2/1/2007	313

11	196789	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Silver. Interim Final.	9/1/2006	137
11	196790	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Vanadium. Interim Final.	4/1/2005	103
11	196773	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Arsenic. Interim Final.	3/1/2005	128
11	196776	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Cadmium. Interim Final.	3/1/2005	236
11	196778	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Cobalt. Interim Final.	3/1/2005	76
11	196783	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Lead. Interim Final.	3/1/2005	242
11	196772	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Antimony. Interim Final.	2/1/2005	29
11	196774	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Barium. Interim Final.	2/1/2005	85
11	196775	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Beryllium. Interim Final.	2/1/2005	38
11	195	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND (RAGS), VOLUME 9 - HUMAN HEALTH EVALUATION MANUAL, PART E: SUPPLEMENTAL GUIDANCE FOR DERMAL RISK ASSESSMENT	7/1/2004	156
11	136657	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING RELEASE OF "GUIDANCE FOR DEVELOPING ECOLOGICAL SOIL SCREENING LEVELS" (ESSLS) AND ECO-SSLS FOR NINE CONTAMINANTS	12/29/2003	4
11	136	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING REVISIONS TO HUMAN HEALTH TOXICITY VALUES IN SUPERFUND RISK ASSESSMENTS	12/5/2003	4
11	196771	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Aluminum. Interim Final.	11/1/2003	34
11	196782	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Iron. Interim Final.	11/1/2003	44
11	190659	Administrative Record, Published	UCTL(Uncontrolled)	RCRA ECOLOGICAL SCREENING LEVELS	8/22/2003	14
11	175878	Administrative Record, Published	UCTL(Uncontrolled)	SUPPLEMENTAL GUIDANCE FOR DEVELOPING SOIL SCREENING LEVELS FOR SUPERFUND SITES - OSWER 9355.4-24	12/1/2002	106

11	112636	Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR COMPARING BACKGROUND AND CHEMICAL CONCENTRATIONS IN SOIL FOR CERCLA SITES	9/1/2002	89
11	129328	Administrative Record, Published	UCTL(Uncontrolled)	ROLE OF BACKGROUND IN THE CERCLA CLEANUP PROGRAM	4/26/2002	13
11	175137	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND: VOLUME I HUMAN HEALTH EVALUATION MANUAL RAGS) PART D, STANDARDIZED PLANNING, REPORTING, AND REVIEW OF SUPERFUND RISK ASSESSMENTS) - FINAL	12/1/2001	218
11	202	Administrative Record, Published	UCTL(Uncontrolled)	THE ROLE OF SCREENING-LEVEL RISK ASSESSMENTS AND REFINING CONTAMINANTS OF CONCERN IN BASELINE ECOLOGICAL RISK ASSESSMENTS	6/1/2001	8
11	190616	Administrative Record, Published	UCTL(Uncontrolled)	PEER REVIEW DRAFT - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROTOCOL FOR HAZARDOUS WASTE COMBUSTION FACILITIES, VOLUME ONE	8/1/1999	1362
11	190617	Administrative Record, Published	UCTL(Uncontrolled)	PEER REVIEW DRAFT - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROTOCOL FOR HAZARDOUS WASTE COMBUSTION FACILITIES, VOLUME TWO APPENDIX A	8/1/1999	310
11	190618	Administrative Record, Published	UCTL(Uncontrolled)	PEER REVIEW DRAFT - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROTOCOL FOR HAZARDOUS WASTE COMBUSTION FACILITIES, VOLUME THREE APPENDICES B TO H	8/1/1999	675
11	189662	Administrative Record, Published	UCTL(Uncontrolled)	GUIDELINES FOR ECOLOGICAL RISK ASSESSMENT	4/1/1998	188
11	157968	Administrative Record, Published	UCTL(Uncontrolled)	EPA RULES OF THUMB FOR SUPERFUND REMEDY SELECTION	8/1/1997	26
11	158350	Administrative Record	UCTL(Uncontrolled)	EPA Health Effects Assessment Summary Tables FY 1997 Update	7/1/1997	403
11	157941	Administrative Record, Published	UCTL(Uncontrolled)	ECOLOGICAL RISK ASSESSMENT GUIDANCE FOR SUPERFUND: PROCESS FOR DESIGNING AND CONDUCTING ECOLOGICAL RISK ASSESSMENTS - INTERIM FINAL	6/1/1997	239
11	156941	Administrative Record, Published	UCTL(Uncontrolled)	ECO UPDATE: ECOTOX THRESHOLDS	1/1/1996	13

11	174005	Administrative Record, Published	UCTL(Uncontrolled)	FACTSHEET: ESTABLISHING BACKGROUND LEVELS - DIRECTIVE 9285.7-19FS - EPA/540/F-94/030	9/1/1995	7
11	500008080	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING EPA RISK CHARACTERIZATION PROGRAM	3/21/1995	3
11	157100	Administrative Record	UCTL(Uncontrolled)	GUIDANCE MANUAL FOR THE INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL FOR LEAD IN CHILDREN	2/1/1994	248
11	190663	Administrative Record, Published	UCTL(Uncontrolled)	WILDLIFE EXPOSURE FACTORS HANDBOOK, VOLUME I OF II	12/1/1993	84
11	190664	Administrative Record, Published	UCTL(Uncontrolled)	WILDLIFE EXPOSURE FACTORS HANDBOOK, APPENDIX: LITERATURE REVIEW DATABASE, VOLUME Ii OF II	12/1/1993	481
11	177098	Administrative Record, Published	UCTL(Uncontrolled)	TEST METHOD: METHOD FOR THE DETERMINATION OF ASBESTOS IN BULK BUILDING MATERIALS; EPA/600/R-93/116, 7/93	7/1/1993	99
11	100000047	Administrative Record, Published	UCTL(Uncontrolled)	PROVISIONAL GUIDANCE FOR QUANTITATIVE RISK ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBONS	7/1/1993	28
11	127549	Administrative Record, Published	UCTL(Uncontrolled)	SUPPLEMENTAL GUIDANCE TO RAGS: CALCULATING THE CONCENTRATION TERM	5/1/1992	8
11	156759	Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR DATA USEABILITY IN RISK ASSESSMENT (PART B) - FINAL	5/1/1992	74
11	156756	Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR DATA USEABILITY IN RISK ASSESSMENT (PART A) - FINAL	4/1/1992	282
11	500008380	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING GUIDANCE ON RISK CHARACTERIZATION FOR RISK MANAGERS AND RISK ASSESSORS	2/26/1992	6
11	190620	Administrative Record, Published	UCTL(Uncontrolled)	FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT	2/1/1992	57
11	192	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND (RAGS), VOLUME I - HUMAN HEALTH EVALUATION MANUAL, PART B: DEVELOPMENT OF RISK-BASED PRELIMINARY REMEDIATION GOALS	12/1/1991	57
11	156748	Administrative Record, Published	UCTL(Uncontrolled)	A Guide to Principal Threat and Low Level Threat Wastes Office	11/1/1991	4

11	191	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND (RAGS), VOLUME I-HUMAN HEALTH EVALUATION MANUAL, PART A	12/1/1989	288
11	174527	Administrative Record, Published	UCTL(Uncontrolled)	SUPERFUND LDR GUIDE #5 DETERMINING WHEN LAND DISPOSAL RESTRICTIONS (LDRS) ARE APPLICABLE TO CERCLA RESPONSE ACTIONS OSWER 9347.3-05FS	7/1/1989	4
11	199078	Administrative Record	UCTL(Uncontrolled)	Interim Final Guidance on Preparing Superfund Decision Documents	6/30/1989	209
11	128301	Administrative Record, Published	UCTL(Uncontrolled)	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, OSWER Directive 9355.3-01	10/1/1988	186
11	174076	Administrative Record, Published	UCTL(Uncontrolled)	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL: INTERIM FINAL EPA/540/G-89/006	8/1/1988	243
11	101190	Administrative Record	UCTL(Uncontrolled)	OSWER Directive 9285.5-1: Superfund Exposure Assessment Manual; Compendium 5013	4/1/1988	164

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1	635729	Administrative Record		UCTL(Uncontrolled)	LETTER REGARDING MA DEPT OF ENVIRONMENTAL PROTECTION (MASSDEP) COMMENTS ON RECORD OF DECISION (ROD)	6/14/2019	3
1	635460	Administrative Record, Published		UCTL(Uncontrolled)	REMOVAL FACT SHEET, PRELIMINARY ARSENIC RESULTS	5/23/2019	1
1	635086	Administrative Record		UCTL(Uncontrolled)	LETTER RESPONDING TO 12/31/2019 LETTER, NATIONAL HISTORIC PRESERVATION ACT - SECTION 106 CONSULTATION	5/13/2019	4
1	635111	Administrative Record		UCTL(Uncontrolled)	SAMPLING AND ANALYSIS PLAN (SAP), CREESE AND COOK CO. (FORMER) 3 SITE	3/1/2019	28
1	635082	Administrative Record		UCTL(Uncontrolled)	LETTER REQUESTING ADDITIONAL INFORMATION FOR COMMENT ON ELIGABILITY FOR NATIONAL REGISTER (07/14/2017 LETTER AND ELIGABILITY FOR NATIONAL REGISTER FORM ATTACHED)	12/31/2018	5
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1	631480	Administrative Record		UCTL(Uncontrolled)	EMAIL TRANSMITTING FORMAL PETITION AND COMMENT ON CLEANUP PROPOSAL (10/29/2018 COMMENT EMAIL ATTACHED)	11/9/2018	4
1	632594	Administrative Record		UCTL(Uncontrolled)	TRANSCRIPT OF 10/25/2018 PUBLIC HEARING	11/9/2018	19
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1	631478	Administrative Record		UCTL(Uncontrolled)	LETTER REGARDING TECHNICAL COMMENTS ON PROPOSED PLAN (EMAIL TRANSMITTAL ATTACHED)	11/8/2018	8
1	631400	Administrative Record		UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL	11/2/2018	1
1	631474	Administrative Record		UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON PROPOSED PLAN	11/2/2018	4
1	100010576	Administrative Record		UCTL(Uncontrolled)	HANDWRITTEN LETTER REGARDING PUBLIC COMMENT ON CLEAN UP PLAN (1872 MAP OF TANNERIES AND SHOE FABRICATION FACILITIES ATTACHED)	11/1/2018	4
1	631193	Administrative Record		UCTL(Uncontrolled)	NEWS ARTICLE: EPA PLAN CALLS FOR $24M CLEANUP OF DANVERS NEIGHBORHOOD'S CONTAMINATED SOIL	10/30/2018	3
1	631196	Administrative Record		UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL	10/30/2018	1

1	631402 Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL	10/27/2018	1
1	631188 Administrative Record, Published	UCTL(Uncontrolled)	PUBLIC MEETING PRESENTATION: REMEDIAL INVESTIGATION (RI) SUMMARY AND PROPOSED CLEANUP PLAN	10/25/2018	53
1	631407 Administrative Record, Published	UCTL(Uncontrolled)	PRESENTATION POSTER BOARDS FROM PUBLIC MEETING	10/25/2018	6
1	631198 Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING PUBLIC COMMENT ON CLEANUP PROPOSAL (PROPOSED PLAN ATTACHED)	10/12/2018	50
1	630986 Administrative Record	UCTL(Uncontrolled)	FACEBOOK POST REGARDING NEWS ARTICLE: EPA ANNOUNCES CLEANUP PLAN FOR TANNERY SITE	10/9/2018	1
1	631187 Administrative Record	UCTL(Uncontrolled)	POSTAGE STATEMENT - US POSTAL SERVICE (USPS) MARKETING MAIL	10/9/2018	7
1	630983 Administrative Record, Published	UCTL(Uncontrolled)	PRESS RELEASE: EPA PROPOSES CLEANUP PLAN FOR THE CREESE & COOK TANNERY SUPERFUND SITE IN DAVERS, MA	10/5/2018	2
1	630984 Administrative Record	UCTL(Uncontrolled)	NEWS ARTICLE: EPA ANNOUNCES CLEANUP PLAN FOR TANNERY SITE	10/5/2018	3
1	625461 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 33 WATER STREET, UNIT 22	10/4/2018	2
1	625462 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 45 WATER STREET, UNIT 1	10/4/2018	2
1	625463 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 45 WATER STREET, UNIT 2	10/4/2018	2
1	625464 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 45 WATER STREET, UNIT 3	10/4/2018	2
1	625465 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 45 WATER STREET, UNIT 4	10/4/2018	2
1	625466 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 45 WATER STREET, UNIT 5	10/4/2018	2
1	625468 Administrative Record	UCTL(Uncontrolled)	NOTIFICATION TO POTENTIALLY INTERSTED PARTY (PIP) OF PROPOSED CLEANUP PLAN - 12 CHEEVER STREET	10/4/2018	2
1	629340 Administrative Record, Published	UCTL(Uncontrolled)	PROPOSED PLAN	10/1/2018	49

1	629395 Administrative Record		UCTL(Uncontrolled)	MEMO REGARDING RATIONALE FOR SELECTION OF BACKGROUND CHEMICAL CONCENTRATIONS IN SOILS (2016 MASS DEP GUIDANCE ATTACHED)	9/28/2018	17
1	625445 Administrative Record, Published	Approval Of Action Memo	UCTL(Uncontrolled)	ACTION MEMORANDUM - REQUEST FOR REMOVAL ACTION	9/24/2018	14
1	630975 Administrative Record		UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON DRAFT FINAL FEASIBILITY STUDY (FS)	9/20/2018	4
1	630901 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING 45 WATER STREET SOIL SAMPLING FIGURE AND SOIL DATA FILE	9/20/2018	44
1	630969 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING RESPONSE TO COMMENTS ON REMEDIAL INVESTIGATION (RI) (EMAIL HISTORY ATTACHED)	9/18/2018	6
1	635762 Administrative Record		UCTL(Uncontrolled)	REDACTED EMAIL REGARDING IMPACTS OF PROPOSED REMEDY ON RESIDENTIAL CONDOMINIUMS - EAST STUDY AREA (EMAIL HISTORY ATTACHED)	9/15/2018	2
1	630953 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING IMPACTS OF PROPOSED REMEDY ON RESIDENTIAL CONDOMINIUMS - EAST STUDY AREA (EMAIL HISTORY ATTACHED)	9/15/2018	3
1	630921 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING RESIDENTIAL RISK AND INSTITUTIONAL CONTROL (IC) ISSUES (EMAIL HISTORY ATTACHED)	9/11/2018	2
1	630945 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING REVISED MINI-RISK TABLES (EMAIL HISTORY ATTACHED)	9/10/2018	5
1	630951 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING PROPERTIES WITH PROPOSED INSTITUTIONAL CONTROLS (IC) (EMAIL HISTORY ATTACHED)	9/6/2018	2
1	630917 Administrative Record		UCTL(Uncontrolled)	FIGURE: HISTORIC PROPERTY LAYOUT AND EXCAVATION AREAS (09/18/2018 TRANSMITTAL EMAIL ATTACHED)	9/1/2018	2
1	630971 Administrative Record		UCTL(Uncontrolled)	FEASIBILITY STUDY (FS), EAST AND WEST STUDY AREAS	9/1/2018	921
1	630937 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) QUESTIONS	8/27/2018	2
1	630915 Controlled, Administrative Record		PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) QUESTION	8/22/2018	1

1	635728	Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING EPA RESPONSE TO MA DEPT OF ENVIRONMENTAL PROTECTION (MASSDEP) COMMENTS ON EAST STUDY AREA HUMAN HEALTH RISK ASSESSMENT (HHRA), EAST STUDY AREA FINAL REMEDIAL INVESTIGATION (RI), WEST STUDY AREA DRAFT HHRA, AND WEST STUDY DRAFT RI REPORT	8/16/2018	14
1	630919	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING PROPOSED ALTERNATIVE TITLE REVISIONS	7/20/2018	5
1	630935	Administrative Record	UCTL(Uncontrolled)	TABLE OF VOLUMES OF ESTIMATED EXCAVATION SOIL QUANTITIES FOR FEASIBILITY STUDY (FS)	6/19/2018	2
1	630943	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING INFORMATION ON INDUSTRI-PLEX CAP (EMAIL HISTORY AND INDUSTRI-PLEX 100% DESIGN REPORT ATTACHED)	5/25/2018	263
1	630903	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING 500 YEAR FLOODPLAIN - EXECUTIVE ORDER 13690 REVOKED (EMAIL HISTORY ATTACHED)	5/24/2018	1
1	635763	Administrative Record	UCTL(Uncontrolled)	REDACTED EMAIL REGARDING FOLLOW UP ON OUTSTANDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) ISSUES (EMAIL HISTORY ATTACHED	5/22/2018	1
1	630959	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING FOLLOW UP ON OUTSTANDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) ISSUES (EMAIL HISTORY ATTACHED	5/22/2018	6
1	630947	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING MBTA-2 - FLOODPLAIN APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) COMPLIANCE	5/14/2018	2
1	100010166	Administrative Record, Published	UCTL(Uncontrolled)	LETTER REGARDING MA DEPT OF ENVIRONMENTAL PROTECTION (MADEP) COMMENTS ON EAST SIDE HUMAN HEALTH RISK ASSESSMENT (HHRA), EAST SIDE REMEDIAL INVESTIGATION (RI), WEST HUMAN HEALTH RISK ASSESSMENT (HHRA), AND WEST SIDE REMEDIAL INVESTIGATION (RI)	5/10/2018	4
1	630905	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING FLOODPLAIN COMPENSATORY STORAGE VOLUME, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) UPDATE	5/10/2018	1
1	630949	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING IMPACTED FLOODPLAIN (EMAIL HISTORY ATTACHED)	5/10/2018	2

1	630911	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING IMPACTED FLOODPLAIN	5/9/2018	2
1	630913	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING DIOXING GUIDANCE, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR)	5/8/2018	36
1	630939	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) QUESTIONS (EMAIL HISTORY AND ASBESTOS WASTE MANAGMENT GUIDE ATTACHED)	5/3/2018	41
1	630927	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT (HHRA) EVALUATIONS (04/27/2018 EMAIL TRANSMITTAL ATTACHED)	4/1/2018	16
1	630929	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING PROPOSED EXPEDITED SITE SCHEDULE	3/26/2018	2
1	630925	Administrative Record	UCTL(Uncontrolled)	EMAIL REGARDING SITE VISIT - STORM RECONNAISSANCE 03/05/2018 (IMAGE ATTACHED)	3/6/2018	2
1	630967	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING RATIONALE FOR USING MA DEPT. OF ENVIRONMENTAL PROTECTION (MA DEP) ARSENIC BACKGROUND GUIDANCE (EMAIL HISTORY ATTACHED)	3/6/2018	8
1	630923	Administrative Record	UCTL(Uncontrolled)	FIELD REPORT - SITE RECONNAISSANCE (03/06/2018 TRANSMITTAL EMAIL ATTACHED)	3/5/2018	5
1	630973	Administrative Record, Published	UCTL(Uncontrolled)	REMEDIAL INVESTIGATION (RI), EAST STUDY AREA (TRANSMITTAL LETTER ATTACHED)	3/1/2018	1265
1	630931	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING WASTE DISPOSITION FLOW CHART	2/28/2018	2
1	630909	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	HUMAN HEALTH RISK BASIS BY PROPERTY (02/07/2018 EMAIL TRANSMITTAL ATTACHED)	2/6/2018	6
1	630963	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING MA DEPT. OF ENVIRONMENTAL PROTECTION (MA DEP) UPPER CONCENTRATION LIMITS (UCL) ISSUE, 20 CHEEVER STREET (EMAIL HISTORY ATTACHED)	1/31/2018	7
1	630961	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING MA DEPT. OF ENVIRONMENTAL PROTECTION (MA DEP) UPPER CONCENTRATION LIMITS (UCL) ISSUE (EMAIL HISTORY ATTACHED)	1/30/2018	3

1	630907	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL TRANSMITTING REVISED EVALUATION OF LEAD AT 20 CHEEVER STREET, POST-EXCAVATION OF LEAD HOT SPOT	1/29/2018	9
1	630933	Administrative Record	UCTL(Uncontrolled)	SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT (HHRA) EVALUATION - 12 CHEEVER STREET (EMAIL TRANSMITTAL ATTACHED)	1/23/2018	8
1	630957	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING FOLLOW UP LETTER FROM MASHPEE WAMPANOAG TRIBE (EMAIL HISTORY ATTACHED)	1/22/2018	2
1	630965	Controlled, Administrative Record	PRIV(Controlled/Legal-Privilege)	EMAIL REGARDING QUESTION ON CONSTRUCTION WORKER SCENARIO (EMAIL HISTORY ATTACHED)	11/21/2017	1
1	100001442	Administrative Record, Published	UCTL(Uncontrolled)	FINAL HUMAN HEALTH RISK ASSESSMENT (HHRA) (09/25/2017 TRANSMITTAL LETTER ATTACHED)	9/1/2017	556
1	100001422	Administrative Record, Published	UCTL(Uncontrolled)	FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT (SLERA) - EAST STUDY AREA (09/25/2017 TRANSMITTAL LETTER ATTACHED)	8/1/2017	674
1	635084	Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON ARCHAEOLOGICAL RECONNAISSANCE SURVEY DATED 11/18/2016	7/14/2017	1
1	635085	Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING COMMENTS ON ARCHAEOLOGICAL RECONNAISSANCE SURVEY DATED 11/18/2016	7/14/2017	2
1	621244	Administrative Record, Published	UCTL(Uncontrolled)	LETTER REGARDING ARCHAEOLOGICAL RECONNAISSANCE SURVEY (MAIL RECEIPT ATTACHED)	6/21/2017	4
1	621245	Administrative Record, Published	UCTL(Uncontrolled)	LETTER REGARDING ARCHAEOLOGICAL RECONNAISSANCE SURVEY (MAIL RECEIPT ATTACHED)	6/21/2017	4
1	595615	Administrative Record, Published	UCTL(Uncontrolled)	ARCHAEOLOGICAL RECONNAISSANCE SURVEY	11/18/2016	82
1	594848	Administrative Record, Published	UCTL(Uncontrolled)	FACT SHEET	10/1/2016	4
11	196702	Administrative Record, Published	UCTL(Uncontrolled)	VAPOR INTRUSION SCREENING LEVEL (VISL) CALCULATOR V3.5.1	5/1/2016	1
11	190145	Administrative Record, Published	UCTL(Uncontrolled)	OSWER TECHNICAL GUIDE FOR ASSESSING AND MITIGATING THE VAPOR INTRUSION PATHWAY FROM SUBSURFACE VAPOR SOURCES TO INDOOR AIR	6/1/2015	267
1	564340	Administrative Record	UCTL(Uncontrolled)	MASHPEE WAMPANOAG TRIBE SECTION 106 REVIEW CONSULTATION RESPONSE FORM	9/2/2014	1

1	552845	Administrative Record	UCTL(Uncontrolled)	LETTER REVIEWING MASSACHUSETTS HISTORICAL COMMISSION RESEARCH INTO HISTORIC STATUS OF SITE	8/22/2014	2
1	635081	Administrative Record	UCTL(Uncontrolled)	LETTER REGARDING NOTIFICATION OF REMEDIAL INVESTIGATION / FEASABILITY STUDY (RI/FS) (APRIL 2014 SITE UPDATE ATTACHED)	8/5/2014	6
11	190670	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING HUMAN HEALTH EVALUATION MANUAL, SUPPLEMENTAL GUIDANCE: UPDATE OF STANDARD DEFAULT EXPOSURE FACTORS	2/6/2014	7
11	177112	Administrative Record, Published	UCTL(Uncontrolled)	Determining Groundwater Exposure Point Concentrations, Supplemental Guidance: Groundwater Exposure Point Concentrations, OSWER Directive 9283.1-42	2/1/2014	17
1	539271	Administrative Record	UCTL(Uncontrolled)	FINAL REPORT FOR SITE REASSESSMENT	8/8/2012	240
1	539272	Administrative Record	UCTL(Uncontrolled)	FINAL REPORT FOR SITE INSPECTION (SI)	7/29/2012	350
11	190593	Administrative Record, Published	UCTL(Uncontrolled)	HIGHLIGHTS OF THE EXPOSURE FACTORS HANDBOOK	10/1/2011	72
11	140530	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND VOLUME I: HUMAN HEALTH EVALUATION MANUAL (RAGS) PART F, SUPPLEMENTAL GUIDANCE FOR INHALATION RISK ASSESSMENT	1/1/2009	68
11	196792	Administrative Record	UCTL(Uncontrolled)	Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment	6/1/2008	92
11	190078	Administrative Record, Published	UCTL(Uncontrolled)	33 CFR PART 332 - COMPENSATORY MITIGATION FOR LOSSES OF AQUATIC RESOURCES	4/10/2008	43
11	175344	Administrative Record, Published	UCTL(Uncontrolled)	SHORT SHEET - ESTIMATING THE SOIL LEAD CONCENTRATION TERM FOR THE INTEGRATED EXPOSURE UPTAKE BIOKINETIC (IEUBK) MODEL - OSWER 9200.1-78	9/1/2007	11
11	196788	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Selenium. Interim Final.	7/1/2007	180
11	196787	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs). Interim Final.	6/1/2007	446
11	196791	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Zinc. Interim Final.	6/1/2007	808

11	190615	Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR DEVELOPING ECOLOGICAL SOIL SCREENING LEVELS (ECO-SSLS): EXPOSURE FACTORS AND BIOACCUMULATION MODELS FOR DERIVATION OF WILDLIFE ECO-SSLS	4/1/2007	111
11	196780	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for DDT and Metabolites. Interim Final.	4/1/2007	134
11	196781	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Dieldrin. Interim Final.	4/1/2007	87
11	196784	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Manganese. Interim Final.	4/1/2007	311
11	196786	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Pentachlorophenol. Interim Final.	4/1/2007	116
11	196785	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Nickel. Interim Final.	3/1/2007	133
11	196779	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Copper. Interim Final.	2/1/2007	313
11	196789	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Silver. Interim Final.	9/1/2006	137
11	196790	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Vanadium. Interim Final.	4/1/2005	103
11	196773	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Arsenic. Interim Final.	3/1/2005	128
11	196776	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Cadmium. Interim Final.	3/1/2005	236
11	196778	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Cobalt. Interim Final.	3/1/2005	76
11	196783	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Lead. Interim Final.	3/1/2005	242
11	196772	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Antimony. Interim Final.	2/1/2005	29
11	196774	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Barium. Interim Final.	2/1/2005	85
11	196775	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Beryllium. Interim Final.	2/1/2005	38
11	195	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND (RAGS), VOLUME 9 - HUMAN HEALTH EVALUATION MANUAL, PART E: SUPPLEMENTAL GUIDANCE FOR DERMAL RISK ASSESSMENT	7/1/2004	156

11	136657	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING RELEASE OF "GUIDANCE FOR DEVELOPING ECOLOGICAL SOIL SCREENING LEVELS" (ESSLS) AND ECO-SSLS FOR NINE CONTAMINANTS	12/29/2003	4
11	136	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING REVISIONS TO HUMAN HEALTH TOXICITY VALUES IN SUPERFUND RISK ASSESSMENTS	12/5/2003	4
11	196771	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Aluminum. Interim Final.	11/1/2003	34
11	196782	Administrative Record	UCTL(Uncontrolled)	Ecological Soil Screening Levels for Iron. Interim Final.	11/1/2003	44
11	190659	Administrative Record, Published	UCTL(Uncontrolled)	RCRA ECOLOGICAL SCREENING LEVELS	8/22/2003	14
11	175878	Administrative Record, Published	UCTL(Uncontrolled)	SUPPLEMENTAL GUIDANCE FOR DEVELOPING SOIL SCREENING LEVELS FOR SUPERFUND SITES - OSWER 9355.4-24	12/1/2002	106
11	112636	Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR COMPARING BACKGROUND AND CHEMICAL CONCENTRATIONS IN SOIL FOR CERCLA SITES	9/1/2002	89
11	129328	Administrative Record, Published	UCTL(Uncontrolled)	ROLE OF BACKGROUND IN THE CERCLA CLEANUP PROGRAM	4/26/2002	13
11	175137	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND: VOLUME I HUMAN HEALTH EVALUATION MANUAL RAGS) PART D, STANDARDIZED PLANNING, REPORTING, AND REVIEW OF SUPERFUND RISK ASSESSMENTS) - FINAL	12/1/2001	218
11	202	Administrative Record, Published	UCTL(Uncontrolled)	THE ROLE OF SCREENING-LEVEL RISK ASSESSMENTS AND REFINING CONTAMINANTS OF CONCERN IN BASELINE ECOLOGICAL RISK ASSESSMENTS	6/1/2001	8
11	190616	Administrative Record, Published	UCTL(Uncontrolled)	PEER REVIEW DRAFT - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROTOCOL FOR HAZARDOUS WASTE COMBUSTION FACILITIES, VOLUME ONE	8/1/1999	1362
11	190617	Administrative Record, Published	UCTL(Uncontrolled)	PEER REVIEW DRAFT - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROTOCOL FOR HAZARDOUS WASTE COMBUSTION FACILITIES, VOLUME TWO APPENDIX A	8/1/1999	310
11	190618	Administrative Record, Published	UCTL(Uncontrolled)	PEER REVIEW DRAFT - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROTOCOL FOR HAZARDOUS WASTE COMBUSTION FACILITIES, VOLUME THREE APPENDICES B TO H	8/1/1999	675

11	189662	Administrative Record, Published	UCTL(Uncontrolled)	GUIDELINES FOR ECOLOGICAL RISK ASSESSMENT	4/1/1998	188
11	157968	Administrative Record, Published	UCTL(Uncontrolled)	EPA RULES OF THUMB FOR SUPERFUND REMEDY SELECTION	8/1/1997	26
11	158350	Administrative Record	UCTL(Uncontrolled)	EPA Health Effects Assessment Summary Tables FY 1997 Update	7/1/1997	403
11	157941	Administrative Record, Published	UCTL(Uncontrolled)	ECOLOGICAL RISK ASSESSMENT GUIDANCE FOR SUPERFUND: PROCESS FOR DESIGNING AND CONDUCTING ECOLOGICAL RISK ASSESSMENTS - INTERIM FINAL	6/1/1997	239
11	156941	Administrative Record, Published	UCTL(Uncontrolled)	ECO UPDATE: ECOTOX THRESHOLDS	1/1/1996	13
11	174005	Administrative Record, Published	UCTL(Uncontrolled)	FACTSHEET: ESTABLISHING BACKGROUND LEVELS - DIRECTIVE 9285.7-19FS - EPA/540/F-94/030	9/1/1995	7
11	500008080	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING EPA RISK CHARACTERIZATION PROGRAM	3/21/1995	3
11	157100	Administrative Record	UCTL(Uncontrolled)	GUIDANCE MANUAL FOR THE INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL FOR LEAD IN CHILDREN	2/1/1994	248
11	190663	Administrative Record, Published	UCTL(Uncontrolled)	WILDLIFE EXPOSURE FACTORS HANDBOOK, VOLUME I OF II	12/1/1993	84
11	190664	Administrative Record, Published	UCTL(Uncontrolled)	WILDLIFE EXPOSURE FACTORS HANDBOOK, APPENDIX: LITERATURE REVIEW DATABASE, VOLUME Ii OF II	12/1/1993	481
11	177098	Administrative Record, Published	UCTL(Uncontrolled)	TEST METHOD: METHOD FOR THE DETERMINATION OF ASBESTOS IN BULK BUILDING MATERIALS; EPA/600/R-93/116, 7/93	7/1/1993	99
11	100000047	Administrative Record, Published	UCTL(Uncontrolled)	PROVISIONAL GUIDANCE FOR QUANTITATIVE RISK ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBONS	7/1/1993	28
11	127549	Administrative Record, Published	UCTL(Uncontrolled)	SUPPLEMENTAL GUIDANCE TO RAGS: CALCULATING THE CONCENTRATION TERM	5/1/1992	8
11	156759	Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR DATA USEABILITY IN RISK ASSESSMENT (PART B) - FINAL	5/1/1992	74
11	156756	Administrative Record, Published	UCTL(Uncontrolled)	GUIDANCE FOR DATA USEABILITY IN RISK ASSESSMENT (PART A) - FINAL	4/1/1992	282
11	500008380	Administrative Record, Published	UCTL(Uncontrolled)	MEMO REGARDING GUIDANCE ON RISK CHARACTERIZATION FOR RISK MANAGERS AND RISK ASSESSORS	2/26/1992	6
11	190620	Administrative Record, Published	UCTL(Uncontrolled)	FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT	2/1/1992	57

11	192	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND (RAGS), VOLUME I - HUMAN HEALTH EVALUATION MANUAL, PART B: DEVELOPMENT OF RISK-BASED PRELIMINARY REMEDIATION GOALS	12/1/1991	57
11	156748	Administrative Record, Published	UCTL(Uncontrolled)	A Guide to Principal Threat and Low Level Threat Wastes Office	11/1/1991	4
11	191	Administrative Record, Published	UCTL(Uncontrolled)	RISK ASSESSMENT GUIDANCE FOR SUPERFUND (RAGS), VOLUME I-HUMAN HEALTH EVALUATION MANUAL, PART A	12/1/1989	288
11	174527	Administrative Record, Published	UCTL(Uncontrolled)	SUPERFUND LDR GUIDE #5 DETERMINING WHEN LAND DISPOSAL RESTRICTIONS (LDRS) ARE APPLICABLE TO CERCLA RESPONSE ACTIONS OSWER 9347.3-05FS	7/1/1989	4
11	199078	Administrative Record	UCTL(Uncontrolled)	Interim Final Guidance on Preparing Superfund Decision Documents	6/30/1989	209
11	128301	Administrative Record, Published	UCTL(Uncontrolled)	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, OSWER Directive 9355.3-01	10/1/1988	186
11	174076	Administrative Record, Published	UCTL(Uncontrolled)	CERCLA COMPLIANCE WITH OTHER LAWS MANUAL: INTERIM FINAL EPA/540/G-89/006	8/1/1988	243
11	101190	Administrative Record	UCTL(Uncontrolled)	OSWER Directive 9285.5-1: Superfund Exposure Assessment Manual; Compendium 5013	4/1/1988	164

APPENDIX C

MassDEP

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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July 19, 2019

Mr. Robert Cianciarulo
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency, Region 1
5 Post Office Square
Boston, MA 02109

Re: State Concurrence Determination
Record of Decision – Creese and Cook Superfund Site
Danvers, Massachusetts

Dear Mr. Cianciarulo:

The Department of Environmental Protection ("the Department") has reviewed the Record of Decision ("ROD") for Creese and Cook Superfund Site in Danvers, Massachusetts. The U.S. Environmental Protection Agency ("EPA") recommendation of the selected remedy for the Creese and Cook Superfund Site is documented in a Final ROD dated July 17, 2019. For the reasons described below, MassDEP concurs with the recommended remedy for the Site.

The remedy set forth in the ROD is a comprehensive remedy for Eastern Study Area ("ESA") Operable Unit 1 ("OU1") and West Study Area ("WSA") Operable Unit 2 ("OU2") that utilizes source control components to address unacceptable risks from exposure to soil and riverfront soil contamination at the OU1 and OU2 portions of the Site. The remedy includes source control measures to address contaminated soil and protect human health and the environment by eliminating, reducing, or controlling exposures to human and environmental receptors from direct contact, incidental ingestion, or inhalation of contaminated soil. In addition, the remedy will prevent migration of contaminants to surface water and/or sediments of the Crane River. The components of the remedy include the following:

I. Eastern Study Area/Operable Unit 1

1. Excavation of soil exceeding soil cleanup levels in the ESA (shown on Figure 5-1A of the Feasibility Study ("FS"), and as further delineated by the Pre-Design Investigation ("PDI")) up to 3 ft. below the ground surface ("bgs") from unpaved and paved areas of the residential area (approximately 4,330 cubic yards ("CY")). Excavation around residential structures will include any currently accessible soil or soil that could become accessible in the foreseeable future (including beneath decks and beneath paved walkways and driveways). Excavated soil from the residential area in the ESA will be loaded directly into lined dump trucks and the material will be moved to the WSA for emplacement in the consolidation area, unless the soil is characterized as a hazardous waste and/or has contaminant concentrations that exceed the Upper Concentration Limits ("UCLs"[1]), in which case the soil will be disposed of off-site. Once the excavated area in the ESA is backfilled with clean material, the ground surface in previously landscaped areas will be seeded and/or planted to restore the areas to their original conditions. Previously paved areas will be repaved.
2. Excavation of ESA soil exceeding cleanup levels up to 3 feet bgs (shown on Figure 5-4A of the FS, and as further delineated by the PDI) along the MBTA Right of Way ("ROW") and 35 Water Street (approximately 9,630 CY). Confirmatory sampling, and all excavated soil will ultimately be disposed of off-site after staging and characterization of the material at the WSA staging area.
3. Excavation of ESA riverbank soil exceeding soil cleanup levels (shown on Figure 5-5A of the FS, and as further delineated by a PDI) from 0-2 feet bgs. The total volume of this riverbank soil to be excavated is approximately 2,650 CY. Additional soil will be excavated from a hot spot area on 20 Cheever Street from 0-4 ft. bgs, where soil concentrations for lead exceed the UCL. The total volume of soil to be excavated from the lead hot spot area is approximately 400 CY.
4. Restoration of ESA UCL lead hot spot excavation area on 20 Cheever Street to achieve original conditions, and where necessary restoration and/or replication of wetlands. The wetlands will be created in or near the impacted area(s). The riverbank area excavation will be backfilled with 2 ft. of cover soil selected to match existing wetland/saltmarsh soils (details on soil type to be used to be determined during PDI).
5. Excavation of ESA soil exceeding cleanup levels up to 3 feet bgs (shown on Figure 5-5A of the FS, and as further delineated by the PDI) along the riverbank area of 20 Cheever Street, the MBTA ROW and 45 Water Street (approximately 2,650 CY).
6. Placement of institutional controls on ESA properties to document the need to prevent future exposure to contaminated soil that remains above cleanup levels and prohibit activities that could damage the remedy and/or allow for other restricted activities that could pose an unacceptable risk. For certain areas, future residential use will be prohibited.
7. Excavation and transportation of ESA contaminated soil will be completed at a staging area on 55 Clinton Ave; identified hazardous waste and waste that exceeds UCLs will be transported to an off-site disposal facility via lined and covered roll-off containers/trucks to a licensed disposal facility.

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1 The Upper Concentrations Limits (UCLs) are promulgated standards set forth in the Massachusetts Contingency Plan at 310 CMR 40.0996.

8. Consolidation of excavated soil that is non-hazardous and below UCLs will be placed in a newly constructed consolidation area located in the northern portion of 55 Clinton Avenue for long-term containment. The cover system for the consolidation area will consist of a permeable cap compliant with RCRA Subtitle D requirements (Figures 5-8C and 5-8C of the FS).

II. Western Study Area/Operable Unit 2

1. Implementation of the WSA PDI activities including geotechnical investigations and a land survey to provide data needed for design of the Consolidation Area, as well as a survey of the existing sewer utility line on 55 Clinton Avenue.
2. Relocation and consolidation of existing beam house debris along with all potential asbestos containing material ("PACM") to the area along the northeastern edge of the former beam house to allow drilling access to the underlying slab prior to permanent placement of the PACM material in the consolidation area.
3. Excavation of WSA soil exceeding cleanup levels (estimated 0-4 ft. bgs, but extending to the water table if necessary) from the southern boundary of the WSA Soil Area up to the southern edge of the beam house footprint (as shown on Figure 5-6 of the FS and as further delineated by the PDI). Soil exceeding cleanup levels in the remainder of the WSA Soil Area will be excavated up to 3 ft. bgs (or up to 10 feet bgs to address UCL exceedances – approximately 32,707 CY).
4. Restoration of the ground surface in previously vegetated areas by seeding with a mixture of grasses to establish a grass surface, after WSA excavation and backfilling/installation of soil cover. It is not anticipated that paved areas will be impacted by the remedial actions; if they are, the paved surfaces will be restored. Excavation activities will impact or destroy about 0.32 acres of wetlands located on the eastern side of the WSA soil excavation area on both 55 and 27 Clinton Avenue. To mitigate these impacts, the wetland areas will be restored in the original location or, if necessary, replicated in another area on the 27 and 55 Clinton Avenue parcels
5. Excavation and transportation of ESA contaminated soil will be completed at a staging area on 55 Clinton Ave; identified hazardous waste and waste that exceeds State UCLs will be transported to an off-site disposal facility via lined and covered roll-off containers/trucks to a licensed disposal facility.
6. Consolidation of excavated soil that is non-hazardous and below UCLs will be placed in a newly constructed consolidation area located in the northern portion of 55 Clinton Avenue for long-term containment. The cover system for the consolidation area will consist of a permeable cap compliant with RCRA Subtitle D requirements (Figures 5-8C and 5-8C of the FS).
7. Excavated soil that are non-hazardous and below UCLs will be placed in a newly constructed consolidation area located in the northern portion of 55 Clinton Avenue for long-term containment. The cover system for the consolidation area will consist of a permeable cap compliant with RCRA Subtitle D requirements (Figures 5-8C and 5-8C of the FS).
8. Implementation of a WSA long-term monitoring and maintenance plan includes inspection and maintenance of the vegetated areas and consolidation area cover. Site inspections will be conducted annually for at least 30 years. Ten monitoring wells will be

installed around the perimeter of the consolidation area to verify that the added weight and volume of contaminated materials in the consolidation area is not causing any leaching of metals or other contaminants from the current containment cell or from the newly constructed consolidation area at unacceptable levels. The long-term monitoring groundwater monitoring will be performed at a minimum as required by RCRA D requirements (or more frequently as needed based on groundwater results).

9. Placement of institutional controls is necessary on areas of the WSA where contaminant conditions remaining at the site do not allow unrestricted use (55 Clinton Avenue, 27 Clinton Avenue). The institutional controls will restrict activities that would damage the soil cover and/or consolidation area cap and also prohibit residential use on any portion of 55 Clinton Avenue where waste remains in place. Institutional controls will be placed on 15 Pleasant Street preventing residential use and subsurface excavations.

III. Operable Units 1 & 2

1. Implementation of EPA's Five Year reviews every five years after completion of the remedial action, to ensure that the remedy remains protective over time.

The Department has concluded that the selected remedy is a comprehensive approach for OU1 and OU2 and that it addresses the current and foreseeable future risks associated with OU1 and OU2. The Department supports the proposal, including the application of MassDEP's UCLs as part of the remedy, while noting that MassDEP disagrees with USEPA's exclusion of MassDEP's UCLs as a formal ARAR.

The Department agrees with the conclusions in the ROD, and therefore, MassDEP concurs with the EPA's selection of the remedy.

If you have any questions regarding this letter, please contact Mr. Garry Waldeck, Project Manager at (617) 348-4017.

Very truly yours,

Paul W. Locke
Assistant Commissioner
Bureau of Waste Site Cleanup
Department of Environmental Protection

Copies to:

Garry Waldeck, MADEP
Derrick Golden, USEPA

APPENDIX D

ACRONYMS AND ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
ft bgs	feet below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminants of Concern
COPC	Contaminants of Potential Concern
CTE	Central tendency exposure
CY	Cubic yard
EPA	United States Environmental Protection Agency Management Agency
ESA	East Study Area
FS	Feasibility Study
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
ICs	Institutional Controls
IH	Imminent Hazard
MassDEP	Massachusetts Department of Environmental Protection
MADEQE	Massachusetts Department of Environmental Quality Engineering
MBTA	Massachusetts Bay Transportation Authority
MSL	Mean Sea Level
NPL	National Priorities List
PAH	polycyclic aromatic hydrocarbon
PCL	Proposed Clean-up Level
PDI	Pre-design investigation
PRG	preliminary remediation goal
RAO	Remedial Action Objective
Rfd	Reference dose
RI	Remedial Investigation
RME	Reasonable maximum exposure
ROW	Right of Way
RSL	Regional Screening Level
SI	Site Inspection
Site	Creese & Cook Tannery (Former) Superfund Site

SLERA	Screening Level Ecological Risk Assessment
TBC	To be Considered, CERCLA Guidance and Standards
TEQ	Toxicity equivalent
UCL	Upper concentration limit
µg/dL	micrograms per deciliter
µg/l	micrograms per liter
VI	vapor intrusion
WSA	WSA

APPENDIX E

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE – SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

Removed for Administrative Record

~~**CONTAINS ENFORCEMENT-SENSITIVE INFORMATION**~~

MEMORANDUM

DATE: 20 September 2018

SUBJ: Request for a Removal Action at the Creese & Cook Co. (Former) 3 Site
Water Street, Danvers, Essex County, Massachusetts 01923
Action Memorandum

FROM: Richard A. Haworth, On-Scene Coordinator RAH
Emergency Response and Removal Section II

THRU: William Lovely, Chief
Emergency Response and Removal Section II

Carol Tucker, Chief CT
Emergency Planning & Response Branch

TO: Bryan Olson, Director BJO
Office of Site Remediation and Restoration

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the proposed time-critical removal action at the Creese & Cook Co. (Former) 3 Site[1] (the Site), located on Water Street in the Town of Danvers, Essex County, Massachusetts.

The location of the proposed Removal Action is 45 Water Street at the southern tip of the East Study Area (Operable Unit 1) of the Creese and Cook Tannery (Former) National Priorities List (NPL) Site.

Hazardous substances present in soil will continue to pose a threat to human health and the environment if not addressed by implementing the response actions selected in this Action Memorandum. There are no nationally significant or precedent-setting issues associated with this Site, and the OSC's warrant authority has not been used.

[1] For consistency, the name selected is the same as a prior Removal Action, except that "2" is replaced with "3."

II. SITE CONDITIONS AND BACKGROUND

CERCLIS ID#: MAD001031574
SITE ID#: 01HL
CATEGORY: Time-Critical

A. Site Description

1. Removal Site evaluation

EPA's Remedial Program requested the Removal Program evaluate existing information to determine if a Removal Action could be initiated to address current threats to public health and the environment associated with contaminated soil on select residential properties within Operable Unit 1.

The Remedial Investigation/Feasibility Study (RI/FS) includes data pertaining to soil samples collected at 45 Water Street. The data shows that several hazardous substances are present, and at two locations, the concentration of arsenic at a depth from the surface to six inches exceeds EPA's Regional Removal Management Levels for chemicals with a 10^{-4} risk level for carcinogens or a Hazard Quotient (HQ) of 3 for non-carcinogens (RML3), as well as the Massachusetts Contingency Plan (MCP)[2] Imminent Hazard standard. At one location, the concentration of lead at a depth between 2 and 4 feet exceeds the MCP "S1" soil standard for residential locations.

On September 5th Removal and Remedial Program Managers and staff met with the EPA case team to discuss current Site conditions. It was agreed that the information available was sufficient to support an Action Memorandum to address arsenic-contaminated soil at 45 Water Street.

A Closure Memorandum dated 17 September 2018 formally documents the conclusion of the Removal Site Evaluation, and recommends that a Removal Action is appropriate because conditions at this Site meet the criteria in the National Contingency Plan (NCP) for initiating a Removal Action.

2. Physical location

The address for this Removal Action is 45 Water Street in Danvers, Massachusetts. This address is identified as Parcel 64 on the Town of Danvers Assessor's Office Map 23. The geographic coordinates are approximately 42.4418 degrees north latitude, 70.9258 degrees west longitude. The location of the proposed Removal Action is at the southern tip of the East Study Area of the Creese and Cook Tannery (Former) NPL Site. The boundary of the proposed Removal Action to the north is the balance of the NPL Site, and to the east, south, and west, the Crane River.

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[2] 310 CMR 40.000

3. Site characteristics

The Site is a privately-owned, 0.89-acre parcel located in a mixed residential/commercial area, improved with a single 5-unit condominium building. The parcel includes level paved parking and landscaped areas adjacent to the building, and an unmaintained wooded area that slopes down to the Crane River on 3 sides, a portion of which is in the 100-year flood plain and the intertidal zone. From the level area it is approximately 8 feet to groundwater/mean sea level. All areas are accessible. Receptors may include residents, maintenance workers, and others that might trespass.

The Site was one of several properties formerly owned by or adjacent to the Creese and Cook Tannery Company, which operated a tannery and finishing facility beginning in 1903. Operations included the use and disposal of hazardous substances. Hazardous substances identified by EPA's Remedial Program include but are not limited to arsenic, chromium, PAHs and dioxin. Tannery waste has been identified in the Crane River, but the extent of contamination has not yet been fully defined.

Based on EPA's EJSCREEN environmental justice screening tool, ten of the eleven Environmental Justice Indexes for the area within a one-mile radius of the Site do not exceed the 50th percentile on a national basis. No value is provided for the eleventh category on a national basis, Superfund Proximity.

The operational status is inactive. The incident category is housing area. The owner-operator type is private.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

The analytical results of tests performed on samples collected at this Site reveal that several hazardous substances are present, including but not limited to those listed below. Each is identified as a hazardous substance in 40 CFR 302.4. A comparison to relevant published standards is provided later in this document.

Hazardous Substance	Matrix	Depth (feet)	Maximum Concentration (parts per million - ppm)
Arsenic	soil	0-0.5	107
Lead	soil	2-4	601
Benzo(a)pyrene	soil	0-0.5	2.6

5. NPL status

The Site was proposed for inclusion on the NPL in September 2012, and included in the final listing of NPL sites on May 24, 2013.

B. Other Actions to Date

1. Previous actions - Removal

A Removal Action has taken place previously, however, not at the same location of this proposed action. The address of the former Removal Action was 33 Water Street, more northerly within the East Study Area. Approximately 450 tons of arsenic-contaminated soil was excavated and shipped off site in 2012.

2. Previous actions – Remedial

The information below is a subset of all Remedial Actions. Items identified are those associated with the East Study Area wherein the proposed Removal Action is located.

- Site assessment activities to support an evaluation for possible inclusion to the NPL.
- Remedial Investigation ("RI") sampling activities, on the East Study Area ("ESA") of the Site, which included taking over 350 soil borings, installing 13 groundwater monitoring wells, and obtaining 60 groundwater samples, 15 sediment samples, and including a tidal survey of the Crane River.
- A human health and baseline ecological risk assessment for the ESA.
- A combined Feasibility Study for the East and West Study Areas to evaluate different means of addressing unacceptable risk(s) posed by contaminants.

3. Current actions- Remedial

The Remedial Program's goal is to issue a proposed cleanup plan for the East and West Study Areas in the near future.

C. State and Local Authorities' Roles

1. State and local actions to date

For approximately twenty years, the Massachusetts Department of Environmental Protection ("MassDEP") used its regulations to have investigations and response actions implemented by responsible parties. However ultimately, MassDEP requested EPA determine eligibility for the National Priorities List ("NPL"). The Site was proposed for inclusion on the NPL in September 2012, and included in the final listing of NPL sites on May 24, 2013.

2. Potential for continued State/local response

EPA is the lead agency at this NPL Site, and does not anticipate that the State will participate directly in the proposed Removal Action. The Removal Program will work with the Remedial Project Manager (RPM) and Community Involvement Coordinator (CIC) to maintain established relationships.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Information about the principal contaminants of concern at this Site is provided below. Potential health effects identified are found in the 2010 federal Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profiles or ToxGuides.™

<u>Arsenic</u>

Arsenic cannot be destroyed in the environment. It can only change its form or become attached to, or separated from, particles. Inhalation of inorganic arsenic may cause respiratory irritation, nausea, skin effects, and increased risk of lung cancer. Limited data suggests that dermal absorption of arsenic is very low, however further data would be useful to establish whether arsenic uptake occurs from contact with contaminated soil or water, since humans may be exposed by these routes near hazardous waste sites. EPA and the Department of Health and Human Services (DHHS) have determined that arsenic is a human carcinogen.

<u>Lead</u>

The main target for lead toxicity is the nervous system, both in adults and children. Children are more vulnerable to the effects of lead than adults. The (DHHS) has determined that lead is reasonably anticipated to be a human carcinogen.

<u>PAHs</u>

PAHs are a group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances, such as tobacco and charbroiled meat. There are more than 100 different PAHs. PAHs generally occur as complex mixtures, for example, as part of combustion products such as soot, not as single compounds. PAHs occur naturally, and can be manufactured as individual compounds for research purposes, however, not as the mixtures found in combustion products. Although the health effects of individual PAHs are not exactly alike, the following 17 PAHs were considered as a group for the PAH toxicological profile: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[a]pyrene, *benzo[e]pyrene*, benzo[b]fluoranthene, benzo[g,h,i]perylene, *benzo[j]fluoranthene*, benzo[k]fluoranthene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorine, indeno [1,2,3-c,d]pyrene, phenanthrene, and pyrene. (PAHs in italics are not included as analytes in lab reports for this Site; others were detected present.)

These 17 PAHs were chosen by ATSDR for consideration as a group because (1) more information is available on these than on the others; (2) they are suspected to be more harmful than some of the others, and they exhibit harmful effects that are representative of the PAHs; (3) there is a greater chance that you will be exposed to these PAHs than to the others; and (4) of all the many PAHs analyzed, these were the PAHs identified at the highest concentrations at hazardous waste sites on the NPL.

Under normal conditions of environmental exposure, PAHs could enter your body if your skin comes into contact with soil that contains high levels of PAHs. PAHs can enter all the tissues of the body that contain fat. They tend to be stored mostly in the kidneys, liver, and fat. Studies of people show that individuals exposed by breathing or skin contact for long periods to mixtures that contain PAHs and other compounds can also develop cancer. The PAH content of plants and animals living on the land or in water can be many times higher than the content of PAHs in soil or water.

Based on Site conditions and information available on the hazardous substances present, the Site poses the threats to public health and the environment outlined below.

Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; [§300.415(b)(2)(i)];

Lab analysis reveals the presence of several hazardous substances, including but not limited to those listed above in Section II A 4. The residents of the condominium on the Site are the most likely to be exposed to hazardous substances in surface soil while playing or spending time on the property. Other potential exposures include new residents, maintenance workers, utility/construction workers, trespassers, and pets.

High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate [§300.415(b)(2)(iv)];

Lab tests performed on soil samples collected from the surface to a depth of six inches, show that several hazardous substances are present, and at two locations, the concentration of arsenic exceeds EPA's RML3, and the MCP's Imminent Hazard standard. At one location, the concentration of lead at a depth between 2 and 4 feet exceeds the MCP "S1" soil standard for residential locations.

Hazardous Substance	Matrix & depth bgs (feet)	Maximum Concen-tration (ppm)	EPA RML HQ=3 Residential (ppm)	DEP Imminent Hazard (ppm)	DEP S1 (residential) (ppm)
Lead	soil 2-4	601	**400**	none	**200**
Arsenic	soil 0-0.5	107	**68**	**40**	**20**
Benzo(a)pyrene	soil 0-0.5	2.6	11	none	**2.0**
Bold indicates the standard is exceeded. bgs = below ground surface					

Lateral and/or vertical migration may occur via precipitation or by water used to fight a fire should one occur. People and pets could spread contamination after contacting contaminated soil, as might maintenance or construction workers.

Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released [§300.415(b)(2)(v)];

Some hazardous substances found in soil have also been found in groundwater. Precipitation may be causing contaminants to migrate into groundwater, or laterally into the Crane River or adjoining shoreline. Hazardous substances in low-lying portions of the site could migrate to the River from tidal influence or flood events.

The availability of other appropriate Federal or State response mechanisms to respond to the release [§300.415(b)(2)(vii)];

EPA's Remedial Program has requested the Removal Program abate the threats outlined above so that they are addressed more quickly than would otherwise be possible. Due to the limited scope of the proposed Removal Action, and because EPA is the lead agency at this NPL Site, it is not reasonable to expect that the State would participate directly in the execution of the proposed Removal Action.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances or pollutants or contaminants from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, welfare, or the environment.

In accordance with OSWER Directive 9360.0-34 (August 19, 1993), an endangerment determination is made based on "appropriate Superfund policy or guidance, or on collaboration with a trained risk assessor. Appropriate sources include, but are not limited to, relevant action level or clean-up standards, Agency for Toxic Substances and Disease Registry documents or personnel, or staff toxicologists." The sources cited above in this action memorandum document this requirement has been met, specifically, EPA's Removal Management Levels (http://www.epa.gov/region4/superfund/programs/riskassess/rml/rml.html), and the Massachusetts Contingency Plan Imminent Hazard soil standard.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

While the available data set is adequate to support a Removal Action, it does not provide enough information to define the limits of the proposed action at 45 Water Street. Therefore, EPA will collect additional soil samples at the beginning of the proposed action to better define the extent of soil contamination that will be addressed as part of the presumptive response action, which is further described in the paragraphs below.

The presumptive response action is excavation and off-site disposal of contaminated soil to a depth of three feet or groundwater, whichever is less, and at locations where the MCP "S1" standard is exceeded for arsenic, lead, or PAHs. However, other actions may also be implemented. The reconnaissance-level archaeological survey performed for the RI concluded that undisturbed, undeveloped areas, including 45 Water Street, are areas of high archaeological potential, where historical and/or pre-contact archaeological resources may remain. The survey recommended that these areas should be avoided and protected during any remediation activities. The area of interest is approximated by the area in the 100-year flood plain. This will be considered when selecting a removal response action in this area.

For example, as compared to soil excavation, installing rip rap in areas subject to tide or flood could be an effective means to prevent access and transport of contaminants from the Site to the Crane River, and conversely, to avoid re-contamination of clean backfill that may result from deposition of contaminated river sediment by tide or flood. In the alternative, a fence might be the best option for this portion of the Site. It is also possible that sample results may demonstrate no action is necessary in this particular area.

The balance of the site is categorized as a low-interest area due to prior disturbance/ development, and so is not expected to be negatively impacted by excavating contaminated soil. Nevertheless, workers will be made aware of the situation, and any potential items of interest that may be encountered will be addressed, as appropriate. Following the collection and review of additional soil data, the OSC will perform an initial Site visit with a representative of EPA's Emergency and Rapid Response Services (ERRS) contractor to review the scope, objectives, and approach to the project, health and safety considerations, and arrangements necessary to initiate work at the Site.

A site-specific Health and Safety Plan will be developed in accordance with regulations promulgated by the Occupational Safety and Health Administration, and all actions at the Site will be performed in accordance with this Plan.

An office trailer, storage units, and sanitary facilities may be brought to the Site. Silt fence, hay bales, or other similar measures will be installed as necessary to limit or avoid impacting the Crane River and adjacent shoreline. Temporary fence, caution tape, and/or signs will be used to identify work areas. Crushed stone or other suitable material may be used to stabilize existing conditions to allow access to work areas.

The project will employ temporary fence, caution tape, and/or warning signs to secure work areas, and security guards posted if warranted by circumstances. Wetting soil will be performed if needed to supplement existing soil moisture so that dust will be limited or prevented, thereby preventing the potential for off-site migration of contaminants.

Where excavation is implemented, heavy equipment will be used to clear and grub vegetation prior to addressing contaminated soil. Excavation will be limited to a maximum depth of three feet; however, excavation below three feet, may be undertaken in a limited area to remove a discrete source of contamination, such as a pocket of highly-contaminated soil, or drums or bulk waste that may be discovered during soil excavation. The limits of excavation will be identified for future reference with high visibility fence. Excavated areas will be filled with clean soil obtained from off-site, and analyzed for hazardous substances before placement. The proposed action includes addressing drums, other containers, or waste that may be encountered while performing the proposed action where NCP criteria are met.

The proposed action does not include excavation or removal of sediment in the Crane River or adjoining shoreline, or soil under the site building or paved areas.

Grass and landscape plants around the site building will be re-established, although plants may not be identical cultivars. Similarly, affected portions of the wooded area between the River and the landscaped area will be re-vegetated, however, the size of trees will be limited to those available at local nurseries.

Samples may be collected of waste, soil, water, air or other matrices to comply with the requirements of the Site's health and safety plan, characterize waste, further characterize Site conditions, document the effectiveness of the cleanup/final conditions, assure the quality of backfill obtained from off-site vendors, or for other reasons.

Excavated soil, waste, and other contaminated items that may be encountered, or are related to, or generated during the performance of this proposed action, will be shipped off site for disposal, treatment, re-use, or recycling. Off-site disposal of hazardous waste will be done in accordance with the Off-Site Rule, 40 CFR 300.440.

Response-related damage will be repaired, if appropriate; for example, repair of damage to the exterior of the condominium building if that occurs while excavating contaminated soil in close proximity.

If records believed to be related to contamination are found at the Site, they will be viewed, copied, photographed, and/or otherwise documented, and removed for storage and preservation.

2. Community relations

The OSC will coordinate with the assigned CIC and RPM to establish how best to maintain good community relations, such as arranging a neighborhood meeting and/or providing written Community Updates. A press release may be issued at the start and/or conclusion of the Removal Action. Pollution Reports will be generated periodically. A Site Administrative Record will be established and made available at the local repository that has been established near the Site at the Peabody Institute Library, 15 Sylvan Street in Danvers, as well as the Records Center at EPA's Boston Office, and via the internet at www.epa.gov/superfund/creese.

3. Contribution to remedial performance

The RPM has participated in the development of the proposed Removal Action, which is designed to mitigate the threats to human health and the environment outlined above. Should a proposed cleanup plan for a Remedial Action at the NPL Site be issued prior to the initiation of the Removal Action, the OSC will coordinate with the RPM to ensure consistency with the Remedial Action, subject to the statutory and funding limitations of the Removal program. The Removal Action, to the extent practicable, will contribute to the efficient performance of the long-term Remedial Action, as required by 40 C.F.R. 300.415.

Removing soil contaminated with hazardous substances is expected to reduce exposure to nearby residents, and the potential for migration of contaminants off-site, or to other areas on site, which is a goal consistent with any final Remedial remedy. Because the final remedial remedy for the NPL Site may not be determined while implementing the proposed Removal Action, it is anticipated that contaminated soil will be shipped off-site for disposal. Off-site disposal will not impede a future Remedial response action.

4. Description of alternative technologies and sustainable approaches

In accordance with the December 23, 2013 memorandum issued by OLEM Assistant Administrator as well as the Region I Clean and Greener Policy for Contaminated Sites, greener cleanup practices should be considered for all cleanup projects. Greener cleanup is the practice of incorporating practices that minimize the environmental impacts of cleanup actions and maximize environmental and human benefit. Alternative technologies and sustainable approaches will be considered and incorporated, as appropriate, throughout the implementation of this removal action.

Although the soil to be addressed by the proposed Removal Action has not been fully characterized for disposal, the available data suggests it unlikely that an alternative to landfill disposal can be employed.

Sustainability efforts will include ensuring that contractors are meeting or exceeding the green remediation requirements of their contract. A no-idling policy will be implemented. Solar generators will be utilized if available in the size required.

5. Applicable or relevant and appropriate requirements (ARARs)

Pursuant to 40 C.F.R. 300.415(j), removal actions shall, to the extent practicable considering the exigencies of the situation, attain ARARs. Attainment is subject to EPA Publication 540/P-91/011, "Superfund Removal Procedures: Guidance on the Consideration of ARARs During Removal Actions." The regulations identified at this time are listed below, and are relevant and appropriate.

Federal ARARs

Resource Conservation and Recovery Act, Subtitle C, 40 CFR Parts 260-262 and 268: Hazardous Waste Identification and Listing Regulations; Generator and Handler Requirements; Land Disposal Restrictions.

Clean Air Act, 40 CFR Part 61: standards for controlling dust.

Clean Water Act, 40 CFR Sections 122.26(c)(ii)(C) and 122.44(k): NPDES regulations for storm water control and management.

Clean Water Act Section 404(b), (40 CFR Parts 230 and 231, 33 CFR Parts 320-323, and 33 CFR Part 332): No activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser impacts is available. Controls discharge of dredged or fill material to protect aquatic ecosystems. Any wetlands altered by the cleanup will be restored as required by regulatory standards.

Floodplain Management and Protection of Wetlands, 44 CFR 9 (44 CFR Part 9): Regulations that set forth the policy, procedure and responsibilities to implement and enforce Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). Prohibits activities that adversely affect a federally-regulated wetland unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use. Requires the avoidance of impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplain.

Fish and Wildlife Coordination (50 CFR Part 297; 16 USC Section 661 et seq.): Any modification of a body of water requires consultation with the U.S. Fish and Wildlife Services and the appropriate state wildlife agency to develop measures to prevent, mitigate or compensate for losses of fish and wildlife.

National Historical Preservation Act (16 U.S.C. 469 *et seq.*; 36 CFR Part 65): Standards related to sites where a federal agency finds that its activities in connection with a federal construction project may cause irreparable loss or destruction of significant scientific, pre-historical, historical, or archeological data.

State ARARs

310 CMR 40.0900: Procedures and Standards for the Characterization of the Risk of Harm to Health, Safety, Public Welfare and the environment.

310 CMR 30.100: Hazardous Waste Rules for Identification and Listing of Hazardous Wastes.

310 CMR 30.300: Hazardous Waste Management Rules – Requirements for Generators

310 CMR 7.00: standards for controlling dust and odor

The OSC will coordinate with State officials to identify any additional State ARARs, as appropriate. In accordance with the National Contingency Plan and EPA Guidance Documents, the OSC will determine the applicability and practicability of complying with each ARAR that is identified in a timely manner.

6. Project schedule

The goal is to complete the proposed Removal Action in less than one year.

B. Estimated Costs

Based on the limited data available, and that one or more response actions may be selected based on additional data to be collected, the actual cost may vary widely from the estimate below. It assumes three feet of soil is excavated from across the entire portion of the property above the 100-year flood plain/area of high archeological interest, and is not covered by a building or pavement (3120 tons), and that the entire amount does not require disposal as hazardous waste. An amount is allocated for rip rap and fence installation.

COST CATEGORY		CEILING
REGIONAL REMOVAL ALLOWANCE COSTS:		
ERRS Contractor		$831,000.00
OTHER EXTRAMURAL COSTS NOT FUNDED FROM THE REGIONAL ALLOWANCE:		
START[3] Contractor		$100,000.00
Extramural Subtotal		$931,000.00
Extramural Contingency	20%	$186,000.00
TOTAL, REMOVAL ACTION CEILING		**$1,117,000.00**

[3] Superfund Technical Assistance and Response Team

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

In the absence of the response action described herein, conditions at the Site will persist. The hazardous substances identified above will remain at the Site, and continue to pose the threats to public health, welfare, or the environment outlined in Section III of this action memorandum.

VII. OUTSTANDING POLICY ISSUES

There is no nationally significant or precedent-setting issue associated with this Site that would require a review by EPA Headquarters prior to implementation.

VIII. ENFORCEMENT ... For Internal Distribution Only

See attached Enforcement Strategy.

The total EPA costs for this removal action based on full-time accounting practices that will be eligible for cost recovery are estimated to be $1,117,000 (extramural costs) + $100,000 (EPA intramural costs) = $1,217,000 x 1.4867 (regional indirect rate) = **$1,809,314**[4].

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[4]Direct Costs include direct extramural costs $1,117,000 and direct intramural costs $100,000. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific costs, 48.67% (for fiscal year 2018) of $1,117,000, consistent with the full accounting methodology effective October 13, 2017. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual total costs from this estimate will affect the United States' right to cost recovery.

IX. RECOMMENDATION

This decision document represents the selected removal action for the Creese & Cook Co. (Former) 3 Site in Danvers, Massachusetts, developed in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and is not inconsistent with the National Contingency Plan. The basis for this decision will be documented in the administrative record to be established for the Site.

Conditions at the Site meet the NCP Section 300.415(b) criteria for a removal action based on the following factors:

Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants [§300.415(b)(2)(i)];

High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate [§300.415(b)(2)(iv)];

Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released [§300.415(b)(2)(v)]; and,

The availability of other appropriate Federal or State response mechanisms to respond to the release [§300.415(b)(2)(vii)].

I recommend that you approve the proposed removal action. The total extramural removal action project ceiling if approved will be $1,117,000.00.

APPROVAL:______________ DATE: 9/24/18

DISAPPROVAL:______________ DATE:______________

APPENDIX F

MassDEP

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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

August 28, 2015

Mr. Derrick Golden
U.S. EPA Region I
Massachusetts Superfund Section
5 Post Office Square#100
Boston, MA 02109

re: Groundwater Use and Value Determination
Creese and Cook Tack Superfund Site

Dear Mr. Golden:

Enclosed please find the Groundwater Use and Value Determination prepared by the MassDEP for the Creese and Cook Superfund Site. This Use and Value Determination was conducted by the MassDEP pursuant to the finalized Guidance developed by the EPA.

In determining the use and value of the groundwater in the vicinity of the Creese and Cook Site, MassDEP referred to the aquifer classification contained in the Massachusetts Contingency Plan (MCP). The classification in the MCP gives consideration to all of the factors in the Use and Value Guidance. Enclosed with the Use and Value Determination are copies of the GIS maps (500 and 0.5 mile radii) used to determine the aquifer classification. These maps provides a variety of information, including the USGS yield classification, the presence of public water supplies and zones of protection, surface water bodies, wetlands, protected open space areas, and drainage basin boundaries.

If you have any questions regarding this letter, contact me at 617 348-4017.

Very truly yours,

Garry Waldeck,
Project Manager

Cc: J Naparstek
efile

GROUNDWATER USE AND VALUE DETERMINATION
Creese and Cook Superfund Site
Danvers, MA

August 25, 2015

Consistent with the Environmental Protection Agency's (EPA) 1996 Final Ground Water Use and Value Determination Guidance, the Department has developed a "Use and Value Determination" of the groundwater relative to the Creese and Cook Superfund Site in Danvers (the "Site"). The purpose of the Use and Value Determination is to identify whether the aquifer at the site should be considered of "High", "Medium", or "Low" use and value. In the development of its Determination, the Department has applied the criteria for groundwater classification as promulgated in the Massachusetts Contingency Plan (MCP). The classification contained in the MCP considers criteria similar to those recommended in the Use and Value Guidance as agreed to in the Memorandum of Agreement (MOA) between EPA and DEP. The Department's recommendation supports a low use and value for the Site Area groundwater. A brief background of the Site, an explanation for the determination, are outlined below and DEP's Preliminary Assessment Maps for a 500 foot and ½ mile radius is attached.

The Site covers approximately 17 acres in Danvers, Massachusetts along the east and west banks of the Crane River. The site is a former tannery and contaminates of concern at the site include soil and sediments containing heavy metals(eg arsenic, chromium, and lead). The Remedial Investigation was started in 2014 and is ongoing.

The groundwater beneath and in the vicinity of the Site is not classified as a current or potential drinking water supply. There are no public drinking water wells within one mile of the Site as shown on attached Figure. The aquifer underlying the Site is classified as Non Potential Drinking Water Source Area by the United States Geological Survey (USGS) because of land use. The Site Area aquifer is classified as both GW-2 and GW-3 (see description below).

A number of considerations are used to determination the use and value of the groundwater underlying Creese and Cook including the groundwater classification system in the Massachusetts Contingency Plan. Under the MCP, all groundwater in the Commonwealth is classified as GW-3, which considers the ecological and human health impacts and risks associated with the discharge of groundwater to surface water. In addition, groundwater can be classified as GW-2, and GW-1. GW-2 groundwaters are those that may pose an indoor vapor risk, and as such, is outside of the scope of this determination. GW-1 groundwaters are those that are of high quantity and quality and are used for water supplies or have the potential to be used for water supplies. Groundwater is classified as GW-1 under the MCP if it is located:

1. within a Current Drinking Water Source area, which includes groundwater located:
    a. within a Zone II for a public water supply,
    b. within the Interim Wellhead Protection Area for a public water supply,
    c. within the Zone A of a Class A surface water body used as a public water supply, or
    d. within 500 feet of a private well.

2. within a Potential Drinking Water Source Area, which includes groundwater located:
    a. 500 feet or more from a public water supply distribution pipeline,
    b. within an area designated by a municipality specifically for the protection of groundwater to ensure its availability as a source of potable water, or
    c. within a Potentially Productive Aquifer.

The groundwater underlying the site meets criteria for classification as GW-3 due to it being designated a Non potential Drinking Water Source Area because of its land use.

The criteria established in the MCP that were examined in this determination support a low use and value for the Site area groundwater. The overriding fact establishing the determination of low use and value is the absence of private drinking water wells within 500 feet of the site and the site groundwater is saline due to being along the Coast.

In summary, groundwater directly beneath and in the immediate vicinity of the site is category GW-3 and is not considered a source of drinking water. Drinking water standards are not directly applicable in these areas.

Groundwater Use and Value Considerations				
Factors	High	Medium	Low	Comments
1. Quantity		X		Aquifer would be considered low to moderate yield based on hydraulic conductivity values determined at the site.
2. Quality			X	The grounwater is not a suitable drinking water source due to land use and the high saline content as it is along the coast.
3. Current Public Water Supply Systems			X	There are no known public or non-community water supplies within one mile of the site.
4. Current Private Drinking Water Supply Wells			X	No private drinking water supplies exist in the area. None within 500 hundred feet of the site.
5. Likelihood and I.D. of Future Drinking Water Use			X	Given the saline content, groundwater is unlikely to be considered as a viable source of future drinking water.
6. Other Current or reasonable Expected Groundwater Use(s) in Review Area			X	It is unlikely the groundwater would be permitted to be utilized for other purposes.
7. Ecological Value		X		Groundwater in the study area discharges to River and Ocean
8. Public Opinion			X	The absence of private drinking water supplies within the review area would lead to the public's low value of the groundwater resource.

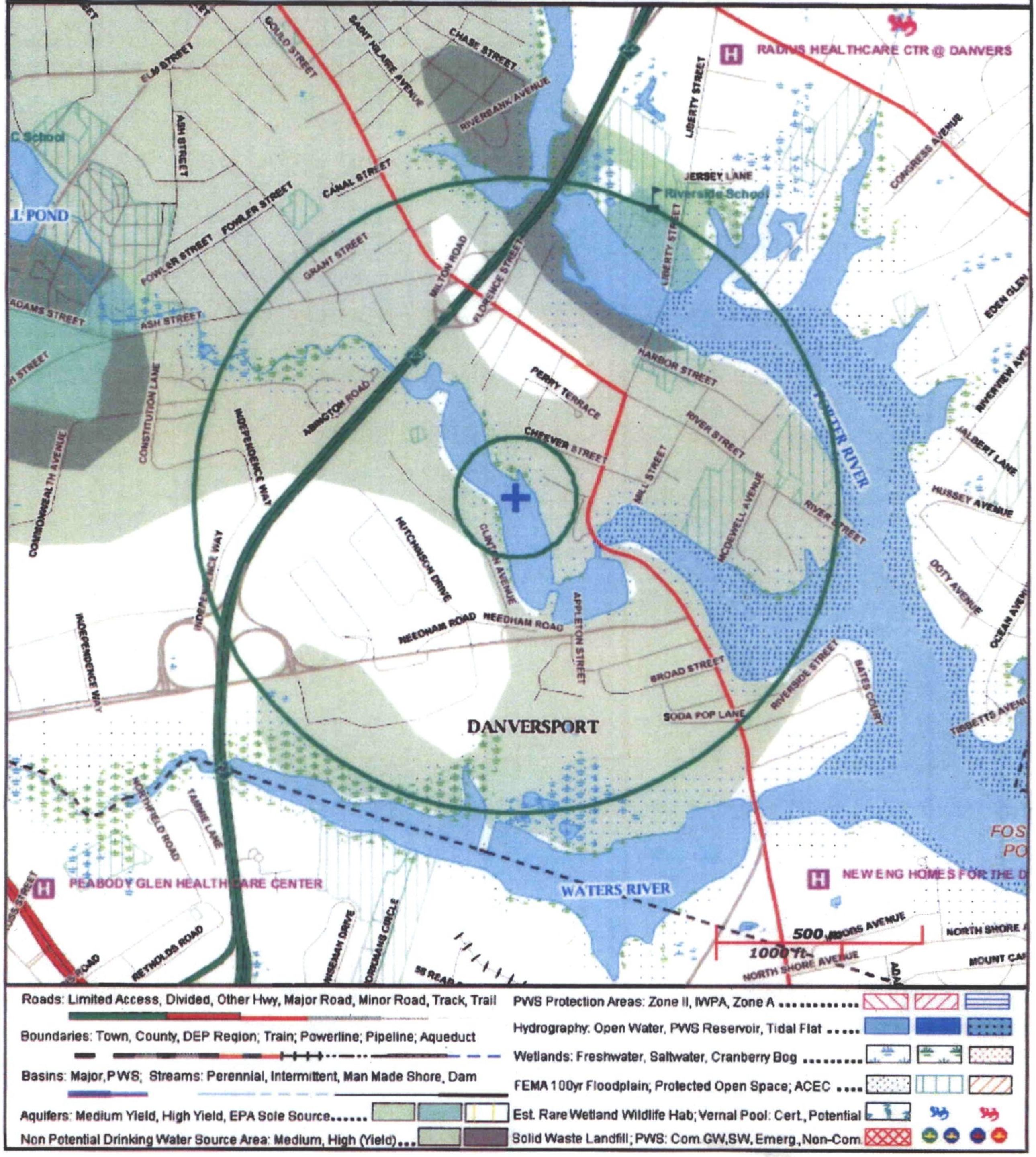
MassDEP - Bureau of Waste Site Cleanup

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

Site Information:
CREESE AND COOK NPL SITE
35 WATER STREET DANVERS, MA
NAD83 UTM Meters:
4713014mN , 341750mE (Zone: 19)
May 7, 2015

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

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



APPENDIX G

Human Health Risk Assessment Tables

TABLE G-1
SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION - SURFACE SOIL
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil

Exposure Point	Contaminant	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	Exposure Point Concentration		
						Value	Units	Statistic
20 Cheever St.	Dioxin/Furan - Toxic Equivalent	0.00000025	0.000014	mg/kg	5/5	0.000014	mg/kg	Maximum
	Benzo(a)anthracene	0.035	5.6	mg/kg	18/21	2.0	mg/kg	95% UCL
	Benzo(a)pyrene	0.044	4.7	mg/kg	17/20	1.7	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.067	6.7	mg/kg	19/22	2.5	mg/kg	95% UCL
	Dibenz(a,h)anthracene	0.0085	0.84	mg/kg	17/20	0.39	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.027	2.6	mg/kg	18/21	1.3	mg/kg	95% UCL
	Arsenic	7.0	456	mg/kg	30/36	57	mg/kg	95% UCL
	Chromium-Hexavalent	2.0	60	mg/kg	6/6	60	mg/kg	Maximum
	Lead	12.3	24000	mg/kg	36/36	1389	mg/kg	Mean
MBTA	Dioxin/Furan - Toxic Equivalent	0.0000047	0.0013	mg/kg	17/17	0.00041	mg/kg	95% UCL
	Benzo(a)anthracene	0.049	9.4	mg/kg	34/34	3.0	mg/kg	95% UCL
	Benzo(a)pyrene	0.055	9.3	mg/kg	34/34	2.8	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.065	22	mg/kg	34/34	5.3	mg/kg	95% UCL
	Dibenz(a,h)anthracene	0.027	1.8	mg/kg	33/34	0.74	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.066	7.4	mg/kg	33/34	2.5	mg/kg	95% UCL
	Arsenic	12.1	269	mg/kg	36/36	75	mg/kg	95% UCL
	Chromium-Hexavalent	0.68	580	mg/kg	17/18	356	mg/kg	95% UCL
	Lead	34.6	3100	mg/kg	36/36	313	mg/kg	Mean
33 Water & 45 Water Sts.	Dioxin/Furan - Toxic Equivalent	0.000000058	0.00061	mg/kg	21/21	0.00022	mg/kg	95% UCL
	Benzo(a)anthracene	0.018	30	mg/kg	29/29	7.0	mg/kg	95% UCL
	Benzo(a)pyrene	0.035	18	mg/kg	29/29	4.8	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.038	37	mg/kg	29/29	6.5	mg/kg	95% UCL
	Dibenz(a,h)anthracene	0.0081	3.7	mg/kg	24/29	1.3	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.028	13	mg/kg	28/29	4.4	mg/kg	95% UCL
	Arsenic	8.5	76	mg/kg	29/29	39	mg/kg	95% UCL
	Chromium-Hexavalent	1.0	26	mg/kg	10/10	26	mg/kg	Maximum

Key
mg/kg: milligrams per kilogram
95% UCL: 95% Upper Confidence Limit
Mean: Arithmetic Mean Concentration
Maximum: Maximum Detected Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil (*i.e.*, the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that dioxins, PAHs, arsenic, hexavalent chromium, and lead are all detected frequently in soil at all three of these areas of the site. The 95%UCL on the arithmetic mean was used as the exposure point concentration for most of the COCs, except lead at 20 Cheever Street and the MBTA properties and dioxins and hexavalent chromium at 20 Cheever Street. Lead models use arithmetic mean concentrations. Due to the limited amount of sample data available for dioxins and hexavalent chromium at 20 Cheever Street, the maximum concentrations were used as the default exposure point concentrations.

TABLE G-2
SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION - AGGREGATE SOIL
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Aggregate Soil

Exposure Point	Contaminant	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	Exposure Point Concentration		
						Value	Units	Statistic
33 Water & 45 Water Sts.	Dioxin/Furan - Toxic Equivalent	0.0000000072	0.00061	mg/kg	44/44	0.000157	mg/kg	95% UCL
	Benzo(a)anthracene	0.0043	170	mg/kg	61/91	17	mg/kg	95% UCL
	Benzo(a)pyrene	0.0076	150	mg/kg	59/91	15	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.010	200	mg/kg	59/91	20	mg/kg	95% UCL
	Dibenz(a,h)anthracene	0.0048	22	mg/kg	48/91	2.3	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.0042	79	mg/kg	59/91	7.8	mg/kg	95% UCL
	Arsenic	3.8	1530	mg/kg	106/108	71	mg/kg	95% UCL
	Chromium-Hexavalent	0.80	49	mg/kg	18/28	20	mg/kg	95% UCL
	Lead	7.1	601	mg/kg	91/91	94	mg/kg	Mean

Key

mg/kg: milligrams per kilogram

95% UCL: 95% Upper Confidence Limit

Mean: Arithmetic Mean Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil/(e., the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that arsenic, dioxins, and lead are the most frequently detected COCs in aggregate soil at 33 and 45 Water Street. The 95%UCL on the arithmetic mean was used as the exposure point concentration for each of the COCs, except lead. Lead models use arithmetic mean concentrations.

TABLE G-3
SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION - RIVERBANK SOIL
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: East Riverbank soil

Exposure Point	Contaminant	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	Exposure Point Concentration		
						Value	Units	Statistic
East Riverbank	2,3,7,8-TCDD TEQ	0.0000054	0.00057	mg/kg	10/10	0.00057	mg/kg	Maximum
	Benzo(a)anthracene	0.0095	1.9	mg/kg	21/21	0.92	mg/kg	95% UCL
	Benzo(a)pyrene	0.07	1.9	mg/kg	20/21	0.79	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.065	2.7	mg/kg	20/21	1.4	mg/kg	95% UCL
	Dibenz(a,h)anthracene	0.011	0.31	mg/kg	19/21	0.16	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.041	1.2	mg/kg	20/21	0.64	mg/kg	95% UCL
	Arsenic	7	882	mg/kg	22/23	242	mg/kg	95% UCL
	Chromium-Hexavalent	0.54	5.6	mg/kg	5/10	5.6	mg/kg	Maximum
	Lead	11.7	652	mg/kg	23/23	171	mg/kg	Mean

Key

mg/kg: milligrams per kilogram
95% UCL: 95% Upper Confidence Limit
Mean: Arithmetic Mean Concentration
Maximum: Maximum Detected Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil (*i.e.*, the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that dioxins, PAHs, arsenic, and lead are all detected frequently in soil at the site. The 95%UCL on the arithmetic mean was used as the exposure point concentration for most of the COCs, except lead, dioxins, and hexavalent chromium. Lead models use arithmetic mean concentrations. Due to the limited amount of sample data available for dioxins, and hexavalent chromium, the maximum concentrations were used as the default exposure point concentrations.

Table G-4

SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION - Surface Soil (0 to 1 ft bgs)
CREESE & COOK TANNERY (FORMER) - WEST STUDY AREA
DANVERS, MASSACHUSETTS

Contaminant	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	Exposure Point Concentration (EPC) Value	Units	Statistic
Clinton Avenue							
Benzo(a)anthracene	0.0044	5.6	mg/kg	88/92	0.23	mg/kg	95% UCL
Benzo(a)pyrene	0.0052	4.5	mg/kg	87/92	0.22	mg/kg	95% UCL
Benzo(b)fluoranthene	0.01	5.8	mg/kg	86/92	0.39	mg/kg	95% UCL
Dibenz(a,h)anthracene	0.0023	0.69	mg/kg	37/92	0.053	mg/kg	95% UCL
Indeno(1,2,3-cd)pyrene	0.002	1.6	mg/kg	85/92	0.11	mg/kg	95% UCL
2,3,7,8-TCDD TEQ	0.0000011	0.013	mg/kg	37/37	0.0030	mg/kg	95% UCL
Arsenic	5.4	785	mg/kg	107/108	115	mg/kg	95% UCL
Chromium-Hexavalent	0.54	17	mg/kg	32/47	3.7	mg/kg	95% UCL
Lead	7.1	919	mg/kg	108/108	66	mg/kg	Arithmetic mean
Pleasant Street							
Benzo(a)pyrene	0.14	0.25	mg/kg	3/3	0.25	mg/kg	Maximum
Arsenic	8.9	23.6	mg/kg	3/3	24	mg/kg	Maximum
Lead	112	412	mg/kg	3/3	229	mg/kg	Arithmetic mean
West Riverbank							
Benzo(a)anthracene	0.0048	1.1	mg/kg	15/15	0.45	mg/kg	95% UCL
Benzo(a)pyrene	0.021	0.88	mg/kg	14/15	0.39	mg/kg	95% UCL
Benzo(b)fluoranthene	0.0082	1.1	mg/kg	15/15	0.34	mg/kg	95% UCL
Dibenz(a,h)anthracene	0.0038	0.2	mg/kg	14/15	0.093	mg/kg	95% UCL
2,3,7,8-TCDD TEQ	0.0000014	0.000	mg/kg	6/6	0.000038	mg/kg	95% UCL
Arsenic	9.8	510	mg/kg	19/19	194	mg/kg	95% UCL
Lead	23.5	914	mg/kg	19/19	179	mg/kg	Arithmetic mean

Key
mg/kg: milligrams per kilogram
95% UCL: 95% Upper Confidence Limit
Mean: Arithmetic Mean Concentration
Maximum: Maximum Detected Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil(i.e., the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that dioxins, PAHs, arsenic, hexavalent chromium, and lead are all detected frequently in soil at the 27 and 55 Clinton Avenue area of the site. Dioxins, PAHs, arsenic, and lead are all detected frequently in west riverbank soil (formerly referred to as sediment). The 95%UCL on the arithmetic mean was used as the exposure point concentration for most of the COCs, except lead at both areas and benzo(a)pyrene and arsenic at 15 Pleasant Street. Lead models use arithmetic mean concentrations. Due to the limited amount of sample data available for benzo(a)pyrene and arsenic at 15 Pleasant Street, the maximum concentrations were used as the default exposure point concentrations.

Table G-5
SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION - Aggregate Soil
CREESE & COOK TANNERY (FORMER) - WEST STUDY AREA
DANVERS, MASSACHUSETTS

Contaminant	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	Exposure Point Concentration (EPC) Value	Units	Statistic
27 Clinton Avenue							
Benzo(a)pyrene	0.00058	0.97	mg/kg	12/16	0.43	mg/kg	95% UCL
Benzo(b)fluoranthene	0.00089	2.2	mg/kg	13/16	1.0	mg/kg	95% UCL
Arsenic	5.3	41.1	mg/kg	16/16	20	mg/kg	95% UCL
Chromium-Hexavalent	1.3	2.1	mg/kg	3/3	2.1	mg/kg	Maximum
55 Clinton Avenue							
Benzo(a)anthracene	0.00036	5.6	mg/kg	137/231	0.27	mg/kg	95% UCL
Benzo(a)pyrene	0.00035	4.5	mg/kg	129/231	0.28	mg/kg	95% UCL
Benzo(b)fluoranthene	0.00055	5.8	mg/kg	131/231	0.35	mg/kg	95% UCL
Dibenz(a,h)anthracene	0.0023	0.69	mg/kg	48/231	0.025	mg/kg	95% UCL
Indeno(1,2,3-cd)pyrene	0.00041	1.6	mg/kg	119/231	0.080	mg/kg	95% UCL
2,3,7,8-TCDD TEQ	0.0000011	0.013	mg/kg	55/55	0.0016	mg/kg	95% UCL
Arsenic	3.0	14400	mg/kg	253/254	360	mg/kg	95% UCL
Chromium-Hexavalent	0.47	17	mg/kg	44/67	4.6	mg/kg	95% UCL
Lead	3.6	3960	mg/kg	254/254	54	mg/kg	Arithmetic mean

Key
mg/kg: milligrams per kilogram
95% UCL: 95% Upper Confidence Limit
Mean: Arithmetic Mean Concentration
Maximum: Maximum Detected Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil (*i.e.* , the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that PAHs, arsenic, and hexavalent chromium are all detected frequently in soil at the 27 Clinton Avenue area of the site. The table indicates that dioxins, PAHs, arsenic, hexavalent chromium, and lead are all detected frequently in soil at the 55 Clinton Avenue area of the site. The 95%UCL on the arithmetic mean was used as the exposure point concentration for most of the COCs, except lead at both areas and hexavalent chromium at 27 Clinton Avenue. Lead models use arithmetic mean concentrations. Due to the limited amount of sample data available for hexavalent chromium at 27 Clinton Avenue, the maximum concentrations were used as the default exposure point concentrations.

Table G-6
SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION
20 Cheever Street - Aggregate Soil
Creese Cook Tannery (Former)
Danvers, Massachusetts

Contaminant	Minimum Detected Concentration	Maximum Detected Concentration	Units	Frequency of Detection	Exposure Point Concentration (EPC)		
					Value	Units	Statistic
Benzo(a)anthracene	0.0044	5.6	mg/kg	24/52	0.79	mg/kg	95% UCL
Benzo(a)pyrene	0.0076	4.7	mg/kg	22/52	0.64	mg/kg	95% UCL
Benzo(b)fluoranthene	0.0046	6.7	mg/kg	24/52	0.83	mg/kg	95% UCL
Dibenz(a,h)anthracene	0.0085	0.84	mg/kg	20/52	0.048	mg/kg	95% UCL
Indeno(1,2,3-cd)pyrene	0.027	2.6	mg/kg	20/52	0.30	mg/kg	95% UCL
Dioxin/Furan - Toxic Equivalent	0.000000254	0.0000235	mg/kg	9/9	0.000024	mg/kg	Maximum
Arsenic	5.2	522	mg/kg	55/55	86	mg/kg	95% UCL
Chromium-Hexavalent	1.2	60	mg/kg	8/9	60	mg/kg	Maximum
Lead	10.2	24000	mg/kg	52/52	868	mg/kg	Arithmetic mean

Key
mg/kg: milligrams per kilogram
95% UCL: 95% Upper Confidence Limit
Mean: Arithmetic Mean Concentration
Maximum: Maximum Detected Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil (*i.e.* , the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that dioxins, PAHs, arsenic, hexavalent chromium, and lead are all detected frequently in soil at the 20 Cheever Street area of the site. The 95%UCL on the arithmetic mean was used as the exposure point concentration for most of the COCs, except lead, dioxins, and hexavalent chromium. Lead models use arithmetic mean concentrations. Due to the limited amount of sample data available for dioxins and hexavalent chromium, the maximum concentrations were used as the default exposure point concentrations.

Table G-7

SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION

MBTA Aggregate Soil

Creese Cook Tannery (Former)

Danvers, Massachusetts

Contaminant	Minimum Detected Concentration	Maximum Detected Concentration	Units	Frequency of Detection	Exposure Point Concentration (EPC)		
					Value	Units	Statistic
Benzo(a)anthracene	0.0038	9.4	mg/kg	55/79	1.8	mg/kg	95% UCL
Benzo(a)pyrene	0.0053	9.3	mg/kg	48/79	1.3	mg/kg	95% UCL
Benzo(b)fluoranthene	0.0049	22	mg/kg	51/79	2.5	mg/kg	95% UCL
Dibenz(a,h)anthracene	0.0016	1.8	mg/kg	38/79	0.26	mg/kg	95% UCL
Indeno(1,2,3-cd)pyrene	0.0035	7.4	mg/kg	44/79	0.88	mg/kg	95% UCL
Dioxin/Furan - Toxic Equivalent	0.00000209	0.00134	mg/kg	20/20	0.000336	mg/kg	95% UCL
Arsenic	4	269	mg/kg	90/90	55	mg/kg	95% UCL
Chromium-Hexavalent	0.68	580	mg/kg	17/18	237	mg/kg	95% UCL
Lead	7.4	3100	mg/kg	81/81	185	mg/kg	Arithmetic mean

Key

mg/kg: milligrams per kilogram

95% UCL: 95% Upper Confidence Limit

Mean: Arithmetic Mean Concentration

Maximum: Maximum Detected Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil (*i.e.*, the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that dioxins, PAHs, arsenic, hexavalent chromium, and lead are all detected frequently in soil at the MBTA Properties area of the site. The 95%UCL on the arithmetic mean was used as the exposure point concentration for most of the COCs, except lead. Lead models use arithmetic mean concentrations.

Table G-8
SUMMARY OF CHEMICAL OF CONCERN AND MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION
15 Pleasant Street - Aggregate Soil
Creese Cook Tannery (Former)
Danvers, Massachusetts

Contaminant	Minimum Detected Concentration	Maximum Detected Concentration	Units	Frequency of Detection	Exposure Point Concentration (EPC) Value	Units	Statistic
Benzo(a)pyrene	0.018	0.45	mg/kg	9/9	0.45	mg/kg	Maximum
Dioxin/Furan - Toxic Equivalent	0.00000505	0.0000051	mg/kg	1/1	0.0000051	mg/kg	Maximum
Arsenic	8.9	95	mg/kg	9/9	95	mg/kg	Maximum
Lead	43.6	2410	mg/kg	9/9	500	mg/kg	Arithmetic mean

Key
mg/kg: milligrams per kilogram
95% UCL: 95% Upper Confidence Limit
Mean: Arithmetic Mean Concentration
Maximum: Maximum Detected Concentration

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil (*i.e.* , the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that dioxins, benzo(a)pyrene, arsenic, and lead were detected frequently in every sample analyzed from this area of the site. The maximum detected concentration was used as the exposure point concentration for most of the COCs, except lead, because of the small number of samples. Lead models use arithmetic mean concentrations.

TABLE G-9
CANCER TOXICITY DATA -- ORAL/DERMAL
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Contaminant of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (1)		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Dates (2)
Dioxin/Furan - Toxic Equivalent	1.30E+05	$(mg/kg\text{-}day)^{-1}$	1.0	1.30E+05	$(mg/kg\text{-}day)^{-1}$	Assessment underway	CalEPA	2017 RSL Table
Benzo(a)anthracene	1.00E-01	$(mg/kg\text{-}day)^{-1}$	1.0	1.00E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	7/12/2017
Benzo(a)pyrene	1.00E+00	$(mg/kg\text{-}day)^{-1}$	1.0	1.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	7/12/2017
Benzo(b)fluoranthene	1.00E-01	$(mg/kg\text{-}day)^{-1}$	1.0	1.00E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	7/12/2017
Dibenz(a,h)anthracene	1.00E+00	$(mg/kg\text{-}day)^{-1}$	1.0	1.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	7/12/2017
Indeno(1,2,3-cd)pyrene	1.00E-01	$(mg/kg\text{-}day)^{-1}$	1.0	1.00E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	7/12/2017
Arsenic	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.0	1.50E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	7/12/2017
Chromium-Hexavalent	5.00E-01	$(mg/kg\text{-}day)^{-1}$	0.025	2.00E+01	$(mg/kg\text{-}day)^{-1}$	D	CalEPA	2017 RSL Table

(1) Source: RAGS Part E Guidance.

(2) Represents date source was searched.

Definitions: CalEPA = California Environmental Protection Agency.

IRIS = Integrated Risk Information System.

NA = Not available.

A - Human carcinogen.

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

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

C - Possible human carcinogen.

D - Not classifiable as a human carcinogen.

This table provides carcinogenic risk information for ingestion and dermal pathways which is relevant to the contaminants of concern in soil. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in the assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route. However, except for hexavalent chromium, adjustment is not necessary for the chemicals evaluated at this site. Therefore, the same values presented for the ingestion slope factors were used as the dermal carcinogenic slope factors for these contaminants.
Each of the COCs are also considered carcinogenic via the inhalation route. See Table XXX.

TABLE G-10
CANCER TOXICITY DATA -- INHALATION
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Contaminant of Potential Concern	Unit Risk		Weight of Evidence/ Cancer Guideline Description	Unit Risk: Inhalation CSF	
	Value	Units		Source(s)	Dates (1)
Dioxin/Furan - Toxic Equivalent	3.80E+01	$(\mu g/m^3)^{-1}$	Assessment underway	CalEPA	2017 RSL Table
Benzo(a)anthracene	6.00E-05	$(\mu g/m^3)^{-1}$	B2	IRIS	7/12/2017
Benzo(a)pyrene	6.00E-04	$(\mu g/m^3)^{-1}$	B2	IRIS	7/12/2017
Benzo(b)fluoranthene	6.00E-05	$(\mu g/m^3)^{-1}$	B2	IRIS	7/12/2017
Dibenz(a,h)anthracene	6.00E-04	$(\mu g/m^3)^{-1}$	B2	IRIS	7/12/2017
Indeno(1,2,3-cd)pyrene	6.00E-05	$(\mu g/m^3)^{-1}$	B2	IRIS	7/12/2017
Arsenic	4.30E-03	$(\mu g/m^3)^{-1}$	A	IRIS	7/12/2017
Chromium-Hexavalent	8.40E-02	$(\mu g/m^3)^{-1}$	A	IRIS	7/12/2017

(1) Represents date source was searched.

Definitions: CalEPA = California Environmental Protection Agency.
IRIS = Integrated Risk Information System.
NA = Not available.
PPRTV = Provisional Peer-Reviewed Toxicity Value.
A - Human carcinogen.
B1 - Probable human carcinogen - indicates that limited human data are available.
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans.
C - Possible human carcinogen.
D - Not classifiable as a human carcinogen.

This table provides carcinogenic risk information for inhalation pathway which is relevant to the contaminants of concern in soil.

TABLE G-11
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
CREESE & COOK TANNERY (FORMER)
DANVERS, MASSACHUSETTS

Contaminant of Potential Concern	Chronic/ Subchronic	Oral RfD		Absorbed RfD for Dermal (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD: Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Dates (2)
Dioxin/Furan - Toxic Equivalent	Chronic	7.00E-10	mg/kg-day	7.00E-10	mg/kg-day	Reproductive	30	IRIS	7/12/2017
Benzo(a)anthracene	—	NA	—	NA	—	—	—	—	—
Benzo(a)pyrene	Chronic	3.00E-04	mg/kg-day	3.00E-04	mg/kg-day	Developmental	300	IRIS	7/12/2017
Benzo(b)fluoranthene	—	NA	—	NA	—	—	—	—	—
Dibenz(a,h)anthracene	—	NA	—	NA	—	—	—	—	—
Indeno(1,2,3-cd)pyrene	—	NA	—	NA	—	—	—	—	—
Arsenic	Chronic	3.00E-04	mg/kg-day	3.00E-04	mg/kg-day	Skin, Cardiovascular system	3	IRIS	7/12/2017
Chromium-Hexavalent	Chronic	3.00E-03	mg/kg-day	7.50E-05	mg/kg-day	None Observed	900	IRIS	7/12/2017

(1) Source: RAGS Part E Guidance.

(2) Represents date source was searched.

Definitions: IRIS = Integrated Risk Information System.

NA = Not available.

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil. Four of the COCs have toxicity data indicating their potential for adverse non-carcinogenic health effects in humans. The chronic toxicity data available for dioxins, benzo(a)pyrene, arsenic, and chromium VI for oral exposures, have been used to develop oral reference doses (RfDs). The available toxicity data indicate that both dioxins and benzoa)pyrene primarily affect the developmental system and arsemic primarily affects the skin and cardiovascular system. Reference doses are not available for benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, or indeno(1,2,3-cd)pyrene, neither are dermal RfDs or inhalation RfCs for any of these contaminants. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from the oral RfDs applying an adjustment factor as appropriate. However, for dioxins, benzo(a)pyrene, and arsenic no adjustment is necessary, and the oral RfDs discussed were used as the dermal RfDs for these contaminants.

TABLE G-12
NON-CANCER TOXICITY DATA -- INHALATION
CREESE & COOK TANNERY (FORMER)
DANVERS, MASSACHUSETTS

Contaminant of Potential Concern	Chronic/ Subchronic	Inhalation RfC Value	Inhalation RfC Units	Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC: Target Organ(s) Source(s)	RfC: Target Organ(s) Dates (1)
Dioxin/Furan - Toxic Equivalent	Chronic	4.00E-08	mg/m^3	Liver, Reproductive system, Developmental, Endocrine system, Respiratory system, Blood	10,000	CalEPA	2017 RSL Table
Benzo(a)anthracene	---	NA	---	---	---	---	---
Benzo(a)pyrene	Chronic	2.00E-06	---	Developmental	3,000	IRIS	7/12/2017
Benzo(b)fluoranthene	---	NA	---	---	---	---	---
Dibenz(a,h)anthracene	---	NA	---	---	---	---	---
Indeno(1,2,3-cd)pyrene	---	NA	---	---	---	---	---
Arsenic	Chronic	1.50E-05	mg/m^3	Developmental, Cardiovascular system, Nervous system, Lung, Skin	30	CalEPA	2017 RSL Table
Chromium-Hexavalent	Chronic	1.00E-04	mg/m^3	Respiratory System	300	IRIS	7/12/2017

(1) Represents date source was searched.

Definitions: CalEPA = California Environmental Protection Agency.
HEAST = Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information System.
NA = Not available.
RSL = Regional Screening Level.

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil. Four of the COCs have toxicity data indicating their potential for adverse non-carcinogenic health effects in humans via the inhalation route. The available toxicity data indicate that both dioxins and benzo(a)pyrene primarily affect the developmental system; dioxins also affect the liver, reproductive system, endocrine system, respiratory system, and blood; arsenic primarily affects the developmental system, cardiovascular system, nervous system, lung, and skin; and hexavalent chromium affects the respiratory system. Reference concentrations (RfCs) are not available for benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, or indeno(1,2,3-cd)pyrene.

TABLE G-13 RME
RISK CHARACTERIZATION SUMMARY - CARCINOGENIC EFFECTS FOR AGE-ADJUSTED RESIDENT EXPOSURE TO SURFACE SOIL
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	33 Water & 45 Water Sts.	Dioxin/Furan - Toxic Equivalent	4.0E-05	1.5E-06	3.4E-06	4.4E-05
			Benzo(a)anthracene	4.6E-06	4.4E-11	1.5E-06	6.1E-06
			Benzo(a)pyrene	3.2E-05	3.1E-10	1.1E-05	4.2E-05
			Benzo(b)fluoranthene	4.2E-06	4.1E-11	1.4E-06	5.7E-06
			Dibenz(a,h)anthracene	8.5E-06	8.2E-11	2.8E-06	1.1E-05
			Indeno(1,2,3-cd)pyrene	2.9E-06	2.7E-11	9.5E-07	3.8E-06
			Arsenic	5.1E-05	6.5E-09	7.2E-06	5.8E-05
			Chromium-Hexavalent	8.5E-05	2.3E-07	—	8.5E-05
						Total* Risk Across All Media - 33 Water & 45 Water Sts.	2.6E-04

*Total Risk includes risks from all COPCs, not just the COCs presented here.

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a current resident exposure to surface soil, as well as the toxicity of the COCs (dioxins, arsenic, hexavalent chromium, and several carcinogenic PAHs). The total risk from direct exposure to contaminated soil at this site to a current resident is estimated to be 2.6 x 10^{-4}. The COCs contributing most to this risk level are dioxins, arsenic, hexavalent chromium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

TABLE G-14 RME
RISK CHARACTERIZATION SUMMARY - NON-CARCINOGENIC AND THRESHOLD EFFECTS FOR CHILD RESIDENT EXPOSURE TO SURFACE SOIL
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	33 Water & 45 Water Sts.	Dioxin/Furan - Toxic Equivalent	Reproductive	3.9	0.0027	0.28	4.2
			Arsenic	Dermal, Cardiovascular	1.0	0.0003	0.12	1.1
				Total* Hazard Across All Media - 33 Water & 45 Water Sts.				7.0
				Total* Reproductive HI Across All Media				4.5
				Total* Dermal HI Across All Media				1.1
				Total* Cardiovascular System HI Across All Media				1.1

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 4.5, dermal HI of 1.1, and cardiovascular HI of 1.1 indicate that the potential for adverse noncancer effects could occur from child resident exposure to contaminated soil containing dioxins and arsenic.

TABLE G-15 RME

RISK CHARACTERIZATION SUMMARY - CARCINOGENIC EFFECTS FOR AGE-ADJUSTED RESIDENT EXPOSURE TO AGGREGATE SOI

CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA

DANVERS, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Aggregate Soil	33 Water & 45 Water Sts.	Dioxin/Furan - Toxic Equivalent	2.9E-05	1.1E-06	2.5E-06	3.2E-05
			Benzo(a)anthracene	1.1E-05	1.1E-10	3.8E-06	1.5E-05
			Benzo(a)pyrene	9.8E-05	9.5E-10	3.3E-05	1.3E-04
			Benzo(b)fluoranthene	1.3E-05	1.3E-10	4.4E-06	1.8E-05
			Dibenz(a,h)anthracene	1.5E-05	1.4E-10	4.9E-06	2.0E-05
			Indeno(1,2,3-cd)pyrene	5.1E-06	4.9E-11	1.7E-06	6.8E-06
			Arsenic	9.2E-05	1.2E-08	1.3E-05	1.0E-04
			Chromium-Hexavalent	6.4E-05	1.7E-07	—	6.4E-05
					Total* Risk Across All Media - 33 Water & 45 Water Sts.		3.9E-04

*Total Risk includes risks from all COPCs, not just the COCs presented here.

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future resident exposure to soil, as well as the toxicity of the COCs (dioxins, arsenic, hexavalent chromium, and several carcinogenic PAHs). The total risk from direct exposure to contaminated soil at this site to a future resident is estimated to be 3.9×10^{-4}. The COCs contributing most to this risk level are dioxins, arsenic, hexavalent chromium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 4 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

TABLE G-16 RME
RISK CHARACTERIZATION SUMMARY - NON-CARCINOGENIC AND THRESHOLD EFFECTS FOR CHILD RESIDENT EXPOSURE TO AGGREGATE SOIL
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Aggregate Soil	33 Water & 45 Water Sts.	Dioxin/Furan - Toxic Equivalent	Reproductive	2.9	0.0019	0.20	3.1
			Arsenic	Dermal, Cardiovascular	1.8	0.0005	0.21	2.0
							Total* Hazard Across All Media - 33 Water & 45 Water Sts.	7.7

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

Total* Reproductive HI Across All Media	3.1
Total* Dermal HI Across All Media	2.0
Total* Cardiovascular System HI Across All Media	2.0

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 3.1, dermal HI of 2, and cardiovascular HI of 2 indicate that the potential for adverse noncancer effects could occur from future child resident exposure to contaminated soil containing dioxins and arsenic.

TABLE G-17 RME

SK CHARACTERIZATION SUMMARY - CARCINOGENIC EFFECTS AND NON-CARCINOGENIC AND THRESHOLD EFFECTS FOR CHILD RECREATIONAL VISITOR EXPOSURE TO SURFACE S(

CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA

DANVERS, MASSACHUSETTS

Scenario Timeframe: Current
Receptor Population: Recreational Visitor
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	MBTA	Dioxin/Furan - Toxic Equivalent	1.3E-05	1.2E-08	9.2E-07	1.4E-05	Reproductive	1.7	0.000093	0.12	1.8
			Benzo(a)pyrene	3.6E-06	1.4E-12	1.1E-06	4.7E-06					
			Dibenz(a,h)anthracene	9.6E-07	3.8E-13	3.0E-07	1.3E-06					
			Arsenic	1.6E-05	5.2E-11	1.9E-06	1.8E-05					
			Chromium-Hexavalent	2.3E-04	2.6E-08	—	2.3E-04					
						Total* Risk MBTA	2.7E-04				Total* Hazard Index MBTA	3.1
											Total* Reproductive HI Across All Media	1.8

*Total Risk, total HI, and total organ-specific HIs include risks or hazard quotients from all COPCs, not just the COCs presented here.

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a recreational visitor exposure to surface soil, as well as the toxicity of the COCs (dioxins, arsenic, hexavalent chromium, benzo(a)pyrene, and dibenz(a,h)anthracene). The total risk from direct exposure to contaminated soil at this site to a future resident is estimated to be 2.7 x 10-4. The COCs contributing most to this risk level are dioxins, arsenic, hexavalent chromium, benzo(a)pyrene, and dibenz(a,h)anthracene in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

This table also provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 1.8 indicates that the potential for adverse noncancer effects could occur from child recreational visitor exposure to contaminated soil containing dioxins.

TABLE G-18 RME
Risk Characterization Summary – Non-Carcinogenic and Threshold Effects for Child Recreational Visitor Exposure to Riverbank Soil
CREESE & COOK TANNERY (FORMER) - EAST STUDY AREA
DANVERS, MASSACHUSETTS

Scenario Timeframe: Current
Receptor Population: Recreational Visitor
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Riverbank Soil	East Bank of Crane River	Dioxin/Furan - Toxic Equivalent	Reproductive	2.3	—	—	2.5
			Arsenic	Dermal, Cardiovascular	1.4	—	—	1.5
				Riverbank Soil Total* HI =				4.4

Total* Reproductive HI Across All Media	2.5
Total* Dermal HI Across All Media	1.5
Total* Cardiovascular HI Across All Media	1.5

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 2.5, dermal HI of 1.5, and cardiovascular HI of 1.5 indicate that the potential for adverse noncancer effects could occur from child recreational visitor exposure to contaminated soil containing dioxins and arsenic.

Table G-19

Risk Characterization Summary – Carcinogenic Effects for Current Homeless Adult Trespasser Exposure to Surface Soil - 27 and 55 Clinton Avenue (Combined)

Contaminant of Potential Concern (COPC)	Cancer Risks				
	Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	Total
Clinton Avenue					
2,3,7,8-TCDD TEQ	2.2E-04	8.5E-06	NA	8.1E-12	2.3E-04
Arsenic	5.8E-05	3.7E-06	7.3E-09	NA	6.2E-05
Chromium-Hexavalent	1.0E-06	NA	4.5E-09	NA	1.0E-06
				Clinton Avenue Total* =	2.9E-04

NA = Not available

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a homeless adult trespasser exposure to soil, as well as the toxicity of the COCs (dioxins, arsenic, and hexavalent chromium). The total risk from direct exposure to contaminated surface soil at this site to a current homeless adult trespasser is estimated to be 2.9×10^{-4}. The COCs contributing most to this risk level are dioxins, arsenic, and hexavalent chromium in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

*Total Risk includes risks from all COPCs, not just the COCs presented here.

Table G-20
Risk Characterization Summary – Non-Carcinogenic and Threshold Effects for Current Homeless Adult Trespasser Exposure to Surface Soil - 27 and 55 Clinton Avenue (Combined)

Contaminant of Potential Concern (COPC)	Primary Target Organ	Hazard Quotients Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	Hazard Index
Clinton Avenue						
2,3,7,8-TCDD TEQ	Reproductive	17	0.66	NA	0.000037	18
Arsenic	Cardiovascular, Dermal	1.5	0.058	0.00079	NA	1.6
					Clinton Avenue Total* =	20
					Reproductive Hazard Index* =	18
					Cardiovascular Hazard Index* =	1.6
					Dermal Hazard Index* =	1.6

NA = Not available

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated eproductive HI of 18, dermal HI of 1.6, and cardiovascular HI of 1.6 indicate that the potential for adverse noncancer effects could occur from homeless adult trespasser exposure to contaminated soil containing dioxins and arsenic.

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

Table G-21
Risk Characterization Summary – Non-Carcinogenic and Threshold Effects for Current Adolescent Trespasser
Exposure to Surface Soil - 27 and 55 Clinton Avenue (Combined)

Contaminant of Potential Concern (COPC)	Primary Target Organ	Hazard Quotients				Hazard Index
		Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	
Clinton Avenue						
2,3,7,8-TCDD TEQ	Reproductive	2.1	0.31	NA	0.0000014	2.4
					Clinton Avenue Total* =	2.6
					Reproductive Hazard Index* =	2.4

NA = Not available

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 2.4 indicates that the potential for adverse noncancer effects could occur from adolescent trespasser exposure to contaminated soil containing dioxins.

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

Table G-22
Risk Characterization Summary – Carcinogenic Effects for Future Age-Adjusted Residents
Exposure to Aggregate Soil - 55 Clinton Avenue

Contaminant of Potential Concern (COPC)	Cancer Risks				
	Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	Total
55 Clinton Avenue					
Benzo(a)pyrene	1.8E-06	6.0E-07	1.7E-11	NA	2.4E-06
2,3,7,8-TCDD TEQ	3.0E-04	2.6E-05	NA	1.1E-08	3.3E-04
Arsenic	4.7E-04	6.6E-05	5.9E-08	NA	5.3E-04
Chromium-Hexavalent	1.5E-05	NA	4.1E-08	NA	1.5E-05
				55 Clinton Avenue Total* =	8.8E-04

NA = Not available

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future resident exposure to soil, as well as the toxicity of the COCs (dioxins, arsenic, hexavalent chromium, and benzo(a)pyrene). The total risk from direct exposure to contaminated soil at this site to a future resident is estimated to be 8.8 x 10^{-4}. The COCs contributing most to this risk level are dioxins, arsenic, hexavalent chromium, and benzo(a)pyrene in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 9 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

*Total Risk includes risks from all COPCs, not just the COCs presented here.

Table G-23
Risk Characterization Summary – Non-Carcinogenic and Threshold Effects for Future Child Residents Exposure to Aggregate Soil - 55 Clinton Avenue

Contaminant of Potential Concern (COPC)	Primary Target Organ	Hazard Quotients: Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	Hazard Index
55 Clinton Avenue						
2,3,7,8-TCDD TEQ	Reproductive	30	2.1	0.0000042	0.000020	32
Arsenic	Cardiovascular, Dermal	9.2	1.1	0.0025	NA	10
					55 Clinton Avenue Total* =	43
					Reproductive Hazard Index* =	32
					Cardiovascular Hazard Index* =	10
					Dermal Hazard Index* =	10

NA = Not available

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 32, dermal HI of 10, and cardiovascular HI of 10 indicate that the potential for adverse noncancer effects could occur from future resident exposure to contaminated soil containing dioxins and arsenic.

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

Table G-24
Risk Characterization Summary – Non-Carcinogenic and Threshold Effects for Future Adult Resident Exposure to Aggregate Soil - 55 Clinton Avenue

Contaminant of Potential Concern (COPC)	Primary Target Organ	Hazard Quotients				Hazard Index
		Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	
55 Clinton Avenue						
2,3,7,8-TCDD TEQ	Reproductive	2.8	0.35	0.0000042	0.000020	3.1
Arsenic	Cardiovascular, Dermal	0.86	0.18	0.0025	NA	1.0
					55 Clinton Avenue Total* =	4.3
					Reproductive Hazard Index* =	3.1
					Cardiovascular Hazard Index* =	1
					Dermal Hazard Index* =	1

NA = Not available

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 3.1, dermal HI of 1.0, and cardiovascular HI of 1.0 indicate that the potential for adverse noncancer effects could occur from future residents' exposure to contaminated soil containing dioxins and arsenic.

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

Table G-25
Risk Characterization Summary – Carcinogenic Effects for Future Commercial/Industrial Worker Exposure to Aggregate Soil - 55 Clinton Avenue

Contaminant of Potential Concern (COPC)	Cancer Risks				
	Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	Total
55 Clinton Avenue					
2,3,7,8-TCDD TEQ	5.8E-05	7.2E-06	NA	2.3E-09	6.5E-05
Arsenic	8.9E-05	1.9E-05	1.2E-08	NA	1.1E-04
				55 Clinton Avenue Total* =	1.7E-04

NA = Not available

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future commercial/industrial worker exposure to soil, as well as the toxicity of the COCs (dioxins and arsenic). The total risk from direct exposure to contaminated soil at this site to a future commercial/industrial worker is estimated to be 1.7×10^{-4}. The COCs contributing most to this risk level are dioxins and arsenic in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 2 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

*Total Risk includes risks from all COPCs, not just the COCs presented here.

Table G-26
Risk Characterization Summary – Non-Carcinogenic and Threshold Effects for Future Commercial/Industrial Worker Exposure to Aggregate Soil - 55 Clinton Avenue

Contaminant of Potential Concern (COPC)	Primary Target Organ	Hazard Quotients				Hazard Index
		Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	
55 Clinton Avenue						
2,3,7,8-TCDD TEQ	Reproductive	1.8	0.22	0.00000089	0.000020	2.0
					55 Clinton Avenue Total* =	2.8
					Reproductive Hazard Index* =	2.0

NA = Not available

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 2.0 indicates that the potential for adverse noncancer effects could occur from future commercial/industrial worker exposure to contaminated soil containing dioxins.

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

Table G-27
Risk Characterization Summary – Non-Carcinogenic and Threshold Effects for Future Construction Worker Exposure to Aggregate Soil - 55 Clinton Avenue

Contaminant of Potential Concern (COPC)	Primary Target Organ	Hazard Quotients				Hazard Index
		Soil Ingestion	Dermal Contact	Inhalation (Particulate)	Inhalation (VOCs)	
55 Clinton Avenue						
2,3,7,8-TCDD TEQ	Reproductive	3.4	0.13	NA	0.000020	3.5
Arsenic	Cardiovascular, Dermal	1.1	0.067	2.1	NA	3.2
					55 Clinton Avenue Total* =	7.8
					Reproductive Hazard Index* =	3.5
					Cardiovascular Hazard Index* =	3.2
					Dermal Hazard Index* =	3.2

NA = Not applicable

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 3.5, dermal HI of 3.2, and cardiovascular HI of 3.2 indicate that the potential for adverse noncancer effects could occur from construction worker exposure to contaminated soil containing dioxins and arsenic.

*Total HI and total organ-specific HIs include hazard quotients from all COPCs, not just the COCs presented here.

Table G-28
RISK CHARACTERIZATION SUMMARY -
CARCINOGENIC EFFECTS AND NON-CARCINOGENIC AND THRESHOLD EFFECTS FOR RESIDENT EXPOSURE TO AGGREGATE SOIL - 20 CHEEVER STREET
Creese and Cook Tannery (Former)
Danvers, Massachusetts

Contaminant	Primary Target Organ	Hazard Quotient/Index	Cancer Risk
Benzo(a)pyrene			5.8E-06
Dioxin/Furan - Toxic Equivalent			4.9E-06
Arsenic	Cardiovascular, Dermal	2.5	1.3E-04
Chromium-Hexavalent			2.0E-04
	20 Cheever Street Totals*	11	3.4E-04

Total* Cardiovascular System HI	2.5
Total* Dermal HI	2.6

This table provides hazard quotients (HQs) for each contaminant and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated dermal HI of 2.6 and cardiovascular HI of 2.5 indicate that the potential for adverse noncancer effects could occur from residential exposure to contaminated soil containing arsenic.

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future residential exposure to soil, as well as the toxicity of the COCs (dioxins, PAHs, arsenic, and hexavalent chromium). The total risk from direct exposure to contaminated soil at this site to a future resident is estimated to be 3.4 x 10^{-4}. The COCs contributing most to this risk level are arsenic and hexavalent chromium in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

*Total Risk, total HI, and total organ-specific HIs include risks or hazard quotients from all COPCs, not just the COCs presented here.

Table G-29
RISK CHARACTERIZATION SUMMARY -
CARCINOGENIC EFFECTS AND NON-CARCINOGENIC AND THRESHOLD EFFECTS FOR RESIDENT EXPOSURE TO AGGREGATE SOIL - MBTA
Creese and Cook Tannery (Former)
Danvers, Massachusetts

Contaminant	Primary Target Organ	Hazard Quotient/Index	Cancer Risk
Benzo(a)anthracene			1.7E-06
Benzo(a)pyrene			1.2E-05
Benzo(b)fluoranthene			2.3E-06
Dibenz(a,h)anthracene			2.4E-06
Dioxin/Furan - Toxic Equivalent	Reproductive	6.6	7.0E-05
Arsenic	Cardiovascular, Dermal	1.6	8.0E-05
Chromium-Hexavalent	None	1.0	7.9E-04
	MBTA Totals*	11	9.6E-04

Total* Cardiovascular System HI	1.6
Total* Dermal HI	1.7
Total* Reproductive System HI	6.6

This table provides hazard quotients (HQs) for each contaminant and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated reproductive HI of 6.6, dermal HI of 1.7, and cardiovascular HI of 1.6 indicate that the potential for adverse noncancer effects could occur from residential exposure to contaminated soil containing arsenic dioxins, and hexavalent chromium.

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future residential exposure to soil, as well as the toxicity of the COCs (dioxins, PAHs, arsenic, and hexavalent chromium). The total risk from direct exposure to contaminated soil at this site to a future resident is estimated to be 9.6×10^{-4}. The COC contributing most to this risk level is hexavalent chromium in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 1,000 of developing cancer as a result of site-related exposure to the COCs.

*Total Risk, total HI, and total organ-specific HIs include risks or hazard quotients from all COPCs, not just the COCs presented here.

Table G-30
RISK CHARACTERIZATION SUMMARY -
CARCINOGENIC EFFECTS AND NON-CARCINOGENIC AND THRESHOLD EFFECTS FOR RESIDENT EXPOSURE TO AGGREGATE SOIL - 15 PLEASANT STREET
Creese and Cook Tannery (Former)
Danvers, Massachusetts

Contaminant	Primary Target Organ	Hazard Quotient/Index	Cancer Risk
Benzo(a)pyrene			4.1E-06
Dioxin/Furan - Toxic Equivalent			1.1E-06
Arsenic	Cardiovascular, Dermal	2.7	1.4E-04
	Pleasant Street Totals*	13	1.4E-04

Total* Cardiovascular System HI	2.7
Total* Dermal System HI	2.8

This table provides hazard quotients (HQs) for each contaminant and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated dermal HI of 2.8 and cardiovascular HI of 2.7 indicate that the potential for adverse noncancer effects could occur from residential exposure to contaminated soil containing arsenic.

This table provides cancer risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future residential exposure to soil, as well as the toxicity of the COCs (dioxins, PAHs, and arsenic). The total risk from direct exposure to contaminated soil at this site to a future resident is estimated to be 1.4 x 10^{-4}, which is within the EPA target risk range.

*Total Risk, total HI, and total organ-specific HIs include risks or hazard quotients from all COPCs, not just the COCs presented here.

Table G-31
RISK CHARACTERIZATION SUMMARY -
CARCINOGENIC EFFECTS AND NON-CARCINOGENIC AND THRESHOLD EFFECTS FOR RESIDENT EXPOSURE TO SURFACE SOIL -
WEST RIVERBANK
Creese and Cook Tannery (Former)
Danvers, Massachusetts

Contaminant	Primary Target Organ	Hazard Quotient/Index	Cancer Risk
Benzo(a)pyrene			3.5E-06
Dioxin/Furan - Toxic Equivalent			7.8E-06
Arsenic	Cardiovascular, Dermal	5.5	2.9E-04
	West Riverbank Totals*	9	3.0E-04

Total* Cardiovascular System HI	5.5
Total* Dermal HI	5.7

This table provides hazard quotients (HQs) for each contaminant and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated dermal HI of 5.7, and cardiovascular HI of 5.5 indicate that the potential for adverse noncancer effects could occur from residential exposure to contaminated soil containing arsenic.

This table provides cancer risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future residential exposure to soil, as well as the toxicity of the COCs (dioxins, PAHs, and arsenic). The total risk from direct exposure to contaminated soil at this site to a future resident is estimated to be 3.0×10^{-4}. The COC contributing most to this risk level is arsenic in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

*Total Risk, total HI, and total organ-specific HIs include risks or hazard quotients from all COPCs, not just the COCs presented here.

Ecological Risk Assessment Tables

SLERA-1
Samples Used in the ESA SLERA
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Matrix	Exposure Area	Location	Sample ID	Date	Type
SD	Bkgd	SD-03	SD-03 (0-1)	5/18/2011	N
SD	Bkgd	SD-04	SD-04 (0-0.5)	5/17/2011	N
SD	Bkgd	SD-50	SD-50 (0-0.75)	12/6/2011	N
SD	Bkgd	SD-51	SD-51 (0-0.75)	12/6/2011	N
SD	Salt Marsh Fringe	SD-101	SD101-101514X	10/14/2014	N
SD	Salt Marsh Fringe	SD-102	SD102-101414X	10/14/2014	N
SD	Salt Marsh Fringe	SD-103	SD103-101414X	10/14/2014	N
SD	Salt Marsh Fringe	SD-104	SD104-101414X	10/14/2014	N
SD	Salt Marsh Fringe	SD-105	SD105-101414X	10/14/2014	N
SD	Salt Marsh Fringe	SD-106	SD106-101414X	10/14/2014	N
SD	Salt Marsh Fringe	SD-107	SD107-101414X	10/14/2014	N
SD	Salt Marsh Fringe	SD-108	SD108-101414X	10/14/2014	N
SD	Salt Marsh Fringe	SD-109	SD109-101314X	10/13/2014	N
SD	Salt Marsh Fringe	SD-110	SD110-101314X	10/13/2014	N
SD	Salt Marsh Fringe	SD-111	SD111-101314D	10/13/2014	FD
SD	Salt Marsh Fringe	SD-111	SD111-101314X	10/13/2014	N
SD	Salt Marsh Fringe	SD-112	SD112-101314X	10/13/2014	N
SD	Salt Marsh Fringe	SD-113	SD113-101314X	10/13/2014	N
SD	Salt Marsh Fringe	SD-114	SD114-101314X	10/13/2014	N
SD	Salt Marsh Fringe	SD-115	SD115-101314X	10/13/2014	N
SD	Salt Marsh Fringe	SD-13	SD-13 (0.5-1)	5/16/2011	N
SD	Salt Marsh Fringe	SD-15	SD-15 (0.8-1.2)	5/16/2011	N
SD	Salt Marsh Fringe	SD-17	SD-17 (1-1.5)	5/16/2011	N
SD	Salt Marsh Fringe	SD-18	SD-18 (0-1)	5/16/2011	N
SD	Salt Marsh Fringe	SD-18	SD-30 (0-1)	5/16/2011	FD
SD	Salt Marsh Fringe	SD-19	SD-19 (0-1)	5/16/2011	N
SD	Salt Marsh Fringe	SD-20	SD-20 (0-1)	5/16/2011	N
SD	Salt Marsh Fringe	SD-60	SD-60 (0-1)	12/6/2011	N
SD	Salt Marsh Fringe	SD-61	SD-61 (0-0.75)	12/6/2011	N
SO	20 Cheever-SS	20CH-01	20CH-SS01-0001-061614X	6/16/2014	N
SO	20 Cheever-SS	20CH-02	20CH-SS02-0001-061714X	6/17/2014	N
SO	20 Cheever-SS	20CH-03	20CH-SS03-0001-061714X	6/17/2014	N
SO	20 Cheever-SS	20CH-04	20CH-SS04-0001-061714X	6/17/2014	N
SO	20 Cheever-SS	20CH-05	20CH-SS05-0001-061914X	6/19/2014	N
SO	20 Cheever-SS	20CH-06	20CH-SS06-0001-061914X	6/19/2014	N
SO	20 Cheever-SS	20CH-07	20CH-SS07-0001-061914X	6/19/2014	N
SO	20 Cheever-SS	20CH-08	20CH-SS08-0001-061914X	6/19/2014	N
SO	20 Cheever-SS	20CH-09	20CH-SS09-0001-061914X	6/19/2014	N
SO	20 Cheever-SS	20CH-10	20CH-SS10-0001-061814X	6/18/2014	N
SO	20 Cheever-SS	20CH-11	20CH-SS11-0001-062014D	6/20/2014	FD
SO	20 Cheever-SS	20CH-11	20CH-SS11-0001-062014X	6/20/2014	N
SO	20 Cheever-SS	20CH-12	20CH-SS12-0001-062014X	6/20/2014	N
SO	20 Cheever-SS	20CH-13	20CH-SS13-0001-061814X	6/18/2014	N
SO	20 Cheever-SS	20CH-14	20CH-SS14-0001-062414X	6/24/2014	N
SO	20 Cheever-SS	20CH-15	20CH-SS15-0001-061814X	6/18/2014	N
SO	20 Cheever-SS	20CH-16	20CH-SS16-0001-062614D	6/26/2014	FD
SO	20 Cheever-SS	20CH-16	20CH-SS16-0001-062614X	6/26/2014	N
SO	20 Cheever-SS	SS-14	SS-14A (0-2)	4/18/2011	N
SO	20 Cheever-SS	SS-14	SS-34A (0-2)	4/18/2011	FD
SO	20 Cheever-SS	SS-15	SS-15A (0-2)	4/22/2011	N
SO	20 Cheever-SS	SS-27	SS-27A (0-1)	4/20/2011	N
SO	20 Cheever-SS	SS-28	SS-28A (0.7-2)	4/22/2011	N
SO	MBTA-SS	ROW-01	ROW-SS01-0001-062314X	6/23/2014	N
SO	MBTA-SS	ROW-02	ROW-SS02-0001-062314D	6/23/2014	FD
SO	MBTA-SS	ROW-02	ROW-SS02-0001-062314D	6/23/2014	N
SO	MBTA-SS	ROW-02	ROW-SS02-0001-062314X	6/23/2014	N
SO	MBTA-SS	ROW-03	ROW-SS03-0001-062314X	6/23/2014	N
SO	MBTA-SS	ROW-04	ROW-SS04-0001-062314X	6/23/2014	N

SLERA-1
Samples Used in the ESA SLERA
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Matrix	Exposure Area	Location	Sample ID	Date	Type
SO	MBTA-SS	ROW-05	ROW-SS05-0001-062414X	6/24/2014	N
SO	MBTA-SS	ROW-06	ROW-SS06-0001-062414X	6/24/2014	N
SO	MBTA-SS	ROW-07	ROW-SS07-0001-062414X	6/24/2014	N
SO	MBTA-SS	ROW-08	ROW-SS08-0001-062414X	6/24/2014	N
SO	MBTA-SS	ROW-09	ROW-SS09-0001-062414X	6/25/2014	N
SO	MBTA-SS	ROW-10	ROW-SS10-0001-062014X	6/20/2014	N
SO	MBTA-SS	ROW-11	ROW-SS11-0001-062514D	6/25/2014	N
SO	MBTA-SS	ROW-11	ROW-SS11-0001-062514X	6/25/2014	N
SO	MBTA-SS	ROW-12	ROW-SS12-0001-062514X	6/25/2014	N
SO	MBTA-SS	ROW-13	ROW-SS13-0001-062014D	6/20/2014	FD
SO	MBTA-SS	ROW-13	ROW-SS13-0001-062014X	6/20/2014	N
SO	MBTA-SS	ROW-14	ROW-SS14-0001-061914X	6/19/2014	N
SO	MBTA-SS	ROW-15	ROW-SS15-0001-061914X	6/19/2014	N
SO	MBTA-SS	ROW-16	ROW-SS16-0001-061914D	6/19/2014	FD
SO	MBTA-SS	ROW-16	ROW-SS16-0001-061914X	6/19/2014	N
SO	MBTA-SS	ROW-17	ROW-SS17-0001-061814X	6/18/2014	N
SO	MBTA-SS	ROW-18	ROW-SS18-0001-061814X	6/18/2014	N
SO	MBTA-SS	ROW-19	ROW-SS19-0001-061114X	6/11/2014	N
SO	MBTA-SS	ROW-20	ROW-SS20-0001-061014X	6/10/2014	N
SO	MBTA-SS	ROW-21	ROW-SS21-0001-060914X	6/9/2014	N
SO	MBTA-SS	ROW-22	ROW-SS22-0001-062514X	6/25/2014	N
SO	MBTA-SS	ROW-23	ROW-SS23-0001-062514X	6/25/2014	N
SO	MBTA-SS	SO-62	SO-62 (0-1)	12/5/2011	N
SO	MBTA-SS	SO-63	SO-63 (0-1)	12/5/2011	N
SO	MBTA-SS	SS-12	SS-12A (0-2)	4/22/2011	N
SO	MBTA-SS	SS-13	SS-13A (0-1)	4/18/2011	N
SO	MBTA-SS	SS-22	SS-22A (0-1)	4/21/2011	N
SO	MBTA-SS	SS-23	SS-23A (0-2)	4/21/2011	N
SO	MBTA-SS	SS-23	SS-35A (0-2)	4/21/2011	FD
SO	MBTA-SS	SS-23	SS-35A (0-2)	4/21/2011	N
SO	MBTA-SS	SS-24	SS-24A (1-1.5)	4/21/2011	N
SO	MBTA-SS	SS-25	SS-25A (0-2)	4/20/2011	N
SO	MBTA-SS	SS-26	SS-26A (0-2)	4/19/2011	N
SO	MBTA-SS	SS-29	SS-29A (0-1.5)	4/18/2011	N
SO	MBTA-SS	SS-30	SS-30A (0-2)	4/22/2011	N
SO	WSCC-SS	33WS-03	33WS-SS03-0001-061314X	6/13/2014	N
SO	WSCC-SS	33WS-04	33WS-SS04-0001-061314X	6/13/2014	N
SO	WSCC-SS	33WS-06	33WS-SS06-0001-061614X	6/16/2014	N
SO	WSCC-SS	33WS-07	33WS-SS07-0001-061214D	6/12/2014	FD
SO	WSCC-SS	33WS-07	33WS-SS07-0001-061214X	6/12/2014	N
SO	WSCC-SS	33WS-08	33WS-SS08-0001-061714D	6/17/2014	FD
SO	WSCC-SS	33WS-08	33WS-SS08-0001-061714D	6/17/2014	N
SO	WSCC-SS	33WS-08	33WS-SS08-0001-061714X	6/17/2014	N
SO	WSCC-SS	33WS-09	33WS-SS09-0001-061714X	6/17/2014	N
SO	WSCC-SS	33WS-10	33WS-SS10-0001-061814X	6/18/2014	N
SO	WSCC-SS	33WS-12	33WS-SS12-0001-061614X	6/16/2014	N
SO	WSCC-SS	33WS-14	33WS-SS14-0001-062314X	6/23/2014	N
SO	WSCC-SS	33WS-15	33WS-SS15-0001-062614X	6/26/2014	N
SO	WSCC-SS	33WS-SS17	33WS-SS17-0001-060415X	6/5/2015	N
SO	WSCC-SS	35WS-01	35WS-SS01-0001-061114X	6/11/2014	N
SO	WSCC-SS	45WS-02	45WS-SS02-0001-061014D	6/10/2014	FD
SO	WSCC-SS	45WS-02	45WS-SS02-0001-061014X	6/10/2014	N
SO	WSCC-SS	45WS-03	45WS-SS03-0001-061014X	6/10/2014	N
SO	WSCC-SS	45WS-04	45WS-SS04-0001-060914X	6/9/2014	N
SO	WSCC-SS	45WS-05	45WS-SS05-0001-060415X	6/4/2015	N
SO	WSCC-SS	MW-11	CC-SO-MW11-0001-052615X	5/26/2015	N
SO	WSCC-SS	MW-11	CC-SO-MW11-0001-052615X	5/26/2015	FD
SO	WSCC-SS	MW-12	CC-SO-MW12-0001-052615X	5/26/2015	N

SLERA-1
Samples Used in the ESA SLERA
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Matrix	Exposure Area	Location	Sample ID	Date	Type
SO	WSCC-SS	SS-02	SS-02A (0-1)	4/18/2011	N
SO	WSCC-SS	SS-03	SS-03A (0.3-1)	4/19/2011	N
SO	WSCC-SS	SS-04	SS-04A (0-1)	4/21/2011	N
SO	WSCC-SS	SS-05	SS-05A (0.5-1.7)	4/20/2011	N
SO	WSCC-SS	SS-06	SS-06A (0-2)	4/19/2011	N
SO	WSCC-SS	SS-07	SS-07A (0.5-1.7)	4/19/2011	N
SO	WSCC-SS	SS-08	SS-08A (0-1)	4/21/2011	N
SO	WSCC-SS	SS-09	SS-09A (0-1)	4/21/2011	N
SO	WSCC-SS	SS-09	SS-33A (0-1)	4/21/2011	FD
SO	WSCC-SS	SS-09	SS-33A (0-1)	4/21/2011	N
SO	WSCC-SS	SS-10	SS-10A (0.5-2)	4/21/2011	N
SO	WSCC-SS	SS-11	SS-11A (0-1)	4/21/2011	N
SO	WSCC-SS	SS-17	SS-17A (0-1.5)	4/18/2011	N
SO	WSCC-SS	SS-18	SS-18A (0-1)	4/19/2011	N
SO	WSCC-SS	SS-19	SS-19A (0-1)	4/19/2011	N
SO	WSCC-SS	SS-20	SS-20A (0-1)	4/20/2011	N
SO	WSCC-SS	SS-21	SS-21A (0-1)	4/20/2011	N

20 Cheever-SS = 20 Cheever Street surface soil (up to 2 ft bgs)
Bkgd = Background
Salt Marsh Fringe
FD = Field duplicate
MBTA-SS = Massachusetts Bay Transportation Authority surface soil (up to 2 ft bgs)
N = Primary
SD = Sediment
SO = Soil
WSCC-SS = Water Street Condominium Complex surface soil (up to 2 ft bgs)

SLERA-2
Summary Statistics for Potential Ecological COCs - Water Street Condominium Complex - Soil
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Units	FOD	Range of Detects			Maximum Detect Sample ID	Range of SQLs			Average	Standard Deviation
Inorganics											
Arsenic	mg/kg	29/29	8.5	-	107	45WS-SS04-0001-060914X		NA		23	22
Chromium	mg/kg	29/29	18.9	-	2070	45WS-SS04-0001-060914X		NA		320	440
Chromium-Hexavalent	mg/kg	9/12	1	-	25	45WS-SS04-0001-060914X	0.5	-	2	5	6.8

Note: Concentrations rounded to two significant digits.
COC - Contaminant of Concern
FOD = Frequency of Detection.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SQL = Sample Quantitation Limit.

SLERA-3
Summary Statistics for Potential Ecological COCs - MBTA ROW - Soil
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Units	FOD	Range of Detects			Maximum Detect Sample ID	Range of SQLs			Average	Standard Deviation
Dioxins/Furans											
2,3,7,8-TCDD TEQ (Bird)	mg/kg	17/17	3.1414E-06	-	0.00107078	SO-62 (0-1)		NA		0.00014	0.00026
2,3,7,8-TCDD TEQ (Mammal)	mg/kg	17/17	0.00000473	-	0.00134	SO-62 (0-1)		NA		0.00019	0.00033
Inorganics											
Arsenic	mg/kg	35/35	12.1	-	269	ROW-SS13-0001-062014X		NA		59	51
Chromium	mg/kg	35/35	19.5	-	10700	SO-62 (0-1)		NA		800	2100
Chromium-Hexavalent	mg/kg	17/18	0.68	-	580	SS-24A (1-1.5)	0.5	-	2.1	37	140

Note: Concentrations rounded to two significant digits.
COC - Contaminant of Concern
FOD = Frequency of Detection.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SQL = Sample Quantitation Limit.

Table SLERA-4
Summary Statistics for Potential Ecological COCs - 20 Cheever Street - Soil
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Units	FOD	Range of Detects			Maximum Detect Sample ID	Range of SQLs			Average	Standard Deviation
Inorganics											
Arsenic	mg/kg	20/20	8.1	-	133	20CH-SS08-0001-061914X		NA		28	31
Chromium	mg/kg	20/20	27.3	-	865	20CH-SS08-0001-061914X		NA		180	230
Chromium-Hexavalent	mg/kg	6/6	2	-	60	20CH-SS08-0001-061914X	2	-	2	16	22
Lead	mg/kg	20/20	12.3	-	24000	20CH-SS11-0001-062014X		NA		1500	4200

Note: Concentrations rounded to two significant digits.
COC - Contaminant of Concern
FOD = Frequency of Detection.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SQL = Sample Quantitation Limit.

Table SLERA-5
Assessment and Measurement Endpoints
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Receptor	Assessment Endpoint	Measurement Endpoint
Terrestrial and Wetland Plants	Support of a functioning plant community	HQ_{LO} based on COPEC soil concentration comparison with literature-based phytotoxicity values.
Soil Invertebrates	Support of a functioning soil invertebrate community	HQ_{LO} based on COPEC soil concentration comparison with literature-based effect values.
Invertivorous Birds	Support of a functioning invertivorous bird community	HQ_{NO} and HQ_{LO} based on dietary intake of COPECs by the American robin using site-specific soil and surface water concentrations and modeled dietary concentrations compared with literature-based effect values.
Invertivorous Mammals	Support of a functioning invertivorous mammal community	HQ_{NO} and HQ_{LO} based on dietary intake of COPECs by the short-tailed shrew using site-specific soil and surface water concentrations and modeled dietary concentrations compared with literature-based effect values.
Benthic Invertebrate Community	Support of a functioning benthic invertebrate community	HQ_{NO} and HQ_{LO} based on COPEC sediment concentration comparison with literature-based benthic invertebrate toxicity values.
Piscivorous Birds	Support of a functioning piscivorous bird community	HQ_{NO} and HQ_{LO} based on dietary intake of COPECs by the great blue heron using site-specific soil and surface water concentrations and modeled dietary concentrations compared with literature-based effect values.

SLERA-6
Ecological Soil Screening - Water Street Condominum Complex
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Maximum (mg/kg)	Soil Screening Benchmark			Ratio[a]	COPEC?
		Value (mg/kg)	Comment	Source		
Inorganics						
Arsenic	110	18	Plant	Eco-SSL	6.1	Yes
Chromium	2100	26	Bird	Eco-SSL	81	Yes
Chromium-Hexavalent	25	130	Mammal	Eco-SSL	0.19	No

[a]Ratio of maximum detected concentration to benchmark.
mg/kg = Milligrams per kilogram.
COPEC = Chemical of potential ecological concern.

SLERA-7
Ecological Soil Screening - MBTA ROW
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Maximum (mg/kg)	Soil Screening Benchmark			Ratio[a]	COPEC?
		Value (mg/kg)	Comment	Source		
Dioxins/Furans						
2,3,7,8-TCDD TEQ (Bird)	0.0011	0.00000158	American Woodcock	Efroymson et al., 1997a	700	Yes
2,3,7,8-TCDD TEQ (Mammal)	0.0013	0.000000315	Short-tailed Shrew	Efroymson et al., 1997a	4100	Yes
Inorganics						
Arsenic	270	18	Plant	Eco-SSL	15	Yes
Chromium	11000	26	Bird	Eco-SSL	420	Yes
Chromium-Hexavalent	580	130	Mammal	Eco-SSL	4.5	Yes

[a]Ratio of maximum detected concentration to benchmark.
mg/kg = Milligrams per kilogram.
COPEC = Chemical of potential ecological concern.

SLERA-8
Ecological Soil Screening - 20 Cheever Street
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Maximum (mg/kg)	Soil Screening Benchmark			Ratio[a]	COPEC?
		Value (mg/kg)	Comment	Source		
Inorganics						
Arsenic	130	18	Plant	Eco-SSL	7.2	Yes
Chromium	860	26	Bird	Eco-SSL	33	Yes
Chromium-Hexavalent	60	130	Mammal	Eco-SSL	0.46	No
Lead	24000	11	Bird	Eco-SSL	2200	Yes

[a]Ratio of maximum detected concentration to benchmark.
mg/kg = Milligrams per kilogram.
COPEC = Chemical of potential ecological concern.

SLERA-9
Soil-based Phytotoxicity and Microbe/Soil Invertebrate Benchmarks
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Phytotoxicity		Microbe/Soil Invertebrate	
	Value (mg/kg)	Source	Value (mg/kg)	Source
Dioxins/Furans				
2,3,7,8-Tetrachlorodibenzo-p-dioxin			0.5	EPA, 1999
Inorganics				
Arsenic	18	Eco SSL	0.25	EPA, 1999
Chromium	0.018	EPA, 1999	0.2	EPA, 1999
Chromium-Hexavalent	0.018	EPA, 1999	0.2	EPA, 1999
Lead	120	Eco SSL	1700	Eco SSL

Note: Presents only those COPECs with phototoxicity and or microbe/soil invertebrate benchmarks.
mg/kg = Milligrams/kilogram.
SSL = Soil screening level.

SLERA-10
Avian Toxicity Reference Values (TRVs)
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Test Species	Study Duration	Effect	Dose (mg/kg-day)		TRV (mg/kg-day)		Toxicity Value Form or Surrogate	Initial Value Source
				NOAEL	LOAEL	NOAEL	LOAEL		
Dioxins/Furans									
2,3,7,8-TCDD TEQ (Bird)	Ring-necked pheasant	Chronic	Reproduction	0.000014	0.00014	0.000014	0.00014	2,3,7,8-TCDD	EPA, 1999 and Sample et al., 1996
Inorganics									
Arsenic	Chicken	Chronic	Reproduction	2.24		2.24	11.2		EPA, 2005
Chromium	Black duck	Chronic	Reproduction and growth	0.5	2.78	0.5	2.78	Chromium III	EPA, 2008
Chromium-Hexavalent	Chicken	Chronic	Reproduction	5		5	25		EPA, 2008
Lead	Chicken	Subchronic	Reproduction	1.63	3.26	0.163	0.326	Lead acetate	EPA, 2005b

SLERA-11
Mammalian Toxicity Reference Values (TRVs)
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Analyte	Test Species	Study Duration	Effect	Dose (mg/kg-day)		TRV (mg/kg-day)		Toxicity Value Form or Surrogate	Initial Value Source
				NOAEL	LOAEL	NOAEL	LOAEL		
Dioxins/Furans									
2,3,7,8-TCDD TEQ (mammal)	Rat	Chronic	Reproduction	0.000001	0.00001	0.000001	0.00001	2,3,7,8-TCDD	EPA, 1999
Inorganics									
Arsenic	Dog	Chronic	Growth	1.04	1.66	1.04	1.66		EPA, 2005
Chromium	Rat	Chronic	Growth	8.09		8.09	40.45	Chromium III	EPA, 2008
Chromium-Hexavalent	multiple	Chronic	Reproduction and growth	9.24		9.24	46.2		EPA, 2008
Lead	Rat	Chronic	Growth	4.7	8.9	4.7	8.9		EPA, 2005

Table SLERA-12
Phytotoxicity Hazard Quotients - WSCC
Creese and Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Sample ID	Arsenic		Chromium	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
33WS-SS03-0001-061314X	0.922	0.0922	5540	554
33WS-SS04-0001-061314X	0.883	0.0883	3790	379
33WS-SS06-0001-061614X	1.62	0.162	14400	1440
33WS-SS07-0001-061214X	0.778	0.0778	7830	783
33WS-SS08-0001-061714X	0.606	0.0606	4140	414
33WS-SS09-0001-061714X	0.672	0.0672	4460	446
33WS-SS10-0001-061814X	0.528	0.0528	6060	606
33WS-SS12-0001-061614X	0.911	0.0911	12500	1250
33WS-SS14-0001-062314X	0.522	0.0522	3600	360
33WS-SS15-0001-062614X	0.611	0.0611	57200	5720
35WS-SS01-0001-061114X	2.02	0.202	16200	1620
45WS-SS02-0001-061014X	3.04	0.304	29500	2950
45WS-SS03-0001-061014X	4.12	0.412	53300	5330
45WS-SS04-0001-060914X	5.94	0.594	115000	11500
SS-02A (0-1)	0.506	0.0506	5260	526
SS-03A (0.3-1)	0.589	0.0589	27300	2730
SS-04A (0-1)	0.717	0.0717	47800	4780
SS-05A (0.5-1.7)	0.722	0.0722	10900	1090
SS-06A (0-2)	0.983	0.0983	18700	1870
SS-07A (0.5-1.7)	2.78	0.278	34600	3460
SS-08A (0-1)	0.689	0.0689	5170	517
SS-09A (0-1)	0.911	0.0911	3010	301
SS-10A (0.5-2)	1.47	0.147	4440	444
SS-11A (0-1)	1.08	0.108	9720	972
SS-17A (0-1.5)	0.472	0.0472	1160	116
SS-18A (0-1)	0.689	0.0689	4030	403
SS-19A (0-1)	0.717	0.0717	1050	105
SS-20A (0-1)	0.756	0.0756	9390	939
SS-21A (0-1)	0.933	0.0933	6500	650

Table SLERA-13
Phytotoxicity Hazard Quotients - MBTA ROW
Creese and Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Sample ID	Arsenic		Chromium		Chromium-Hexavalent	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
ROW-SS01-0001-062314X	5.53	0.553	2260	226	NA	NA
ROW-SS02-0001-062314X	4.21	0.421	1130	113	61.1	6.11
ROW-SS03-0001-062314X	0.939	0.0939	1290	129	NA	NA
ROW-SS04-0001-062314X	3.66	0.366	2270	227	83.3	8.33
ROW-SS05-0001-062414X	2.56	0.256	1490	149	NA	NA
ROW-SS06-0001-062414X	5.27	0.527	1700	170	522	52.2
ROW-SS07-0001-062414X	3.87	0.387	1480	148	383	38.3
ROW-SS08-0001-062414X	6.5	0.65	1530	153	156	15.6
ROW-SS09-0001-062414X	6.11	0.611	1240	124	144	14.4
ROW-SS10-0001-062014X	1.67	0.167	1920	192	NA	NA
ROW-SS11-0001-062514D	4.53	0.453	1570	157	NA	NA
ROW-SS11-0001-062514X	3.97	0.397	1350	135	53.9	5.39
ROW-SS12-0001-062514X	7.72	0.772	2740	274	192	19.2
ROW-SS13-0001-062014X	13.8	1.38	4410	441	43.9	4.39
ROW-SS14-0001-061914X	1.56	0.156	35600	3560	611	61.1
ROW-SS15-0001-061914X	2.46	0.246	266000	26600	186	18.6
ROW-SS16-0001-061914X	5.98	0.598	38200	3820	NA	NA
ROW-SS17-0001-061814X	0.972	0.0972	8500	850	NA	NA
ROW-SS18-0001-061814X	8.67	0.867	3570	357	111	11.1
ROW-SS19-0001-061114X	2.54	0.254	16600	1660	NA	NA
ROW-SS20-0001-061014X	1.69	0.169	2250	225	NA	NA
ROW-SS21-0001-060914X	4.2	0.42	28800	2880	144	14.4
ROW-SS22-0001-062514X	1.23	0.123	11900	1190	1440	144
ROW-SS23-0001-062514X	1.17	0.117	9890	989	NA	NA
SO-62 (0-1)	1.3	0.13	594000	59400	NA	NA
SO-63 (0-1)	0.856	0.0856	42700	4270	NA	NA
SS-12A (0-2)	1.13	0.113	5060	506	NA	NA
SS-13A (0-1)	1.49	0.149	5560	556	NA	NA
SS-22A (0-1)	0.672	0.0672	2970	297	NA	NA
SS-23A (0-2)	2.02	0.202	2390	239	NA	NA
SS-24A (1-1.5)	1.97	0.197	246000	24600	32200	3220
SS-25A (0-2)	2.51	0.251	57200	5720	394	39.4
SS-26A (0-2)	0.928	0.0928	154000	15400	150	15
SS-29A (0-1.5)	1.05	0.105	2240	224	NA	NA
SS-30A (0-2)	0.717	0.0717	2620	262	NA	NA

NA = Not analyzed.

Table SLERA-14
Phytotoxicity Hazard Quotients - 20 Cheever Street
Creese and Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Sample ID	Arsenic		Chromium		Lead	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
20CH-SS01-0001-061614X	3.12	0.312	11800	1180	2.02	0.202
20CH-SS02-0001-061714X	0.817	0.0817	2980	298	0.652	0.0652
20CH-SS03-0001-061714X	0.461	0.0461	2230	223	0.486	0.0486
20CH-SS04-0001-061714X	1.92	0.192	7170	717	0.942	0.0942
20CH-SS05-0001-061914X	0.45	0.045	2560	256	0.803	0.0803
20CH-SS06-0001-061914X	0.561	0.0561	3130	313	0.61	0.061
20CH-SS07-0001-061914X	0.728	0.0728	2940	294	10.2	1.02
20CH-SS08-0001-061914X	7.39	0.739	48100	4810	2.42	0.242
20CH-SS09-0001-061914X	0.639	0.0639	2420	242	1.48	0.148
20CH-SS10-0001-061814X	2.76	0.276	23500	2350	1.24	0.124
20CH-SS11-0001-062014X	1.71	0.171	27700	2770	157	15.7
20CH-SS12-0001-062014X	3.99	0.399	33200	3320	30.1	3.01
20CH-SS13-0001-061814X	1.31	0.131	6280	628	1.39	0.139
20CH-SS14-0001-062414X	0.928	0.0928	8890	889	14.3	1.43
20CH-SS15-0001-061814X	0.494	0.0494	2840	284	0.334	0.0334
20CH-SS16-0001-062614X	0.589	0.0589	3690	369	0.862	0.0862
SS-14A (0-2)	0.953	0.0953	6360	636	26.9	2.69
SS-15A (0-2)	0.756	0.0756	2530	253	0.313	0.0313
SS-27A (0-1)	0.533	0.0533	2360	236	0.7	0.07
SS-28A (0.7-2)	0.639	0.0639	1520	152	0.102	0.0102

Table SLERA-15
Soil Invertebrate Hazard Quotients - Water Street Condominium Complex
Creese and Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Sample ID	Arsenic		Chromium	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
33WS-SS03-0001-061314X	66.4	6.64	499	49.9
33WS-SS04-0001-061314X	63.6	6.36	342	34.2
33WS-SS06-0001-061614X	116	11.6	1300	130
33WS-SS07-0001-061214X	56	5.6	705	70.5
33WS-SS08-0001-061714X	43.6	4.36	373	37.3
33WS-SS09-0001-061714X	48.4	4.84	401	40.1
33WS-SS10-0001-061814X	38	3.8	545	54.5
33WS-SS12-0001-061614X	65.6	6.56	1120	112
33WS-SS14-0001-062314X	37.6	3.76	324	32.4
33WS-SS15-0001-062614X	44	4.4	5150	515
35WS-SS01-0001-061114X	146	14.6	1460	146
45WS-SS02-0001-061014X	219	21.9	2660	266
45WS-SS03-0001-061014X	297	29.7	4800	480
45WS-SS04-0001-060914X	428	42.8	10400	1040
SS-02A (0-1)	36.4	3.64	473	47.3
SS-03A (0.3-1)	42.4	4.24	2460	246
SS-04A (0-1)	51.6	5.16	4300	430
SS-05A (0.5-1.7)	52	5.2	980	98
SS-06A (0-2)	70.8	7.08	1680	168
SS-07A (0.5-1.7)	200	20	3120	312
SS-08A (0-1)	49.6	4.96	466	46.6
SS-09A (0-1)	65.6	6.56	270	27
SS-10A (0.5-2)	106	10.6	400	40
SS-11A (0-1)	77.6	7.76	875	87.5
SS-17A (0-1.5)	34	3.4	104	10.4
SS-18A (0-1)	49.6	4.96	362	36.2
SS-19A (0-1)	51.6	5.16	94.5	9.45
SS-20A (0-1)	54.4	5.44	845	84.5
SS-21A (0-1)	67.2	6.72	585	58.5

Table SLERA-16
Soil Invertebrate Hazard Quotients - MBTA ROW
Creese and Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Sample ID	2,3,7,8-Tetrachlorodibenzo-p-dioxin		Arsenic		Chromium		Chromium-Hexavalent	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
ROW-SS01-0001-062314X	NA	NA	398	39.8	203.5	20.35	NA	NA
ROW-SS02-0001-062314X	NA	NA	303.4	30.34	101.5	10.15	5.5	0.55
ROW-SS03-0001-062314X	NA	NA	67.6	6.76	116	11.6	NA	NA
ROW-SS04-0001-062314X	NA	NA	263.2	26.32	204	20.4	7.5	0.75
ROW-SS05-0001-062414X	NA	NA	184.4	18.44	134.5	13.45	NA	NA
ROW-SS06-0001-062414X	NA	NA	379.6	37.96	153	15.3	47	4.7
ROW-SS07-0001-062414X	NA	NA	278.4	27.84	133	13.3	34.5	3.45
ROW-SS08-0001-062414X	NA	NA	468	46.8	137.5	13.75	14	1.4
ROW-SS09-0001-062414X	NA	NA	440	44	112	11.2	13	1.3
ROW-SS10-0001-062014X	NA	NA	120.4	12.04	173	17.3	NA	NA
ROW-SS11-0001-062514D	NA	NA	326	32.6	141.5	14.15	NA	NA
ROW-SS11-0001-062514X	NA	NA	285.6	28.56	121.5	12.15	NA	NA
ROW-SS12-0001-062514X	NA	NA	556	55.6	246.5	24.65	4.85	0.485
ROW-SS13-0001-062014X	0.00000448	0.000000448	996	99.6	396.5	39.65	17.25	1.725
ROW-SS14-0001-061914X	NA	NA	112	11.2	3200	320	3.95	0.395
ROW-SS15-0001-061914X	NA	NA	176.8	17.68	23950	2395	55	5.5
ROW-SS16-0001-061914X	0.00000803	0.000000803	430.8	43.08	3435	343.5	16.7	1.67
ROW-SS17-0001-061814X	0.00000256	0.000000256	70	7	765	76.5	NA	NA
ROW-SS18-0001-061814X	NA	NA	624	62.4	321.5	32.15	NA	NA
ROW-SS19-0001-061114X	NA	NA	183.2	18.32	1490	149	10	1
ROW-SS20-0001-061014X	NA	NA	122	12.2	202.5	20.25	NA	NA
ROW-SS21-0001-060914X	0.00000878	0.000000878	302.4	30.24	2590	259	NA	NA
ROW-SS22-0001-062514X	0.00000482	0.000000482	88.8	8.88	1070	107	13	1.3
ROW-SS23-0001-062514X	0.00000388	0.000000388	84.4	8.44	890	89	130	13
SO-62 (0-1)	0.0000868	0.00000868	93.6	9.36	53500	5350	NA	NA
SO-63 (0-1)	0.0000222	0.00000222	61.6	6.16	3840	384	NA	NA
SS-12A (0-2)	0.00000236	0.000000236	81.6	8.16	455.5	45.55	NA	NA
SS-13A (0-1)	NA	NA	107.2	10.72	500	50	NA	NA
SS-22A (0-1)	NA	NA	48.4	4.84	267.5	26.75	NA	NA
SS-23A (0-2)	0.000001189	1.189E-07	145.4	14.54	215.5	21.55	NA	NA
SS-24A (1-1.5)	0.000088	0.0000088	142	14.2	22150	2215	2900	290
SS-25A (0-2)	0.00001924	0.000001924	180.8	18.08	5150	515	35.5	3.55
SS-26A (0-2)	0.0000476	0.00000476	66.8	6.68	13850	1385	13.5	1.35
SS-29A (0-1.5)	0.000000672	6.72E-08	75.6	7.56	201.5	20.15	NA	NA
SS-30A (0-2)	NA	NA	51.6	5.16	235.5	23.55	NA	NA

NA = Not analyzed.

Table SLERA-17
Soil Invertebrate Hazard Quotients - 20 Cheever Street
Creese and Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

Sample ID	Arsenic		Chromium		Lead	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
20CH-SS01-0001-061614)	225	22.5	1060	106	0.142	0.0142
20CH-SS02-0001-061714)	58.8	5.88	268	26.8	0.0461	0.00461
20CH-SS03-0001-061714)	33.2	3.32	201	20.1	0.0343	0.00343
20CH-SS04-0001-061714)	138	13.8	645	64.5	0.0665	0.00665
20CH-SS05-0001-061914)	32.4	3.24	230	23	0.0567	0.00567
20CH-SS06-0001-061914)	40.4	4.04	282	28.2	0.0431	0.00431
20CH-SS07-0001-061914)	52.4	5.24	265	26.5	0.718	0.0718
20CH-SS08-0001-061914)	532	53.2	4320	432	0.171	0.0171
20CH-SS09-0001-061914)	46	4.6	218	21.8	0.104	0.0104
20CH-SS10-0001-061814)	198	19.8	2120	212	0.0876	0.00876
20CH-SS11-0001-062014)	123	12.3	2490	249	11.1	1.11
20CH-SS12-0001-062014)	288	28.8	2990	299	2.12	0.212
20CH-SS13-0001-061814)	94	9.4	565	56.5	0.0982	0.00982
20CH-SS14-0001-062414)	66.8	6.68	800	80	1.01	0.101
20CH-SS15-0001-061814)	35.6	3.56	256	25.6	0.0236	0.00236
20CH-SS16-0001-062614)	42.4	4.24	332	33.2	0.0609	0.00609
SS-14A (0-2)	68.6	6.86	572	57.2	1.9	0.19
SS-15A (0-2)	54.4	5.44	228	22.8	0.0221	0.00221
SS-27A (0-1)	38.4	3.84	212	21.2	0.0494	0.00494
SS-28A (0.7-2)	46	4.6	136	13.6	0.00724	0.000724

SLERA-18
Hazard Quotients - WSCC - American Robin and Short-tailed Shrew
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

COPEC	Hazard Quotient			
	American Robin		Short-tailed Shrew	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
Inorganics				
Arsenic	0.34	0.068	0.37	0.23
Chromium	41	7.3	1.7	0.34

Notes:
Results rounded to two significant digits.
Shading indicates HQ >1.0.

SLERA-19
Hazard Quotients - MBTA - American Robin and Short-tailed Shrew
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

COPEC	Hazard Quotient			
	American Robin		Short-tailed Shrew	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
Dioxins/Furans				
2,3,7,8-TCDD TEQ	8	0.8	100	10
Inorganics				
Arsenic	0.58	0.12	0.59	0.37
Chromium	200	35	27	5.5
Chromium-Hexavalent	3	0.6	1.1	0.22

Notes:
Results rounded to two significant digits.
Shading indicates HQ >1.0.

SLERA-20
Hazard Quotients - 20 Cheever Street - American Robin and Short-tailed Shrew
Creese & Cook Tannery (Former) - East Study Area
Danvers, Massachusetts

COPEC	Hazard Quotient			
	American Robin		Short-tailed Shrew	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
Inorganics				
Arsenic	0.32	0.065	0.35	0.22
Chromium	34	6.2	1.4	0.29
Lead	900	450	18	9.6

Notes:
Results rounded to two significant digits.
Shading indicates HQ >1.0.

Table SLERA-21
Samples Used in the WSA SLERA
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Matrix	Sample ID	Date	Depth (ft bgs)	Type
SD-Bkgd	SD-03 (0-1)	5/18/2011	0-1	N
SD-Bkgd	SD-04 (0-0.5)	5/17/2011	0-0.05	N
SD-Bkgd	SD-50 (0-0.75)	12/6/2011	0-0.75	N
SD-Bkgd	SD-51 (0-0.75)	12/6/2011	0-0.75	N
SD	SD213-031716	3/17/2016	0-0.25	N
SD	SD214-031716	3/17/2016	0-0.25	N
SD	SD215-031716	3/17/2016	0-0.25	N
SD	SD201-031716	3/17/2016	0-0.25	N
SD	SD202-031716	3/17/2016	0-0.25	N
SD	SD203-031716	3/17/2016	0-0.25	N
SD	SD204-031716	3/17/2016	0-0.25	N
SD	SD205-031716	3/17/2016	0-0.25	N
SD	SD206-031716	3/17/2016	0-0.25	N
SD	SD207-031716	3/17/2016	0-0.25	N
SD	SD208-031716	3/17/2016	0-0.25	N
SD	SD209-031716	3/17/2016	0-0.25	N
SD	SD210-031716	3/17/2016	0-0.25	N
SD	SD211-031716	3/17/2016	0-0.25	N
SD	SD212-031716	3/17/2016	0-0.25	N
SD	SD-56 (0-1)	12/6/2011	0-1	N
SD	SD-57 (0.2-1)	12/6/2011	0.2-1	N
SD	SD-58 (0.1-0.75)	12/6/2011	0.1-0.75	N
SD	SD-59 (0-0.75)	12/6/2011	0-0.75	N
SD	SD-70 (0-1)	12/6/2011	0-1	FD
SD	SD-DUP01-031716	3/17/2016	0-0.25	FD
SO	27CL-HB01-0001-111115X	11/11/2015	0-0.5	N
SO	27CL-HB01-0102-111115X	11/11/2015	1-2	N
SO	27CL-HB02-0001-111115X	11/11/2015	0-0.5	N
SO	27CL-HB02-0102-111115X	11/11/2015	1-2	N
SO	27CL-HB03-0001-111115X	11/11/2015	0-0.5	N
SO	27CL-HB03-0102-111115X	11/11/2015	1-2	N
SO	27CL-HB04-0001-111115X	11/11/2015	0-0.5	N
SO	27CL-HB04-0102-111115X	11/11/2015	1-2	N
SO	27CL-HB05-0001-111615X	11/16/2015	0-0.5	N
SO	27CL-HB06-0001-111615X	11/16/2015	0-0.5	N
SO	27CL-HB06-0102-111615X	11/16/2015	1-2	N
SO	27CL-HB07-0001-111615X	11/16/2015	0-0.5	N
SO	27CL-SS01-0001-112015X	11/20/2015	0-0.5	N
SO	55CL-HB01-0001-111115D	11/11/2015	0-0.5	FD
SO	55CL-HB01-0001-111115X	11/11/2015	0-0.5	N
SO	55CL-HB02-0001-111115X	11/11/2015	0-0.5	N
SO	55CL-HB02-0102-111115X	11/11/2015	1-2	N
SO	55CL-SS01-0001-111915X	11/19/2015	0-0.5	N
SO	55CL-SS02-0001-111915X	11/19/2015	0-0.5	N
SO	55CL-SS03-0001-111215X	11/12/2015	0-0.5	N
SO	55CL-SS04-0001-111215X	11/12/2015	0-0.5	N
SO	55CL-SS05-0001-111215X	11/12/2015	0-0.5	N
SO	55CL-SS06-0001-111615X	11/16/2015	0-0.5	N
SO	55CL-SS07-0001-111915X	11/19/2015	0-0.5	N
SO	55CL-SS08-0001-111915X	11/19/2015	0-0.5	N
SO	55CL-SS09-0001-111015X	11/10/2015	0-0.5	N
SO	55CL-SS10-0001-111215X	11/12/2015	0-0.5	N
SO	55CL-SS11-0001-111815X	11/18/2015	0-0.5	N
SO	55CL-SS12-0001-111615X	11/16/2015	0-0.5	N
SO	55CL-SS13-0001-110915X	11/9/2015	0-0.5	N
SO	55CL-SS14-0001-111315X	11/13/2015	0-0.5	N
SO	55CL-SS15-0001-111315X	11/13/2015	0-0.5	N
SO	55CL-SS16-0001-111315D	11/13/2015	0-0.5	FD
SO	55CL-SS16-0001-111315X	11/13/2015	0-0.5	N
SO	55CL-SS17-0001-111715X	11/17/2015	0-0.5	N
SO	55CL-SS18-0001-111715D	11/17/2015	0-0.5	FD
SO	55CL-SS18-0001-111715X	11/17/2015	0-0.5	N
SO	55CL-SS19-0001-110915X	11/9/2015	0-0.5	N
SO	55CL-SS20-0001-110915X	11/9/2015	0-0.5	N
SO	55CL-SS21-0001-111315X	11/13/2015	0-0.5	N
SO	55CL-SS22-0001-111215D	11/12/2015	0-1	FD
SO	55CL-SS22-0001-111215X	11/12/2015	0-1	N
SO	55CL-SS23-0102-111215X	11/12/2015	1-2	N
SO	55CL-SS24-0001-111215X	11/12/2015	0-0.5	N

Matrix	Sample ID	Date	Depth (ft bgs)	Type
SO	55CL-SS25-0001-111215X	11/12/2015	0-0.5	N
SO	55CL-SS26-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS27-0001-110915X	11/9/2015	0-0.5	N
SO	55CL-SS28-0001-111715X	11/17/2015	0-0.5	N
SO	55CL-SS29-0001-111315X	11/13/2015	0-0.5	N
SO	55CL-SS30-0001-111715X	11/17/2015	0-0.5	N
SO	55CL-SS31-0001-111615D	11/16/2015	0-0.5	FD
SO	55CL-SS31-0001-111615X	11/16/2015	0-0.5	N
SO	55CL-SS32-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS33-0001-111015D	11/10/2015	0-0.5	FD
SO	55CL-SS33-0001-111015X	11/10/2015	0-0.5	N
SO	55CL-SS34-0001-111615X	11/16/2015	0-0.5	N
SO	55CL-SS35-0001-111015D	11/10/2015	0-0.5	FD
SO	55CL-SS35-0001-111015X	11/10/2015	0-0.5	N
SO	55CL-SS36-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS37-0001-111815D	11/18/2015	0-0.5	FD
SO	55CL-SS37-0001-111815X	11/18/2015	0-0.5	N
SO	55CL-SS38-0001-111615X	11/16/2015	0-0.5	N
SO	55CL-SS39-0001-110915X	11/9/2015	0-0.5	N
SO	55CL-SS40-0001-110515X	11/5/2015	0-0.5	N
SO	55CL-SS41-0001-110515X	11/5/2015	0-0.5	N
SO	55CL-SS42-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS43-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS44-0001-110515X	11/5/2015	0-0.5	N
SO	55CL-SS45-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS46-0001-110915D	11/9/2015	0-0.5	FD
SO	55CL-SS46-0001-110915X	11/9/2015	0-0.5	N
SO	55CL-SS47-0001-110615D	11/6/2015	0-0.5	FD
SO	55CL-SS47-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS48-0001-110315X	11/3/2015	0-0.5	N
SO	55CL-SS49-0001-110315X	11/3/2015	0-0.5	N
SO	55CL-SS50-0001-110915X	11/9/2015	0-0.5	N
SO	55CL-SS51-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS52-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS53-0001-110315X	11/3/2015	0-0.5	N
SO	55CL-SS54-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS55-0001-110415D	11/4/2015	0-0.5	FD
SO	55CL-SS55-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS56-0001-110515X	11/5/2015	0-0.5	N
SO	55CL-SS57-0001-110515X	11/5/2015	0-0.5	N
SO	55CL-SS58-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS59-0001-110515D	11/5/2015	0-0.5	FD
SO	55CL-SS59-0001-110515X	11/5/2015	0-0.5	N
SO	55CL-SS60-0001-110515X	11/5/2015	0-0.5	N
SO	55CL-SS61-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS62-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS63-0001-110415X	11/4/2015	0-0.5	N
SO	55CL-SS64-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS64A-0001-110615X	11/6/2015	0-0.5	N
SO	55CL-SS65-0001-111915D	11/19/2015	0-0.5	FD
SO	55CL-SS65-0001-111915X	11/19/2015	0-0.5	N
SO	55CL-SS66-0001-111015X	11/10/2015	0-0.5	N
SO	55CL-SS67-0001-111715X	11/17/2015	0-0.5	N
SO	55CL-SS68-0001-111915X	11/19/2015	0-0.5	N
SO	55CL-SS69-0001-111815X	11/18/2015	0-0.5	N
SO	55CL-SS70-0001-111815X	11/18/2015	0-0.5	N
SO	55CL-SS71-0001-111815X	11/18/2015	0.5-1	N
SO	55CL-SS72-0001-111715X	11/17/2015	0-0.5	N
SO	55CL-SS73-0001-111715X	11/17/2015	0-0.5	N
SO	55CL-SS74-0001-112015X	11/20/2015	0-0.5	N
SO	55CL-SSCAMP-0001-111315X	11/13/2015	0-0.5	N
SO	SO-01 (0.5-2)	5/23/2011	0.5-2	N
SO	SO-03 (0-1.8)	5/23/2011	0-1.8	N
SO	SO-04 (0.5-2)	5/23/2011	0.5-2	N
SO	SO-06 (1-2)	5/23/2011	1-2	N
SO	SO-07 (0-1.5)	5/23/2011	0-1.5	N
SO	SO-12 (0.5-1.2)	5/23/2011	0.5-1.2	N
SO	SO-13 (0.8-1.5)	5/23/2011	0.8-1.5	N
SO	SO-14 (1.5-2)	5/23/2011	1.5-2	N
SO	SO-18 (1-2)	5/23/2011	1-2	N
SO	SO-20 (0-2)	5/23/2011	0-2	N
SO	SO-26 (0-2)	5/23/2011	0-2	FD
SO	SO-50 (0-1)	12/5/2011	0-1	N
SO	SO-51 (0-1.5)	12/5/2011	0-1.5	N

Matrix	Sample ID	Date	Depth (ft bgs)	Type
SO	SO-52 (0.75-1.5)	12/5/2011	0.75-1.5	N
SO	SO-53 (0.75-2)	12/5/2011	0.75-2	N
SO	SO-54 (0-0.25)	12/5/2011	0-0.25	N
SO	SO-55 (0-0.25)	12/5/2011	0-0.25	N
SO	SO-56 (0-0.25)	12/5/2011	0-0.25	N
SO	SO-57 (0-0.25)	12/5/2011	0-0.25	N
SO	SO-58 (0-1)	12/5/2011	0-1	N
SO	SO-59 (0-0.25)	12/5/2011	0-0.25	N
SO	SO-60 (0-0.25)	12/5/2011	0-0.25	N
SO	SO-61 (0.25-0.83)	12/5/2011	0.25-0.8	N
SO	SO-70 (0-1)	12/5/2011	0-1	FD

Bkgd = Background
FD = Field duplicate
MBTA-SS = Massachusetts Bay Transportation Authority surface soil (up to 2 ft bgs)
N = Primary
SD = 27 and 55 Clinton Avenue salt marsh fringe
SO = 27 and 55 Clinton Avenue surface soil (up to 2 ft bgs)

Table SLERA-22
Summary Statistics for Potential Ecological COCs - 27 and 55 Clinton Avenue - Soil
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Analyte	Units	FOD	Range of Detects	Maximum Detect Sample ID	Range of SQLs	Average	Standard Deviation
Dioxins/Furans							
2,3,7,8-TCDD TEQ (Bird)	mg/kg	37/37	7.2423E-07 - 0.00393009	SO-58 (0-1)	NA	0.00025	0.00068
2,3,7,8-TCDD TEQ (Mammal)	mg/kg	37/37	1.1109E-06 - 0.01284884	SO-58 (0-1)	NA	0.00076	0.0022
Inorganics							
Chromium	mg/kg	114/114	13.5 - 20500	SO-58 (0-1)	NA	660	2500
Chromium-Hexavalent	mg/kg	33/49	0.54 - 17	SO-03 (0-1.8)	0.44 - 1.4	1.9	2.7

Note: Concentrations rounded to two significant digits.
COC - Contaminant of Concern
FOD = Frequency of Detection.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SQL = Sample Quantitation Limit.

Table SLERA-23
Summary Statistics for Potential Ecological COCs - Salt Marsh Fringe - Sediment
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Analyte	Units	FOD	Range of Detects	Maximum Detect Sample ID	Range of SQLs	Average	Standard Deviation
Inorganics							
Chromium	mg/kg	19/19	50.8 - 9240	SD-56 (0-1)	NA	1100	2000

Note: Concentrations rounded to two significant digits.
COC - Contaminant of Concern
FOD = Frequency of Detection.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SQL = Sample Quantitation Limit.

Table SLERA-24
Assessment and Measurement Endpoints
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Receptor	Assessment Endpoint	Measurement Endpoint
Terrestrial and Wetland Plants	Support of a functioning plant community	HQ_{LO} based on COPEC soil concentration comparison with literature-based phytotoxicity values.
Soil Invertebrates	Support of a functioning soil invertebrate community	HQ_{LO} based on COPEC soil concentration comparison with literature-based effect values.
Invertivorous Birds	Support of a functioning invertivorous bird community	HQ_{NO} and HQ_{LO} based on dietary intake of COPECs by the American robin using site-specific soil and surface water concentrations and modeled dietary concentrations compared with literature-based effect values.
Invertivorous Mammals	Support of a functioning invertivorous mammal community	HQ_{NO} and HQ_{LO} based on dietary intake of COPECs by the short-tailed shrew using site-specific soil and surface water concentrations and modeled dietary concentrations compared with literature-based effect values.
Benthic Invertebrate Community	Support of a functioning benthic invertebrate community	HQ_{NO} and HQ_{LO} based on COPEC sediment concentration comparison with literature-based benthic invertebrate toxicity values.
Piscivorous Birds	Support of a functioning piscivorous bird community	HQ_{NO} and HQ_{LO} based on dietary intake of COPECs by the great blue heron using site-specific soil and surface water concentrations and modeled dietary concentrations compared with literature-based effect values.

Table SLERA-25
Ecological Soil Screening - 27 and 55 Clinton Avenue
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Analyte	Maximum (mg/kg)	Soil Screening Benchmark Value (mg/kg)	Comment	Source	Ratio[a]	COPEC?
Dioxins/Furans						
2,3,7,8-TCDD TEQ (Bird)	0.003930085	0.00000158	American Woodcock	Efroymson et al., 1997a	2500	Yes
2,3,7,8-TCDD TEQ (Mammal)	0.012848841	0.000000315	Short-tailed Shrew	Efroymson et al., 1997a	41000	Yes
Inorganics						
Chromium	20500	26	Bird	Eco-SSL	790	Yes
Chromium-Hexavalent	17	130	Mammal	Eco-SSL	0.13	No

[a]Ratio of maximum detected concentration to benchmark.
mg/kg = Milligrams per kilogram.
COPEC = Chemical of potential ecological concern.

Table SLERA-26
Ecological Sediment Screening - Salt Marsh Fringe
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Analyte	Maximum (mg/kg)	Sediment Screening Benchmark		Ratio[a]	COPEC?
		Value (mg/kg)	Source		
Inorganics					
Chromium	9240	81	Long et al., 1995	110	Yes

[a]Ratio of maximum detected concentration to benchmark.
mg/kg = Milligrams per kilogram.
COPEC = Chemical of potential ecological concern.

Table SLERA-27
Sediment-based Benchmarks
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Analyte	Value (mg/kg)		
	Low-End	High-End	Source
Inorganics			
Chromium	81	370	Long et al., 1995

Note: Presents only those COPECs with sediment benchmarks.
Low-end values are equivalent to NOAEL-based values and high-end values are equivalent to LOAEL values.
mg/kg = Milligrams/kilogram.

TableSLERA-28
Phytotoxicity Hazard Quotients - 27 and 55 Clinton Avenue
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Sample ID	Chromium	
	NOAEL-based	LOAEL-based
27CL-HB01-0001-111115X	3480	348
27CL-HB01-0102-111115X	2950	295
27CL-HB02-0001-111115X	3380	338
27CL-HB02-0102-111115X	2620	262
27CL-HB03-0001-111115X	1510	151
27CL-HB03-0102-111115X	2060	206
27CL-HB04-0001-111115X	3080	308
27CL-HB04-0102-111115X	1740	174
27CL-HB05-0001-111615X	3640	364
27CL-HB06-0001-111615X	1290	129
27CL-HB06-0102-111615X	11000	1100
27CL-HB07-0001-111615X	2230	223
27CL-SS01-0001-112015X	3080	308
55CL-HB01-0001-111115X	4910	491
55CL-HB02-0001-111115X	5160	516
55CL-HB02-0102-111115X	9220	922
55CL-SS01-0001-111915X	2920	292
55CL-SS02-0001-111915X	18100	1810
55CL-SS03-0001-111215X	19000	1900
55CL-SS04-0001-111215X	994	99.4
55CL-SS05-0001-111215X	2640	264
55CL-SS06-0001-111615X	40500	4050
55CL-SS07-0001-111915X	2910	291
55CL-SS08-0001-111915X	5080	508
55CL-SS09-0001-111015X	1010	101
55CL-SS10-0001-111215X	1230	123
55CL-SS11-0001-111815X	1550	155
55CL-SS12-0001-111615X	4420	442
55CL-SS13-0001-110915X	1030	103
55CL-SS14-0001-111315X	2300	230
55CL-SS15-0001-111315X	5400	540
55CL-SS16-0001-111315X	5230	523
55CL-SS17-0001-111715X	5610	561
55CL-SS18-0001-111715X	1530	153
55CL-SS19-0001-110915X	4390	439
55CL-SS20-0001-110915X	2970	297
55CL-SS21-0001-111315X	71700	7170
55CL-SS22-0001-111215X	13300	1330
55CL-SS23-0102-111215X	2600	260
55CL-SS24-0001-111215X	3080	308
55CL-SS25-0001-111215X	8830	883
55CL-SS26-0001-110615X	2460	246
55CL-SS27-0001-110915X	10000	1000
55CL-SS28-0001-111715X	2580	258
55CL-SS29-0001-111315X	2140	214
55CL-SS30-0001-111715X	7000	700

TableSLERA-28
Phytotoxicity Hazard Quotients - 27 and 55 Clinton Avenue
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Sample ID	Chromium	
	NOAEL-based	LOAEL-based
55CL-SS31-0001-111615X	1870	187
55CL-SS32-0001-110615X	3920	392
55CL-SS33-0001-111015X	29800	2980
55CL-SS34-0001-111615X	13500	1350
55CL-SS35-0001-111015X	967	96.7
55CL-SS36-0001-110615X	23000	2300
55CL-SS37-0001-111815X	661000	66100
55CL-SS38-0001-111615X	2020	202
55CL-SS39-0001-110915X	13600	1360
55CL-SS40-0001-110515X	6780	678
55CL-SS41-0001-110515X	3430	343
55CL-SS42-0001-110615X	2010	201
55CL-SS43-0001-110615X	5160	516
55CL-SS44-0001-110515X	6110	611
55CL-SS45-0001-110415X	7580	758
55CL-SS46-0001-110915X	1460	146
55CL-SS47-0001-110615X	3880	388
55CL-SS48-0001-110315X	7440	744
55CL-SS49-0001-110315X	17500	1750
55CL-SS50-0001-110915X	1580	158
55CL-SS51-0001-110415X	3310	331
55CL-SS52-0001-110615X	6890	689
55CL-SS53-0001-110315X	2110	211
55CL-SS54-0001-110415X	1840	184
55CL-SS55-0001-110415X	2210	221
55CL-SS56-0001-110515X	2840	284
55CL-SS57-0001-110515X	2470	247
55CL-SS58-0001-110415X	2710	271
55CL-SS59-0001-110515X	2030	203
55CL-SS60-0001-110515X	928	92.8
55CL-SS61-0001-110415X	3790	379
55CL-SS62-0001-110415X	63900	6390
55CL-SS63-0001-110415X	11500	1150
55CL-SS64-0001-110615X	2290	229
55CL-SS64A-0001-110615X	45300	4530
55CL-SS65-0001-111915X	750	75
55CL-SS66-0001-111015X	1590	159
55CL-SS67-0001-111715X	4470	447
55CL-SS68-0001-111915X	8780	878
55CL-SS69-0001-111815X	14300	1430
55CL-SS70-0001-111815X	2480	248
55CL-SS71-0001-111815X	10100	1010
55CL-SS72-0001-111715X	3470	347
55CL-SS73-0001-111715X	1470	147
55CL-SS74-0001-112015X	1380	138
5CL-SSCAMP-0001-111315	906	90.6

TableSLERA-28
Phytotoxicity Hazard Quotients - 27 and 55 Clinton Avenue
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Sample ID	Chromium	
	NOAEL-based	LOAEL-based
SO-01 (0.5-2)	131000	13100
SO-03 (0-1.8)	86700	8670
SO-04 (0.5-2)	2080	208
SO-06 (1-2)	1420	142
SO-07 (0-1.5)	1780	178
SO-12 (0.5-1.2)	1970	197
SO-13 (0.8-1.5)	2980	298
SO-14 (1.5-2)	3910	391
SO-18 (1-2)	9250	925
SO-20 (0-2)	18900	1890
SO-50 (0-1)	3170	317
SO-51 (0-1.5)	961	96.1
SO-52 (0.75-1.5)	917	91.7
SO-53 (0.75-2)	3990	399
SO-54 (0-0.25)	12100	1210
SO-55 (0-0.25)	407000	40700
SO-56 (0-0.25)	772000	77200
SO-57 (0-0.25)	1060000	106000
SO-58 (0-1)	223000	22300
SO-59 (0-0.25)	63300	6330
SO-60 (0-0.25)	68300	6830
SO-61 (0.25-0.83)	0.677	0.0677

Table SLERA-29
Phytotoxicity Hazard Quotients - Salt Marsh Fringe
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Sample ID	Chromium	
	NOAEL-based	LOAEL-based
SD201-031716	2820	282
SD202-031716	34300	3430
SD203-031716	91700	9170
SD204-031716	8780	878
SD205-031716	38300	3830
SD206-031716	35700	3570
SD207-031716	106000	10600
SD208-031716	12900	1290
SD209-031716	50100	5010
SD210-031716	31200	3120
SD211-031716	5340	534
SD212-031716	42400	4240
SD213-031716	43500	4350
SD214-031716	40900	4090
SD215-031716	43100	4310
SD-56 (0-1)	510000	51000
SD-57 (0.2-1)	25900	2590
SD-58 (0.1-0.75)	7670	767
SD-59 (0-0.75)	73300	7330

Table SLERA-30
Soil Invertebrate Hazard Quotients - 27 and 55 Clinton Avenue
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

	2,3,7,8-Tetrachlorodibenzo-p-dioxin		Chromium	
Sample ID	**NOAEL-based**	**LOAEL-based**	**NOAEL-based**	**LOAEL-based**
27CL-HB01-0001-111115X	NA	NA	344	34.4
27CL-HB01-0102-111115X	NA	NA	313	31.3
27CL-HB02-0001-111115X	NA	NA	266	26.6
27CL-HB02-0102-111115X	NA	NA	304	30.4
27CL-HB03-0001-111115X	NA	NA	236	23.6
27CL-HB03-0102-111115X	NA	NA	136	13.6
27CL-HB04-0001-111115X	NA	NA	185	18.5
27CL-HB04-0102-111115X	NA	NA	277	27.7
27CL-HB05-0001-111615X	NA	NA	156	15.6
27CL-HB06-0001-111615X	NA	NA	328	32.8
27CL-HB06-0102-111615X	NA	NA	116	11.6
27CL-HB07-0001-111615X	NA	NA	990	99
27CL-SS01-0001-112015X	NA	NA	200	20
55CL-HB01-0001-111115X	NA	NA	278	27.8
55CL-HB02-0001-111115X	NA	NA	442	44.2
55CL-HB02-0102-111115X	NA	NA	464	46.4
55CL-SS01-0001-111915X	NA	NA	830	83
55CL-SS02-0001-111915X	NA	NA	263	26.3
55CL-SS03-0001-111215X	0.0000012	0.00000012	1620	162
55CL-SS04-0001-111215X	NA	NA	1710	171
55CL-SS05-0001-111215X	NA	NA	89.5	8.95
55CL-SS06-0001-111615X	NA	NA	238	23.8
55CL-SS07-0001-111915X	0.00000834	0.000000834	3640	364
55CL-SS08-0001-111915X	NA	NA	262	26.2
55CL-SS09-0001-111015X	NA	NA	457	45.7
55CL-SS10-0001-111215X	NA	NA	91	9.1
55CL-SS11-0001-111815X	NA	NA	110	11
55CL-SS12-0001-111615X	NA	NA	140	14
55CL-SS13-0001-110915X	0.00000088	0.000000088	398	39.8
55CL-SS14-0001-111315X	NA	NA	93	9.3
55CL-SS15-0001-111315X	NA	NA	207	20.7
55CL-SS16-0001-111315X	0.000000652	6.52E-08	486	48.6
55CL-SS17-0001-111715X	NA	NA	471	47.1
55CL-SS18-0001-111715X	NA	NA	505	50.5
55CL-SS19-0001-110915X	NA	NA	138	13.8
55CL-SS20-0001-110915X	0.00000112	0.000000112	395	39.5
55CL-SS21-0001-111315X	NA	NA	267	26.7
55CL-SS22-0001-111215X	0.0000114	0.00000114	6450	645
55CL-SS23-0102-111215X	NA	NA	1200	120
55CL-SS24-0001-111215X	NA	NA	234	23.4
55CL-SS25-0001-111215X	NA	NA	277	27.7
55CL-SS26-0001-110615X	0.00000156	0.000000156	795	79.5
55CL-SS27-0001-110915X	NA	NA	221	22.1
55CL-SS28-0001-111715X	NA	NA	900	90
55CL-SS29-0001-111315X	NA	NA	232	23.2
55CL-SS30-0001-111715X	NA	NA	193	19.3
55CL-SS31-0001-111615X	NA	NA	630	63
55CL-SS32-0001-110615X	NA	NA	168	16.8
55CL-SS33-0001-111015X	NA	NA	352	35.2
55CL-SS34-0001-111615X	0.0000139	0.00000139	2680	268
55CL-SS35-0001-111015X	0.00000342	0.000000342	1220	122
55CL-SS36-0001-110615X	NA	NA	87	8.7
55CL-SS37-0001-111815X	NA	NA	2070	207
55CL-SS38-0001-111615X	0.000512	0.0000512	59500	5950
55CL-SS39-0001-110915X	NA	NA	182	18.2
55CL-SS40-0001-110515X	NA	NA	1220	122
55CL-SS41-0001-110515X	0.00000144	0.000000144	610	61

Table SLERA-30
Soil Invertebrate Hazard Quotients - 27 and 55 Clinton Avenue
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

	2,3,7,8-Tetrachlorodibenzo-p-dioxin		Chromium	
55CL-SS42-0001-110615X	0.00000262	0.000000262	309	30.9
55CL-SS43-0001-110615X	NA	NA	181	18.1
55CL-SS44-0001-110515X	NA	NA	464	46.4
55CL-SS45-0001-110415X	0.00000147	0.000000147	550	55
55CL-SS46-0001-110915X	0.000000402	4.02E-08	682	68.2
55CL-SS47-0001-110615X	NA	NA	132	13.2
55CL-SS48-0001-110315X	NA	NA	350	35
55CL-SS49-0001-110315X	NA	NA	670	67
55CL-SS50-0001-110915X	0.00000068	0.000000068	1580	158
55CL-SS51-0001-110415X	NA	NA	142	14.2
55CL-SS52-0001-110615X	NA	NA	298	29.8
55CL-SS53-0001-110315X	NA	NA	620	62
55CL-SS54-0001-110415X	NA	NA	190	19
55CL-SS55-0001-110415X	NA	NA	165	16.5
55CL-SS56-0001-110515X	NA	NA	199	19.9
55CL-SS57-0001-110515X	NA	NA	256	25.6
55CL-SS58-0001-110415X	NA	NA	222	22.2
55CL-SS59-0001-110515X	0.00000092	0.000000092	244	24.4
55CL-SS60-0001-110515X	NA	NA	183	18.3
55CL-SS61-0001-110415X	NA	NA	83.5	8.35
55CL-SS62-0001-110415X	NA	NA	342	34.2
55CL-SS63-0001-110415X	NA	NA	5750	575
55CL-SS64-0001-110615X	0.00000318	0.000000318	1040	104
55CL-SS64A-0001-110615X	0.000000204	2.04E-08	206	20.6
55CL-SS65-0001-111915X	NA	NA	4080	408
55CL-SS66-0001-111015X	NA	NA	67.5	6.75
55CL-SS67-0001-111715X	NA	NA	143	14.3
55CL-SS68-0001-111915X	NA	NA	402	40.2
55CL-SS69-0001-111815X	NA	NA	790	79
55CL-SS70-0001-111815X	NA	NA	1280	128
55CL-SS71-0001-111815X	NA	NA	224	22.4
55CL-SS72-0001-111715X	NA	NA	905	90.5
55CL-SS73-0001-111715X	NA	NA	312	31.2
55CL-SS74-0001-112015X	NA	NA	132	13.2
55CL-SSCAMP-0001-111315X	NA	NA	124	12.4
SO-01 (0.5-2)	NA	NA	81.5	8.15
SO-03 (0-1.8)	0.00004	0.000004	11800	1180
SO-04 (0.5-2)	0.0000204	0.00000204	7800	780
SO-06 (1-2)	0.000000558	5.58E-08	188	18.8
SO-07 (0-1.5)	0.000000554	5.54E-08	128	12.8
SO-12 (0.5-1.2)	NA	NA	160	16
SO-13 (0.8-1.5)	0.000000492	4.92E-08	178	17.8
SO-14 (1.5-2)	0.00000062	0.000000062	268	26.8
SO-18 (1-2)	0.00000179	0.000000179	352	35.2
SO-20 (0-2)	0.000000255	2.55E-08	832	83.2
SO-50 (0-1)	0.00000131	0.000000131	1700	170
SO-51 (0-1.5)	0.00000051	0.000000051	286	28.6
SO-52 (0.75-1.5)	NA	NA	86.5	8.65
SO-53 (0.75-2)	NA	NA	82.5	8.25
SO-54 (0-0.25)	NA	NA	360	36
SO-55 (0-0.25)	NA	NA	1090	109
SO-56 (0-0.25)	0.0000175	0.00000175	36600	3660
SO-57 (0-0.25)	0.000167	0.0000167	69500	6950
SO-58 (0-1)	0.000153	0.0000153	95000	9500
SO-59 (0-0.25)	0.0000166	0.00000166	20100	2010
SO-60 (0-0.25)	0.000044	0.0000044	5700	570
SO-61 (0.25-0.83)	0.0000174	0.00000174	6150	615

Table SLERA-30
Soil Invertebrate Hazard Quotients - 27 and 55 Clinton Avenue
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

	2,3,7,8-Tetrachlorodibenzo-p-dioxin	Chromium

NA = Not analyzed.

Table SLERA-31
Benthic Invertebrate Hazard Quotients - Salt Marsh Fringe
Creese and Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

Sample ID	Chromium	
	Low-end	**High-end**
SD201-031716	0.627	0.137
SD211-031716	1.19	0.26
SD-58 (0.1-0.75)	1.7	0.373
SD204-031716	1.95	0.427
SD208-031716	2.88	0.63
SD-57 (0.2-1)	5.75	1.26
SD210-031716	6.94	1.52
SD202-031716	7.63	1.67
SD206-031716	7.93	1.74
SD205-031716	8.51	1.86
SD214-031716	9.09	1.99
SD212-031716	9.43	2.06
SD215-031716	9.58	2.1
SD213-031716	9.67	2.12
SD209-031716	11.1	2.44
SD-59 (0-0.75)	16.3	3.57
SD203-031716	20.4	4.46
SD207-031716	23.6	5.16
SD-56 (0-1)	113	24.8

Table SLERA-32
Hazard Quotients - American Robin and Short-tailed Shrew
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

COPEC	American Robin		Short-tailed Shrew	
	NOAEL-based	LOAEL-based	NOAEL-based	LOAEL-based
Dioxins/Furans				
2,3,7,8-TCDD TEQ	10	1	300	30
Inorganics				
Chromium	140	26	20	4

Shading indicates HQ >1.0.
Note: Results rounded to two significant digits.
NA = Not available, COPEC not detected in medium.
NTV = No toxicity value.

Table SLERA-33
Hazard Quotients - Salt Marsh Fringe - Great Blue Heron
Creese & Cook Tannery (Former) - West Study Area
Danvers, Massachusetts

COPEC	NOAEL-based	LOAEL-based
Inorganics		
Chromium	25	4.6

Shading indicates HQ >1.0.
Note: Results rounded to two significant digits.
NTV = No toxicity value.

APPENDIX H

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, EPA 540-R-01-003, OSWER 9285.7-41, September 2002	Guidance document to aid statistician's with the process of collecting and analyzing background sample at CERCLA sites. Identifies circumstances when suitable background reference areas may not be available and discusses use of published sources for establishing background conditions.	To Be Considered	Guide was used to characterize background concentrations, evaluate options for analyzing background data, and develop PRGs.
Federal Criteria, Advisories, and Guidance	Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead In Soil, EPA-540-R-03-001, January 2003	EPA Guidance for evaluating risks posed by lead in soil.	To Be Considered	Guide was used to calculate potential risks caused by exposure to lead in soil and develop PRGs.
Federal Criteria, Advisories, and Guidance	EPA Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006, OSWER 9285.7-25, June 1997.	This provides guidance on the designing and conducting of technically defensible ecological risk assessments for the Superfund program.	To Be Considered	This guidance was used to design and conduct the ecological risk assessment(s) performed for the site.
Federal Criteria, Advisories, and Guidance	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA-630-R-03-003F	This provides guidance on assessing risk to children from carcinogens.	To Be Considered	This guidance was used to calculate potential risks caused by exposure to carcinogenic contaminants in soil and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Guidelines for Carcinogenic Risk Assessment, EPA-630-P-03-001F	These guidelines provide guidance on conducting risk assessments involving carcinogens.	To Be Considered	This guidance was used to design and conduct the human health risk assessments to evaluate health risks associated with carcinogens and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Establishing Background Levels, EPA/540/F-94/030 (September 1995)	This guidance describes how to determine background levels for each migration pathway and describes situations when published data may be used to establish background levels at a site.	To Be Considered	This guidance supports the use of state-specific background data in lieu of federal or site-specific data in certain circumstances.
Federal Criteria, Advisories, and Guidance	OSWER Publication 9285.6-07P: Role of Background in the CERCLA Cleanup Program, April 2002	Guidance document that presents EPA's preferred approach for the consideration of background constituent concentrations of hazardous substances, pollutants, and contaminant in the remedy process at CERCLA sites.	To Be Considered	Guide was used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guide was also used in developing the PRGs.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	Risk Assessment for Dioxin at Superfund Sites, https://www.epa.gov/superfund/risk-assessment-dioxin-superfund-sites, Last updated on December 7, 2017	This website details the approach used to select a PRG for dioxin.	To Be Considered	This guidance was used to guide the selection of PRGs for dioxins at the Site.
Federal Criteria, Advisories, and Guidance	EPA Fact Sheet on the Management of Dioxin Contaminated Soils, May 2011	This document provides guidance on the proper management of dioxin contaminated soils.	To Be Considered	Guidance document was used in the remedial technology selection and screening process.
Federal Criteria, Advisories, and Guidance	EPA Risk Reference Doses (RfDs)	RfDs are dose levels developed by EPA for use in estimating the non-carcinogenic effects of exposure to toxic substances.	To Be Considered	RfDs were used to characterize human health risks due to non-carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Cancer Slope Factors (CSFs)	Guidance values used to evaluate the potential carcinogenic risk caused by exposure to contaminants.	To Be Considered	CSFs were used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER Directive 9283.1-33	Provides compilation of important groundwater policies EPA uses in making groundwater restoration decisions pursuant to CERCLA and the NCP.	To Be Considered	Consistent with the policy regarding beneficial use, the state has classified the groundwater as GW-3, a non-potential drinking water source area.
State Criteria, Advisories, and Guidance	Massachusetts Department of Environmental Protection Technical Update - Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil, dated May 2002	Provides the basis for identifying and applying background concentrations in soil samples of "Natural" Soil as well as Soil Containing Coal Ash or Wood Ash Associated with Fill Material.	To Be Considered	Guide was used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guide was also used in developing the PRGs.

Notes:

1. Chemical-specific ARARs associated with on-site consolidation and capping can be found in Table H-4a.

Table H-1b
Action-Specific ARARs for ESA Residential 2A
Record of Decision
Creese Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirements	Clean Water Act, §402 NPDES, 33 USC 1343, 40 CFR 122.22 -125, 131	These standards govern discharge of water into surface waters. Applies to construction sites greater than 5 acres; construction at ESA Residential is less than 5 acres, but degradation concerns similar to larger construction area; therefore, are relevant and appropriate.	Relevant and Appropriate	It is not anticipated that dewatering will be needed during remedial construction. Additionally, decontamination wastewater should not require discharges to surface water. However, if dewatering is required because of unusually high water table or other factor, any discharges into surface water (decontamination water or dewatering water) will meet the substantive standards of this regulations including meeting effluent standards and preventing degradation of surface water. During remediation, best management practices and other measures will be implemented to control pollutants in wastewater discharges.
Federal Regulatory Requirements	Clean Water Act Regulations (Stormwater Discharges) (40 CFR 122.26(c)(ii)(C))	Discharges of stormwater associated with construction activities are required to implement measures, including best management practices, to control pollutants in stormwater discharges during and after construction activities. Applies to construction sites greater than 5 acres; construction at ESA Residential is less than 5 acres, but stormwater runoff concerns are similar to larger construction area.	Relevant and Appropriate	Best management practices shall be used to control and manage stormwater runoff during remedial activities and incorporated into the final remedy.
Federal Regulatory Requirements	Clean Water Act Federal Water Quality Criteria §304(a), 40 CFR 131	The National Recommended Water Quality Criteria (NRWQC) are provided by EPA for both protection of human health and aquatic life for specific chemicals.	Relevant and Appropriate	NRWQC will be used as a performance standard for evaluating the effectiveness of soil cleanup activities, including those in and around the wetlands and salt marsh areas, on surface water quality to ensure there is no degradation of the surface water during remediation.
Federal Criteria, Advisories, and Guidance	Invasive Species (Executive Order 13112)	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment.	To Be Considered	During remedial action measures will be taken to address invasive species consistent with this Executive Order. To the extent practicable, native vegetation shall be used for restoration.
State Regulatory Requirements	Surface Water Discharge Permit Program (314 CMR 3.00)	Governs the issuance of surface water discharge permits in Massachusetts in conformance with the Mass Clean Waters Act and federal Clean Water Act	Relevant and Appropriate	It is not anticipated that dewatering will be needed during remedial construction. Additionally, decontamination wastewater should not require discharges to surface water. However, if dewatering is required because of unusually high water table or other factor, any discharges into surface water (decontamination water or dewatering water) will meet the substantive standards of this regulation, including meeting effluent standards and preventing degradation of surface water.
State Regulatory Requirements	Massachusetts Surface Water Quality Standard (314 CMR 4.00) and Massachusetts Clean Water Act (MGL c.21 s. 26-53)	Implements the provisions of the federal Clean Water Act. Maintains surface water quality by regulating discharges of pollutants.	Relevant and Appropriate	State surface water standards will be used as a performance standard for evaluating the effectiveness of soil cleanup activities, including those in and around the wetland and salt marsh areas, on surface water quality to ensure there is no degradation of the surface water during remediation.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Operation, Maintenance, and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Establishes standards and pretreatment requirements for wastewater treatment works and protects waters within the Commonwealth.	Applicable	Assuming that the local POTW has capacity, water generated from decontamination and other remediation activities will be sampled, treated (if necessary), and then may be discharged to the local POTW and will need to comply with these regulations. Decontamination water will be treated on-site if necessary to meet the pretreatment standards.
State Regulatory Requirements	Air Pollution Control Regulations (310 CMR 7.00); Standards for Dust (310 CMR 7.09); Standards for Noise (310 CMR 7.10)	Regulations that prohibit burning or emissions of dust which causes or contributes to condition air pollution. Also establishes measures for management of noise.	Applicable	Activities involving soil excavation or handling will be conducted in a manner to minimize fugitive dust emissions. Air monitoring and best engineering practices will be employed to minimize fugitive dust emissions. Operation of heavy machinery and equipment will comply with these requirements.
State Regulatory Requirements	Massachusetts Hazardous Waste Regulations: 310 CMR 30.100 (Identification and Listing of Hazardous Waste); 310 CMR 30.300 (Requirements for Generators of Hazardous Waste); 310 CMR 30.400 (Requirements for Transporters of Hazardous Waste); 310 CMR 30.510 (Management Standards); and 310 CMR 30.513 (Waste Analysis)	Massachusetts is delegated to administer the federal RCRA standards through its regulations. These sections are comprehensive regulations addressing the identification, management, and transportation of hazardous waste in Massachusetts. The RCRA standards of 40 CFR 260-264 are incorporated by reference.	Applicable	Soil will be tested in-situ prior to excavation and tested again following excavation. Any soil that tests positive for meeting hazardous characteristics will be managed in accordance with these regulations. If hazardous waste is identified, hazardous media will be managed, stockpiled in the WSA staging area in accordance with these requirements. This alternative assumes that up to 15% of the soil addressed will require management, transportation, and off-site disposal as hazardous waste. The transportation of hazardous waste from the ESA Residential Area to the stockpiling area in the WSA will comply with these requirements.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19.142(1) and (5)(a) Landfill Post-Closure Requirements)	Sets requirements for post-closure care to maintain, care for and monitor the site to ensure the integrity of the closure measures and to detect and prevent any adverse impacts of the site on public health, safety or the environment and requires corrective action in the event conditions would compromise the integrity and purpose of the final cover.	Relevant and Appropriate	Soil and pavement covers installed where soil contains site-related contaminants exceeding site cleanup levels shall be protective of dermal contact and shall be maintained in accordance with these post-closure requirements. Buildings covering soil that contains site-related contaminants exceeding site cleanup levels shall be maintained in accordance with these post-closure monitoring requirements. Long-term monitoring and maintenance requirements will be contained in a site-specific long-term monitoring and maintenance plan that is consistent with these requirements.
State Criteria, Advisories, and Guidance	Division of Air Quality Control (DAQC) Policy 90-001, Noise Regulation, February 1990	Establishes guideline where sources of new noise should not emit more than 10 decibels above the existing (background) level.	To Be Considered	Site operation noise level will be minimized and will follow the suggested noise limit (10 decibels) to the extent possible. Construction will be scheduled during daylight hours.

Table H-1b
Action-Specific ARARs for ESA Residential 2A
Record of Decision
Creese Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance	Massachusetts DEP Landfill Technical Guidance Manual	Provides a standard reference for and guidance on landfill design, construction, and QA/QC procedures in accordance with 310 CMR 19.	To Be Considered	Soil covers will be designed and constructed consistent with this guidance to the extent practical.
State Criteria, Advisories, and Guidance	Massachusetts Department of Environmental Protection Standard References for Monitoring Wells, WSC-310-91	Guidelines on locating, drilling, installing, sampling and decommissioning monitoring wells.	To Be Considered	These guidelines will be followed when decommissioning existing monitoring wells.

Notes:

1. Action-specific ARARs associated with on-site consolidation and capping can be found in Table H-4b.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirement	National Historic Preservation Act (NHPA) (16 U.S.C. 470, Sec. 106; 36 CFR Part 800 – Protection of Historic Properties)	Pursuant to Section 106 of the NHPA, as amended, CERCLA response actions are required to take into account the effects of the response activities on any historic property included or eligible for inclusion on the National Register of Historic Places (NRHP) and, if a historic property is identified, consult with the State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer (THPO).	Applicable	Areas of potential archeological and historic significance have been identified at 45 Water Street. EPA will continue to consult with the Massachusetts Historical Commission (MHC), SHPO, and THPO regarding planned activities and actions to determine whether implementation of the remedy will adversely impact such resources. If any such adverse impact cannot be avoided EPA will coordinate with the MHC, SHPO, and THPO to develop a set of activities to mitigate those impacts, or memorialize those actions in a Memorandum of Agreement (MOA) with these parties.
Federal Regulatory Requirement	Federal Coastal Zone Management Act (CZMA) 1972. 16 U.S.C. § 1451 et seq.	This site is located in a coastal zone management area. All actions must be conducted in a manner consistent with state-approved management programs.	Applicable	The federal act gives States the primary role in managing coastal areas. See State requirements below for actions to be taken to comply with the Massachusetts coastal zone management policy.
Federal Regulatory Requirement	Clean Water Act, Section 404; Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 33 U.S.C. § 1344; 40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and aquatic resources.	Applicable	EPA has determined that this is the least damaging practicable alternative. Adverse impacts to wetlands may result from installing temporary access roads and excavation of wetlands. Adverse impacts will be minimized to the extent practicable. Mitigation, restoration, and if necessary, replication will be conducted in accordance with these regulations.
Federal Regulatory Requirement	Fish and Wildlife Coordination Act of 1934 (16 U.S.C. § 661 et seq; 40 CFR § 6.302(g))	Requires consultation with the U.S. Fish and Wildlife Service if modifications plan to be made to wetlands, or a body of water. Requires agencies to prevent the loss of wildlife.	Applicable	Excavation activities will likely modify a small area of wetland on 45 Water Street and restoration may be necessary. Adverse project related impacts to fish and wildlife resources will be mitigated and restoration will occur if necessary, in consultation with the U.S Fish and Wildlife Service.
Federal Regulatory Requirement	Floodplains Management (Executive Order 11988); FEMA Regulations (44 CFR Parts 9.4-9.11)	FEMA regulations (incorporating requirements under Executive Order 11988) require federal agencies to avoid long- and short-term impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplains wherever there is a practicable alternative.	Relevant and Appropriate	Remediation will cause temporary impacts to floodplains but will be implemented to avoid occupancy and modification to floodplains through excavation and backfilling to original grade.
Federal Criteria, Advisories, and Guidance	Protection of Wetlands (Executive Order 11990); FEMA Regulations (44 CFR Parts 9.4 - 9.11)	FEMA regulations (incorporating requirements under Executive Order 11990) require federal agencies to avoid adversely impacting federal jurisdictional wetlands unless there is no practicable alternative with lesser effects and the proposed action include all practicable measures to minimize the harm to federal wetlands that may result from such use.	Relevant and Appropriate	Remediation may result in adverse impacts to a small wetland on 45 Water Street from temporary access roads and EPA has determined that there is no practical alternative to taking action in a wetland. Excavation and adverse impacts will be minimized to the extent practicable and wetland restoration or replication, if necessary, will be performed to mitigate any damage to wetlands.
State Regulatory Requirements	Waterways Regulations (310 CMR 9.00) and Massachusetts Public Waterfront Act (MGL c. 91)	Regulates activities that adversely affect tidal wetlands and waterways. Any construction or alteration of the land within 100 feet of a river must adhere to these regulations. The wetland/salt marsh area on parcel 45 Water Street is within 100 feet of a river.	Applicable	The saltmarsh, located within 100 feet of a river, will be rehabilitated or restored following soil excavation and backfill. Work will be completed in accordance with this regulation.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Wetlands Protection Act (310 CMR 10.00 (wetland), 310 CMR 10.32 (saltmarsh), and 10.58 (riverfront area), (MGL c. 131 s. 40)	Sets performance standards for dredging, filling, and altering of resource areas, including fresh water and coastal wetlands (including saltmarshes); land subject to tidal action; or lands within 100 feet of a one of the above listed resource areas (hereinafter called the buffer zone) and riverfront area. Resource areas in the ESA Residential area include a saltmarsh area and 100 foot buffer zone, and riverfront area. Such action in a salt marsh or buffer zone shall not destroy any portion of the resource area and shall not have an adverse effect on the productivity of the salt marsh. However, if the project will restore or rehabilitate a salt marsh, it may be allowed. For riverbank areas, there must be no practicable and substantially equivalent economic alternatives to the proposed project with less adverse effects on resource areas and mitigation may be required.	Applicable	The saltmarsh, located within 100 feet of a river, and impacted riverfront area will be rehabilitated or restored following soil excavation and backfill. EPA has determined that there is no practical alternative to taking action in the riverfront area.
State Regulatory Requirements	Coastal Zone Management, 301 CMR 20.00; Massachusetts Office of Coastal Zone Management Policy Guide, October 2011, Habitat Policy #1	Massachusetts has the primary role in managing its coastal areas under it Coastal Zone Management law and requires that any actions must be conducted in a manner consistent with state-approved management programs. Habitat Policy #1 protects coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and fresh water wetlands for critical wildlife habitat functions as well as other important functions and services including nutrient and sediment attenuation, wave and storm damage protection, and landform movement and processes.	To Be Considered	Remediation will affect terrestrial, intertidal, or submerged areas. Impacts to the coastal habitats present will be considered in light of the Habitat Policy and activities will be conducted in order to minimize impacts to the coastal habitats.
State Regulatory Requirements	Historic Preservation Antiquities Act (M.G.L c.9 §26-27); Massachusetts Historical Commission Regulations (950 CMR 70-71); Protection of Properties Included in the State Register of Historic Places (950 CMR 71)	Protects the public's interest in preserving historic and archaeological properties. Establishes the need for coordination with the National Historic Preservation Act.	Applicable	Areas of potential archeological and historic significance have been identified at 45 Water Street. EPA will continue to consult with the Massachusetts Historical Commission (MHC), SHPO, and THPO regarding planned activities and actions to determine whether implementation of the remedy will adversely impact such resources. If any such adverse impacts cannot be avoided EPA will coordinate with the SHPO, MHC, and THPO to develop a set of activities to mitigate those impacts and will memorialize those actions in a Memorandum of Agreement (MOA) with those parties.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19.038(2)(c)(3)(d)(landfill siting criteria) and 19.080 (1) (variances)	Landfill siting regulations that prohibit the outermost limits of a waste deposition area from being located within a resource area including the 100-year floodplain unless located through a variance including for protection of public health or if no other reasonable alternatives exist. Soil covers may be located within a resource area or 100-year floodplain.	Relevant and Appropriate	Remediation will cause temporary impacts to floodplains but will be implemented to avoid occupancy and modification to floodplains through excavation and backfilling to original grade and the soil cover will be constructed to be protective of public health. The variance is satisfied through concurrence of the final remedial decision.
State Regulatory Requirements	Massachusetts Clean Water Act (MGL 21 26-53); Water quality certification of dredged or fill material in waters of the United States within the Commonwealth (314 CMR 9.00)	Governs work performed in or near a wetland. Establishes criteria and standards for dredging, handling, and disposal of fill and dredged material.	Applicable	Contaminated soil within the saltmarsh wetland area will be adversely affected during the soil excavation and backfilling; temporary access road may also disturb wetlands or buffer zones. Impacts will be minimized to the extent practicable and disturbed wetlands will be restored or replicated, if necessary, following the soil excavation.

Notes:

1. Location-specific ARARs associated with on-site consolidation and capping can be found in Table H-4c.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, EPA 540-R-01-003, OSWER 9285.7-41, September 2002	Guidance document to aid statistician's with the process of collecting and analyzing background sample at CERCLA sites. Identifies circumstances when suitable background reference areas may not be available and discusses use of published sources for establishing background conditions.	To Be Considered	Guide was used to characterize background concentrations, evaluate options for analyzing background data, and develop PRGs.
Federal Criteria, Advisories, and Guidance	Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil, EPA-540-R-03-001, January 2003	EPA Guidance for evaluating risks posed by lead in soil.	To Be Considered	Lead was not found to be a COC for MBTA ROW area.
Federal Criteria, Advisories, and Guidance	EPA Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006, OSWER 9285.7-25, June 1997.	This provides guidance on the designing and conducting of technically defensible ecological risk assessments for the Superfund program.	To Be Considered	This guidance is used to design and conduct the ecological risk assessment(s) performed for the site.
Federal Criteria, Advisories, and Guidance	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA-630-R-03-003F	This provides guidance on assessing risk to children from carcinogens.	To Be Considered	This guidance is used to calculate potential risks caused by exposure to carcinogenic contaminants in soil and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Guidelines for Carcinogenic Risk Assessment, EPA-630-P-03-001F	These guidelines provide guidance on conducting risk assessments involving carcinogens.	To Be Considered	This guidance was used to design and conduct the human health risk assessments to evaluate health risks associated with carcinogens and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	OSWER Publication 9285.6-07P: Role of Background in the CERCLA Cleanup Program, April 2002	Guidance document that presents EPA's preferred approach for the consideration of background constituent concentrations of hazardous substances, pollutants, and contaminant in the remedy process at CERCLA sites.	To Be Considered	Guide was used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guide was also used in developing the PRGs.
Federal Criteria, Advisories, and Guidance	Establishing Background Levels, EPA/540/F-94/030 (September 1995)	This guidance describes how to determine background levels for each migration pathway and describes situations when published data may be used to establish background levels at a site.	To Be Considered	This guidance supports the use of state-specific background data in lieu of federal or site-specific data in certain circumstances.
Federal Criteria, Advisories, and Guidance	EPA Fact Sheet on the Management of Dioxin Contaminated Soils, May 2011	This document provides guidance on the proper management of dioxin contaminated soils.	To Be Considered	Guidance document was used in the remedial technology selection and screening process.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	Risk Assessment for Dioxin at Superfund Sites, https://www.epa.gov/superfund/risk-assessment-dioxin-superfund-sites, Last updated on December 7, 2017	This website details the approach used to select a PRG for dioxin.	To Be Considered	This guidance was used to guide the selection of PRGs for dioxins at the Site.
Federal Criteria, Advisories, and Guidance	EPA Risk Reference Doses (RfDs)	RfDs are dose levels developed by EPA for use in estimating the non-carcinogenic effects of exposure to toxic substances.	To Be Considered	RfDs were used to characterize human health risks due to non-carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Cancer Slope Factors (CSFs)	Guidance values used to evaluate the potential carcinogenic risk caused by exposure to contaminants.	To Be Considered	CSFs were used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER Directive 9283.1-33	Provides compilation of important groundwater policies EPA uses in making groundwater restoration decisions pursuant to CERCLA and the NCP.	To Be Considered	Consistent with the policy regarding beneficial use, the state has classified the groundwater as GW-3, a non-potential drinking water source area.
State Criteria, Advisories, and Guidance	Massachusetts Department of Environmental Protection Technical Update - Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil, dated May 2002	Provides the basis for identifying and applying background concentrations in soil samples of "Natural" Soil as well as Soil Containing Coal Ash or Wood Ash Associated with Fill Material.	To Be Considered	Guide was used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guide was also used in developing the PRGs.

Notes:
1. Chemical-specific ARARs associated with on-site consolidation and capping can be found in Table H-4a

Table H-2b
Action-Specific ARARs for ESA MBTA 3
Record of Decision
Creese & Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirements	Clean Water Act, §402 NPDES, 33 USC 1343, 40 CFR 122.22 -125, 131	These standards govern discharge of water into surface waters. Applies to construction sites greater than 5 acres; construction at ESA MBTA is less than 5 acres, but degradation concerns similar to larger construction area; therefore, are relevant and appropriate.	Relevant and Appropriate	It is not anticipated that dewatering will be needed during remedial construction. Additionally, decontamination wastewater should not require discharges to surface water. However, if dewatering is required because of unusually high water table or other factor, any discharges into surface water (decontamination water or dewatering water) will meet the substantive standards of this regulations including meeting effluent standards and preventing degradation of surface water. During remediation, best management practices and other measures will be implemented to control pollutants in wastewater discharges.
Federal Regulatory Requirements	Clean Water Act Regulations (Stormwater Discharges) (40 CFR 122.26(c)(ii)(C))	Discharges of stormwater associated with construction activities are required to implement measures, including best management practices, to control pollutants in stormwater discharges during and after construction activities. Applies to construction sites greater than 5 acres; construction at ESA MBTA is less than 5 acres, but stormwater runoff concerns are similar to larger construction area.	Relevant and Appropriate	Best management practices shall be used to control and manage stormwater runoff during remedial activities and incorporated into the final remedy.
Federal Regulatory Requirements	Clean Water Act Federal Water Quality Criteria §304(a), 40 CFR 131	The National Recommended Water Quality Criteria (NRWQC) are provided by EPA for both protection of human health and aquatic life for specific chemicals.	Relevant and Appropriate	NRWQC will be used as a performance standard for evaluating the effectiveness of soil cleanup activities on surface water quality to ensure there is no degradation of the surface water during remediation.
Federal Criteria, Advisories, and Guidance	Invasive Species (Executive Order 13112)	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment.	To Be Considered	During remedial action measures will be taken to address invasive species consistent with this Executive Order. To the extent practicable, native vegetation shall be used for restoration.
State Regulatory Requirements	Surface Water Discharge Permit Program (314 CMR 3.00)	Governs the issuance of surface water discharge permits in Massachusetts in conformance with the Mass Clean Waters Act and federal Clean Water Act	Relevant and Appropriate	It is not anticipated that dewatering will be needed during remedial construction. Additionally, decontamination wastewater should not require discharges to surface water. However, if dewatering is required because of unusually high water table or other factor, any discharges into surface water (decontamination water or dewatering water) will meet the substantive standards of this regulation, including meeting effluent standards and preventing degradation of surface water.
State Regulatory Requirements	Massachusetts Surface Water Quality Standard (314 CMR 4.00) and Massachusetts Clean Water Act (MGL c.21 s. 26-53)	Implements the provisions of the federal Clean Water Act. Maintains surface water quality by regulating discharges of pollutants.	Relevant and Appropriate	These regulations will be used as performance standards for evaluating the effectiveness of soil cleanup activities on surface water quality and to ensure there is no degradation of the surface water during remediation.
State Regulatory Requirements	Operation, Maintenance, and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Establishes standards and pretreatment requirements for wastewater treatment works and protects waters within the Commonwealth.	Applicable	Assuming that the local POTW has capacity, water generated from decontamination and other remediation activities will be sampled, treated (if necessary), and then may be discharged to the local POTW and will need to comply with these regulations. Decontamination water will be treated on-site if necessary to meet the pretreatment standards.
State Regulatory Requirements	Air Pollution Control Regulations (310 CMR 7.00); Standards for Dust (310 CMR 7.09); Standards for Noise (310 CMR 7.10)	Regulations that prohibit burning or emissions of dust which causes or contributes to condition air pollution. Also establishes measures for management of noise.	Applicable	Activities involving soil excavation or handling will be conducted in a manner to minimize fugitive dust emissions. Air monitoring and best engineering practices will be employed to minimize fugitive dust emissions. Operation of heavy machinery and equipment will comply with these requirements.

Table H-2b
Action-Specific ARARs for ESA MBTA 3
Record of Decision
Creese & Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Massachusetts Hazardous Waste Regulations: 310 CMR 30.100 (Identification and Listing of Hazardous Waste); 310 CMR 30.300 (Requirements for Generators of Hazardous Waste); 310 CMR 30.400 (Requirements for Transporters of Hazardous Waste); 310 CMR 30.510 (Management Standards); and 310 CMR 30.513 (Waste Analysis)	Massachusetts is delegated to administer the federal RCRA standards through its regulations. These sections are comprehensive regulations addressing the identification, management, and transportation of hazardous waste in Massachusetts. The RCRA standards of 40 CFR 260-264 are incorporated by reference.	Applicable	Soil will be tested in-situ prior to excavation and tested again following excavation. Any soil that tests positive for meeting hazardous characteristics will be managed in accordance with these regulations. If hazardous waste is identified, hazardous media will be managed, stockpiled in the WSA staging area in accordance with these requirements. This alternative assumes that up to 15% of the soil addressed will require management, transportation, and off-site disposal as hazardous waste. The transportation of hazardous waste from the ESA MBTA Area to the stockpiling area in the WSA will comply with these requirements.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19.142(1) and (5)(a) Landfill Post-Closure Requirements	Sets requirements for post-closure care to maintain, care for and monitor the site to ensure the integrity of the closure measures and to detect and prevent any adverse impacts of the site on public health, safety or the environment and requires corrective action in the event conditions would compromise the integrity and purpose of the final cover.	Relevant and Appropriate	Soil and pavement covers installed where soil contains site-related contaminants exceeding site cleanup levels shall be protective of dermal contact and shall be maintained in accordance with these post-closure requirements. Buildings covering soil that contains site-related contaminants exceeding site cleanup levels shall be maintained in accordance with these post-closure monitoring requirements. Long-term monitoring and maintenance requirements will be contained in a site-specific long-term monitoring and maintenance plan that is consistent with these requirements.
State Criteria, Advisories, and Guidance	Massachusetts DEP Landfill Technical Guidance Manual	Provides a standard reference for and guidance on landfill design, construction, and QA/QC procedures in accordance with 310 CMR 19.	To Be Considered	Soil covers will be designed and constructed consistent with this guidance to the extent practical.
State Criteria, Advisories, and Guidance	Division of Air Quality Control (DAQC) Policy 90-001, Noise Regulation, February 1990	Establishes guideline where sources of new noise should not emit more than 10 decibels above the existing (background) level.	To Be Considered	Site operation noise level will be minimized and will follow the suggested noise limit (10 decibels) to the extent possible. Construction will be scheduled during daylight hours.
State Criteria, Advisories, and Guidance	Massachusetts Department of Environmental Protection Standard References for Monitoring Wells, WSC-310-91	Guidelines on locating, drilling, installing, sampling and decommissioning monitoring wells.	To Be Considered	These guidelines will be followed when decommissioning existing monitoring wells.

Notes:

1. Action-specific ARARs associated with on-site consolidation and capping can be found in Table H-4b.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirement	National Historic Preservation Act (NHPA) (16 U.S.C. 470, Sec. 106; 36 CFR Part 800 – Protection of Historic Properties)	Pursuant to Section 106 of the NHPA, as amended, CERCLA response actions are required to take into account the effects of the response activities on any historic property included or eligible for inclusion on the National Register of Historic Places (NRHP) and, if a historic property is identified, consult with the State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer (THPO).	Applicable	Areas of potential historical and archaeological significance have been identified in the ESA MBTA areas proposed for remedial action. EPA will continue to consult with the Massachusetts Historical Commission (MHC), SHPO, and THPO regarding planned activities and actions to determine whether implementation of the remedy will adversely impact historical or cultural resources. If any such adverse impact cannot be avoided EPA will coordinate with the MHC, SHPO, and THPO to develop a set of activities to mitigate those impacts, which will be memorialized in a Memorandum of Agreement (MOA) with these parties.
Federal Regulatory Requirement	Federal Coastal Zone Management Act (CZMA) 1972. 16 U.S.C. § 1451 et seq.	This site is located in a coastal zone management area and requires that any actions must be conducted in a manner consistent with state-approved management programs.	Applicable	The federal act gives States the primary role in managing coastal areas. See State requirements below for actions to be taken to comply with the Massachusetts coastal zone management policy.
Federal Regulatory Requirement	Clean Water Act, Section 404; Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 33 U.S.C. § 1344; 40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and aquatic resources.	Applicable	EPA has determined that this is the least environmentally damaging practicable alternative to work in wetlands/floodplains. Adverse impacts to wetlands/floodplains may be caused from excavation, backfilling and capping activities. Adverse impacts will be minimized to the extent practicable. Mitigation, restoration or, if necessary, replication measures will be conducted in accordance with these regulations.
Federal Regulatory Requirement	Fish and Wildlife Coordination Act of 1934 (16 U.S.C. § 661 et seq; 40 CFR § 6.302(g))	Requires consultation with the U.S. Fish and Wildlife Service if modifications plan to be made to wetlands, or a body of water. Requires agencies to prevent the loss of wildlife.	Applicable	The remedial action will likely impact wetland areas. EPA will mitigate adverse project related impacts to fish and wildlife resources, if necessary, in consultation with the U.S Fish and Wildlife Service.
Federal Regulatory Requirement	Floodplains Management (Executive Order 11988); FEMA Regulations (44 CFR Parts 9.4-9.11)	FEMA regulations (incorporating requirements under Executive Order 11988), require federal agencies to avoid long- and short-term impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplains wherever there is a practicable alternative.	Relevant and Appropriate	Remediation will cause temporary impacts to floodplains but will be implemented to avoid occupancy and modification to floodplains through excavation and backfilling to original grade. The soil cover will be designed and constructed to be resilient to withstand significant flood events.
Federal Criteria, Advisories, and Guidance	Protection of Wetlands (Executive Order 11990); FEMA Regulations (44 CFR Parts 9.4-9.11)	FEMA regulations (incorporating requirements under Executive Order 11990) require federal agencies to avoid adversely impacting federal jurisdictional wetlands unless there is no practicable alternative with lesser effects and the proposed action include all practicable measures to minimize the harm to federal wetlands that may result from such use.	Relevant and Appropriate	Remediation is expected to result in adverse impacts to wetlands from temporary access roads and excavation. EPA has determined that there is no practical alternative to taking action in a wetland. Adverse impacts will be minimized and wetland restoration or replication, if necessary, will be performed to mitigate any damage to wetlands.
State Regulatory Requirements	Waterways Regulations (310 CMR 9.00) and Massachusetts Public Waterfront Act (MGL c. 91)	Regulates activities that adversely affect tidal wetlands and waterways. Any construction proposing construction or alteration of the land within 100 feet of a river must adhere to regulations.	Applicable	Remediation will impact land within 100 feet of the river, including wetlands and saltmarsh. Restoration will occur after the soil cover is installed. Work will be completed in accordance with this regulation.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Wetlands Protection Act (310 CMR 10.00 (wetland), 310 CMR 10.32(saltmarsh), and 10.58 (riverfront area), (MGL c. 131 s. 40)	Sets performance standards for dredging, filling, and altering of resource areas, including fresh water and coastal wetlands (including saltmarshes); land subject to tidal action; or lands within 100 feet of a one of the above listed resource areas (hereinafter called the buffer zone) and riverfront area. Resource areas in the ESA Residential area include a saltmarsh area and 100 foot buffer zone, and riverfront area. Such action in a salt marsh or buffer zone shall not destroy any portion of the resource area and shall not have an adverse effect on the productivity of the salt marsh. However, if the project will restore or rehabilitate a salt marsh, it may be allowed. For riverbank areas, there must be no practicable and substantially equivalent economic alternatives to the proposed project with less adverse effects on resource areas and mitigation may be required.	Applicable	The saltmarsh, located within 100 feet of a river, and impacted riverfront area will be rehabilitated or restored, if necessary, following soil excavation and backfill. EPA has determined that there is no practical alternative to taking action in the riverfront area.
State Regulatory Requirements	Coastal Zone Management, 301 CMR 20.00; Massachusetts Office of Coastal Zone Management Policy Guide, October 2011, Habitat Policy #1	Massachusetts as the primary role in managing its coastal areas under its Coastal Zone Management law and requires that any actions must be conducted in a manner consistent with state-approved management programs. Habitat Policy #1 protects coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and fresh water wetlands for critical wildlife habitat functions as well as other important functions and services including nutrient and sediment attenuation, wave and storm damage protection, and landform movement and processes.	To Be Considered	Remediation will affect wetland areas (fresh water wetlands and possibly salt marsh) along the Crane River. Potential impacts to the coastal habitats present will be evaluated during the PDI and remedial design. The remedial action will be considered in light of the Habitat Policy and activities will be conducted in accordance with state-approved management programs to minimize impacts to the coastal habitats.
State Regulatory Requirements	Historic Preservation Antiquities Act (M.G.L c.9 §26-27); Massachusetts Historical Commission Regulations (950 CMR 70-71); Protection of Properties Included in the State Register of Historic Places (950 CMR 71)	Protects the public's interest in preserving historic and archaeological properties. Establishes the need for coordination with the National Historic Preservation Act.	Applicable	Areas of potential historical and archaeological significance have been identified in the ESA MBTA areas proposed for remedial action. EPA will continue to consult with the SHPO/THPO to determine whether implementation of the remedy will adversely impact historical or cultural resources. If any such adverse impacts cannot be avoided EPA coordinate with the SHPO, MHC, and THPO to develop a set of activities to mitigate those impacts in a Memorandum of Agreement (MOA) with those parties.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19.038(2)(c)(3)(d)(landfill siting criteria) and 19.080 (1) (variances)	Landfill siting regulations that prohibit the outermost limits of a waste deposition area from being located within a resource area including the 100-year floodplain unless located through a variance including for protection of public health or if no other reasonable alternatives exist. Soil covers may be located within a resource area or a 100-year floodplain.	Relevant and Appropriate	Remediation will cause temporary impacts to floodplains but will be implemented to avoid occupancy and modification to floodplains through excavation and backfilling to original grade and the soil cover will be constructed to be protective of public health. The variance is satisfied through concurrence of the final remedial decision.
State Regulatory Requirements	Massachusetts Clean Water Act (MGL 21 26-53); Water quality certification of dredged or fill material in waters of the United States within the Commonwealth (314 CMR 9.00)	Governs work performed in or near a wetland. Establishes criteria and standards for dredging, handling, and disposal of fill and dredged material.	Applicable	Contaminated soil within the wetland area (approximately 300 SF) will be disturbed during soil excavation, construction of the soil cover, and temporary access road construction and removal may also disturb wetlands or buffer zones. Impacts will be minimized to the extent practicable and the disturbed wetlands will be restored or replicated, if necessary, following construction of the soil cover.

Notes:

1. Location-specific ARARs associated with on-site consolidation and capping can be found in Table H-4c.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, EPA 540-R-01-003, OSWER 9285.7-41, September 2002	Guidance document to aid statistician's with the process of collecting and analyzing background sample at CERCLA sites. Identifies circumstances when suitable background reference areas may not be available and discusses use of published sources for establishing background conditions.	To Be Considered	Guide was used to characterize background concentrations, evaluate options for analyzing background data, and develop PRGs.
Federal Criteria, Advisories, and Guidance	Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead In Soil, EPA-540-R-03-001, January 2003	EPA Guidance for evaluating risks posed by lead in soil.	To Be Considered	Guidance was used to calculate potential risks caused by exposure to lead in soil and to develop PRGs.
Federal Criteria, Advisories, and Guidance	EPA Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006, OSWER 9285.7-25, June 1997.	This provides guidance on the designing and conducting of technically defensible ecological risk assessments for the Superfund program.	To Be Considered	This guidance is used to design and conduct the ecological risk assessment(s) performed for the site.
Federal Criteria, Advisories, and Guidance	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA-630-R-03-003F	This provides guidance on assessing risk to children from carcinogens.	To Be Considered	This guidance is used to calculate potential risks caused by exposure to carcinogenic contaminants in soil and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Guidelines for Carcinogenic Risk Assessment, EPA-630-P-03-001F	These guidelines provide guidance on conducting risk assessments involving carcinogens.	To Be Considered	This guidance was used to design and conduct the human health risk assessments to evaluate health risks associated with carcinogens and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Establishing Background Levels, EPA/540/F-94/030 (September 1995)	This guidance describes how to determine background levels for each migration pathway and describes situations when published data may be used to establish background levels at a site.	To Be Considered	This guidance supports the use of state-specific background data in lieu of federal or site-specific data in certain circumstances.
Federal Criteria, Advisories, and Guidance	OSWER Publication 9285.6-07P: Role of Background in the CERCLA Cleanup Program, April 2002	Guidance document that presents EPA's preferred approach for the consideration of background constituent concentrations of hazardous substances, pollutants, and contaminant in the remedy process at CERCLA sites.	To Be Considered	Guide was used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guide was also used in developing the PRGs.
Federal Criteria, Advisories, and Guidance	EPA Fact Sheet on the Management of Dioxin Contaminated Soils, May 2011	This document provides guidance on the proper management of dioxin contaminated soils.	To Be Considered	Guidance document was used in the remedial technology selection and screening process.
Federal Criteria, Advisories, and Guidance	Risk Assessment for Dioxin at Superfund Sites, https://www.epa.gov/superfund/risk-assessment-dioxin-superfund-sites, Last updated on December 7, 2017	This website details the approach used to select a PRG for dioxin.	To Be Considered	This guidance was used to guide the selection of PRGs for dioxins at the Site.

Table H-3a
Chemical-Specific ARARs for ESA Riverfront 2A
Record of Decision
Creese & Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	EPA Risk Reference Doses (RfDs)	RfDs are dose levels developed by EPA for use in estimating the non-carcinogenic effects of exposure to toxic substances.	To Be Considered	RfDs were used to characterize human health risks due to non-carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Cancer Slope Factors (CSFs)	Guidance values used to evaluate the potential carcinogenic risk caused by exposure to contaminants.	To Be Considered	CSFs were used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER Directive 9283.1-33	Provides compilation of important groundwater policies EPA uses in making groundwater restoration decisions pursuant to CERCLA and the NCP.	To Be Considered	Consistent with the policy regarding beneficial use, the state has classified the groundwater as GW-3, a non-potential drinking water source area.
State Criteria, Advisories, and Guidance	Massachusetts Department of Environmental Protection Technical Update - Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil, dated May 2002	Provides the basis for identifying and applying background concentrations in soil samples of "Natural" Soil as well as Soil Containing Coal Ash or Wood Ash Associated with Fill Material.	To Be Considered	Guide was used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guide was also used in developing the PRGs.

Notes:
1. Chemical-specific ARARs associated with on-site consolidation and capping can be found in Table H-4a.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirements	Clean Water Act, §402 NPDES, 33 USC 1343, 40 CFR 122.22-125, 131	These standards govern discharge of water into surface waters. Applies to construction sites greater than 5 acres; construction at ESA Riverfront is less than 5 acres, but degradation concerns similar to larger construction area; therefore, are relevant and appropriate.	Relevant and Appropriate	Any discharges into surface water (decontamination water or dewatering water) will meet the substantive standards of this regulations including meeting effluent standards and preventing degradation of surface water. Construction in ESA Riverfront area may result in a point source discharge to the river from the dewatering system. During remediation, best management practices and other measures will be implemented to control pollutants in wastewater discharges.
Federal Regulatory Requirements	Clean Water Act Regulations (Stormwater Discharges) (40 CFR 122.26(c)(ii)(C))	Discharges of stormwater associated with construction activities are required to implement measures, including best management practices, to control pollutants in stormwater discharges during and after construction activities. Applies to construction sites greater than 5 acres; construction at ESA Riverfront is less than 5 areas, but stormwater runoff concerns are similar to larger construction area.	Relevant and Appropriate	Best management practices shall be used to control and manage stormwater runoff during remedial activities and incorporated into the final remedy.
Federal Regulatory Requirements	Clean Water Act Federal Water Quality Criteria §304(a), 40 CFR 131	The National Recommended Water Quality Criteria (NRWQC) are provided by EPA for both protection of human health and aquatic life for specific chemicals.	Relevant and Appropriate	NRWQC will be used as a performance standard for evaluating the effectiveness of soil cleanup activities on surface water quality to ensure there is no degradation of the surface water during remediation.
Federal Criteria, Advisories, and Guidance	Invasive Species (Executive Order 13112)	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment.	To Be Considered	During remedial action measures will be taken to address invasive species consistent with this Executive Order. To the extent practicable, native vegetation shall be used for restoration.
State Regulatory Requirements	Operation, Maintenance, and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Establishes standards and pretreatment requirements for wastewater treatment works and protects waters within the Commonwealth.	Applicable	Assuming that the local POTW has capacity, water generated from decontamination and other remediation activities will be sampled, treated (if necessary), and then may be discharged to the local POTW and will need to comply with these regulations. Decontamination water will be treated on-site if necessary to meet the pretreatment standards.
State Regulatory Requirements	Surface Water Discharge Permit Program (314 CMR 3.00)	Governs the issuance of surface water discharge permits in Massachusetts in conformance with the Mass Clean Waters Act and federal Clean Water Act	Applicable	Any discharge of (decontamination or dewatering) water into surface water will meet the substantive standards of this regulation, including meeting effluent standards and preventing degradation of surface water.
State Regulatory Requirements	Massachusetts Surface Water Quality Standard (314 CMR 4.00) and Massachusetts Clean Water Act (MGL c.21 s. 26-53)	Implements the provisions of the federal Clean Water Act. Maintains surface water quality by regulating discharges of pollutants.	Relevant and Appropriate	These regulations will be used as performance standards for evaluating the effectiveness of soil removal cleanup on surface water quality and to ensure there is no degradation of the surface water during remediation.

Table H-3b
Action-Specific ARARs for ESA Riverfront 2A
Record of Decision
Creese & Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Air Pollution Control Regulations (310 CMR 7.00); Standards for Dust (310 CMR 7.09); Standards for Noise (310 CMR 7.10)	Regulations that prohibit burning or emissions of dust which causes or contributes to condition air pollution. Also establishes measures for management of noise.	Applicable	Activities involving soil excavation or handling will be conducted in a manner to minimize fugitive dust emissions. Air monitoring and best engineering practices will be employed to minimize fugitive dust emissions. Operation of heavy machinery and equipment will comply with these requirements.
State Regulatory Requirements	Massachusetts Hazardous Waste Regulations: 310 CMR 30.100 (Identification and Listing of Hazardous Waste); 310 CMR 30.300 (Requirements for Generators of Hazardous Waste); 310 CMR 30.400 (Requirements for Transporters of Hazardous Waste); 310 CMR 30.510 (Management Standards); and 310 CMR 30.513 (Waste Analysis)	Massachusetts is delegated to administer the federal RCRA standards through its regulations. These sections are comprehensive regulations addressing the identification, management, and transportation of hazardous waste in Massachusetts. The RCRA standards of 40 CFR 260-264 are incorporated by reference.	Applicable	Soil will be tested in-situ prior to excavation and tested again following excavation. Any soil that tests positive for meeting hazardous characteristics will be managed in accordance with these regulations. If hazardous waste is identified, hazardous media will be managed, stored in accordance with these requirements. This alternative assumes that up to 15% of the soil addressed will require management, transportation, and off-site disposal as hazardous waste. The transportation of hazardous waste from the ESA Riverfront Area to the stockpiling area in the WSA will comply with these requirements.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19.142(1) and (5)(a) Landfill Post-Closure Requirements	Sets requirements for post-closure care to maintain, care for and monitor the site to ensure the integrity of the closure measures and to detect and prevent any adverse impacts of the site on public health, safety or the environment and requires corrective action in the event conditions would compromise the integrity and purpose of the final cover.	Relevant and Appropriate	Soil and pavement covers installed where soil contains site-related contaminants exceeding site cleanup levels shall be protective of dermal contact and shall be maintained in accordance with these post-closure requirements. Buildings covering soil that contains site-related contaminants exceeding site cleanup levels shall be maintained in accordance with these post-closure monitoring requirements. Long-term monitoring and maintenance requirements will be contained in a site-specific long-term monitoring and maintenance plan that is consistent with these requirements.
State Criteria, Advisories, and Guidance	Massachusetts DEP Landfill Technical Guidance Manual	Provides a standard reference for and guidance on landfill design, construction, and QA/QC procedures in accordance with 310 CMR 19.	To Be Considered	Soil covers will be designed and constructed consistent with this guidance to the extent practical.
State Criteria, Advisories, and Guidance	Division of Air Quality Control (DAQC) Policy 90-001, Noise Regulation, February 1990	Establishes guideline where sources of new noise should not emit more than 10 decibels above the existing (background) level.	To Be Considered	Site operation noise level will be minimized and will follow the suggested noise limit (10 decibels) to the extent possible. Construction will be scheduled during daylight hours.

Notes:

1. Action-specific ARARs associated with on-site consolidation and capping can be found in Table H-4b.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirement	National Historic Preservation Act (NHPA) (16 U.S.C. 470, Sec. 106; 36 CFR Part 800 – Protection of Historic Properties)	Pursuant to Section 106 of the NHPA, as amended, CERCLA response actions are required to take into account the effects of the response activities on any historic property included or eligible for inclusion on the National Register of Historic Places (NRHP) and, if a historic property is identified, consult with the State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer (THPO).	Applicable	Areas of potential historical and archaeological significance have been identified in the ESA Riverfront areas proposed for remedial action. EPA will continue to consult with the Massachusetts Historical Commission (MHC), SHPO, and THPO regarding planned activities and actions to determine whether implementation of the remedy will adversely impact historical or cultural resources. If any such adverse impact cannot be avoided EPA will coordinate with the MHC, SHPO, and THPO to develop a set of activities to mitigate those impacts, which will be memorialized in a Memorandum of Agreement (MOA) with those parties.
Federal Regulatory Requirement	Federal Coastal Zone Management Act (CZMA) 1972. 16 U.S.C. § 1451 et seq.	This site is located in a coastal zone management area. All actions must be conducted in a manner consistent with state-approved management programs.	Applicable	The federal act gives States the primary role in managing coastal areas. See State requirements below for actions to be taken to comply with the Massachusetts coastal zone management policy.
Federal Regulatory Requirement	Clean Water Act, Section 404; Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 33 U.S.C. § 1344; 40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323; Section 10 of the Rivers and Harbors Act of 1899	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and aquatic resources. Under Section 10, the obstruction or alteration (including dredging) of any navigable water of the United States is prohibited except as authorized after a finding that the activity in not contrary to the public interest and otherwise complies with applicable federal laws, pursuant to 33 C.F.R. Part 320	Applicable	Remediation requires excavation and backfilling of wetland, saltmarsh, or riverbank soil that will adversely affect wetland. EPA has determined that this is the least damaging practicable alternative. Adverse impacts will be minimized to the extent practicable and mitigation, restoration or replication, if necessary, measures will be included to restore the wetland and saltmarsh areas damaged by the remedial action. Temporary placement of sheet piles in the river to facilitate riverbank dredging will avoid obstructing navigation to the extent practicable and will be removed at the completion of the riverbank remediation.
Federal Regulatory Requirement	Fish and Wildlife Coordination Act of 1934 (16 U.S.C. § 661 et seq; 40 CFR § 6.302(g))	Requires consultation with the U.S. Fish and Wildlife Service if modifications plan to be made to wetlands, or a body of water. Requires agencies to prevent the loss of wildlife.	Applicable	Remediation will result in adverse impacts to wetlands and may be necessary. EPA will consult with the U.S Fish and Wildlife Service regarding the proposed remedial action and its impacts. Adverse project-related impacts to fish and wildlife resources will be mitigated, if necessary, in consultation with U.S. Fish & Wildlife Service.
Federal Regulatory Requirement	Floodplains Management (Executive Order 11988); FEMA Regulations (44 CFR Parts 9.4-9.11)	FEMA regulations (incorporating requirements under Executive Order 11988), federal agencies are required to avoid long- and short-term impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplains wherever there is a practicable alternative.	Relevant and Appropriate	Remediation will cause temporary impacts to floodplains but will be implemented to avoid occupancy and modification to floodplains through excavation and backfilling to original grade along the riverbank and hot spot area. Soil covers will be designed and constructed to be resilient to withstand significant flood events.
Federal Criteria, Advisories, and Guidances	Protection of Wetlands (Executive Order 11990); FEMA Regulations (44 CFR Parts 9.4-9.11)	FEMA regulations (incorporating requirements under Executive Order 11990) federal agencies are required to avoid adversely impacting federal jurisdictional wetlands unless there is no practicable alternative with lesser effects and the proposed action include all practicable measures to minimize the harm to federal wetlands that may result from such use.	Relevant and Appropriate	Remediation will result in adverse impacts to wetlands; from temporary access roads and excavation. EPA has determined that there is no practical alternative to taking action in a wetland. Adverse impacts will be minimized and wetland restoration or replication, if necessary will be performed to mitigate any damage to wetlands.
State Regulatory Requirements	Waterways Regulations (310 CMR 9.00) and Massachusetts Public Waterfront Act (MGL c. 91)	Regulates activities that adversely affect tidal wetlands and waterways. Any construction or alteration of the land within 100 feet of a river must adhere to these regulations.	Applicable	The excavation of soil within the ESA Riverfront area includes areas within a saltmarsh within 100 feet of a riverfront area. The saltmarsh located within 100 feet of a riverfront area. will be rehabilitated or restored following soil excavation and backfill. Work will be completed in accordance with this regulation.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Wetlands Protection Act (310 CMR 10.00 (wetland), 310 CMR 10.32 (saltmarsh), and 10.58 (riverfront area), (MGL c. 131 s. 40)	Sets performance standards for dredging, filling, and altering of resource areas, including fresh water and coastal wetlands (including saltmarshes); land subject to tidal action; or lands within 100 feet of a one of the above listed resource areas (hereinafter called the buffer zone) and riverfront area. Resource areas in the ESA Residential area include a saltmarsh area and 100 foot buffer zone, and riverfront area. Such action in a salt marsh or buffer zone shall not destroy any portion of the resource area and shall not have an adverse effect on the productivity of the salt marsh. However, if the project will restore or rehabilitate a salt marsh, it may be allowed. For riverbank areas, there must be no practicable and substantially equivalent economic alternatives to the proposed project with less adverse effects on resource areas and mitigation may be required.	Applicable	The saltmarsh will be restored or rehabilitated following soil excavation and backfill; temporary access roads will be removed and the areas rehabilitated or restored to its original conditions. Work will be completed in accordance with these regulations.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19.038(2)(c)(3)(d)(landfill siting criteria) and 19.080 (1) (variances)	Landfill siting regulations that prohibit the outermost limits of a waste deposition area from being located within a resource area including the 100-year floodplain unless located through a variance including for protection of public health or if no other reasonable alternatives exist. Soil covers may be located within a resource area or 100-year floodplain.	Relevant and Appropriate	Remediation will cause temporary impacts to floodplains but will be implemented to avoid occupancy and modification to floodplains through excavation and backfilling to original grade and the soil cover will be constructed to be protective of public health. The variance is satisfied through concurrence on the final remedial decision.
State Regulatory Requirements	Coastal Zone Management, 301 CMR 20.00; Massachusetts Office of Coastal Zone Management Policy Guide, October 2011, Habitat Policy #1	Massachusetts has the primary role in managing its coastal areas under its Coastal Zone Management law and requires that any actions must be conducted in a manner consistent with state-approved management programs. Habitat Policy #1 protects coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and fresh water wetlands for critical wildlife habitat functions as well as other important functions and services, including nutrient and sediment attenuation, wave and storm damage protection, and landform movement and processes.	To Be Considered	Remediation will affect wetland/saltmarsh areas along the Crane River. Impacts to the coastal habitats present will be considered in light of the Habitat Policy, and the remedial action will be conducted in accordance with state-approved management programs to minimize impacts to the coastal habitats.
State Regulatory Requirements	Historic Preservation Antiquities Act (M.G.L c.9 §26-27); Massachusetts Historical Commission Regulations (950 CMR 70-71); Protection of Properties Included in the State Register of Historic Places (950 CMR 71)	Protects the public's interest in preserving historic and archaeological properties. Establishes need for coordination with the National Historic Preservation Act.	Applicable	Areas of potential historical and archaeological significance have been identified in the ESA Riverfront areas proposed for remedial action. EPA will continue to consult with the SHPO/THPO to determine whether implementation of the remedy will adversely impact historical or cultural resources. If any such adverse impacts cannot be avoided EPA coordinate with the SHPO, MHC, and THPO to develop a set of activities to mitigate those impacts in a Memorandum of Agreement (MOA) with those parties.
State Regulatory Requirements	Massachusetts Clean Water Act (MGL 21 26-53); Water quality certification of dredged or fill material in waters of the United States within the Commonwealth (314 CMR 9.00)	Governs work performed in or near a wetland. Establishes criteria and standards for dredging, handling, and disposal of fill and dredged material.	Applicable	Contaminated soil within the saltmarsh and in wetland areas, (approximately 28,000 SF) will be adversely affected during the soil excavation and backfilling. Temporary access road may also disturb wetlands or buffer zones. Impacts will be minimized to the extent practicable and disturbed wetlands will be restored or replicated, if necessary, following the soil excavation.

Notes:

1. Location-specific ARARs associated with on-site consolidation and capping can be found in Table 5-8C.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, EPA 540-R-01-003, OSWER 9285.7-41, September 2002	Guidance document to aid statistician's with the process of collecting and analyzing background sample at CERCLA sites. Identifies circumstances when suitable background reference areas may not be available and discusses use of published sources for establishing background conditions.	To Be Considered	Guide was used to characterize background concentrations and evaluate options for analyzing background data, and develop PRGs.
Federal Criteria, Advisories, and Guidance	Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead In Soil, EPA-540-R-03-001, January 2003	EPA Guidance for evaluating risks posed by lead in soil.	To Be Considered	Lead was not found to be a COC for WSA-2
Federal Criteria, Advisories, and Guidance	EPA Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006, OSWER 9285.7-25, June 1997.	This provides guidance on the designing and conducting of technically defensible ecological risk assessments for the Superfund program.	To Be Considered	This guidance is used to design and conduct the ecological risk assessment(s) performed for the site.
Federal Criteria, Advisories, and Guidance	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA-630-R-03-003F	This provides guidance on assessing risk to children from carcinogens.	To Be Considered	This guidance is used to calculate potential risks caused by exposure to carcinogenic contaminants in soil and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Guidelines for Carcinogenic Risk Assessment, EPA-630-P-03-001F	These guidelines provide guidance on conducting risk assessments involving carcinogens.	To Be Considered	This guidance was used to design and conduct the human health risk assessments to evaluate health risks associated with carcinogens and develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Establishing Background Levels, EPA/540/F-94/030 (September, 1995)	This guidance describes how to determine background levels for each migration pathway and describes situations when published data may be used to establish background levels at a site.	To Be Considered	This guidance supports the use of state-specific background data in lieu of federal or site-specific data in certain circumstances.
Federal Criteria, Advisories, and Guidance	OSWER Publication 9285.6-07P: Role of Background in the CERCLA Cleanup Program, April 2002	Guidance document that presents EPA's preferred approach for the consideration of background constituent concentrations of hazardous substances, pollutants, and contaminant in the remedy process at CERCLA sites.	To Be Considered	Guidance is used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guidance was also used in developing the PRGs.
Federal Criteria, Advisories, and Guidance	EPA Fact Sheet on the Management of Dioxin Contaminated Soils, May 2011	This document provides guidance on the proper management of dioxin contaminated soils.	To Be Considered	Guidance document was used in the remedial technology selection and screening process.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance	Risk Assessment for Dioxin at Superfund Sites, https://www.epa.gov/superfund/risk-assessment-dioxin-superfund-sites, Last updated on December 7, 2017	This website details the approach used to select a PRG for dioxin.	To Be Considered	This guidance was used to guide the selection of PRGs for dioxins at the Site.
Federal Criteria, Advisories, and Guidance	EPA Risk Reference Doses (RfDs)	RfDs are dose levels developed by EPA for use in estimating the non-carcinogenic effects of exposure to toxic substances.	To Be Considered	RfDs were used to characterize human health risks due to non-carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Cancer Slope Factors (CSFs)	Guidance values used to evaluate the potential carcinogenic risk caused by exposure to contaminants.	To Be Considered	CSFs were used to compute the individual incremental cancer risk resulting from exposure to carcinogens in site media and to develop risk-based PRGs.
Federal Criteria, Advisories, and Guidance	Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER Directive 9283.1-33	Provides compilation of important groundwater policies EPA uses in making groundwater restoration decisions pursuant to CERCLA and the NCP.	To Be Considered	Consistent with the policy regarding beneficial use, the state has classified the groundwater as GW-3, a non-potential drinking water source area.
State Criteria, Advisories, and Guidance	Massachusetts Department of Environmental Protection Technical Update - Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil, dated May 2002	Provides the basis for identifying and applying background concentrations in soil samples of "Natural" Soil as well as Soil Containing Coal Ash or Wood Ash Associated with Fill Material.	To Be Considered	Guide was used to help assess contamination that may have originated from sources other than the Site, including natural and/or anthropogenic sources. This guide was also used in developing the PRGs.

Table H-4b
Action-Specific ARARs for WSA-2
Record of Decision
Creese & Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirements	Clean Water Act, §402 NPDES, 33 USC 1343, 40 CFR 122.22 -125, 131	These standards govern discharge of water into surface waters.	Applicable	Any discharges into surface water (decontamination water or dewatering water) will meet the substantive standards of this regulations including meeting effluent standards and preventing degradation of surface water. Construction in WSA may result in a point source discharge to the river from a dewatering system. During remediation, best management practices and other measures will be implemented to control pollutants in wastewater discharges.
Federal Regulatory Requirements	Clean Water Act Regulations (Stormwater Discharges) (40 CFR 122.26(c)(ii)(C))	Discharges of stormwater associated with construction activities are required to implement measures, including best management practices, to control pollutants in stormwater discharges during and after construction activities.	Applicable	Best management practices will be used to manage and stormwater runoff during remedial activities and will be incorporated into the final remedy.
Federal Regulatory Requirements	Clean Air Act (CAA), National Emission Standards for Hazardous Air Pollutants (NESHAPS), Standards for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations 42 U.S.C. §§7411 & 7412; 40 C.F.R. §61.150-151	NESHAPS standards for preventing air releases from asbestos containing material, including dust suppression, and land use controls.	Applicable	Waste from the former beamhouse building will be treated as co-mingled asbestos waste/demolition debris and managed on-site in accordance with these regulations. Asbestos containing material consolidated on site will be capped as required by these standards. The removal and handling of asbestos will be managed through air monitoring and best management practices.
Federal Regulatory Requirements	Clean Water Act Federal Water Quality Criteria §304(a), 40 CFR 131	The National Recommended Water Quality Criteria (NRWQC) are provided by EPA for both protection of human health and aquatic life for specific chemicals.	Relevant and Appropriate	NRWQC will be used as a performance standard for evaluating the effectiveness of soil cleanup activities on surface water quality to ensure there is no degradation of the surface water during remediation.
Federal Criteria, Advisories, and Guidance	Invasive Species (Executive Order 13112)	Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause when requiring actions that impact the environment.	To Be Considered	During remedial action measures will be taken to address invasive species consistent with this Executive Order. To the extent practicable, native vegetation will be used for restoration.
Federal Criteria, Advisories, and Guidance	Framework for Investigating Asbestos-Contaminated Superfund Sites OSWER Directive 9200.0-68 (Sept. 2008)	Guidance on investigating and characterizing the potential human exposure from asbestos contamination in outdoor soil at Superfund sites.	To Be Considered	This guidance will be used in assessing and planning for asbestos work at the Site. Guidance describes how response actions at a site can be conducted without further characterization, after review of historical and current information, if review of the site conditions supports a response.
State Regulatory Requirements	Surface Water Discharge Permit Program (314 CMR 3.00)	Governs the issuance of surface water discharge permits in Massachusetts in conformance with the Mass Clean Waters Act and federal Clean Water Act	Applicable	Any discharge of (decontamination or dewatering) water into surface water will meet the substantive standards of this regulation, including meeting effluent standards and preventing degradation of surface water.
State Regulatory Requirements	Massachusetts Surface Water Quality Standard (314 CMR 4.00) and Massachusetts Clean Water Act (MGL c.21 s. 26-53)	Implements the provisions of the federal Clean Water Act. Maintains surface water quality by regulating discharges of pollutants.	Relevant and Appropriate	State surface water standards will be used as performance standards for evaluating the effectiveness of soil cleanup activities on surface water quality to ensure there is no degradation of the surface water during remediation.
State Regulatory Requirements	Operation, Maintenance, and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)	Establishes standards and pretreatment requirements for wastewater treatment works and protects waters within the Commonwealth.	Applicable	Assuming that the local POTW has capacity, water generated from decontamination and other remediation activities will be sampled, treated (if necessary), and then may be discharged to the local POTW and will need to comply with these regulations. Decontamination water will be treated on-site if necessary to meet the pretreatment standards.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Air Pollution Control Regulations (310 CMR 7.00); Standards for Dust (310 CMR 7.09); Standards for Noise (310 CMR 7.10)	Regulations that prohibit burning or emissions of dust which causes or contributes to condition air pollution. Also establishes measures for management of noise.	Applicable	Activities involving soil excavation or handling and consolidation area construction will be conducted in a manner to minimize fugitive dust emissions. Air monitoring and best engineering practices will be employed to minimize fugitive dust emissions. Operating of heavy equipment and machinery will comply with these regulations.
State Regulatory Requirements	Standards for Asbestos Containing Waste Material (310 CMR 7.15)	Regulations that establish measures for management of asbestos-containing waste materials.	Relevant and Appropriate	The standards will be complied with as relevant and appropriate to any disturbance of asbestos containing waste material handled/disposed of at the Site. Operation of heavy machinery and equipment will comply with these regulations.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19); and 310 CMR 19.412(1) and (5)(a) Landfill Post-Closure Requirements	Sets requirements for post-closure care to maintain, care for and monitor the site to ensure the integrity of the closure measures and to detect and prevent any adverse impacts of the site on public health, safety or the environment and requires corrective action in the event conditions would compromise the integrity and purpose of the final cover.	Applicable	The capped consolidation area and soil covers installed where soil contains site-related contaminants exceeding site cleanup levels shall be protective of dermal contact and shall be maintained in accordance with these post-closure requirements. Long-term monitoring and maintenance requirements will be contained in a site-specific long-term monitoring and maintenance plan that is consistent with these requirements.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations Asbestos Special Waste (310 CMR 19.061(3)b)	Addresses the management of special wastes (e.g. asbestos), including the receipt, handling, storage, processing, treatment and/or disposal.	Applicable	The handling of asbestos waste (found in the debris of the former beamhouse building) is subject to this regulation.
State Regulatory Requirements	Massachusetts Hazardous Waste Regulations (Identification and Listing of Hazardous Waste) 310 CMR 30.100; and 310 CMR 30.300 (Requirements for Generators of Hazardous Waste); 310 CMR 30.510 (Management Standards); 310 CMR 30.400 Requirements for Transporters of Hazardous Waste); 310 CMR 30.513 (Waste Analysis); and 310 CMR 30.640 (Waste Piles)	Massachusetts is delegated to administer the federal RCRA standards through its regulations. These sections are comprehensive regulations addressing the identification, management, and transportation of hazardous waste in Massachusetts. The RCRA standards of 40 CFR 260-264 are incorporated by reference.	Applicable	Soil will be tested in-situ prior to excavation and tested again following excavation. Any soil that tests positive for meeting hazardous characteristics will be managed in accordance with these regulations. If hazardous waste is identified, hazardous media will be managed, stored in accordance with these requirements. Staging and storage areas for any identified hazardous waste will be constructed and managed in accordance with the substantive portions of the Waste Pile requirements. This alternative assumes that up to 15% of the soil addressed will require management, transportation, and disposal as hazardous waste. The transportation of hazardous waste within the WSA and off-site disposal at a licensed TSDF will comply with these requirements.
State Criteria, Advisories, and Guidance	Division of Air Quality Control (DAQC) Policy 90-001, Noise Regulation, February 1990	Establishes guideline where sources of new noise should not emit more than 10 decibels above the existing (background) level.	To Be Considered	Site operation noise level will be minimized and will follow the suggested noise limit (10 decibels) to the extent possible. Construction will be scheduled during daylight hours.
State Criteria, Advisories, and Guidance	Massachusetts Department of Environmental Protection Standard References for Monitoring Wells, WSC-310-91	Guidelines on locating, drilling, installing, sampling and decommissioning monitoring wells.	To Be Considered	These guidelines will be followed when installing and sampling new monitoring wells, as well as, sampling and/or decommissioning existing monitoring wells.
State Criteria, Advisories, and Guidance	Massachusetts DEP Landfill Technical Guidance Manual	Provides a standard reference for and guidance on landfill design, construction, and QA/QC procedures in accordance with 310 CMR 19.	To Be Considered	The construction of the consolidation area, which involves solid waste landfilling, will be consistent with this guidance. Soil covers, the consolidation area cap, (including post-construction groundwater monitoring) will be designed and constructed consistent with this guidance to the extent practical.

Table H-4c
Location-Specific ARARs for WSA-2
Record of Decision
Creese & Cook Tannery (Former) Superfund Site
Danvers, Massachusetts

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
Federal Regulatory Requirement	National Historic Preservation Act (NHPA) (16 U.S.C. 470, Sec. 106; 36 CFR Part 800 – Protection of Historic Properties)	Pursuant to Section 106 of the NHPA, as amended, CERCLA response actions are required to take into account the effects of the response activities on any historic property included or eligible for inclusion on the National Register of Historic Places (NRHP) and, if a historic property is identified, consult with the State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer (THPO).	Applicable	Areas of potential historical and archaeological significance have been identified in parts of the WSA. Adverse impacts to two existing historic cemeteries are not expected and activities near the cemeteries will be minimized to the extent practicable; mitigation measures will be implemented, if necessary. EPA will continue to consult with the SHPO and THPO regarding planned activities and actions to determine whether implementation of the remedy will adversely impact cultural resources. If any such adverse impacts cannot be avoided, EPA will coordinate with the SHPO and THPO to develop a set of activities to mitigate these impacts, which will be memorialized into a Memorandum of Agreement (MOA) with these parties.
Federal Regulatory Requirement	Federal Coastal Zone Management Act (CZMA) 1972. 16 U.S.C. § 1451 et seq.	This site is located in a coastal zone management area and requires that any actions must be conducted in a manner consistent with state-approved management programs.	Applicable	The federal act gives States the primary role in managing coastal areas. See State requirements below for actions to be taken to comply with the Massachusetts coastal zone management policy.
Federal Regulatory Requirement	Clean Water Act, Section 404; Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 33 U.S.C. § 1344; 40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and aquatic resources.	Applicable	EPA has determined that this is the least environmentally damaging practicable alternative. Excavation/backfill and capping will be conducted in accordance with these requirements, including mitigation, restoration, or replication, if necessary, measures to restore the wetland and saltmarsh areas damaged by the remedial action.
Federal Regulatory Requirement	Fish and Wildlife Coordination Act of 1934 (16 U.S.C. § 661 et seq; 40 CFR § 6.302(g))	Requires consultation with the U.S. Fish and Wildlife Service if modifications plan to be made to wetlands, or a body of water. Requires agencies to prevent the loss of wildlife.	Applicable	Remediation will result in modifications to wetlands. EPA will consult with the U.S Fish and Wildlife Service regarding the remedial action and its impacts. Adverse project related impacts to fish and wildlife resources will be mitigated, if necessary, in consultation with the U.S. Fish and Wildlife Service.
Federal Regulatory Requirement	Floodplains Management (Executive Order 11988); FEMA Regulations (44 CFR Parts 9.4-9.11)	FEMA regulations (incorporating requirements under Executive Order 11988), federal agencies are required to avoid long- and short-term impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplains wherever there is a practicable alternative.	Relevant and Appropriate	Temporary impacts to floodplains will occur during remediation. All areas of excavation will be backfilled to original grade to avoid occupancy or modification of the floodplains. The soil cover will be designed and constructed to be resilient to withstand significant flood events.
Federal Criteria, Advisories, and Guidance	Protection of Wetlands (Executive Order 11990); FEMA Regulations (44 CFR Parts 9.4-9.11)	FEMA regulations (incorporating requirements under Executive Order 11990) require federal agencies to avoid adversely impacting federal jurisdictional wetlands unless there is no practicable alternative with lesser effects and the proposed action include all practicable measures to minimize the harm to federal wetlands that may result from such use.	Relevant and Appropriate	Remediation will result in adverse impacts to wetlands from temporary access roads and excavation. EPA has determined that there is no practical alternative to taking action in a wetland. Adverse impacts will be minimized and wetland restoration or replication, if necessary, will be performed to mitigate any damage to wetlands.
State Regulatory Requirements	Waterways Regulations (310 CMR 9.00) and Massachusetts Public Waterfront Act (MGL c. 91)	Regulates activities that adversely affect tidal wetlands and waterways. Any construction or alteration of the land within 100 feet of a river must adhere to these regulations.	Applicable	The excavation of soil with in the WSA riverfront area includes areas with a saltmarsh with 100 feet of a riverfront area. The saltmarsh will be rehabilitated or restored following soil excavation and backfill. Work will be completed in accordance with this regulation.

Authority	Requirement	Requirement Synopsis	Status	Action to Attain ARAR
State Regulatory Requirements	Wetlands Protection Act (310 CMR 10.00 (wetland), 310 CMR 10.32 (saltmarsh), and 10.58 (riverfront area), (MGL c. 131 s. 40)	Sets performance standards for dredging, filling, and altering of resource areas, including fresh water and coastal wetlands (including saltmarshes); land subject to tidal action; or lands within 100 feet of a one of the above listed resource areas (hereinafter called the buffer zone) and riverfront area. Resource areas in the ESA Residential area include a saltmarsh area and 100 foot buffer zone, and riverfront area. Such action in a salt marsh or buffer zone shall not destroy any portion of the resource area and shall not have an adverse effect on the productivity of the salt marsh. However, if the project will restore or rehabilitate a salt marsh, it may be allowed. For riverbank areas, there must be no practicable and substantially equivalent economic alternatives to the proposed project with less adverse effects on resource areas and mitigation may be required.	Applicable	The saltmarsh, located within 100 feet of a river, and impacted riverfront area will be rehabilitated or restored following soil excavation and backfill.
State Regulatory Requirements	Coastal Zone Management, 301 CMR 20.00; Massachusetts Office of Coastal Zone Management Policy Guide, October 2011, Habitat Policy #1	Massachusetts has the primary role in managing its coastal areas under its Coastal Zone Management law and requires that any actions must be conducted in a manner consistent with state-approved management programs. Habitat Policy #1 protects coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and fresh water wetlands for critical wildlife habitat functions as well as other important functions and services including nutrient and sediment attenuation, wave and storm damage protection, and landform movement and processes.	To Be Considered	Remediation will affect wetland areas along the Crane River. Impacts to the wetlands/coastal habitats will be considered in light of the Habitat Policy, and activities will be conducted in accordance with state approved management programs to minimize impacts to the coastal habitats.
State Regulatory Requirements	Historic Preservation Antiquities Act (M.G.L c.9 §26-27); Massachusetts Historical Commission Regulations (950 CMR 70-71); Protection of Properties Included in the State Register of Historic Places (950 CMR 71)	Protects the public's interest in preserving historic and archaeological properties. Establishes a need for coordination with the National Historic Preservation Act.	Applicable	Areas of potential historical and archaeological significance have been identified in the WSA area proposed for remedial action. EPA will continue to consult with the SHPO/THPO to determine whether implementation of the remedy will adversely impact historical or cultural resources. If any such adverse impacts cannot be avoided EPA coordinate with the SHPO, MHC, and THPO to develop a set of activities to mitigate those impacts in a Memorandum of Agreement (MOA) with those parties.
State Regulatory Requirements	Massachusetts Solid Waste Management Regulations (310 CMR 19.038(2)(c)(3)(d)(landfill siting criteria) and 19.080 (1) (variances)	Landfill siting regulations that prohibit the outermost limits of a waste deposition area from being located within a resource area including the 100-year floodplain unless located through a variance including for protection of public health or if no other reasonable alternatives exist.	Relevant and Appropriate	Remediation will cause temporary impacts to floodplains but will be implemented to avoid occupancy and modification to floodplains through excavation and backfilling to original grade and the soil cover will be constructed to be protective of public health. The variance is satisfied through concurrence of the final remedial decision.
State Regulatory Requirements	Massachusetts Clean Water Act (MGL 21 26-53); Water quality certification of dredged or fill material in waters of the United States within the Commonwealth (314 CMR 9.00)	Governs work performed in or near a wetland. Establishes criteria and standards for dredging, handling, and disposal of fill and dredged material.	Applicable	Contaminated soil is present within the wetland area, and the area will be adversely affected. The least damaging practicable alternative requires installing temporary access roads, excavation of wetlands, and installing a soil cover. Impacts will be minimized to the extent practicable and disturbed wetlands will be restored or replicated, if necessary, following the soil excavation.