EXPANDED ENVIRONMENTAL NOTIFICATION FORM

MWRA Section 56 Water Pipeline Replacement Project

Revere and Lynn, Massachusetts

Application of:

Massachusetts Water Resources Authority

Submitted by:

AECOM

July 31, 2023

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EXPANDED ENVIRONMENTAL NOTIFICATION FORM

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Massachusetts Environmental Policy Act (MEPA) Office

Environmental Notification Form

For Office Use Only

EEA#: ____________________

MEPA Analyst: _____________

The information requested on this form must be completed in order to submit a document electronically for review under the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: **MWRA Section 56 Water Pipeline Replacement Project**		
Street Address: **Hanson Street and Rice Avenue**		
Municipality: **Lynn and Revere**	Watershed: **Saugus River**	
Universal Transverse Mercator Coordinates: **Zone 19T; 338951.87 m E, 4701516.07 m N**	Latitude: **42.449251° N** Longitude: **-70.958413° W**	
Estimated commencement date: 9/30/24	Estimated completion date: 9/24/25	
Project Type: **Pipeline Replacement via HDD**	Status of project design: **30** %complete	
Proponent: **Massachusetts Water Resources Authority**		
Street Address: **2 Griffin Way**		
Municipality: **Chelsea**	State: **MA**	Zip Code: **02150**
Name of Contact Person: **Katherine Ronan**		
Firm/Agency: **MWRA**	Street Address: **2 Griffin Way**	
Municipality: **Chelsea**	State: **MA**	Zip Code: **02150**
Phone: **(617) 788-1177** / Fax: **(617) 305-5990**	E-mail: **katherine.ronan@mwra.com**	

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☐Yes ☒No

If this is an Expanded Environmental Notification Form (ENF) (see 301 CMR 11.05(7)) or a Notice of Project Change (NPC), are you requesting:

a Single EIR? (see 301 CMR 11.06(8)) ☒Yes ☐No
a Rollover EIR? (see 301 CMR 11.06(13)) ☐Yes ☒No
a Special Review Procedure? (see 301CMR 11.09) ☐Yes ☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11) ☐Yes ☒No
a Phase I Waiver? (see 301 CMR 11.11) ☐Yes ☒No
(Note: Greenhouse Gas Emissions analysis must be included in the Expanded ENF.)

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?
301 CMR 11.03(3)(b)(1)(e), which states: "New fill or structure or Expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway."

301 CMR 11.03(3)(b)(1)(a), regarding "alteration of coastal dune, barrier beach or coastal bank."

Which State Agency Permits will the project require?
MA WPA Notice of Intent (Order of Conditions anticipated from Revere and Lynn)
MassDEP 401 Water Quality Certification
MassDEP Distribution System Modifications Permit
MWRA 8M Permit
MA Coastal Zone Management Consistency Determination
MassDCR Construction Access Permit
Massachusetts Division of Fisheries and Wildlife Natural Heritage and Endangered Species MESA Checklist/Project Review
Massachusetts Historical Commission Project Notification Form (PNF)
Massachusetts Board of Underwater Archaeological Resources (BUAR) Special Use Permit
Chapter 91 Massachusetts Public Waterfront Act License

Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres:
MWRA is funding the project.

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage	3.37 acres		
New acres of land altered.		2.82 – see project narrative for further discussion	
Acres of impervious area	0.65	0	0.65
Square feet of new bordering vegetated wetlands alteration		0	
Square feet of new other wetland alteration		0	
Acres of new non-water dependent use of tidelands or waterways		0	
STRUCTURES			
Gross square footage	0 acres	0 acres	0 acres
Number of housing units	0	0	0
Maximum height (feet)	N/A	N/A	N/A
TRANSPORTATION			
Vehicle trips per day	0	0	0
Parking spaces	44	0	44
WASTEWATER			
Water Use (Gallons per day)	0	0	0
Water withdrawal (GPD)	0	0	0
Wastewater generation/treatment (GPD)	0	0	0
Length of water mains (miles)	None within the project area	0.91 (4,800 linear ft)	0.91 (4,800 linear ft)
Length of sewer mains (miles)	0	0	0

Has this project been filed with MEPA before?
☐ Yes (EEA #_____) ☒No

Has any project on this site been filed with MEPA before?
☐ Yes (EEA #_____) ☒No

GENERAL PROJECT INFORMATION – all proponents must fill out this section

PROJECT DESCRIPTION:

Describe the existing conditions and land uses on the project site:
The Section 56 Pipeline Replacement is proposed to cross the Saugus River between Lynn and Revere. The proposed horizontal directional drill (HDD) route lies west (seaward) of the General Edwards Memorial Bridge. The project site that would facilitate the HDD in Lynn is located along the Lynn Harbor shoreline on filled tidelands and is a capped landfill. This site is predominately barren due to activities associated with the landfill. The parcel in Revere is a yacht club located in a residential neighborhood. The club's parking lot would be used as the HDD exit site.

Describe the proposed project and its programmatic and physical elements:
MWRA's Section 56 Water Pipeline helps provide water to portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus, and Swampscott. The section of this water pipeline to be replaced was previously attached to the General Edwards Bridge over the Saugus River (which is also Lynn/Revere municipal border), but had to be removed in 2018 due to severe corrosion. MWRA now proposes to replace this section of water pipeline by installing a new section in the ground under the water of the Saugus River. This project will ensure water system redundancy and reliability for residents and businesses in these communities, which is crucial to protecting public and environmental health.

This project involves the installation of approximately 4,800 feet of water pipeline, using both open-cut and trenchless underwater pipeline construction methods. Horizontal directional drilling (HDD) will be used to install the water pipeline in the ground under the water at the of mouth of Saugus River, from points in Lynn and Revere. HDD is a trenchless method of installing underground utilities particularly suited for installing pipeline beneath obstructions and minimizing surface impacts. A hole is drilled in a relatively shallow arc within which the pipe is subsequently inserted. Additional pipeline will be installed in existing roadways and paved areas in Lynn and Revere using open-cut methods to connect the underwater portion of the replacement pipeline to MWRA's existing Section 56 pipeline alignment, located in Route 1A.

The objective of the project is to install a replacement water main. HDD has been selected due to its minimal surface impacts and lack of permanent alterations to the project site. The major components of the project are as follows:

- **Installation of 20-inch diameter water main and appurtenances, including fittings, valves, air release valves, and blow-offs in Hanson Street in Lynn, from the existing Section 56 pipeline in Route 1A to the Saugus River HDD crossing point.**
- **Installation of a 20-inch water main (HDD Route 7) under the Saugus River using HDD methods. The HDD section of the water main is approximately 2,800 feet long.**
- **Installation of 20-inch water main including fittings, valves, air release valves, and blow-offs in Rice Avenue in Revere, from the Saugus River HDD crossing point at the Point of Pines Yacht Club (HDD Route 7) to the existing Section 56 pipeline between the Route 1A northbound onramp and the Lynnway.**
- **All other required work during construction, including but not limited to environmental controls, traffic management, replacement of utilities, surface restoration, road reconstruction and pavement restoration, and sidewalk reconstruction.**

The project is anticipated to take twelve months and is limited to the geographic extent shown in Figure 1 in Attachment A. Please see Attachment A, Section 2, for further details on the

project and its programmatic and physical elements. Please see Attachment A, Section 5, for a discussion of the project's direct and indirect impacts.

NOTE: The project description should summarize both the project's direct and indirect impacts (including construction period impacts) in terms of their magnitude, geographic extent, duration and frequency, and reversibility, as applicable. It should also discuss the infrastructure requirements. of the project and the capacity of the municipal and/or regional infrastructure to sustain these requirements into the future.

Describe the on-site project alternatives (and alternative off-site locations, if applicable) considered by the proponent, including at least one feasible alternative that is allowed under current zoning, and the reasons(s) that they were not selected as the preferred alternative:
The following project alternatives were considered by the proponent during the June 2017 Feasibility Study for Section 56 General Edwards Bridge Crossing of the Saugus River. Please see Attachment M for the Feasibility Study and the Route Selection Matrix.

- **A "No Action" alternative would result in the Section 56 pipeline remaining out of service. This pipeline provides a necessary redundancy in the water supply system, and without it, the MWRA Northern High Service Zone is vulnerable to failure. As a result, the No-Action alternative was dismissed.**
- **Open trench river crossing: The open trench river crossing alternative was comparable in cost to HDD options but included greater environmental risk, greater permitting difficulty, and longer schedule duration and was thus abandoned.**
- **Microtunneling: The microtunneling alternative was rated favorably from a performance and risk perspective but was ultimately abandoned due to having the highest cost and longer schedule duration.**
- **Removal and replacement on the General Edwards Bridge: The pipe replacement on the bridge alternative scored less favorably due to reduced protection against damage, hydraulic limitations, greater technical complexity, and greater construction risk. Additionally, the General Edwards Bridge is deemed structurally deficient by MassDOT, and the Department is planning a replacement project for this 87-year-old structure.**
- **Horizontal Directional Drilling (HDD): HDD is a pipe installation method that involves drilling a guided borehole, referred to as the pilot hole, through the ground along a predetermined path from an entry point to an exit point. This method scored favorably due to lesser environmental risk, shorter scheduling duration, and greater protection against damage.**
- **Eight potential route alignments were identified and screened with respect to pipeline performance, program risks, cost, and schedule. Of the eight routes and the four pipeline installation methods initially considered, two replacement pipeline alignments to be installed via horizontal directional drilling (HDD) construction were selected to progress for further evaluation during preliminary project design. Both alternatives extended from the eastern end of Hanson Street in Lynn to Rice Avenue in Revere. Following the geotechnical investigation, a preferred pipeline placement was identified (Route 7) due to the less disruptive impacts on residents in the Point of Pines neighborhood.**

The Route 7 Alternative was ultimately deemed the preferred alternative for the project and is presented as the proposed project in this EENF.

NOTE*: The purpose of the alternatives analysis is to consider what effect changing the parameters and/or siting of a project, or components thereof, will have on the environment, keeping in mind that the objective of the MEPA review process is to avoid or minimize damage to the environment to the greatest extent feasible. Examples of alternative projects include alternative site locations, alternative site uses, and alternative site configurations.*

Summarize the mitigation measures proposed to offset the impacts of the preferred alternative:

To offset the impacts of the project, the staging area has been designated in Lynn, rather than in Revere. This decision will minimize impacts to the surrounding community as the surronding area in Revere is in a residential neighborhood, while the staging area in Lynn is commercial and mostly vacant. An erosion and sediment control plan will be implemented. This program will minimize exposed soil areas through sequencing and temporary stabilization as necessary and use structural erosion and sedimentation controls, including erosion control barriers. Details of typical controls are illustrated in Attachment D. Waste materials, debris, and trash would be cleaned from the work site at the end of each day and placed in trash barrels and/or dumpsters which would be disposed of off-site. At no time during construction is the dumping of spoils material, waste, or other debris allowed into any wetland area or other unspecified location.

General construction safety procedures would be followed to prevent accidents that could result in spills, releases, or other environmental damage. Activities such as fueling operations and hot work would be monitored and conducted away from sensitive resource areas. MWRA will work with the local communities to develop appropriate traffic management plans.

Mitigation for dust would include watering down of the construction access road and vehicles, as needed, especially during especially windy and dry days. To minimize noise impacts during construction, best management practices (BMPs) would include the use of mufflers on construction equipment and vehicles. Construction activities would also be limited to daylight hours. MWRA will coordinate closely with the surrounding community, including landowners, businesses, and residents, before and throughout the duration of the project. MWRA will work to minimize short-term impacts from the project during construction to the maximum extent practicable.

If the project is proposed to be constructed in phases, please describe each phase:
It is not proposed to construct the project in phases. MWRA will coordinate closely with the surrounding community including landowners, businesses, and residents before and throughout the duration of the project. MWRA will work to minimize short-term impacts from the project during construction to the maximum extent practicable.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN:
Is the project within or adjacent to an Area of Critical Environmental Concern?
☒**Yes** (Specify: **Adjacent**)
☐No
if yes, does the ACEC have an approved Resource Management Plan? _☒__ Yes ___ No; Rumney Marshes ACEC Salt Marsh Restoration Plan
If yes, describe how the project complies with this plan.
The Marsh Restoration Plan is focused on facilitating 'priority projects' and local engagement in efforts to restore and expand the salt marsh area. There are currently five priority projects, which would restore a projected 96 acres of salt marsh is areas deemed to have the highest potential benefits. The plan focuses on community engagement and works with local agencies and advocacy groups to identify and act on restoration opportunities. There is also an emphasis on monitoring, which identifies restoration's effectiveness on previously impaired marshes. This project will not interfere with the restoration plan or any of its projects. The HDD construction will not impact the marsh areas or the related projects.

Will there be stormwater runoff or discharge to the designated ACEC? ___ Yes ☒ **No**;
If yes, describe and assess the potential impacts of such stormwater runoff/discharge to the designated ACEC.
N/A

RARE SPECIES:
Does the project site include Estimated and/or Priority Habitat of State-Listed Rare Species? (see http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm)
☒ Yes (**Specify: Piping plover, *Charadrius melodus***) ☐ **No**
A portion (4,000 sqft) of Beach in Revere will be used to store the Point of Pines (PoP) Yacht Club floats in the boating off-season. The PoP Yacht Club has been storing these floats on the beach for several seasons under an Order of Conditions from the Revere Conservation Commission. The floats will be

stored on the beach between October 1st to April 1st to avoid the sensitive range of dates for the plovers (April 1st through August 31st).

HISTORICAL /ARCHAEOLOGICAL RESOURCES:

Does the project site include any structure, site, or district listed in the State Register of Historic Places or the inventory of Historic and Archaeological Assets of the Commonwealth?

☒ **Yes** (Specify: **The Point of Pines Area REV.P is an inventoried historical area, and the Point of Pines Yacht Club REV.535 is an inventories Property.**) __ No

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources? ☐ Yes (Specify_________________________________) ☒ **No**

AECOM completed a geoarchaeological investigation of the site and coordinated with MHC and MBUAR to conclude that the site did not interfere with historic or archaeological resources. See Attachment A for more information. MHC has requested archaeological monitoring during the terrestrial installation of pipeline in Revere.

WATER RESOURCES:

Is there an Outstanding Resource Water (ORW) on or within a half-mile radius of the project site? ☒ **Yes** __ No; if yes, identify the ORW and its location.

Belle Island Inlet/Rumney Marshes is located inland from the project project. It is most proximate to the Revere site (820 feet from the HDD location). The 600-acre salt marsh is located in Saugus, Massachusetts.

(NOTE: Outstanding Resource Waters include Class A public water supplies, their tributaries, and bordering wetlands; active and inactive reservoirs approved by MassDEP; certain waters within Areas of Critical Environmental Concern, and certified vernal pools. Outstanding resource waters are listed in the Surface Water Quality Standards, 314 CMR 4.00.)

Are there any impaired water bodies on or within a half-mile radius of the project site? ☒**Yes** ___No; if yes, identify the water body and pollutant(s) causing the impairment:

The "inner" portion of Lynn Harbor (MA93-52) is impaired (Enterococcus and Fecal Coliform).

Is the project within a medium or high-stress basin, as established by the Massachusetts Water Resources Commission? ___Yes ☒ No

STORMWATER MANAGEMENT:

Generally describe the project's stormwater impacts and measures that the project will take to comply with the standards found in MassDEP's Stormwater Management Regulations:

Best management practices for stormwater management will be incorporated into project design. Work will be conducted in compliance with the Lynn and Revere Conservation Commissions' Order of Conditions for the project. Before the start of construction, all erosion and sedimentation controls will be approved by the Engineer and inspected by the Conservation Commissions if they so choose. The project design does not introduce new impervious surface to the project site and will not impact the quality or volume of stormwater runoff.

MASSACHUSETTS CONTINGENCY PLAN:

Has the project site been, or is it currently being, regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? **Yes** ☒ **(a small portion of the project site – not the entire site)** No__; if yes, please describe the current status of the site (including Release Tracking Number (RTN), cleanup phase, and Response Action Outcome classification):

Closed National Grid MCP disposal site on Riley Way Extension (Release Tracking Number [RTN] 3-32437). Permanent Solution Statement with No Conditions, dated November 2014.

The Conceptual Site Model for the closed National Grid site is presented in Section 4.2 in the closure report (Permanent Solution Statement with No conditions) and states the following about soil impacts: "*The results of the investigation activities indicate that PAHs and metals are present in soil, and are likely related to a combination of fill material (including remnants of the timber bulkhead and asphalt pavement for Riley Way Extension), the former landfill, and the history of industrial activities in the immediate vicinity of the site; there are other no apparent sources for these compounds*."

Lead was detected in a sample along Rice Avenue in Revere during the sediment investigation. Subsequent testing of the sample's material composition indicated the following material detected: Coal (moderate), Coal Ash (moderate), Wood Ash (light), and Asphalt (trace). Per MassDEP, a background concentration for lead in soil containing coal ash or wood ash associated with fill material is 600 mg/kg. As the lead level detected in this sample was below 600 mg/kg, it was concluded that these lead levels can be attributable to fill and is exempt from reporting to MassDEP.

During the groundwater investigation, dissolved lead was detected in a groundwater sample (20B-14MW) along a short stretch of Rice Avenue in Revere. The level detected is above Massachusetts Contingency Plan (MCP) reportable concentration and constituted a 120-day reportable condition per the MCP (MWRA notified the property owner of the condition).

Is there an Activity and Use Limitation (AUL) on any portion of the project site? Yes ___ **No** ☒;
if yes, describe which portion of the site and how the project will be consistent with the AUL:
_____________________.

Are you aware of any Reportable Conditions at the property that have not yet been assigned an RTN?
Yes ___ **No** ☒; if yes, please describe:____________________________________

During AECOM's subsurface work to assess groundwater conditions, dissolved lead was detected in a groundwater sample (20B-14MW) located along a short stretch of Rice Avenue in Revere. The lead concentrations were high enough to be considered a reportable concentration and constituted a 120-day reportable condition. In addition, the property owner was made aware of the impairment.

SOLID AND HAZARDOUS WASTE:

If the project will generate solid waste during demolition or construction, describe alternatives considered for re-use, recycling, and disposal of, e.g., asphalt, brick, concrete, gypsum, metal, wood:

> **Materials generated during the removal of the twelve timber piles and the HDD are anticipated to yield 64 cubic yards of solid waste. Due to the deteriorated quality of the timber, there is no considered alternative use.**

(NOTE: Asphalt pavement, brick, concrete, and metal are banned from disposal in Massachusetts landfills and waste combustion facilities, and wood is banned from disposal at Massachusetts landfills. See 310 CMR 19.017 for the complete list of banned materials.)

Will your project disturb asbestos-containing materials? Yes ___ **No** ☒;
if yes, please consult state asbestos requirements at http://mass.gov/MassDEP/air/asbhom01.htm

Describe anti-idling and other measures to limit emissions from construction equipment:

> **Best management practices would be employed to reduce the impacts on air quality. This may include reducing the idling times of construction vehicles. Due to the number of vehicles and duration of activity required to perform the work being limited, emissions are not anticipated to cause an exceedance of national or state air quality standards in the vicinity of the project site.**

DESIGNATED WILD AND SCENIC RIVER:

Is this project site located wholly or partially within a defined river corridor of a federally Designated Wild and Scenic River or a state-designated Scenic River? Yes ___ **No** ☒;
if yes, specify name of the river and designation:

If yes, does the project have the potential to impact any of the "outstandingly remarkable" resources of a federally Wild and Scenic River or the stated purpose of a state-designated Scenic River?
Yes ___ No ☐; if yes, specify name of the river and designation: _____________;
If yes, will the project will result in any impacts on any of the designated "outstandingly remarkable" resources of the Wild and Scenic River or the stated purposes of a Scenic River.
Yes ___ No ___ ;
If yes, describe the potential impacts on one or more of the "outstandingly remarkable" resources or stated purposes and mitigation measures proposed.

ATTACHMENTS

1. List of all attachments to this document.
2. U.S.G.S. map (good quality color copy, 8-½ x 11 inches or larger, at a scale of 1:24,000) indicating the project location and boundaries.
3. Plan, at an appropriate scale, of existing conditions on the project site and its immediate environs, showing all known structures, roadways and parking lots, railroad rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities.
4. Plan, at an appropriate scale, depicting environmental constraints on or adjacent to the project site such as Priority and/or Estimated Habitat of state-listed rare species, Areas of Critical Environmental Concern, Chapter 91 jurisdictional areas, Article 97 lands, wetland resource area delineations, water supply protection areas, and historic resources and/or districts.
5. Plan, at an appropriate scale, of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase).
6. List of all agencies and persons to whom the proponent circulated the ENF in accordance with 301 CMR 11.16(2).
7. List of municipal and federal permits and reviews required by the project, as applicable.
8. Printout of output report from RMAT Climate Resilience Design Standards Tool, available here.
9. Printout from the EEA EJ Maps Viewer showing the project location relative to Environmental Justice (EJ) Populations located in whole or in part within a 1-mile and 5-mile radius of the project site.

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1) ___ Yes ☒ **No**; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site as follows:

	Existing	**Change**	**Total**
Footprint of buildings	0.00	0.00	0.00
Internal roadways	0.00	0.00	0.00
Parking and other paved areas	0.65	0.00	0.65
Other altered areas	0	0	0
Undeveloped areas	2.73	0.00	2.73
Total	**3.36**	**0.00**	**3.36**

Note: The direct project limits of work encompass 3.36 acres. After construction, the only remaining surface impacts will be approximately six manholes, and the removal and fill of the twelve timber piles.

B. Has any part of the project site been in active agricultural use in the last five years? ___ Yes ☒ **No**; if yes, how many acres of land in agricultural use (with prime state or locally important agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use? ___ Yes ☒ **No**; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a forest management plan approved by the Department of Conservation and Recreation:

D. Does any part of the project involve the conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose, not in accordance with Article 97? ☒ **Yes** ___No; if yes, describe:
The Lynnway is owned by the Massachusetts Department of Conservation and Recreation (MassDCR) and is classified as Article 97 land. MWRA is working with MassDCR to determine Article 97 applicability.

III. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction? ___ Yes ☒ **No**; if yes, does the project involve the release or modification of such restriction? ___ Yes ___ No; if yes, describe:

III. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes ☒ **No**; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes ___ ☒ **No**; if yes, describe:

III. Consistency

A. Identify the current municipal comprehensive land use plan

Title: **Next Stop Revere (Draft Master Plan)** Date: **January 2020**

Title: **Lynn Waterfront Master Plan** Date: **September 2019**

B. Describe the project's consistency with that plan with regard to:

1. economic development **N/A, this project is unrelated to economic development**
2. adequacy of infrastructure Relevant excerpts from each plan are provided below,

followed by a statement of the proposed project's consistency with each statement.

Revere: The "provision of adequate infrastructure development" is consistent with the City's planning documents. The proposed Section 56 water main replacement is consistent with this goal because it attends to currently inadequate infrastructure.

Lynn: "To achieve enhanced connectivity across many individual developments and open spaces, street and infrastructure improvement projects should be coordinated closely with private development."The proposed project will significantly improve existing infrastructure and mitigate the risk of wastewater infrastructure failure. This will benefit the private businesses and residential areas that depend on this infrastructure.

3. open space impacts **N/A, this project presents no permanent impacts on open space.**
4. compatibility with adjacent land uses **N/A, this project presents no permanent impacts that would be incompatible with adjacent land uses.**

C. Identify the current Regional Policy Plan of the applicable Regional Planning Agency (RPA)

Title: **MetroFuture: Greater Boston Region's 30-year plan** Date: **May 2008**

D. Describe the project's consistency with that plan with regard to:

1. economic development **N/A, this project is unrelated to economic development.**
2. adequacy of infrastructure Relevant excerpts from the plan are provided below, followed by a statement of the proposed project's consistency with each statement.
   - **"Urban areas benefit from existing infrastructure and they demonstrate great potential for new growth through reuse of existing buildings and developed land." This project will enable a return-to-service of existing infrastructure, conserving investments that would otherwise be needed to create a new water distribution main.**
   - **"The region will be prepared for and resilient to natural disasters and climate change. . .[w]ell maintained infrastructure would be more resilient to disasters." Section 56 creates a necessary redundancy in the water supply system which would make the overall system more resilient to disaster.**
3. open space impacts **N/A, this project presents no permanent impacts to open space**

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___Yes ☒ **No**; if yes, specify, in quantitative terms:
(NOTE: If you are uncertain, it is recommended that you consult with the Natural Heritage and Endangered Species Program (NHESP) prior to submitting the ENF.)
The project proposes temporary impacts to 4,000 square feet of NHESP Priority Habitat of Rare Species (Piping Plover, *Charadrius melodus*). There will be no alteration of designated significant habitat and temporary impacts will be less than two acres.

B. Does the project require any state permits related to **rare species or habitats**? ☒ **Yes** __ No

III. Does the project site fall within mapped rare species habitat (Priority or Estimated Habitat?) in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ☒ **Yes** ___ No.

III. If you answered "No" to all questions A, B and C, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ☒ Yes ___ No. If yes,

1. Have you consulted with the Division of Fisheries and Wildlife Natural Heritage and Endangered Species Program (NHESP)? ___Yes ☒ **No**; if yes, have you received a determination as to whether the project will result in the "take" of a rare species? ___ Yes ___ No; if yes, attach the letter of determination to this submission.

2. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ☒ **No**; if yes, provide a summary of proposed measures to minimize and mitigate rare species impacts

III. Which rare species are known to occur within the Priority or Estimated Habitat?
Piping plover, *Charadrius melodus*

III. Has the site been surveyed for rare species in accordance with the Massachusetts Endangered Species Act? ___ Yes ☒ **No**

III. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ☒ **No** ; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No **N/A**

III. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ☒ **No**; if yes, provide a summary of proposed measures to minimize and mitigate impacts to significant habitat:
A portion (4,000 sqft) of Beach in Revere will be used to store the Point of Pines (PoP) Yacht Club floating docks in the boating off-season. The PoP Yacht Club has been storing many of these floats on the beach for several seasons under an Order of Conditions from the Revere Conservation Commission. The rest of the floats are typically stored in the parking lot, which will be unavailable due to construction activities. The floating docks will be stored on the beach between October 1st to April 1st to avoid the sensitive range of dates for the plovers (April 1st through August 31st). They will be stacked to minimize their cumulative footprint.

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? ☒ **Yes** ___ No; if yes, specify, in quantitative terms:

301 CMR 11.03(3)(b)(1)I, which states: "New fill or structure or Expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway" – The pipeline to be installed via HDD, although below grade with no permanent structures occupying space in the velocity zone from the ground surface up, is a new structure in the velocity zone. Additionally, the extraction of the twelve timber piles and subsequent fill to be placed in the leftover void space would be considered new fill.

301 CMR 11.03(3)(b)(1)(a), regarding "alteration of coastal dune, barrier beach or coastal bank" – This would be a temporary impact due to the HDD exit area and pipeline in Revere being located in a parking lot and road that is within Barrier Beach In addition, access to the timber piles in Lynn that are located along the HDD pathway and must be removed would require temporary alteration of Bank to create a stable access way to remove the piles.

III. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? ☒ **Yes** ___ No; if yes, specify which permit:

- **MA Wetlands Protection Act Local Order of Conditions from Lynn and Revere Conservation Commissions**
- **MassDEP Chapter 91 License**
- **MassDEP 401 Water Quality Certification**

III. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? ☒ **Yes** ___ No; if yes, has a Notice of Intent been filed? ___ Yes ☒ No; if yes, list the date and MassDEP file number; if yes, has a local Order of Conditions been issued? **N/A**; Was the Order of Conditions appealed? **N/A**. Will the project require a Variance from the Wetlands regulations? ___ Yes ☒ **No**.

B. Describe any proposed permanent or temporary impacts to wetland resource areas located on the project site:

Impacts to Wetland Resource Areas include the following activities (the square footage of area being disturbed are provided below in Section C):

Coastal Bank

Temporary: *Clearing (without grubbing, leaving stumps intact to ensure stabilization of the bank) to enable access to the twelve timber piles on the Lynn shoreline that will need to be removed.*

Permanent: *None.*

Riverfront Area

Temporary: *HDD Exit site and terrestrial pipeline installation within the existing roadway (Rice Avenue) in Revere.*

Permanent: *six at-grade manholes. Five manholes will be sited within the existing roadway, three in Lynn and three in Revere. An additional manhole in*

Revere will be sited in the grassy triangle between Route 1A and the Lynnway.

Coastal Dune/Barrier Beach System

Temporary: *The HDD Exit and staging area and Rice Avenue in Revere are located in an area mapped by MassDEP as Coastal Dune/Barrier Beach System. Both the HDD Staging area and Rice Avenue are paved/developed.*

Permanent: *None.*

Coastal Beach/Tidal Flats

Temporary: *Surface impacts associated with the extraction and subsequent fill of twelve timber piles from the dilapidated sea wall along the shoreline in Lynn. Surface impacts (4,000 square feet) associated with the storage of PoP Yacht Club's floats for the winter (October 1st to April 1st) in Revere.*

Permanent: *Fill placed in the empty voids of the removed timber piles (75 sqft in area).*

Land Subject to Coastal Storm Flowage (100-Year Floodplain)

Temporary: *The entire project limit of work (terrestrial cut and cover pipeline installation in Rice Avenue and Hanson Street, HDD Exit and staging area in Revere, HDD Entry and Staging area in Lynn, pipe string layout area in Lynn, timber pile removal in Lynn) is located within the 100-Year Floodplain.*

Permanent: *Fill placed in the empty voids of the removed timber piles (75 sqft in area) and six manholes sited within existing roadway. Any area that is cleared or grubbed will be replanted with appropriate, native vegetation. Manholes and timber pile void fill will be at grade and will not have a permanent impact on flood storage*

III. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

Coastal Wetlands	**Area (square feet) or length**	**Temporary or Permanent Impact?**
Land Under the Ocean	0	
Designated Port Areas	0	
Coastal Beaches/Tidal Flat	**5,800**	**Temporary, 75 sqft permanent**
Coastal Dune/Barrier Beach System	**18,050**	**Temporary**
Coastal Banks	**940**	**Temporary**
Rocky Intertidal Shores	0	
Salt Marshes	0	
Land Under Salt Ponds	0	
Land Containing Shellfish		
Fish Runs		
Land Subject to Coastal Storm Flowage	**143,650**	**Temporary**

Inland Wetlands	0	
Bank (lf)	0	
Bordering Vegetated Wetlands	0	
Isolated Vegetated Wetlands	0	
Isolated Land Subject to Flooding	0	
Bordering Land Subject to Flooding	0	
Riverfront Area	**15,100**	**Temporary**

D. Is any part of the project:

1. proposed as a limited project? _☒_ Yes **No**; if yes, what is the area (in sf)? **143,560 sqft**

2. the construction or alteration of a **dam**? ___ Yes ☒ **No**; if yes, describe:
3. fill or structure in a velocity zone or regulatory floodway? ☒ **Yes** ___ No
4. dredging or disposal of dredged material? ☒ **Yes** ___ No; if yes, describe the volume of dredged material and the proposed disposal site:

An estimated 50 cubic yards of material will be dredged in the removal of the twelve timber piles. An additional 93,650 cubic yards will be dredged by the HDD drill. In total, this is 93,700 cubic yards.

5. a discharge to an Outstanding Resource Water (ORW) or an Area of Critical Environmental Concern (ACEC)? ___ Yes ☒ **No**
6. subject to a wetlands restriction order? ___ Yes ☒ **No**; if yes, identify the area (in sf):
7. located in buffer zones? ☒ **Yes** ___No; if yes, how much (in sf) **69,290 sqft**

E. Will the project:

1. be subject to a local wetlands ordinance or bylaw? ☒ **Yes** ___ No
2. alter any federally-protected wetlands not regulated under state law? ___ Yes ☒ **No**; if yes, what is the area (sqft)? **N/A**

III. Waterways and Tidelands Impacts and Permits

A. Does the project site contain waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? ☒ **Yes** ___ No; if yes, is there a current Chapter 91 License or Permit affecting the project site? ☒ **Yes** ___ No; if yes, list the date and license or permit number and provide a copy of the historic map used to determine extent of filled tidelands: **The existing Chapter 91 License for General Edwards Bridge was filed under License No.1464. The historic map can be seen in Attachment K.**

B. Does the project require a new or modified license or permit under M.G.L.c.91? ☒ **Yes** ___ No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water-dependent use? Current **0** Change **0** Total **0**

If yes, how many square feet of solid fill or pile-supported structures (in sf)? **No solid fill.**

C. For non-water-dependent use projects, indicate the following: **N/A, project is water dependent.**

Area of filled tidelands on the site:____________________
Area of filled tidelands covered by buildings:____________
For portions of site on filled tidelands, list ground floor uses and area of each use:
Does the project include new non-water-dependent uses located over flowed tidelands? Yes ___ No ___
Height of building on filled tidelands: ________________

Also show the following on a site plan: Mean High Water, Mean Low Water, Water-dependent Use Zone, location of uses within buildings on tidelands, interior and exterior areas and facilities dedicated for public use, and historical high and historic low water marks.

D. Is the project located on landlocked tidelands? ___ Yes ☒ **No**; if yes, describe the project's impact on the public's right to access, use and enjoy jurisdictional tidelands and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

E. Is the project located in an area where low groundwater levels have been identified by a municipality or by a state or federal agency as a threat to building foundations? ___Yes ☒ **No**; if yes, describe the project's impact on groundwater levels and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

F. Is the project non-water-dependent **and** located on landlocked tidelands **or** waterways or tidelands subject to the Waterways Act **and** subject to a mandatory EIR? __Yes ☒ **No**; *(NOTE: If yes, the project will be subject to Public Benefit Review and Determination.)* **Note: based on previous correspondence with MassDEP, it is anticipated that the project is considered a water-dependent infrastructure crossing facility.**

G. Does the project include dredging? ☒ **Yes** ___No; if yes, answer the following questions:

What type of dredging? **Improvement** ☒ Maintenance ___ Both ____

What is the proposed dredge volume, in cubic yards (cys) **93,670**

What is the proposed dredge footprint ____length (ft) ___width (ft)____depth (ft);

The proposed dredging would occur in two locations, the first being the HDD drill path beneath the Saugus River (a cylindrical shape 2,784 ft long and 34 inches in diameter). The second is the removal of twelve timber piles, six of which are 70 feet deep and the other six are 68 feet deep. They are tapered and thus shaped as partial cones with an upper diameter of 2 feet and a lower diameter of 0.8 feet.

Will dredging impact the following resource areas?

Intertidal ☒ **Yes** __ No; if yes, **1,900 sqft**

Outstanding Resource Water __Yes ☒ **No**; if yes, ___ sq ft

Other resource area (i.e. shellfish beds, eelgrass beds) ☒ **Yes** __No; if yes, **1,900 sqft (coincident with the intertidal area reported above)**

If yes to any of the above, have you evaluated appropriate and practicable steps to 1) avoidance; 2) if avoidance is not possible, minimization; 3) if either avoidance or minimize is not possible, mitigation?

Alternatives included a no-action alternative wherein the Section 56 pipeline would remain out of service. As indicated above, this pipeline provides a necessary redundancy in the water supply system, and without it, the MWRA Northern High Service Zone is vulnerable to failure. As a result, the no-action alternative was dismissed. Various construction methods and nine routes were considered as alternatives, and two were selected for geotechnical investigation. The proposed HDD route is the least disruptive to adjacent resource areas. See Attachment A for further Alternatives Analysis.

If no to any of the above, what information or documentation was used to support this determination? **N/A**

Provide a comprehensive analysis of practicable alternatives for improvement dredging in accordance with 314 CMR 9.07(1)(b). Physical and chemical data of the sediment shall be included in the comprehensive analysis.

Sediment Characterization

Existing gradation analysis results? ☒ **Yes** ___No: if yes, provide results.

Gradation results are included in Attachment J.

Existing chemical results for parameters listed in 314 CMR 9.07(2)(b)6? ___Yes ☒ **No**; if yes, provide results.

Do you have sufficient information to evaluate the feasibility of the following management options for dredged sediment? If yes, check the appropriate option.

Beach Nourishment ___

Unconfined Ocean Disposal ___

Confined Disposal:

Confined Aquatic Disposal (CAD) ___

Confined Disposal Facility (CDF) ___

Landfill Reuse in accordance with COMM-97-001 ___

Shoreline Placement ___

Upland Material Reuse____

In-State landfill disposal____

Out-of-state landfill disposal ____

(NOTE: This information is required for a 401 Water Quality certification.)

The HDD pipe will displace 93,650 cubic yards of sediment from beneath the Saugus River bed. Behind the drill rig, a series of sieves and cyclones will be used to separate the

sediment into soil and sand. These materials will be trucked off-site. The material is expected to be suitable for use as daily cover at a nearby landfill and this will be confirmed by sampling once the material is stockpiled as it is generated. It is not expected that contamination will be detected due to the depths of the sediments and distance from surface impacts.

IV. Consistency:

A. Does the project have effects on the coastal resources or uses, and/or is the project located within the Coastal Zone? ☒ **Yes** ___ No; if yes, describe these effects and the projects consistency with the policies of the Office of Coastal Zone Management:
Coastal Hazards Policy #1: This policy concerns the protection of beneficial functions provided by natural coastal landforms. This project has been designed to limit permanent surface impacts to avoid impacting any coastal landforms. Returning Section 56 to service is a necessary task to protect the water supply system that serves thousands of residents. The HDD method described herein has been assessed and determined to be the most favorable alternative to minimize impact on coastal landforms.
Coastal Hazards Policy #2: This policy concerns water circulation and sediment transport. This project will have no permanent impacts that would have an adverse effect on the project site or adjacent or downcoast areas.
Coastal Hazards Policy #3: This policy concerns hazards presented by projects within the coastal zone. This project will have no permanent impacts that will exacerbate (or otherwise impact) existing hazards, nor promote growth in hazard-zone or buffer areas.
Coastal Hazards Policy #4: This policy concerns the relocation of structures out of coastal high-hazard areas. This section of water main previously crossed the Saugus River on the General Edwards Bridge, which is a structure in a coastal high-hazard area that is scheduled to be replaced due to structural deficiency. MWRA understands that the bridge replacement is in the planning stages and will go to bid in 2028, putting construction into 2033 (with the potential of being delayed further). The replacement of the water main via HDD methods prevents a future replacement from being built above ground in the coastal high-hazard area and thus is aligned with this policy.

B. Is the project located within an area subject to a Municipal Harbor Plan? ☒ **Yes** __ No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:
The project area is located within the area subject to the Lynn Harbor Plan [1]. Central to the Lynn Harbor Plan is the signature public waterfront park (Lynn Harbor Park), and the goal of transitioning the Lynn waterfront to a new, mixed-use neighborhood. This project will ensure water supply system redundancy and resiliency for this public park, new residences, and businesses. Permanent impacts of the project will not impair public access to areas within the water-dependent use zone.

1 https://www.lynnma.gov/cityhall_documents/planning/harbor_plan/Lynn_Municipal_Harbor_Plan_2020.pdf

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to water supply (see 301 CMR 11.03(4))? ___ Yes ☒ **No**; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to water supply? ☒ **Yes** ___ No; if yes, specify which permit:

MassDEP Distribution Modifications for Systems, MWRA Section 8(m) Permit

C. If you answered "No" to <u>both</u> questions A and B, proceed to the Wastewater Section. If you answered "Yes" to <u>either</u> question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons per day (gpd), the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Municipal or regional water supply	N/A	0	N/A
Withdrawal from groundwater	0	0	0
Withdrawal from surface water	N/A	0	N/A
Interbasin transfer	0	0	0

The project will have no effect on water supply volume or interbasin transfer, as it is replacing a previously existing water main and will not result in any change to existing MWRA withdrawal volumes.

(NOTE: Interbasin Transfer approval will be required if the basin and community where the proposed water supply source is located is different from the basin and community where the wastewater from the source will be discharged.)

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ☒ **Yes** ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source, has a pumping test been conducted? **N/A, the project does not involve withdrawal from groundwater or surface water source.** ___ Yes ___ No; if yes, attach a map of the drilling sites and a summary of the alternatives considered and the results.

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons per day)? **N/A, the project does not involve withdrawal from groundwater or surface water source.** Will the project require an increase in that withdrawal? ___Yes ___No; if yes, then how much of an increase (gpd)? ____________________

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? Yes ___ **No** ☒**.** If yes, describe existing and proposed water supply facilities at the project site:

F. If the project involves a new interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed? **N/A**

G. Does the project involve:

1. new water service by the Massachusetts Water Resources Authority or other agency of the Commonwealth to a municipality or water district? ___ Yes ☒ **No, this project is a replacement of a section in an existing water service**
2. a Watershed Protection Act variance? ___ Yes ☒ **No**; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes ☒ **No**

III. Consistency

Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

This project is a replacement of a water main portion that was previously removed from the system due to severe corrosion. This project will enable a return to service of this pipeline and reinstate important system redundancy in the water supply system that supports thousands of residents. Inherently, this project will enhance water supply services. The proposed project has no impact on water supply volume or drinking water quality as it is a distribution project related to the existing MWRA water supply and treatment facilities.

WASTEWATER SECTION (N/A)

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ___ Yes ☒ **No**; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ___ Yes ☒ **No**; if yes, specify which permit:

C. If you answered "No" to <u>both</u> questions A and B, proceed to the **Transportation – Traffic Generation Section**. If you answered "Yes" to <u>either</u> question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe the volume (in gallons per day) and type of disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00 for septic systems or 314 CMR 7.00 for sewer systems):

	Existing	Change	Total
Discharge of sanitary wastewater	________	________	________
Discharge of industrial wastewater	________	________	________
TOTAL	________	________	________

	Existing	Change	Total
Discharge to groundwater	________	________	________
Discharge to outstanding resource water	________	________	________
Discharge to surface water	________	________	________
Discharge to municipal or regional wastewater facility	________	________	________
TOTAL	________	________	________

B. Is the existing collection system at or near its capacity? ___ Yes ___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

C. Is the existing wastewater disposal facility at or near its permitted capacity? ___ Yes___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? ___ Yes ___ No; if yes, describe as follows:

E. If the project requires an interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or new?
(NOTE: Interbasin Transfer approval may be needed if the basin and community where wastewater will be discharged is different from the basin and community where the source of water supply is located.)

F. Does the project involve new sewer service by the Massachusetts Water Resources Authority (MWRA) or other Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there an existing facility, or is a new facility proposed at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, wastewater reuse (gray water) or other sewage residual materials? ___ Yes ___ No; if yes, what is the capacity (tons per day):

	Existing	Change	Total
Storage	________	________	________
Treatment	________	________	________
Processing	________	________	________
Combustion	________	________	________
Disposal	________	________	________

III. Describe the water conservation measures to be undertaken by the project, and other wastewater mitigation, such as infiltration and inflow removal.

III. Consistency

A. Describe measures that the proponent will take to comply with applicable state, regional, and local plans and policies related to wastewater management:

B. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EEA number for the plan and whether the project site is within a sewer service area recommended or approved in that plan:

TRANSPORTATION SECTION (TRAFFIC GENERATION)

III. Thresholds / Permit

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes ☒ **No**; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**?
☒ **Yes** ___ No; if yes, specify which permits:
MassDCR Access Permit

C. If you answered "No" to <u>both</u> questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to <u>either</u> question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	44*	0	44*
Number of vehicle trips per day	0	N/A**	0
ITE Land Use Code(s):	0	0	0

*Parking spaces in the Point of Pines Yacht Club will be unavailable for the duration of construction.
**Project will not generate any operational vehicle trips but there will be vehicles accessing the site during construction.

B. What is the estimated average daily traffic on roadways serving the site?

Roadway	Existing	Change	Total
Rice Avenue, Revere	Unknown	Temporary constructio increase*	Same as Existing
Hanson Street, Lynn	Unknown	Temporary constructio increase*	Same as Existing
Lynnway/ North Shore Road	Unknown	Temporary constructio increase*	Same as Existing

*Minor increase in traffic due to construction vehicles and delivery of equipment/supplies for the duration of a few months.

C. If applicable, describe proposed mitigation measures on state-controlled roadways that the project proponent will implement:
The Lynnway and northbound onramp onto North Shore Road and the Lynnway on the east side of the General Edwards Bridge may be temporarily restricted to one lane to enable construction access at the location where the new water main will connect to the existing water main. MWRA will coordinate with MassDCR and the local communities regarding required traffic mitigation measures. Please see Attachment L for the Traffic Management Plan.

D. How will the project implement and/or promote the use of transit, pedestrian and bicycle facilities and services to provide access to and from the project site?
The proposed project will not result in any changes to transit, pedestrian and bicycle facilities and services.

E. Is there a Transportation Management Association (TMA) that provides transportation demand management (TDM) services in the area of the project site? ☒ **Yes** ____ No; if

yes, describe if and how will the project will participate in the TMA:
Lynn is served by the North Shore TMA. The project will work with the TMA to minimize unnecessary construction traffic and limit lane closures to non-peak hours when possible.

F. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation facilities? ☒ **Yes** ____ No; if yes, generally describe:
An MBTA station along the Newbury/Rockport commuter rail is located roughly a mile (20 minute walk) away from the Lynn project site. However, this station has recently been closed for the foreseeable future. A free shuttle exists between the Lynn and Swampscott station (2.5 miles).

G. If the project will penetrate approach airspace of a nearby airport, has the proponent filed a Massachusetts Aeronautics Commission Airspace Review Form (780 CMR 111.7) and a Notice of Proposed Construction or Alteration with the Federal Aviation Administration (FAA) (CFR Title 14 Part 77.13, forms 7460-1 and 7460-2)? **N/A**

III. Consistency

Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:
The proposed project will have only a minor, temporary impact on traffic and state-controlled roads and is not a transportation – oriented project. MWRA will coordinate with MassDCR and the local communities to implement required traffic mitigation to minimize impacts to local drivers in the area during construction. However, no long-term measures are proposed related to traffic, transit, pedestrian and bicycle transportation facilities and services.

TRANSPORTATION SECTION (ROADWAYS AND OTHER TRANSPORTATION FACILITIES)

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ___ Yes ☒ **No**; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**? ☒ **Yes** ___ No; if yes, specify which permit: **MassDCR Access Permit**

C. If you answered "No" to <u>both</u> questions A and B, proceed to the **Energy Section**. If you answered "Yes" to <u>either</u> question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities in the immediate vicinity of the project site:
There area six roadways in the project area. Route 1A northbound and Route 1A southbound are urban principal arterial. Hanson Street (Lynn), Rice Avenue (Revere), Lynnway, and Whitin Avenue (Revere) are local streets. Rice Avenue and Whitin Avenue are both one way streets.

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? **N/A**
2. Cutting of living public shade trees (number)? **N/A**
3. Elimination of stone wall (in linear feet)? **N/A**

III. Consistency

Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

For the duration of construction, the project will minimize unnecessary construction traffic and limit lane closures to non-peak hours when possible. The proposed project is not a transit-oriented project and will result in no long term impacts on traffic after construction is complete.

The proposed project will have only a minor, temporary impact on state-controlled roads and is not a transporation – oriented project. MWRA will coordinate with MassDCR to implement required traffic mitigation to minimize impacts to local drivers in the area during construction. However, no long-term measures are proposed related to traffic, transit, pedestrian and bicycle transportation facilities and services.

ENERGY SECTION (N/A)

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))? ___ Yes ☒ **No**; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes ☒ **No**; if yes, specify which permit:

C. If you answered "No" to <u>both</u> questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to <u>either</u> question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)			
Length of fuel line (in miles)			
Length of transmission lines (in miles)			
Capacity of transmission lines (in kilovolts)			

B. If the project involves construction or expansion of an electric generating facility, what are:
1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way? ___Yes ___No; if yes, please describe

D. Describe the project's other impacts on energy facilities and services:

III. Consistency

Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION (N/A)

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes ☒ **No**; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes ☒ **No**; if yes, specify which permit:

C. If you answered "No" to <u>both</u> questions A and B, proceed to the **Solid and Hazardous**

Waste Section. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)? ___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	________	________	________
Carbon monoxide	________	________	________
Sulfur dioxide	________	________	________
Volatile organic compounds	________	________	________
Oxides of nitrogen	________	________	________
Lead	________	________	________
Any hazardous air pollutant	________	________	________
Carbon dioxide	________	________	________

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION (N/A)

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes ☒ **No**; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? ___ Yes ☒ **No**; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	________	________	________
Treatment, processing	________	________	________
Combustion	________	________	________
Disposal	________	________	________

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	________	________	________
Recycling	________	________	________
Treatment	________	________	________
Disposal	________	________	________

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos?
___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency
Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Have you consulted with the Massachusetts Historical Commission? ☒ **Yes** ___ No; if yes, attach correspondence. For project sites involving lands underwater, have you consulted with the Massachusetts Board of Underwater Archaeological Resources? ☒ **Yes** ____ No; if yes, attach correspondence

B. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes ☒ **No**; if yes, does the project involve the demolition of all or any exterior part of such historic structure? ___ Yes ☒ **No**; if yes, please describe:

C. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ☒ **Yes** ___ No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ☒ **No**; if yes, please describe:

D. If you answered "No" to all parts of both questions A, B and C, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

II. Impacts

Describe and assess the project's impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

The project is anticipated to have neither direct nor indirect impacts on listed or inventoried historical and archaeological resources. The Point of Pines Area (REV.P) is an inventoried historic area, and the Point of Pines Yacht Club (REV.535) is an inventoried Property. While the project will take place in the Point of Pines Area (REV.P) and in the parking lot of the Point of Pines Yacht Club (REV.535), the project will sustain no above-ground impacts aside from the installation of three manholes in the paved roadway. Construction impacts will be temporary, located in existing paved areas (aside from the grassy shoulder at the western end of Rice Avenue), and will not result in any lasting visual changes.

A marine archaeological area of potential effects (APE) was developed and investigated via a survey, which collected a combination of single beam (SB) bathymetric data, Side Scan Sonar (SSS) data, and Sub-Bottom Profiler (SBP) data collected by CE Environmental using a real-time kinematic (RTK) navigation system with an accuracy within .39 inch (1cm), the conclusion of what was that there would be low potential for significant submerged cultural resources within the proposed HDD routes. This conclusion was affirmed by the MBUAR in a communication dated September 28, 2021 (included in Attachment E). See Attachment A for further details.

III. Consistency

Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

Per communications with BUAR and MHC (Attachment E), an archaeologist will be on site during the Rice Avenue trench excavation to identify and evaluate any intact, significant archaeological resources that may be present within the buried natural stratigraphy.

CLIMATE CHANGE ADAPTATION AND RESILIENCY SECTION

This section of the Environmental Notification Form (ENF) solicits information and disclosures related to climate change adaptation and resiliency, in accordance with the MEPA Interim Protocol on Climate Change Adaptation and Resiliency (the "MEPA Interim Protocol"), effective October 1, 2021. The Interim Protocol builds on the analysis and recommendations of the 2018 Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), and incorporates the efforts of the Resilient Massachusetts Action Team (RMAT), the inter-agency steering committee responsible for implementation, monitoring, and maintenance of the SHMCAP, including the "Climate Resilience Design Standards and Guidelines" project. The RMAT team recently released the RMAT Climate Resilience Design Standards Tool, which is available here.

The MEPA Interim Protocol is intended to gather project-level data in a standardized manner that will both inform the MEPA review process and assist the RMAT team in evaluating the accuracy and effectiveness of the RMAT Climate Resilience Design Standards Tool. Once this testing process is completed, the MEPA Office anticipates developing a formal Climate Change Adaptation and Resiliency Policy through a public stakeholder process. Questions about the RMAT Climate Resilience Design Standards Tool can be directed to rmat@mass.gov.

All Proponents must complete the following section, referencing as appropriate the results of the output report generated by the RMAT Climate Resilience Design Standards Tool and attached to the ENF. In completing this section, Proponents are encouraged, but not required at this time, to utilize the recommended design standards and associated Tier 1/2/3 methodologies outlined in the RMAT Climate Resilience Design Standards Tool to analyze the project design. However, Proponents are requested to respond to a respond to a user feedback survey on the RMAT website or to provide feedback to rmat@mass.gov, which will be used by the RMAT team to further refine the tool. Proponents are also encouraged to consult general guidance and best practices as described in the RMAT Climate Resilience Design Guidelines.

I. Climate Change Adaptation and Resiliency Strategies

Has the project taken measures to adapt to climate change for all of the climate parameters analyzed in the RMAT Climate Resilience Design Standards Tool (sea level rise/storm surge, extreme precipitation (urban or riverine flooding), extreme heat)? ☒ **Yes** ___ No

Note: Climate adaptation and resiliency strategies include actions that seek to reduce vulnerability to anticipated climate risks and improve resiliency for future climate conditions. Examples of climate adaptation and resiliency strategies include flood barriers, increased stormwater infiltration, living shorelines, elevated infrastructure, increased tree canopy, etc. Projects should address any planning priorities identified by the affected municipality through the Municipal Vulnerability Preparedness (MVP) program or other planning efforts, and should consider a flexible adaptive pathways approach, an adaptation best practice that encourages design strategies that adapt over time to respond to changing climate conditions. General guidance and best practices for designing for climate risk are described in the RMAT Climate Resilience Design Guidelines*.*

A. If no, explain why.

B. If yes, describe the measures the project will take, including identifying the planning horizon and climate data used in designing project components. If applicable, specify the return period and design storm used (e.g., 100-year, 24-hour storm).

   The proposed project does not include any permanent above-ground structures associated with the Section 56 water pipeline replacement. Furthermore, there is

no new impervious surface proposed. The portion of the pipeline below the Saugus River is greater than forty feet below the riverbed, and the connecting land portions of the pipeline are also below-grade predominantly in existing paved areas. Therefore, it is not anticipated that consideration of climate data is relevant in the proposed project. While the RMAT Climate Design Standards Tool was consulted, there are no applicable design recommendations that can be incorporated into this project.

C. Is the project contributing to regional adaptation strategies? __ Yes ☒ **No**; If yes, describe.

II. Has the Proponent considered alternative locations for the project in light of climate change risks?
___ Yes ☒ **No**

A. If no, explain why.

The project is a replacement of an existing water main that traversed the Saugus River between Lynn and Revere. No alternative location would meet the project objective.

B. If yes, describe alternatives considered.

III. Is the project located in Land Subject to Coastal Storm Flowage (LSCSF) or Bordering Land Subject to Flooding (BLSF) as defined in the Wetlands Protection Act?
☒ **Yes** ____No

If yes, describe how/whether proposed changes to the site's topography (including the addition of fill) will result in changes to floodwater flow paths and/or velocities that could impact adjacent properties or the functioning of the floodplain. General guidance on providing this analysis can be found in the CZM/MassDEP Coastal Wetlands Manual, available here.

The only change in topography at the site is the removal of twelve timber piles from the dilapidated sea wall along the shoreline in Lynn. The deteriorating seawall does not offer the adjacent BLSF significant protection and the removal of this section is not anticipated to change floodwater flow paths and/or velocities. There are no other permanent proposed changes to the site's topographies.

ENVIRONMENTAL JUSTICE SECTION

I. Identifying Characteristics of EJ Populations

A. If an Environmental Justice (EJ) population has been identified as located in whole or in part within 5 miles of the project site, describe the characteristics of each EJ population as identified in the EJ Maps Viewer (i.e., the census block group identification number and EJ characteristics of "Minority," "Minority and Income," etc.). Provide a breakdown of those EJ populations within 1 mile of the project site, and those within 5 miles of the site.

There are three municipalities within a 1-mile radius of the project site. These are Lynn, Revere, and Saugus.

Within a 1-mile radius of the project site, there are 31 EJ block groups across three municipalities (Lynn, Revere, and Saugus). The project site is located within two block groups designated as environmental justice popultions in Lynn and Revere. One is on the basis of income and one on the basis of minority. There are 29 additional block groups designated as environmental justice populations either in whole or in part within the designated geographic area (i.e. within one mile of the project). A figure in Attachment I indicates the EJ criteria for each block group.

Within a 5-mile radius, there are 255 EJ block groups across twelve municipalities (Boston, Chelsea, Everett, Lynn, Malden, Melrose, Peabody, Revere, Salem, Saugus, Swampscott, and Winthrop). A list of these populations is included in Attachment I.

B. Identify all languages identified in the "Languages Spoken in Massachusetts" tab of the EJ Maps Viewer as spoken by 5 percent or more of the EJ population who also identify as not speaking English "very well." The languages should be identified for each census tract located in whole or in part within 1 mile and 5 miles of the project site, regardless of whether such census tract contains any designated EJ populations.

Within a 1-mile radius of the project site, there are five EJ block groups that meet this qualification (four in Lynn and one in Revere). The languages spoken are Spanish or Spanish Creole, Russian, Mon-Khmer Cambodian, and "Other Indic Language." Within a 5-mile radius, there are 52 EJ block groups across eight municipalities that meet this qualification. Lists of these block groups are included as Attachment I.

C. If the list of languages identified under Section I.B. has been modified with approval of the EEA EJ Director, provide a list of approved languages that the project will use to provide public involvement opportunities during the course of MEPA review. If the list has been expanded by the Proponent (without input from the EEA EJ Director), provide a list of the additional languages that will be used to provide public involvement opportunities during the course of MEPA review as required by Part II of the MEPA Public Involvement Protocol for Environmental Justice Populations ("MEPA EJ Public Involvement Protocol"). If the project is exempt from Part II of the protocol, please specify.

In order to meet the needs of the "Other Indic Languages" category, the EJ Screening Form was translated into Urdu. Translated forms in all five languages (English, Spanish, Russian, Mon-Khmer Cambodian, and Urdu) were distributed to the CBO Distribution List, as well as the project municipalities and their Conservation Commissions and other stakeholders identified by MWRA.

IV. Potential Effects on EJ Populations

A. If an EJ population has been identified using the EJ Maps Viewer within 1 mile of the project site, describe the likely effects of the project (both adverse and beneficial) on the identified EJ population(s).

The following impacts may affect EJ populations as well as the wider public:

- **Short-term impacts to traffic on Rice Avenue would impact residents on this street during the terrestrial pipeline installation. Increased activity in the vicinity of the project site, including the Point of Pines parking lot, would temporarily disrupt local traffic.**
- **Short-term impacts to traffic on Hanson Street would impact traffic patterns in the commercial/industrial vicinity during the terrestrial pipeline installation.**
- **Short-term impacts to air quality in the project area could result from the temporary operation of machinery associated with construction activities. Best management practices (BMPs) to control construction emissions would be implemented to minimize visible fugitive dust emissions at the property line.**
- **Short-term impacts to noise levels in the project area would occur during construction, primarily from mechanical equipment used for construction activities.**
- **Short-term impacts to the accessibility to what is named on Google Maps as "The Community Path of Lynn" and what appears to be a segment of a walking/biking trail that goes along the waterfront. This area would be restricted from public access due to its proximity to the project site.**

The project would result in the following benefits to EJ populations as well as the wider public:

- **MWRA's Section 56 water pipeline supplies water and provides water system redundancy to portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus, and Swampscott. The EJ populations served by this pipeline as well as the wider community will benefit from the security that this pipeline replacement will bring to the area's water supply.**

B. If an EJ population has been identified using the EJ Maps Viewer within 5 miles of the project site, will the project: (i) meet or exceed MEPA review thresholds under 301 CMR 11.03(8)(a)-(b) __ Yes _X_ No; or (ii) generate150 or more new average daily trips (ADT) of diesel vehicle traffic, excluding public transit trips, over a duration of 1 year or more. ___ Yes ☒ **No**

C. If you answered "Yes" to either question in Section II.B., describe the likely effects of the project (both adverse and beneficial) on the identified EJ population(s).

III. Public Involvement Activities

A. Provide a description of activities conducted prior to filing to promote public involvement by EJ populations, in accordance with Part II of the MEPA EJ Public Involvement Protocol. In particular:

1. If advance notification was provided under Part II.A., attach a copy of the Environmental Justice Screening Form and provide list of CBOs/tribes contacted (with dates). Copies of email correspondence can be attached in lieu of a separate list.

Please see Attachment H for the Community-Based Organizations (CBOs) and MEPA Distribution List and Attachment I for the EJ Screening Form (English, Russian, Khmer, Urdu, and Spanish language translations).

2. State how CBOs and tribes were informed of ways to request a community meeting, and if any meeting was requested. If public meetings were held, describe any issues of concern that were raised at such meetings and any steps taken (including modifications to the project design) to address such concerns.
   Advance Notification under Part II of the MEPA EJ Public Involvement Protocol was provided. On June 14th, 2023, the Environmental Justice Screening Form in Attachment I was emailed to the CBO list, which includes environmental organizations, indigenous organizations, and federal tribes on the attached list (see Attachment H).
   Via the Environmental Justice Screening Form sent on June 14th, CBOs were informed that a community meeting could be requested by emailing or calling the specified contact at AECOM, the Proponent's consultant. As of this EENF filing, no meeting has been requested. The Environmental Justice Screening Form was also distributed to the project municipalities, their Conservation Commissions, and other stakeholders identified by MWRA.

3. If the project is exempt from Part II of the protocol, please specify.
   The project is not exempt from Part II of the protocol.

B. Provide below (or attach) a distribution list (if different from the list in Section III.A. above) of CBOs and tribes or other individuals or entities the Proponent intends to maintain for the notice of the MEPA Site Visit and circulation of other materials and notices during the course of MEPA review.

   The Proponent intends to use the list in Section III.A for this purpose.

C. Describe (or submit as a separate document) the Proponent's plan to maintain the same level of community engagement throughout the MEPA review process as conducted prior to filing.

   The Proponent's plan to maintain community engagement comprises:
   - **Circulating to community-based organizations (CBOs) and tribes a written project summary with basic project details and information about the project review procedure; a notice of the MEPA Site Visit; summaries of supplemental information submitted to the MEPA office; and other relevant notices or materials generated during the course of MEPA review**
   - **Holding community meetings, if requested, during weekend or evening hours, at accessible locations**
   - **Establishing a local repository for project review documents, notices, and decisions**
   - **Creation of an MWRA project website with regular project updates: https://www.mwra.com/projects/water/7454-section56-saugus-river/7454-update.html#**
   - **MWRA will incorporate and respond to any comments from CBOs and other entities received at public meetings and throughout the MEPA review process.**

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

   The Public Notice (in English and in Spanish) can be found in Attachment N.

Language	Newspaper	Website	Date
English	Boston Globe	https://www.bostonglobe.com/	7/27/23
English	Boston Herald	https://www.bostonherald.com/	7/27/23
English	Revere Journal	http://reverejournal.com/	7/26/23
English	Lynn Journal	http://lynnjournal.com/	7/28/23
Spanish	El Mundo	https://elmundoboston.com/	7/27/23

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

Signatures:

Rebecca Weidman

Date Signature of Responsible Officer or Proponent

Rebecca Weidman
Name (print or type)

Massachusetts Water Resources Authority
Firm/Agency

2 Griffin Way
Street

Chelsea, MA 02150
Municipality/State/Zip

617-788-4958
Phone

Katharine Schassler

Date Signature of person preparing ENF (if different from above)

Katharine Schassler
Name (print or type)

AECOM
Firm/Agency

250 Apollo Drive
Street

Chelmsford
Municipality/State/Zip

(978) 905-2334
Phone

ATTACHMENT A

Detailed Project Description

1. Introduction

The Massachusetts Water Resources Authority (MWRA) is proposing to replace a section of its existing Section 56 water pipeline, which helps supply water to portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus and Swampscott. This critical pipeline had previously provided redundancy for the MWRA Northern High Service Zone prior to 2018, when a section crossing the Saugus River via the General Edwards Bridge was removed due to severe corrosion and upcoming bridge work. The Section 56 water main has since been inoperable, leaving the Northern High Service Zone without redundancy and thus vulnerable to failure. MWRA's Section 56 Pipeline Replacement Project will ensure water system redundancy and reliability for residents and businesses in these communities, which is crucial to protecting public and environmental health.

MWRA's Section 56 pipeline was initially constructed in 1934 and is located below Ocean Avenue, Revere Street, Revere Beach Boulevard, the State Route 1A North ramp, and North Shore Road (State Route 1A) in Revere. The pipeline continues in Lynn along the Lynnway (State Route 1A) and Broad Street, terminating at the intersection of Broad and Washington Streets. Section 56 primarily consists of 20-inch diameter cast iron pipes for most of its length.

During the design phase of the project, four pipe installation methods and eight routes were considered. Two routes were selected for further geotechnical investigation and supplemental borings. As discussed further in **Section 3.2**, after a review of the alternatives analysis and in consultation with the Cities of Revere and Lynn, Route 7 and Horizontal Directional Drilling (HDD) were selected as the preferred alternatives and are presented in this EENF.

2. Project Description

The following section provides a description of the project site, project goal, and major work activities that would be required to implement the preferred alternative.

2.1. Project Site Description and Background

The project area includes sites on either side of the Saugus River in Lynn and Revere. The project boundaries in Revere are from the intersection of Route 1A North Shore Road "Lynnway" and Rice Avenue in Revere, along Rice Avenue and into the Point of Pines Yacht Club parking. The proposed pipeline route continues below the Lower Saugus River northeasterly towards Hanson Street in Lynn, then westerly along Hanson Street to the intersection of Route 1A Northern Shore Road "Lynnway" Hanson Street, in Lynn. The project's southerly and northerly terminus points connect to the existing Section 56 Saugus River Crossing water main on North Shore Road in Revere and the Lynnway in Lynn. The proposed pipeline route can be seen in **Figure 1**. Site photos can be found in **Attachment C**.

AECOM

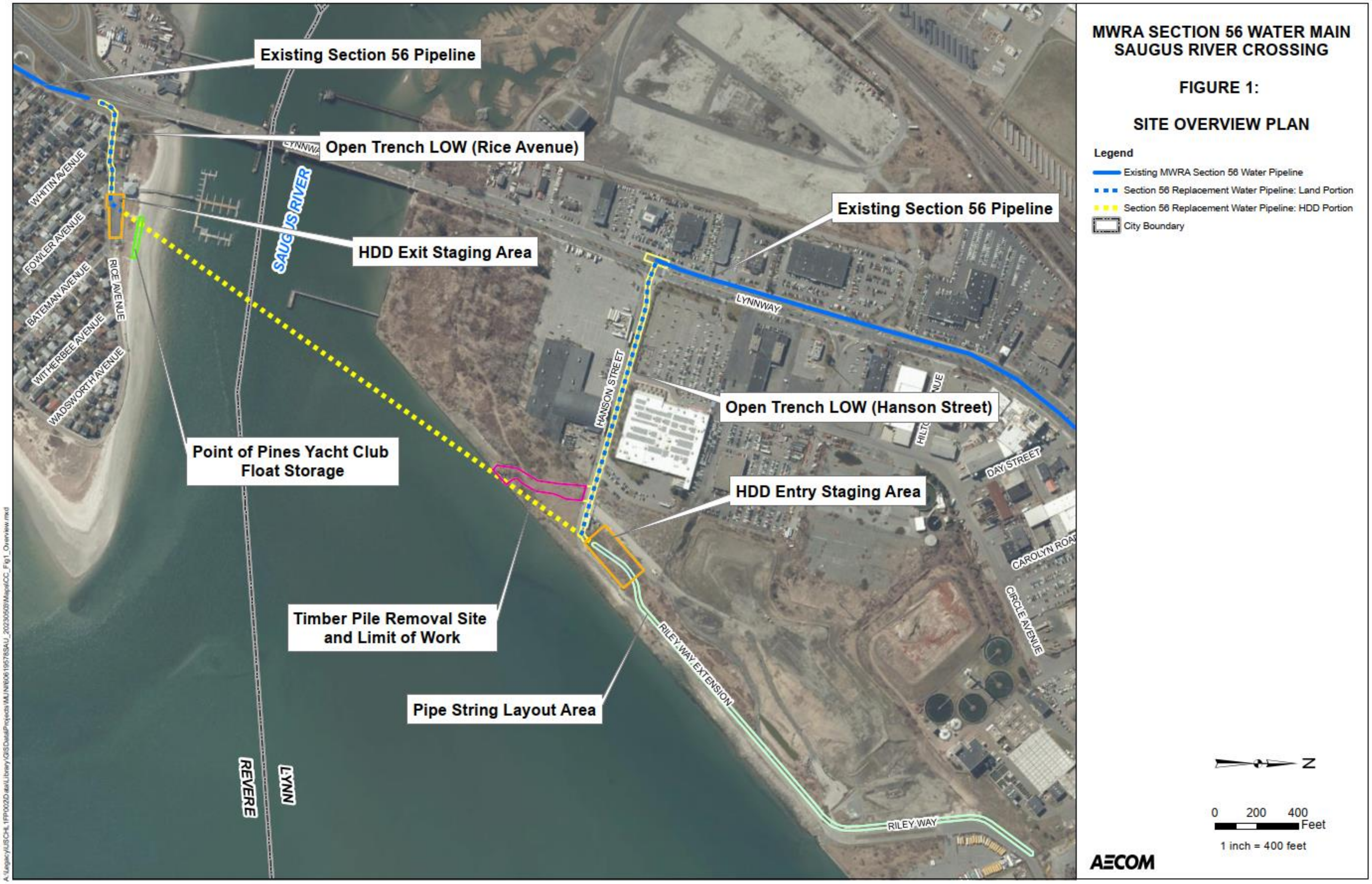

Figure 1. The proposed pipeline route, including two terrestrial portions (Lynn and Revere), and the section beneath the Saugus River. The terrestrial portions of the proposed water main will join with the existing Section 56 pipeline at the ends of Hanson Street and Rice Avenue.

2.2. Project Goal

The objective of the Project is a return to service of the Section 56 water main. Without the system redundancy previously provided by this water main, the MWRA Northern High Service Zone is vulnerable to failure. This project will reinstate system redundancy for the residents and businesses supported by this water pipeline.

2.3. Proposed Design

MWRA is proposing that the portion of the Section 56 water main be replaced below the riverbed of the Saugus River between Lynn and Revere. The new water main section below the Saugus River would be installed via Horizontal Direction Drilling (HDD), with an entry pit located in Lynn near the southern end of Hanson Street and an exit pit in Revere within the Point of Pines Yacht Club parking lot. **Table 1** and **Figure 1** depict the limits various limits of work.

Table 1. Limits of Work

City	Limit of Work	Area (sqft)	Purpose
Revere	Rice Avenue pipeline installation	4,315	Installation of terrestrial pipeline via traditional cut-and-cover methods with existing paved roadway.
	HDD Exit Staging Area (Point of Pines Yacht Club Parking Lot)	13,740	Equipment staging area for horizontal directional drilling pipe string exit point. Location is a paved parking lot.
Lynn	Hanson Street pipeline installation	10,040	Installation of terrestrial pipeline via traditional cut-and-cover methods with existing paved roadway.
	HDD Entry Staging Area	37,050	Equipment staging area for horizontal directional drilling pipe string entry point. Location is vegetated and parallels Hanson Street Extension.
	Timber Pile Removal along Lynn Shoreline	25,590	Access route for equipment required to remove the dilapidated timber piles along the Lynn shoreline. Route is vegetated and will need to be cleared (with stumps left in place) and will be replanted following construction.
	Pipe string Layout Area	56,000	Area immediately north of the horizontal directional drilling for laying out the pipe string prior to deployment. This area is necessary to ensure the pipe will enter the drill hole at the correct angle.

The design elements of the proposed water main installation are illustrated in the various project plans and drawings in **Attachment D**. The new water main marine section would be connected to the existing pipeline on North Shore Road in Revere and the Lynnway in Lynn by water main segments installed via traditional open-cut excavation.

2.3.1 Terrestrial Pipeline Segments

The on-land sections of the proposed Section 56 replacement pipeline will be installed by open-cut construction, which is the most common installation method for water mains. The trench will be opened approximately seven feet wide and will largely be within the existing paved roadways. Once the trench has been excavated to the required depth, pipe bedding material is placed in the bottom of the trench prior to installation of the pipe. The pipe will be installed section by section, and then backfilled and compaction will occur. The trench length open at any time will be approximately twenty to thirty feet in length (i.e., not in exceedance of the length of pipe that can reasonably be installed in one day). This length is slowly and constantly moving as construction is progressed. Trenches will be properly shored or sheeted to protect against trench collapses in accordance with all Occupational Safety and Health Administration (OSHA) trenching guidelines and requirements. In the event groundwater is encountered during the installation of the terrestrial pipeline segments, pumps and/or dewatering sumps will be used to keep the trench bottom in-the-dry during pipeline installation. Dewatering effluent will either be discharged to an upland area or an existing storm drain; in both cases, the dewatering effluent will be pumped through a silt sack/catch basin insert to reduce turbidity prior to discharge. All mains will be installed with 5 feet of cover where possible. The project will comply with applicable regulations and requirements per the NPDES Construction General Permits and NPDES Dewatering and Remediation General Permits.

2.3.2 Saugus River Crossing

The Hanson Street (Lynn) and Rice Avenue (Revere) on-shore alignments will be connected via a section of pipe in the ground beneath the water of the Saugus River. It is proposed that this 34-inch diameter pipe be high-density polyethylene and installed via HDD. HDD is a method of underground utility installation that entails drilling a pilot hole at a relatively shallow angle. HDD is typically employed to avoid obstacles and minimize surface impacts. The length of the pipe beneath the Saugus River will be 2,800 feet.

2.3.3 Appurtenances

The proposed 20-inch ductile iron Section 56 replacement pipeline will include pipe bends, line valves, required thrust restraints, blow-offs, and air release and vacuum valves. Horizontal bends will be installed at locations where a change of direction is required that exceeds the allowable joint deflection. Vertical bends will be installed where required to deflect the pipe above or below existing utilities, such as the 18-inch drainpipe in Rice Avenue at the Lynnway and the 36-inch culvert on Rice Avenue. No existing utilities will need to be relocated. The only above-ground impacts resulting from the installation of this water main will be six manholes.

2.3.4 Dredging

Dredging will result as the water main to be installed in the ground beneath the water of the Saugus River will displace a volume of sediment (approximately 94,000 cubic yards). Additionally, twelve timber piles will need to be removed from the dilapidated seawall on the Lynn shoreline as they obstruct the proposed HDD path. Because the degraded wood piles are embedded in the ground, removal thereof is considered dredging (approximately 50 cubic yards). At this point in the design, there are two scenarios for pile removal under consideration. The first would be pile removal by land, and the second would entail the use of a barge to remove the piles. The former requires a greater land disturbance (primarily the clearing of vegetation). While the second scenario offers less impact on existing environmental conditions on land, the barge will need to be supported by spuds and temporarily grounded to the ocean floor. Environmental impacts of both scenarios (i.e., greater area of clearing on land and temporary impacts to Land Under Water) are discussed herein. See Project Plans in **Attachment D** and **Section 5.2** for further details as to the area impacted by the proposed timber pile removals.

3. Alternatives to the Project

This section summarizes the alternatives to the proposed replacement project. As noted above, the project's purpose is to return to service the Section 56 Water Main. To meet this purpose, various pipe materials and routes were evaluated. The No Action Alternative is also discussed below. After the alternatives below were fully considered, the proposed route and HDD installation method were selected as the preferred alternative for the reasons outlined below.

3.1. No Action

The no-action alternative would result in the Section 56 pipeline remaining out of service. As indicated above, this pipeline provides a necessary redundancy in the water supply system, and without it, the MWRA Northern High Service Zone is vulnerable to failure. As a result, the no-action alternative was dismissed.

3.2. Route and Installation Method Alternatives

In 2017, MWRA's consultant conducted an alternatives analysis that analyzed four pipe installation methods and nine routes for the new pipe placement. The installation methods included open trench river crossing, Horizontal Directional Drilling (HDD), microtunneling, and removal and replacement on the General Edwards bridge. The microtunneling alternative was rated favorably from a performance and risk perspective but had the highest cost and longer schedule duration. The open trench river crossing alternative was comparable in cost to HDD options but included greater environmental risk, greater permitting difficulty, and longer schedule duration. The pipe replacement on the bridge alternative scored less favorably due to reduced protection against damage, hydraulic limitations, greater technical complexity, and greater construction risk. Additionally, the General Edwards Bridge is deemed structurally deficient by MassDOT, and the Department is in the planning phase of replacing this 87-year-old structure. The bid date for this project is in 2028, which puts the timeline for finishing the bridge at least five years after that (with the possibility of it being much longer). Planning to put the pipeline on the bridge would cause a significant and unacceptable delay to the pipeline replacement, which again, is necessary to ensure water supply system redundancy for several communities. The 2017 Feasibility Study can be found in **Attachment M**.

Route alternatives were screened concerning pipeline performance, program risks, cost, and schedule. Of the nine routes initially considered, two (Routes 3 and 7) were selected to be further evaluated, which included an extensive geotechnical investigation of these two potential alignments. This work included twelve geotechnical borings, nine marine geotechnical borings, and three test pits. These geotechnical survey methods provide a better understanding of which route is less impactful to the surrounding environments. The two pipe replacement alternatives, extending from Hanson Street in the City of Lynn to Rice Avenue in the City of Revere, were designated Route 3 and Route 7. Both routes connect to the Section 56 water main in the Revere on the North Shore Road/Lynnway near the ramp onto State Route 1A North and in the Lynn on the Lynnway (State Route 1A) opposite Hanson Street.

In 2020, AECOM conducted geological boring investigations along Routes 3 and 7. Although both offered feasible routes from an HDD perspective, Route 7 involves a shorter distance of open-cut trench excavation for the land portion of the connection to the existing Section 56 water pipeline in Revere and therefore is the route with less impact on the Barrier Beach System, as well as less impact on the Point of Pines community. The weighted Route Selection Matrix summarizing the scoring of Routes 3 and 7 is provided in **Attachment M**. Following the geotechnical investigation, Route 7 was identified as the preferred pipeline route due to the less disruptive impacts on the Barrier Beach System and residents in the Point of Pines neighborhood. Because both pipeline routes were under consideration at the time the geotechnical investigation was performed, Route 3 is still visible on some figures. Route 7 is the proposed Project presented in this EENF; mention of or reference to Route 3 in any supplementary documents should be disregarded with concern to the proposed project.

4. Existing Environment

4.1. Topography, Soils, and Sediment

According to the Natural Resources Conservation Service soil maps, the vicinity of Hanson Street, the timber pile removal site, the HDD Entry and Staging area, and the pipe string layout area (all of which are in Lynn, Essex County) are characterized as urban land (1.5 acres) and refuse substratum Udorthents (1.9 acres). Rice Avenue and the HDD Exit Staging area are characterized as sand beach (0.1 acres), Merrimac-Urban land complex 0 to 8 percent slopes (0.4 acres), and wet substratum Udorthents (<0.1 acres).

Based on the Surficial Materials Map of the Lynn Quadrangle, Massachusetts, published by the United States Geological Survey (USGS) in 2018, surficial geology at the project site consists of artificial fill in Lynn and portions of the Revere side of the project site. This fill consists of earth and manmade materials that have been artificially placed. In addition, beach and dune deposits are present in the Point of Pines area in Revere. These deposits are primarily composed of sand and fine gravel deposited along the shoreline by waves, currents, and wind action. Beach sand deposits are composed of moderately sorted, very coarse to fine sand, and are commonly laminated. Coarser layers may contain fine gravel particles, while finer layers may contain very fine sand and silt.

4.1.1 Site Surveys

An aerial survey was performed using aerial photography by Blue-Sky Geospatial Ltd., formerly Col-East. Bluesky utilized standard aerial photography methods to prepare topographic mapping at a scale of 1-inch equals 20 feet with 1-foot contour intervals. Single beam bathymetric, sub-bottom sonar and side scan sonar surveys were performed December 14-16, 2020. The surveys were intended to map current bathymetry (bed elevations), characterize sediment stratigraphy (overburden thickness), and identify surficial bed features which might hinder other aspects of site investigations. The extent of these operations was limited to the two alternate HDD alignments (Route 3 and Route 7) under consideration at the time. **Figure 2** is a bathymetric map depicting site conditions using 1.0-foot NAD83 contours.

A geophysical investigation along the land portions of the HDD alignments was conducted between late December 2020 and January 2021 by Hager GeoScience, Inc. (HGI). The purpose of this investigation was to locate potential obstructions, defined by AECOM as dense sands, fine or coarse gravels, cobbles, and boulders, to a depth of 50 feet. Because of the brackish tidal environment of the survey locations, HGI selected low-frequency ground penetrating radar (LFGPR) and electrical resistivity tomography (ERT) as the methods most likely to be able to resolve obstructions and map soil strata to the depth specified, with work to be performed during the low tide window to maximize depth penetration.

The survey produced GPR and ERT figures that illustrate concentrations of gravel and individual cobbles and/or boulders observed along the proposed routes. On the Lynn side, the

GPR data illustrates a two-tier stratigraphy below the reported clay layer starting at approximately 50 feet deep (Elevation ~40 feet). A few large objects are noted in the till. A U-shaped depression was noted as a former channel. This interval may represent a drainage system along which till was washed and fines were removed, leaving behind a concentration of coarse material. On the Revere side, GPR data show scattered individual objects within the clay layer and the beginning of concentrations of coarse material in the northern end of the profile, suggesting continuation into the channel. A portion of the route GPR traverse was obstructed by wooden docks owned by the Yacht Club, resulting in a 65-foot gap in coverage.

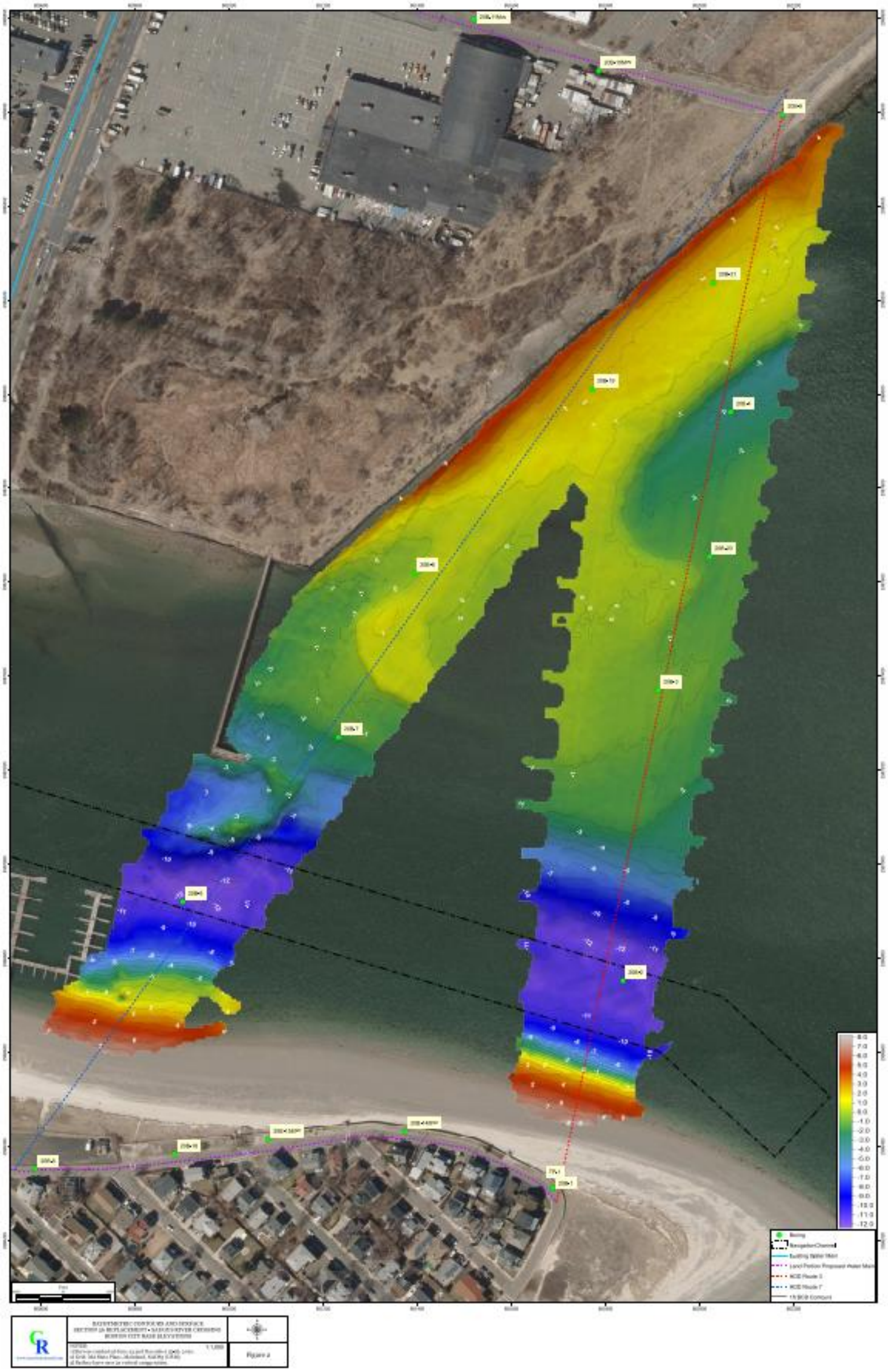

Figure 2. Bathymetric contours and surface (December, 2020).

4.1.2 Geophysical Borings

To better inform the project design with information relative to soil properties and groundwater levels, an extensive environmental soil exploration was undertaken between October 2020 and January 2021. This program included twelve landside test borings with eight monitoring well installations. All test borings and monitoring well installations were conducted in the Cities of Lynn, MA (20B-9, and 20B-10MW through 20B-13MW) and Revere, MA (20B-1, 20B-5, 20B-14MW through 20B-17MW, and 20B-18) as noted on **Figure 3**Error! Reference source not found..

In general, the land side of the project site is underlain by very loose to medium-dense sand fill, which can extend to depths up to 18 feet. The existing fill is underlain by either a natural sand or a slightly organic silt, which overlies stiff to soft clay. The clay layer can extend to a depth of up to 94 feet below the existing ground surface and is underlain by glacial till. The subsurface conditions in the Saugus River generally consist of 3 to 20 feet of silty sand with few organics, overlying a stiff to very soft clay or clayey sand deposit that can extend to 69 feet below the mudline, with boulders encountered near the center of the Saugus River and the Lynn coast. The clay and/or clayey sand deposit is generally underlain by silty sand and gravel overlying glacial till and Argillite bedrock.

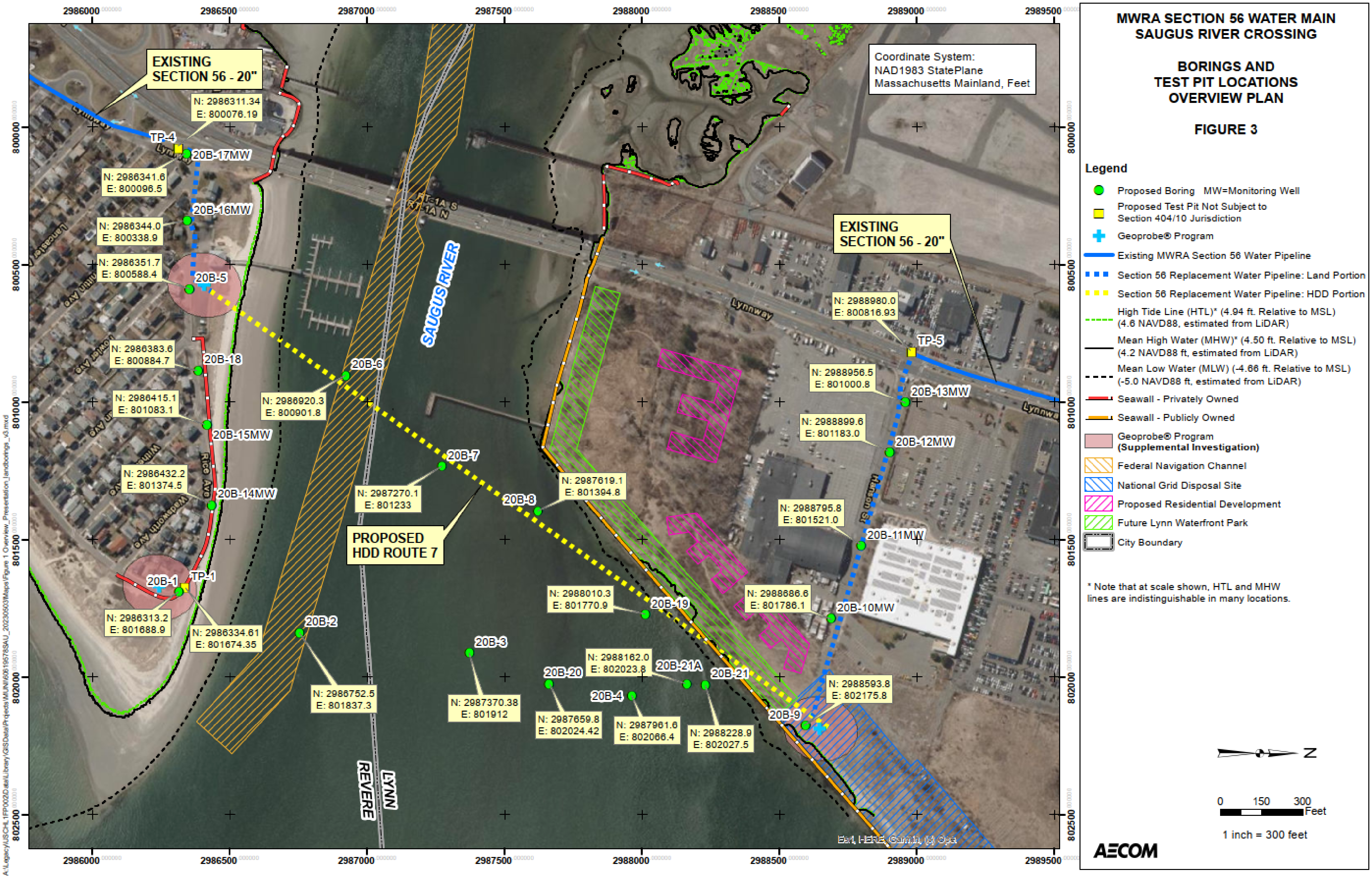

Figure 3. Geophysical Borings and Test Pit Locations Overview Plan.

Since the project site spans a large geographical area, the subsurface conditions for the two land side areas in Lynn and Revere and the HDD route across the Saugus River are summarized separately in the sections presented below.

4.1.2.1 Hanson Street, Lynn

Borings performed along Hanson Street in Lynn are identified as 20B-9, 20B-10MW, 20B-11MW, 20B- 12MW, and 20B-13MW. The following strata were encountered:

- Fill - Loose to occasionally medium-dense granular fill was encountered at the ground surface of each boring, which extended to depths between 8 and 13 feet (EL. 8.3 and EL. 3.2).
- Organic Silt - The fill was underlain by a very soft to stiff, slightly organic silt deposit, which extended to depths between 11 and 16 feet (EL. 8.6 and EL. 0.7).
- Glaciofluvial Granular Deposit – The organic silt deposit was underlain by a medium-dense glaciofluvial granular deposit, which ranged from 9 to at least 17 feet in thickness and extended to depths between 20 and 26 feet (EL.-3.7 and EL. -8.3).
- Silt - A 4-foot-thick layer of stiff silt was observed to underlie the glaciofluvial deposit in boring 20B-9, extending to a depth of 29 feet (EL. -12.3).
- Marine Clay - The silt deposit encountered in boring 20B-9 and the glaciofluvial deposit in the other borings were underlain by a very soft to stiff marine clay deposit. The medium stiff and stiff clay was generally observed directly beneath the glaciofluvial or silt deposits, transitioning to a softer clay with depth. In boring 20B-9, the marine clay deposit was observed to extend to a depth of 55 feet, corresponding to EL. -39.
- Glacial Till - Dense to very dense glacial till was encountered beneath the marine clay. No bedrock was encountered within this set of borings.
- The groundwater depth in the borings at the time of drilling ranged between 5.0 and 9.0 feet below the ground surface. Based on several readings taken at the monitoring wells after borehole completion, the depth to groundwater has been observed to vary between 5.0 and 7.0 feet from the ground surface and is tidally influenced.

4.1.2.2 Rice Avenue, Revere

Borings performed along Rice Avenue, in order from east to west, in Revere are identified as 20B-1, 20B- 14MW, 20B-15MW, 20B-18, 20B-5, 20B-16MW, and 20B-17MW:

- Fill - Medium dense granular fill was encountered at the ground surface of each boring, which extended to depths between 8 and at least 17.5 feet (EL. 8.9 and EL. -1.4).
- Glaciofluvial Deposit - The fill was underlain by a loose to medium-dense glaciofluvial deposit consisting mainly of sand, which ranged from 11.5 to at least 17 feet in thickness and extended to depths between 24 and at least 29 feet (EL. -8.8 and EL. -12.9).
- Marine Clay - The glaciofluvial deposit was underlain by very soft to very stiff marine clay. The stiff clay was generally observed directly beneath the glaciofluvial deposit, transitioning to a softer clay with depth.
- Glacial Till - The marine clay deposit extended to depths between 94 and 98.5 feet (EL. -80.6 and EL. -82.4). Dense glacial till was encountered below the marine clay deposit. No bedrock was encountered within this set of borings.
- The groundwater depth in the borings at the time of drilling ranged between 4.0 and 9.0 feet below the ground surface. Based on several readings taken at the monitoring wells after

borehole completion, the depth to groundwater has been observed to vary between 4.0 and 9.0 feet from the ground surface and is tidally influenced.

4.1.2.3 Saugus River HDD Route (Route 7)

Borings performed along Saugus River Route 7 are identified as 20B-5, 20B-6, 20B-7, 20B-8, 20B-19, 20B- 21, 20B-21A, and 20B-9:

- River Sediment - Soft river sediment was encountered at the mudline of every boring. The sediment was comprised of sand and silt and extended to depths between 5 and 7 feet (EL. -5.2 and EL. -16.6). Glaciofluvial Deposit - The river sediment was underlain by a medium-dense glaciofluvial deposit of interbedded sand and clay, which extended to a depth of 7 feet below the mudline (EL. -7.0).
- Marine Clay Deposit- The glaciofluvial deposit was underlain by a very soft to stiff marine clay deposit, with the stiff clay located near the top of the deposit transitioning to a softer clay with depth. This deposit extended to depths between 20 and 30 feet below the mudline (EL. -18.8 and EL. -40.0).
- Gravel Deposit - The marine clay deposit was underlain by an 11.5-foot-thick deposit of very dense gravel encountered in boring 20B-21 at a depth of 23.5 feet, corresponding to EL. -21.7.
- Glaciofluvial Deposit - The gravel was underlain by a very loose to medium-dense glaciofluvial deposit, mainly consisting of sand, gravel, and clay. This deposit extended to depths between 45 and 70 feet below the mudline (EL. -45.0 and EL. -81.6).
- Glacial Till - The glaciofluvial deposit was underlain by medium-dense to very dense glacial till, which extended to depths between 75 and 95 feet (EL. -74.0 and EL. -95.0).
- Argillite Bedrock - Fresh, very hard Argillite (bedrock) underlaid the glacial till. The top of bedrock was encountered between elevations EL. -74.0 and EL. -95.0.

4.1.3 Sediment Quality

An environmental soil sampling program was conducted in conjunction with the geotechnical exploration with the purpose of obtaining representative characterization data to assist with soil and groundwater management planning and obtaining necessary permits and approvals for off-site soil disposal facilities and regulatory agencies overseeing groundwater treatment and/or discharge. No soil above the Massachusetts Contingency Plan reportable conditions were found. The results of the soil sampling and analyses can be found in **Attachment F** and are discussed generally herein.

All landside test borings and groundwater monitoring wells were completed with truck-mounted drill rigs operated by GeoLogic-Earth Exploration, Inc. of Norfolk, MA. The test borings were advanced using flush-jointed casing with drive and wash drilling techniques using a 4-inch drag bit. Drilling operations were conducted in conformance with ASTM standards where prudent. A driven standard split spoon (SPT) sampler was advanced to recover samples of soils. Continuous samples were collected using 2-foot split spoon samplers.

The result of the soil sampling and analyses (26 samples, 2 per soil boring plus two duplicates) as pertaining to environmental standards are summarized below:

- In general, PID screening results of soil sample headspaces were non-detectable or within background levels (below two parts per million per volume [ppmv]). There were low readings of 16 ppmv at 20B-10, and 4.4 ppmv and 2.1 ppm at 20B-18.

- Very low or non-detectable levels of extractable petroleum hydrocarbons (EPH) and total petroleum hydrocarbons (TPH) were detected in various samples, with all levels well below RCS-1 standards. No volatile petroleum hydrocarbon (VPH) levels were detected in the samples.
- Various levels of total metals were detected in the samples, with all levels except one, below RCS-1 standards. Lead was detected in the 20B-14MW duplicate sample (3 – 5 ft bgs) at 350 milligrams per kilogram (mg/kg) and at 170 mg/kg in the other sample from the same interval. The arithmetic average of the two samples is 260 mg/kg, which is above the RCS-1 lead standard of 200 mg/kg. This sample location, along Rice Avenue in Revere, is within an RCS-1 area because of residential homes within 500 ft (310 CMR 40.0361). The PLM analyses of the sample from 20B-14MW (3 – 5 ft bgs) indicated the following material detected: Coal (moderate), Coal Ash (moderate), Wood Ash (light), and Asphalt (trace). Per MassDEP, a background concentration for lead in soil containing coal ash or wood ash associated with fill material is 600 mg/kg (Table 1 of MassDEP's Background Levels of PAHs and Metals in Soil Technical Update May 2002), and lead levels below this can be attributable to fill containing coal ash or wood ash and is exempt from reporting to MassDEP.
- TCLP–lead analyses were completed on three samples, and the results are 0.83 milligrams per liter (mg/l) (20B-14MW, 3 – 5 ft bgs) to 1.8 mg/l (20B-15MW, 3 – 5 ft bgs), indicating non-hazardous.
- No levels of PCBs, volatile organic compounds (VOCs), and reactive cyanide and sulfide were detected in the 26 samples.
- Very low or non-detectable levels of semi-VOCs or polyaromatic hydrocarbons (PAH) contained with the EPH analyses were detected in various samples. Except for one compound, all levels are below RCS-1 standards. The PAH acenaphthene was detected at a level of 5.3 in the 10 – 12 ft bgs sample from 20B- 12MW (Lynn), which is slightly greater than the RCS-1 standard of 4 mg/kg, but below the RCS-2 standard of 3,00 mg/kg. The sample location is in a RCS-2 area based upon the S-2 definition in the MCP (310 CMR 40.0361), and therefore does not constitute a reportable condition.
- Although there were no reportable conditions above the Massachusetts Contingency Plan, a small portion of the project area is currently regulated under the MCP. The site in question is a closed National Grid MCP disposal site on Riley Way Extension (Release Tracking Number [RTN] 3-0032437). The Conceptual Site Model for the closed National Grid site states the following about soil impacts: "The results of the investigation activities indicate that PAHs and metals are present in soil, and are likely related to a combination of fill material (including remnants of the timber bulkhead and asphalt pavement for Riley Way Extension), the former landfill, and the history of industrial activities in the immediate vicinity of the site; there are other no apparent sources for these compounds." As of 2014, the status of the site is "Permanent Solution with No Conditions." The only work proposed in that area of the site would be the pipe string laydown area, which would not entail ground disturbance.

4.2. Wetland Resource Areas

An off-site wetlands investigation included the consultation of various sources regarding the topography, wetlands, and floodplains in and around the proposed project area. Off-site resources consulted included the U.S. Geological Survey (USGS) topographic map, the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer, the MassDEP wetlands and hydrologic connection MassGIS data overlay, National Wetlands Inventory (NWI) MassGIS overlay, and the Massachusetts Department of Conservation and Recreation Areas of Critical Environmental Concern (ACEC) Program MassGIS layer.

An AECOM wetland scientist (PWS) conducted onsite resource area delineations to identify regulated resource areas present, and the top of Coastal Beach in both Revere and Lynn in particular. These delineations were performed on May 14, 2020 and were in accordance with the Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1; ACOE 1987) and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (USACE 2012), the Massachusetts Wetlands Protection Act (WPA) regulations (310 CMR 10.00), and MassDEP's publication entitled "Applying the Massachusetts Coastal Wetlands Regulations" published August 2017. Per this manual, a subsequent desktop delineation was performed to identify the top of Coastal Bank in Lynn.

Wetland resource areas protected under the Massachusetts Wetland Protection Act (MA WPA) and implementing regulations (301 CMR 10.00) that are present at the site include Coastal Beach, Coastal Dune/Barrier Beach Complex, Coastal Bank, 200-foot Riverfront Area, and Bordering Land Subject to Flooding (which coincides with the FEMA designated 100-year Floodplain). In addition, the 100-foot Buffer Zone to various resource areas is present. The boundary of these resource areas is illustrated in **Figures 2A** and **2B** in **Attachment B**.

The location of Coastal Bank in Lynn was determined using 1-foot site contours and according to the Coastal Manual. A field visit on March 10th, 2023, confirmed actual field conditions. For the purposes of the coastal bank delineation, the scope of analysis was within 100 feet of the project area. The CZM Coastal Manual indicates that the "*coastal bank begins at the toe of the coastal bank slope, whether other coastal wetland resources end….The landward edge (or top) of the coastal bank is generally the top of, or the first major break in, the face of the coastal bank*". The lower boundary of Coastal Bank was defined as the upper boundary of Coastal Beach, as flagged in the field. Top of Coastal Bank is determined by the following scenario (Scenario D) from the Coastal Manual: "*A 'top of coastal bank' will fall below the 100-year flood elevation and is the point where the slope ceases to be ≥10:1.*". This DEP Bank Policy figure illustrating Scenario D is shown in **Figure 4** and was selected as the most applicable scenario to the site conditions because Coastal Bank confines Land Under the Ocean at the site, but Land Subject to Coastal Zone Flowage extends well inland and is not confined by Coastal Bank.

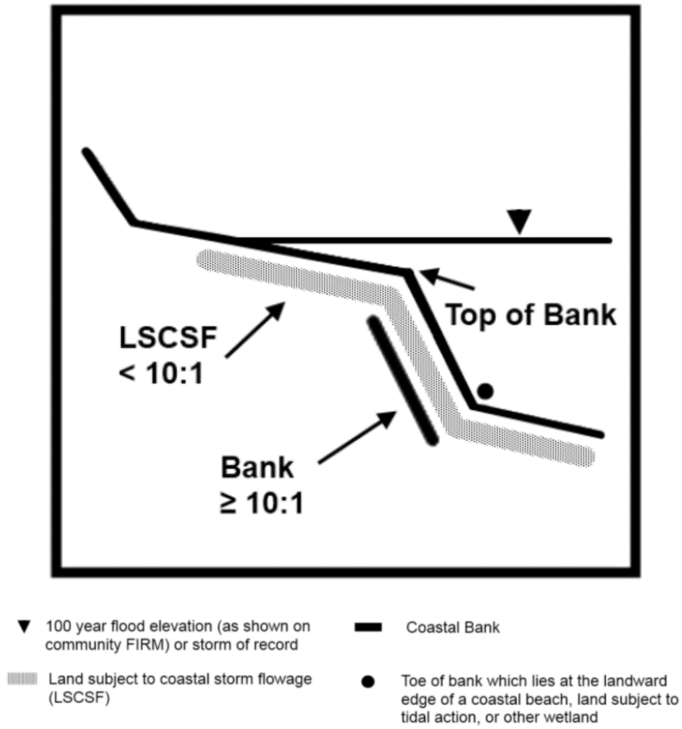

Figure 4. Scenario D from the Coastal Manual.

No Bordering Vegetated Wetland (BVW) is present within the limits of work (as indicated by the MassDEP Wetland data layer and confirmed during on-site wetland delineation). Bordering Land Subject to Flooding (BLSF) is present at nearly the entire project site. BLSF boundaries are illustrated in **Figure 2A** in **Attachment B**. No aquatic vegetation was seen around the base of the timber piles during a site visit in March 2023.

4.3. Fisheries and Wildlife

No fisheries data are available for the Saugus River, and no evidence suggests any commercial fisheries are located near the project site. However, the Saugus River is mapped by the Massachusetts Division of Marine Fisheries as a diadromous fish migratory habitat for the following species: alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*), white perch (*Morone americana*), and Atlantic tomcod (*Microgadus tomcod*). Anecdotal evidence suggests that striped bass (*Morone saxatilis*), winter flounder (*Pseudopleuronectes americanus*), largemouth bass (*Micropterus salmoides*), and summer flounder (*Paralichthys dentatus*) may be present in the area (Fishbrain.com, April 2023).

The Saugus River is mapped as a diadromous fish migratory habitat by the National Marine Fisheries Services for the species listed in Section 4.3. (above). Additionally, NOAA Fisheries maps this area as Essential Fish Habitat (EFH) for species including Atlantic surfclam (*Spisula solidissima*), Bluefish (*Pomatomus saltatrix*), Silver Hake (*Merluccius bilinearis*), Little Skate (*Leucoraja erinacea*), Atlantic Mackerel (*Scomber scombrus*), Yellowtail flounder (*Pleuronectes ferruginea*), among others. The area is also mapped as Highly Migratory Species EFH for Bluefin tuna (*Thunnus thynnus*) and White Shark (*Carcharodon carcharias*).

Recreational fishing occurs adjacent to the project site on both sides of the river. The Revere side of the river crossing is used as a yacht club and boat dock. A fishing pier is located at the mouth of the Saugus River in Lynn. The pier was closed from public access in the past several years for repairs, and it remains unclear whether it is open to the public at this time.

Wildlife that may be present in the area includes ubiquitous species present in the North Coast watershed, including the gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), and New England cottontail rabbit (*Sylvilagus transitionalis*). The area provides appropriate habitat for many types of common bird species as well.

4.4. Threatened and Endangered Species

Based on a review of the most recent Natural Heritage and Endangered Species Program (NHESP) mapping, the project area overlaps with Priority Habitat of the Piping Plover, (*Charadrius melodus)* on the beach in Revere.

Based on information available on the U.S. Fish and Wildlife Service (USFWS) website, there are no land-based endangered species or critical habitats known to occur in the project area. A threatened species, the Northern Long-eared Bat (*Myotis septentrionalis*), has the potential to occur throughout Massachusetts, including the project area. However, there are no known maternity roost trees in the region, and the nearest known winter hibernacula is more than 8 miles from the project site. Thus, neither preparation of a Biological Assessment nor further consultation with USFWS under Section 7 of the Endangered Species Act is required.

The National Marine Fisheries Service (NMFS) website was reviewed for Section 7 threatened and endangered species. It was determined that there were no critical habitats in the project area for the species listed. The species listed on the NMFS website are: large whales, sea turtles, Atlantic salmon (*Salmo salar*) in the Gulf of Maine, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), and shortnose sturgeon (*Acipenser brevirostrum*).

4.5. Historic Structures or Districts and Archaeological Sites

A terrestrial and underwater assessment of the entire study area's archaeological sensitivity was conducted before the geotechnical investigation in 2021. This included the review of historical boring logs and bathymetric data collected for the project. Archaeological monitoring and recordation of the geotechnical borings and test pits provided information regarding subsurface conditions and preservation potential for archaeological resources. No archaeological resources have been previously identified within the project area. Consultations with the Massachusetts Board of Underwater Archaeological Resources (BUAR) and the Massachusetts Historical Commission (MHC) occurred prior to the field program. Following the field program, the report was sent to BUAR, who then provided confirmation of their concurrence with the reported results and conclusions. Documentation of this consultation can be found in **Attachment E**.

Certain terrestrial borings indicated the potential for archaeological resources. Archaeological monitoring of trench excavation will be performed, for which an amended State Archaeologist Permit will be obtained in coordination with MHC. If archaeological resources are observed, work will halt and appropriate protocols will be followed.

As for the marine potential for archaeological resources, background research did not identify any historical properties in or directly adjacent to the HDD corridors. In addition, both geophysical surveys did not record potential previously sub-aerially exposed landforms. Geotechnical borings did record the presence of peat fragments in two cores but it was determined that they were not in situ and likely originated from eroded peat beds outside of the project area. Engineering studies of the sediments in the HDD indicate a very low potential for frac-outs occurring during the water main installation that would migrate up the organic-rich strata or to the surface. Based on these results, no further marine archaeological investigations are recommended or required by BUAR (see communication in **Attachment E**).

4.6. Hydrology and Water Quality

The Saugus River begins at Lake Quannapowitt in Wakefield and meanders south thirteen miles through eleven communities before emptying into the Broad Sound. Near its mouth, the river becomes the Rumney Marsh/Pine River Estuary. Tributaries include the Mill River in Wakefield, Shute Brook in Saugus, Strawberry Brook in Lynn, Town Line Brook in Revere, Malden, and Everett. The river drains a watershed of approximately forty-seven square miles, which includes several ponds, such as Breeds Pond (Lynn), Birch Pond (Lynn), Walden Pond (Lynn), Hawkes Pond (Lynn), Crystal Lake (Wakefield), and Spring Pond (Saugus).

During the environmental groundwater sampling program, characteristic data was obtained to assist with groundwater management planning, obtaining necessary approvals or permits from regulatory agencies overseeing groundwater treatment/discharge, and completing any required plans for groundwater management. Groundwater sample analyses included the United States Environmental Protection Agency (EPA) Remediation General Permit (RGP) parameters list. During this investigation, dissolved lead was detected in a groundwater sample (20B-14MW) along a short stretch of Rice Avenue in Revere. The level detected is above Massachusetts Contingency Plan (MCP) reportable concentration and constituted a 120-day reportable condition per the MCP (MWRA notified the property owner of the condition). The other results of groundwater sampling and analyses (9 samples in November 2020 and 3 samples in 2021) are summarized below.

- Very low or non-detectable levels of EPH, VPH, VOCs and SVOCs, Oil and Grease (TPH) were detected in the samples, all below RCGW-2 standards.
- There were non-detectable levels of PCBs in the samples.
- In the 2020 samples, very low or non-detectable levels of total metals were detected in various samples, and except for two samples, all levels are below RCGW-2 standards. The total lead level of 17 micrograms per liter (ug/l) in the sample from 20B-14MW is slightly above the RCGW-2 standard of 10 ug/l. The total selenium level of 170 ug/l in the sample from 20B-15MW is above the RCGW-2 standard of 100 ug/l. The re-sampling in April 2021 indicated dissolved lead at 11 ug/l in the sample from 20B-14MW and dissolved selenium at 7.6 ug/l in the sample from 20B-15MW (below the RCGW-2 standard, which applies to dissolved levels, not total). The July 2021 dissolved lead result from the sample from 20B-14MW was 110 ug/l. The lead condition constitutes a 120-day reportable condition per the MCP. AECOM notified MWRA via e-mail on April 14, 2021 of the April 2021 dissolved lead in groundwater reportable condition, and MWRA notified the property owners (Point of Pines Beach Association, Inc.) in a letter dated August 12, 2021.

At the location of the proposed pipeline installation, the Saugus River has a Zone AE floodplain, as depicted in **Figure 5** (and **Figure 2A** in **Attachment B)**. The Base Flood Water Surface elevation (BFE) in Lynn is shown to be EL 14 feet NAVD88. In Revere, this elevation is EL 10 feet NAVD88.

Figure 5. Excerpt from Flood Insurance Rate Map for Essex County (Lynn, Panel 529) and Suffolk County (Revere, Panel 29). The maps are not to scale with respect to one another.

4.7. Air Quality

The U.S. Environmental Protection Agency (USEPA) has set a National Ambient Air Quality Standard (NAAQS) for ground-level ozone, as well as other pollutants such as carbon monoxide, nitrogen oxides, sulfur oxides, particulate matter, and lead. The USEPA establishes primary and secondary standards. While primary standards focus on public health, secondary standards concern general public welfare, such as visibility. The state regulates air quality using USEPA's standards (310 CMR 6.00). MassDEP maintains monitoring stations throughout the state that record the highest concentration of the mean concentration of regulated air pollutants. There are two MassDEP air monitoring stations within five miles of the project site: 390 Parkland Avenue in Lynn and 31 Willow Street in Chelsea. The Lynn station monitors particulate matter ($PM_{2.5}$) concentrations, ozone, carbon monoxide, nitrogen dioxide, and volatile organic compounds, among other meteorological data. The Chelsea station monitors $PM_{2.5}$ concentrations. Data from these stations indicate that in 2021 there were no exceedances above the NAAQS at either station for any of the measured parameters during 2021 (MassDEP, 2022).

MassDEP also regulates volatile organic compounds (VOCs), and the state's air pollution regulations also qualitatively regulate odor, by stating that no person having control of any odor-generating operations shall permit emissions therefrom which cause or contribute to a condition of air pollution (310 CMR 7.09). There were no obvious odors noted during any of the site visits.

4.8. Noise

Many federal agencies use the day-night sound level to describe noise and to predict community effects from long-term exposure to noise. In addition, this noise level classification system is used to determine the appropriateness of a given use of specific land (land use compatibility) relative to the average level of environmental noise experienced at the location. Noise levels ranging from 65-75 decibels are generally compatible with residential land use.

On the Revere side of the project site, the nearest residence is 10 Rice Avenue. The open-cut trench for the terrestrial pipeline will be dug approximately thirty feet away from this residence's front door. The current noise-producing activities at the Revere site include those affiliated with recreational boating and the traffic on North Shore Road. In Lynn, the nearest residence is half a mile from the project site. The current noise-producing activities at the Lynn staging area include construction activities affiliated with the Lynn Landfill Cap Repair, an ongoing project adjacent to the proposed HDD Staging Area/Entry.

4.9. Traffic and Transportation

The impacted roadways due to construction are shown in **Table 2** with roadway classification and jurisdiction indicated.

Route 1A: Route 1A is a multi-lane roadway that runs in the North/South direction connecting Boston in the South to Northeastern Massachusetts, New Hampshire, and Maine in the North. The area of construction for this project occurs at the intersection of Route 1A and Hanson Street in Lynn, MA. This intersection is in a commercially developed area with several businesses in the immediate vicinity. Business hours are generally 7 AM to 9 PM for businesses within 1,000 feet of the area of construction. There is no parking allowed on Route 1A. The lane configuration for each approach is as follows:

- Route 1A Northbound: Three through lanes.

- Hanson Street Westbound: One left turn lane and one right turn lane.
- Route 1A Southbound: Three through lanes and one southbound left turn lane.

Hanson Street (Lynn): Hanson Street is approximately forty-five feet wide with one lane of traffic in each direction and two-hour parking allowed on both sides. Hanson street is a local street that provides access to two business developments from Route 1A. Hanson Street provides no connections to other roadways and is terminated on one end. At the road terminus there is a gate blocking vehicle access. There is a sidewalk on both sides of the road. Pedestrians may continue beyond the gate and access the Lynn Community Path.

Rice Ave (Revere): Rice Ave ranges between approximately eighteen feet wide to twenty-two feet wide with one lane of traffic in each direction. No parking is permitted on Rice Ave. Rice Ave is a local street in a dense residential neighborhood. There is a non-continuous sidewalk on the north side of the street. Several side streets intersect with Rice Ave. These side streets are all one-way southbound roadways.

The intersection of Rice Ave, Whitin Ave, and Lynnway: Lynnway is a one-way street that provides access to Rice Ave and Whitin Ave from Route 1A. Whitin Ave is a one-way street in the southbound direction. Rice Ave is a two-direction street. Vehicles entering the intersection from Rice Ave must make a left turn onto Whitin Ave.

Table 2. Functional Classification and Jurisdiction of Impacted Roadways

Impacted Roadway(s)	Functional Classification	Jurisdiction
Route 1A NB	Rural or urban principal arterial	Massachusetts Department of Transportation (MassDOT)
Route 1A SB	Rural or urban principal arterial	Department of Conservation and Recreation (DCR)
Hanson Street	Local	Lynn, MA
Rice Ave	Local	Revere, MA
Lynnway	Local	Revere, MA
Whitin Ave	Local	Revere, MA

Source: Massachusetts geoDOT GIS application portal

4.10. Aesthetic Resources/Open Space/Recreational Resources

The area surrounding the proposed water pipeline installation in Revere is a residential neighborhood. The Massachusetts Department of Conservation and Recreation owns and maintains the Lynnway and North Shore Road and adjacent Right-of-Way, immediately west of the intersection between Rice Avenue and the Lynnway. This parcel of land is mapped as Article 97 Open Space on the MassGIS datalayer (MassMapper, 2023). Vegetation on the said parcel is limited to mixed herb-level grasses. See **Attachment C** for representative photographs of the project area).

The area surrounding the proposed water pipeline installation in Lynn is primarily industrial and suspected to be entirely fill. The HDD staging area and pipe string layout are in an area restricted from public access due to an ongoing, adjacent landfill cap project. The capped landfill will be the site of a planned harbor park. As evidenced by footpaths in the vegetation and occasional trash in the vicinity of the timber pile removal site, the project site seemingly is used currently for passive recreation, such as walking and fishing. See **Attachment C** for representative photographs of the project area).

4.11. Socioeconomic Characteristics / Environmental Justice

4.11.1 Revere Socioeconomic Characteristics

According to the 2017-2021 American Community Survey 5-Year Estimates (U.S. Census Bureau, Table DP05, ACS Demographic and Housing Estimates), the City of Revere has a population of 60,720. The racial composition of the population was 79.2 percent White, 7.0 percent Black or African American, 0.8 percent American Indian or Alaska Native, 5.7 percent Asian, 0.1 percent Native Hawaiian or Other Pacific Islander, and 21 percent some other race. In terms of ethnicity, 36.7 percent of the city was Hispanic or Latino.

Also, according to the 2016-2020 American Community Survey 5-Year Estimates (Table DP05, Median Household Income in the Past 12 Months), the median household income in Revere was $64,331. The poverty rate in the city was 13 percent (Table S1701, Poverty Status in the Past 12 Months).

4.11.2 Lynn Socioeconomic Characteristics

According to the 2017-2021 American Community Survey 5-Year Estimates (U.S. Census Bureau, Table DP05, ACS Demographic and Housing Estimates), the City of Lynn has a population of 100,233. The racial composition of the population was 58.4 percent White, 19.5 percent Black or African American, 2.0 percent American Indian or Alaska Native, 6.4 percent Asian, 0.7 percent Native Hawaiian and Other Pacific Islander, and 26.4 percent some other race. In terms of ethnicity, 41.8 percent of the city was Hispanic or Latino.

Also, according to the 2017-2021 American Community Survey 5-Year Estimates (Table DP05, Income in the Past 12 Months), the median household income in Lynn was $64,986. The poverty rate in the city was 13.6 percent (Table S1701, Poverty Status in the Past 12 Months).

4.11.3 Environmental Justice

The project site is located within two block groups designated as environmental justice populations in Lynn and Revere. The Revere block group is designated an EJ community on the basis of minority and the Lynn block group on the basis of minority and income. There are 29 additional block groups designated as environmental justice populations either in whole or in part within the designated geographic area (i.e., within one mile of the project). Nine block groups are minority populations, six are minority and English isolation, three are minority and income, and eleven are minority, income, and English isolation. The EJ Screening Forms in **Attachment I** have maps of the populations in a one-mile radius color coded by EJ criteria. **Table 3** provides a summary.

The full list of Environmental Justice populations within five miles of the project site can be found in **Attachment I**.

Table 3. Environmental Justice Communities within the Designated Geographic Area of the Proposed Project.

	Count
Within the Project Area	
Minority	1
Minority and income	1
Within the Designated Geographic Area (1-mile)	
Minority	9
Minority and English isolation	6
Minority and income	3
Minority, income, and English isolation	11
Total (Project Area and DGA)	31

The Massachusetts Department of Public Health Environmental Justice Tool was consulted to determine whether Revere, Lynn, or Saugus (the three municipalities within one mile of the project site) exhibit any of the four priority community environmental justice criteria. As shown in **Table 4**, Revere meets two of the criteria (Childhood Asthma ED Visits and Hearth Attack Rate), and Lynn meets two of the criteria (Childhood Asthma ED Visits and Elevated Blood Lead Presence). Saugus does not exhibit priority community environmental justice criteria, as the related health indicators are statistically significantly higher than statewide rates based on a five-year rolling average.

Table 4. Priority Community Environmental Justice Criteria.

Criteria	**Revere**	**Lynn**	**Saugus**	**Statewide Rate per 10,000**	**110% of Statewide Rate**
Childhood Asthma Emergency Department Visits Rate per 10,000 (2013-2017)	110.8	129.8	72	83.1	91.4
Elevated Blood Lead Prevalence per 1,000 (2016-2020)	13.2	29.1	6.3	14.985	16.484
Low Birth Weight per 1,000 (2011-2015)	197.2	237.9	204.1	216.8	238.5
Heart Attack Rate per 10,000 (2013-2017)	30.1	25.7	28.4	26.423	29.065

The Massachusetts Department of Public Health Environmental Justice Tool was also consulted to identify potential sources of pollution within one mile of the project site. The number and type of mapped facilities and infrastructure within one mile of the project site are summarized in **Figure 6** and in **Table 5**.

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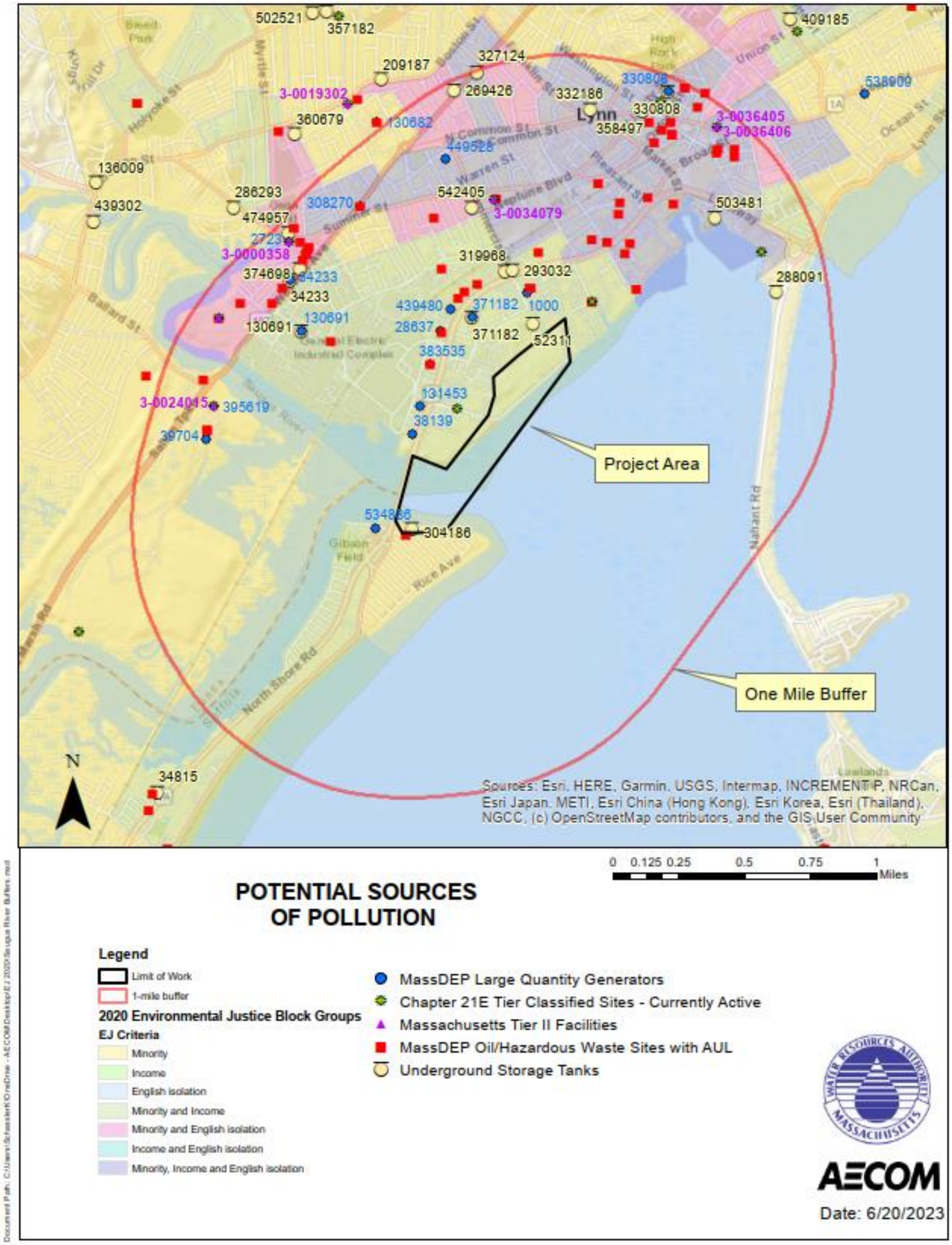

Figure 6. Potential Sources of Pollution within One Mile of the Project Area.

Table 5. Potential Sources of Pollution within One Mile of the Project Area.

Number	Block Group	Facility
MassDEP Large Quantity Generators		
330808	2, Census Tract 2068	US POSTAL SERVICE- LYNN VMF
34233	3, Census Tract 2058	MBTA LYNN BUS GARAGE
449528	1, Census Tract 2071	CVS 0075
439480	1, Census Tract 2072	SULLIVAN TIRE
131453	1, Census Tract 2072	PRIDE HYUNDAI OF LYNN
130691	1, Census Tract 2072	GENERAL ELECTRIC COMPANY
371182	1, Census Tract 2072	GARELICK FARMS LLC
383535	1, Census Tract 2072	PRIDE CHEVROLET PONTIAC INC
400130	1, Census Tract 2072	AUTOZONE 5122
28637	1, Census Tract 2072	ATLANTIC TOYOTA GROUP INC
1000	1, Census Tract 2072	LYNN DPW
38139	1, Census Tract 2072	AUTO FITNESS II INC DBA EASY LUBE
395619	1, Census Tract 2081.02	PATTYS AUTO PARTS INC
39704	1, Census Tract 2081.02	WHEELABRATOR SAUGUS INC
534886	3, Census Tract 1705.02	G J COMPANIES
2723	3, Census Tract 2058	CL HAUTHAWAY & SONS
308270	1, Census Tract 2071	VALVOLINE INSTANT OIL CHANGE
Underground Storage Tanks		
288091	N/A	DCR NAHANT LABOR YARD
327124	1, Census Tract 2060	CHOWDHURY INC DBA CONVENIENCE STATION
330808	2, Census Tract 2068	US POSTAL SERVICE- LYNN VMF
374698	3, Census Tract 2058	AL PRIME ENERGY CONSULTANTS INC
371182	1, Census Tract 2072	GARELICK FARMS LLC
319968	1, Census Tract 2072	MOTIVA ENTERPRISES LLC
293032	1, Census Tract 2072	P&E SERVICE STATION INC
304186	1, Census Tract 1705.02	POINT OF PINES YACHT CLUB INC
332186	1, Census Tract 2061	VERIZON MASSACHUSETTS 552509
542405	2, Census Tract 2071	HIBERNIA ATLANTIC
503481	3, Census Tract 2069	CITY OF LYNN SEAPORT MARINA
130691	1, Census Tract 2072	GENERAL ELECTRIC COMPANY
269426	2, Census Tract 2060	S&E INC CORP DBA STOP QUICK MART
358497	2, Census Tract 2068	AMERADA HESS CORP
34233	3, Census Tract 2058	MBTA LYNN BUS GARAGE
474957	3, Census Tract 2058	CL HAUTHAWAY & SONS
52311	1, Census Tract 2072	LYNN REGIONAL WWTP
Chapter 21E Tier Classified Sites - Currently Active		
3-0035954	2, Census Tract 2068	RIP-RAP ROCK SHORE BEND OCEAN SHORE APTS
3-0036405	1, Census Tract 2069	38 EXCHANGE STREET
3-0036406	1, Census Tract 2069	38 EXCHANGE STREET
3-0034079	3, Census Tract 2058	MCMANUS PARK
3-0020896	3, Census Tract 2069	NO LOCATION AID
3-0024015	2, Census Tract 2072	PATTYS AUTO PARTS INC
3-0024134	1, Census Tract 2081.02	CAPS AUTO WRECKING CORP.
3-0012510	3, Census Tract 2058	LOT 75 OF BLOCK 752, ASSESSORS MAP 85
3-0000358	1, Census Tract 2072	C L HAUTHAWAY AND SONS CORP
3-0001308	1, Census Tract 2072	LYNN GAS & ELECTRIC (FMR)
3-0018100	1, Census Tract 2072	NO LOCATION AID
Massachusetts Tier II Facilities		
3-0036405	1, Census Tract 2069	38 EXCHANGE STREET
3-0036406	1, Census Tract 2069	38 EXCHANGE STREET
3-0024134	3, Census Tract 2058	CAPS AUTO WRECKING CORP.
3-0000358	3, Census Tract 2058	C L HAUTHAWAY AND SONS CORP
3-0034079	2, Census Tract 2072	MCMANUS PARK
3-0024015	1, Census Tract 2081.02	PATTYS AUTO PARTS INC

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MassDEP Oil/Hazardous Waste Sites with Activity and Use Limitation (AUL)		
3-0002426	3, Census Tract 2058	MBTA BUS TERMINAL
3-0001883	3, Census Tract 2058	MBTA PARKING LOT PARCEL 300-018-001
3-0012372	3, Census Tract 2058	RIVER ST BETWEEN IDA AND BURNS ST
3-0001680	1, Census Tract 2070	NORTH AMERICAN PHILLIPS LTNG
3-0001308	1, Census Tract 2072	LYNN GAS & ELECTRIC (FMR)
3-0000357	1, Census Tract 2072	GE RIVER WORKS
3-0011034	1, Census Tract 2072	NO LOCATION AID
3-0004534	1, Census Tract 2072	PURITY OIL
3-0013920	2, Census Tract 2068	MULBERRY ST
3-0019084	2, Census Tract 2068	NO LOCATION AID
3-0019214	2, Census Tract 2068	NO LOCATION AID
3-0032660	2, Census Tract 2068	COMMERCIAL PROPERTY
3-0033931	2, Census Tract 2068	COMMERCIAL PROPERTY
3-0030098	2, Census Tract 2068	NO LOCATION AID
3-0032762	2, Census Tract 2068	NO LOCATION AID
3-0028221	2, Census Tract 2068	NO LOCATION AID
3-0033301	2, Census Tract 2068	501 WASHINGTON STREET
3-0021432	1, Census Tract 2069	CARROLL ST
3-0027272	1, Census Tract 2069	BETWEEN #23 & #26 FARRAR STREET
3-0014672	3, Census Tract 2058	BTWN IDA AND BURNS
3-0014673	3, Census Tract 2058	CRNR OF JOHN AND RIVER ST
3-0014674	3, Census Tract 2058	BTWN JOHN AND BURNS ST
3-0015833	3, Census Tract 2058	NO LOCATION AID
3-0021402	3, Census Tract 2058	CORNER RIVER ST ANS HEATH CT
3-0032403	3, Census Tract 2058	NO LOCATION AID
3-0024134	3, Census Tract 2058	CAPS AUTO WRECKING CORP
3-0032117	3, Census Tract 2058	NO LOCATION AID
3-0011830	2, Census Tract 2071	NO LOCATION AID
3-0015264	1, Census Tract 2070	FMR CAMBRIDGE TIRE
3-0015354	1, Census Tract 2070	NO LOCATION AID
3-0015389	1, Census Tract 2070	FORMER METAL IMPROVEMENT CO
3-0015391	1, Census Tract 2070	FMR BEACON CHEVROLET
3-0018919	1, Census Tract 2070	NO LOCATION AID
3-0025838	1, Census Tract 2070	JB BLOOD BLDG TANK ROOM
3-0016807	1, Census Tract 2071	EXPRESS CAR CARE
3-0016898	2, Census Tract 2072	MARSHALLS WHARF II
3-0013409	1, Census Tract 2072	CORNER OF LYNNWAY & COMMERCIAL
3-0015603	1, Census Tract 2072	ATLANTIC CHRYSLER PLYMOUTH TOYOTA
3-0013417	1, Census Tract 2072	ABUTS GENERAL ELECTRIC
3-0018171	1, Census Tract 2072	NO LOCATION AID
3-0017457	1, Census Tract 2072	DPW
3-0017458	1, Census Tract 2072	NO LOCATION AID
3-0033121	1, Census Tract 2072	613-623 LYNNWAY
3-0029746	1, Census Tract 2072	FMR CRYSTAL FOOD IMPORT LOCATION
3-0028899	1, Census Tract 2081.02	WHEELABRATOR SAUGUS
3-0024149	1, Census Tract 2081.02	NO LOCATION AID
3-0029500	1, Census Tract 2081.02	WHEELABRATOR SAUGUS INC GRASS SWALE
3-0020428	1, Census Tract 1705.02	NO LOCATION AID
3-0022880	1, Census Tract 2069	NO LOCATION AID
3-0025664	1, Census Tract 2069	STERLING MACHINE CO
3-0026986	3, Census Tract 2058	DRY CLEANERS
3-0033419	1, Census Tract 2070	451 BROAD STREET
3-0022778	1, Census Tract 2070	NO LOCATION AID
3-0031884	1, Census Tract 2070	EDIC LYNN COMMUTER FERRY PROJECT

The U.S. Environmental Protection Agency's EJScreen Environmental Justice Screening and Mapping Tool (Version 2.0) provides percentile rankings by census block group, compared against statewide averages, for 12 environmental indicators. The state percentile indicates what percent of the Massachusetts population has an equal or lower value, meaning less potential for exposure, risk, or proximity. The two block groups in which project activities are proposed to occur are Block Group 1, Census Tract 1705.02, Suffolk County, Massachusetts, (Revere) and Block Group 1, Census Tract 2072, Essex County, Massachusetts (Lynn). **Table 6** summarizes the rankings for these two census tracts. The data suggests these two clock groups generally have higher rankings than the State Average in the indicators listed. **Table 6** indicates higher potential for exposure, risk, and proximity to environmental hazards. Notably, both block groups are within the 99th state percentile for 2017 Air Toxics Cancer Risk, 96th percentile for 2017 Air Toxics Respiratory Hazard Index, and both are above the 90th percentile for RMP Facility Proximity.

Table 6. Environmental Indicators State Percentile Ranks, Project Block Groups

		Revere		**Lynn**	
Pollution and Sources	State Average	Value	Percentile in State	Value	Percentile in State
Particulate Matter 2.5 (µg/m3)	6.79	7.12	61	7	57
Ozone (ppb)	39.5	39.4	54	39.5	57
2017 Diesel Particulate Matter* (µg/m3)	0.307	0.448	81	0.428	79
2017 Air Toxics Cancer Risk* (lifetime risk per million)	24	30	99	30	99
2017 Air Toxics Respiratory Hazard Index*	0.3	0.4	96	0.4	96
Traffic Proximity (daily traffic count/distance to road)	2400	2800	80	1700	69
Lead Paint (% Pre-1960 Housing)	0.49	0.42	36	0.64	61
Superfund Proximity (site count/km distance)	0.18	0.074	29	0.089	42
RMP Facility Proximity (facility count/km distance)	0.74	2.4	94	5.6	99
Hazardous Waste Proximity (facility count/km distance)	5.6	3.1	55	7.6	82
Underground Storage Tanks (count/km2)	3.4	0.32	20	3.9	70
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.21	0.025	90	0.017	88

Notes: * Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's 2017 Air Toxics Data Update.
µg/m3 indicates micrograms per cubic meter.
ppb indicates parts per billion.
count/km indicates count per kilometer.
count/km2 indicates count per square kilometer.
Source: Based on U.S. Environmental Protection Agency, EJScreen (Version 2.0), accessed May 3, 2023.

Attachment G provides the output report generated from the RMAT Climate Resilience Design Standards Tool. Based on user-provided project information and the project location, the RMAT Tool output indicates "High Exposure" preliminary climate change exposure and risk ratings for sea level rise/storm surge, extreme precipitation – urban flooding, and extreme heat. This comprises a preliminary assessment of whether the project site and the proposed project infrastructure (assets) are exposed to impacts of natural hazard events and/or future impacts of climate change. The RMAT Project Report also notes that the proposed project is within mapped environmental justice populations. While the analysis indicates "High Exposure" to risks related to climate change, when the replacement pipeline is finished, the pipeline will be underground and underwater. This inherent aspect of the project design mitigates risk to the infrastructure. The project will also ensure water system redundancy and increased resiliency to the impacts of climate change.

5. Impacts of Proposed Project

5.1. Topography, Soils, and Sediment

In Lynn, a portion of the shoreline would be impacted during construction, which may cause the potential for short-term soil erosion and the need for minor regrading. Pre-construction activities to mitigate this potential would include the installation of erosion and sedimentation controls, as shown on Sheets C-1 and C-2 and the HDD-7 Entry Point Major Equipment Layout figure in **Attachment D**. The HDD Staging Area and Entry site would also need to be cleared and grubbed, which would result in surface-level soil disturbance. No soil erosion is anticipated in Revere, as both the HDD Staging and Exit site and the Hanson Street limit of work are within paved areas.

The sediment dredged by the HDD drill bit to accommodate the pipeline is approximately 94,000 cubic yards. Dredged sediment will be separated onsite by a series of sieves and cyclones into soil and sand. These materials will then be trucked offsite for disposal. The material is expected to be suitable for use as daily cover at a nearby landfill and this will be confirmed by sampling once the material is stockpiled as it is generated. It is not expected that contamination will be detected due to the depths of the sediments and distance from surface impacts. In addition to the dredging related to the HDD installation, the removal of the twelve timber piles is also considered dredging. The volume of material being removed (i.e., the volume of the piles under the mudline) is 50 cubic yards. The dilapidated timber piles will be cut into pieces (to discourage their reuse) and disposed of off-site. Their deteriorated quality and the presence of creosote make the piles unsuitable for reuse on-site or otherwise.

5.2. Wetland Resource Areas

The proposed project would result in temporary impacts to a variety of wetland resource areas present at the site that are protected under the Massachusetts Wetlands Protection Act (MA WPA) and implementing regulations (310 CMR 10.00), including Coastal Dune/Barrier Beach System, Coastal Bank, Coastal Beach/Tidal Flats, 200-foot Riverfront Area, Bordering Land Subject to Flooding, and the 100-foot Buffer Zone. **Table 7** summarizes the proposed impacts to these resource areas. Activities resulting in these impacts are further described below in sections organized according to which resource area is affected. As there will be impacts to resource areas on both sides of the Saugus River in two different municipalities (which will be mitigated to the extent practicable), the leftmost column in **Table 7** indicates whether the resource area being impacted is in Lynn or Revere.

The only permanent impacts associated with the project are the installation of six manholes (three in Lynn and three in Revere) and filling the voids left from the timber pile removal. These manholes will be installed within Rice Avenue, Hanson Street (both of which are areas that are already paved).

Table 7. Summary of Impacts Associated with the Section 56 Saugus River Crossing.*

Municipality	Resource Area	Temporary Disruption During Construction	Permanent Impacts
Revere	Coastal Dune/Barrier Beach System	18,100 sqft: Rice Avenue pipeline installation via trench and HDD Staging and Exit Area.	0
	200-foot Riverfront Area	15,100 sqft: Rice Avenue pipeline installation via trench and HDD Staging and Exit Area.	0
Lynn	Coastal Bank	950 sqft: clearing and regrading required to access the timber pile removal site.	0
	Coastal Beach/ Tidal Flats	1,800 sqft: timber pile removal site and access route.	40 sqft: Timber pile removal and subsequent fill with low-density grout.
	100-foot Buffer Zone	69,300 sqft: timber pile access route, HDD Staging Area and Entry, and pipe string layout area.	0
Both Lynn and Revere	Bordering Land Subject to Flooding	145,650 sqft: nearly the entire project site (all of the above: Rice Avenue pipeline installation via trench, HDD Staging and Exit Area, Hanson Street pipeline installation via trench, HDD Staging and Entry Area, timber pile removal site and access route, and pipe string layout area).	45 sqft: Six manholes within existing impervious surface.

*All areas are approximate; sqft = square feet.

5.2.1 Coastal Dune/Barrier Beach System

Impacts on the Barrier Beach System (only present on the Revere side of the project) are entirely temporary and overlap with the 200-foot Riverfront Area. They include the parking lot used as the HDD Staging/Exit Area and the Rice Avenue limit of work (LOW). No work will take place within the undeveloped, sandy beachfront. All work in the Barrier Beach System will be limited to paved areas (and the grassy shoulder at the western end of Rice Avenue).

5.2.2 200-foot Riverfront Area

The Rice Avenue pipeline installation and the HDD Staging/Exit Area are located partially within the 200-foot Riverfront Area. As previously discussed, this terrestrial section of the pipeline will be installed via traditional cut-and-cover methods in a trench approximately seven feet wide within existing paved areas (the Point of Pines Yacht Club Parking Lot), roadway, and grassy shoulder at the western end of Rice Avenue. As the project limit of work (LOW) within the 200-oot Riverfront Area is entirely developed and paved, no clearing will be necessary. Sedimentation controls in the form of coir wattles will be installed along the perimeter of work, as shown in the attached project plans.

5.2.3 Coastal Bank

A 950-square-foot section of Coastal Bank will need to be regraded in either timber pile removal scenario to facilitate equipment access to the pile removal site. The extent of the Bank that will need to be regraded has been reduced to the extent practicable and routed to avoid a large tree that appears to provide support to the bank. The regrading will include the temporary placement of geotextile reinforcement and riprap to make the slope less steep. Both the geotextile reinforcement and the riprap will be removed following construction, and the bank will be returned to preexisting conditions. These layers of protection will help prevent erosion to the bank structure and maintain its existing slope to the extent practicable. Vegetation on the coastal bank in the path that will need regrading will be cleared. Stumps of the trees and shrubs being removed will be ground to grade so that the support the roots provide to the Coastal Bank will remain intact. During construction, riprap would prevent sediment transport. This riprap will be removed following construction. In the long term, there will be no adverse effect on the movement of sediment from the bank.

5.2.4 Coastal Beach/Tidal Flats

Work within Coastal Beach, including tidal flats, is limited to the extraction and subsequent fill of twelve timber piles from the dilapidated sea wall along the shoreline in Lynn. The area of Coastal Beach/Tidal Flat temporarily impacted by this work is 1,800 square feet. This pile removal will have no adverse effect by increasing erosion, decreasing the volume, or changing the form of the Coastal Beach or Tidal Flat. The existing dilapidated seawall provides no significant structure to the sediments or the form of the beach, and the partial removal thereof presents no adverse impact. The removal of the timber piles will not have any adverse effect on any specified habitat sites or rare vertebrate or invertebrate species. The pile removal itself will impact approximately 40 square feet and necessitate 50 cubic yards of low-density grout to be pumped into these voids. The timber piles will be excavated either by land or by barge. In either scenario, the voids left from the pile removal would be backfilled with grouting immediately following the removal. Grouting will be pumped through a tube into the hollow pipe from a pump truck. The pump truck would remain upslope of the Mean High Water line.

The land removal scenario would require the piles to be removed on the upslope side of the existing Lynn timber bulkhead at low tide along the horizontal directional drilling route. The piles will be excavated at low tide and backfilled before the high tide returns during one tidal cycle. Geotextile will be placed where equipment will need to traverse the Coastal Beach to facilitate access and protect the bank from erosion.

The removal by barge scenario would entail a spud barge with a large crane at a seaward position adjacent to the piles. The barge would be anchored in place by H-piles on each of the four corners, each with a surface area of 30 square inches for a total area of impact to Tidal Flats of less than one square foot. These spuds would be placed temporarily and are not anticipated to permanently alter Coastal Beach/Tidal Flats. If the work requires more than one tidal cycle, the barge will be removed from the shore to a depth that would prevent the barge from grounding. Upon the return of the high tide, the barge would be floated back in place to complete the pile extraction.

5.2.5 100-foot Buffer Zone

Work within the 100-foot Buffer Zone of the Coastal Bank and Coastal Beach includes a portion of the HDD staging area (including the drill entry point), the access route to the timber bulkhead, a portion of the terrestrial pipeline installation within Hanson Street, and the pipe string laydown area. The HDD Staging Area and entry site will need to be cleared and grubbed to accommodate construction equipment. This area is vegetated primarily with phragmites and mixed grasses. Some sections include larger trees and shrubs such as Eastern cottonwood (*Populus deltoides*), white ash (*Fraxinus americana*), staghorn sumac (*Rhus typhina*), crab apple (*Malus spp.*), flowering pear (*Pyrus calleryana*), Japanese knotweed (*Fallopia japonica*), and multiflora rose (*Rosa multiflora*). The area will be revegetated with comparable, native plant species following all construction activities. The access route to the timber piles will also need to be cleared but not grubbed and is primarily vegetated by mixed grasses and autumn olive (*Elaeagnus umbellata*). This area will also be revegetated with comparable native plantings. As previously discussed, Hanson Street is paved, and the terrestrial pipeline installation will not require any clearing of vegetation. Similarly, the pipe string laydown area follows Riley Way Extension and will not require any vegetation to be cleared.

5.3. Fisheries and Wildlife

As noted on the USACE New England website, Massachusetts Division of Marine Fisheries (DMF) recommends time of year (TOY) work restrictions in the Saugus River for the following species: alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*), white perch (*Morone americana*), Atlantic tomcod (*Microgadus tomcod*), winter flounder (*Pseudopleuronectes americanus*), and shellfish. The generic recommended DMF TOY restriction for these species is that no work occurs between February 15 and November 10. Construction period work restrictions specific to the Section 56 crossing will require consultation with the USACE and may allow work outside of the generic DMF TOY window considering that the proposed construction by HDD is not anticipated to directly impact the water column or substrate of the Saugus River. The construction noise may influence the local fish and wildlife populations in the general area. This temporary impact is necessary to install this pipeline and restore system redundancy to the communities impacted. Short-term disruption to the area during construction is not anticipated to negatively impact fish or wildlife long-term.

5.4. Threatened and Endangered Species

As previously stated, the project area overlaps with Priority Habitat for the Piping Plover (*Charadrius melodus*). The project proposes temporary impacts to 4,000 square feet of NHESP Priority Habitat to store Point of Pines Yacht Club's floating docks in the boating off-season. The Point of Pines Yacht Club has been storing many of these floats on the beach for several seasons under an Order of Conditions from the Revere Conservation Commission. The rest of the floats are typically stored in the parking lot, which will be unavailable due to construction activities. The total floats that need to be stored on the beach have a footprint of 4,000 square feet. The floating docks will be stored on the beach between October 1^{st} to April 1^{st} to avoid the sensitive range of dates for the plovers (April 1^{st} through August 31^{st}). They will be stacked to minimize their cumulative footprint. No work of excavation will occur in NHESP area as work will not occur on the beach and, in Revere, be limited to existing paved areas (and the grassy shoulder at the western end of Rice Avenue).

While the endangered Northern Long-eared Bat (*Myotis septentrionali*s) has the potential to occur throughout Massachusetts, there are no known maternity roost trees in the region, and the nearest known winter hibernacula are more than 8 miles from the project site. Thus, no impacts on threatened or endangered species are anticipated.

5.5. Historic Structures or Districts and Archaeological Sites

The terrestrial potential for archaeological resources referenced in **Section 4.5** was investigated during the geotechnical boring program with oversight from MHC and BUAR. The archaeological investigation indicated that natural stratigraphy is present under modern fill deposits within portions of the proposed water main trench along Rice Avenue in Revere. The Massachusetts Historical Commission has required that an archaeologist be present to monitor the construction of the water main installation within the Rice Avenue portion of the project. Documentation of this is provided in **Attachment E**. A qualified archaeologist shall be present during construction to confirm that no archaeological deposits/sites are encountered during construction activities. If a site or archaeological deposit is encountered, then the construction crew will be required to stop work while the archaeologist assesses the deposit based on MHC guidelines. The 2021 Archaeology Report for the project, which BUAR confirmed agreement with, concluded that there was low potential for archaeological resources present along the HDD subterranean route as well as a low potential for surface frac-outs. Based on these results, no further marine archaeological investigations are recommended or required by BUAR, and no adverse impacts to marine archaeological resources are anticipated. Please see the communication with MHC and BUAR in **Attachment E** for further elaboration.

5.6. Hydrology and Water Quality

As the new pipeline section will be entirely underground, there will be no impact to the hydrology or the water quality of the Saugus River caused by the pipe installation by HDD methods. The potential for inadvertent returns during drilling ("frac-out") has been considered in developing the pipe string route). Frac-outs occur when drilling fluid is released to the ground surface during HDD installation, or there is mud loss. Due to this HDD installation being beneath a river, it is virtually impossible to immediately identify a frac-out. Engineering studies of the sediments in the HDD alignment indicate a very low potential for frac-outs occurring during the water main installation that would migrate up the organic-rich strata or to the surface. A temporary steel conductor casing is planned for the entry and exit sides of the drill, specifically to reduce risks of inadvertent returns at these locations. Additionally, a site-specific frac-out management plan will be developed to best prepare for the unlikely occurrence of a frac-out during HDD activities.

While the pipe installation by HDD methods is not anticipated to have any impact on the hydrology of water quality at the site, removal of the twelve timber piles along the Lynn shoreline will necessitate access to the shoreline. Due to the presumed depth of the piles, the timber pile bulkhead presents obstructions to the HDD route and must be removed to prevent a disturbance to the HDD operation. The twelve timber piles along the Lynn shoreline that will be removed are located on Tidal Flats and are regularly inundated at the base. As previously discussed, the dilapidated bulkhead provides no significant flood protection nor modulation of tidal action along the Lynn shoreline. Due to the age of the piles, it can be assumed that the treatment process utilized was creosote. Creosote is no longer allowed by environmental law except in very special cases. This is because creosote leaches from the timber structure upon which it has been applied and contaminates the adjacent soil and water. The removal of these piles will cease the creosote contamination.

A turbidity curtain and floating debris boom will be placed to contain any creosote splinters or debris as the piles are removed. Several local marine pile driving firms have been contacted concerning the extraction of marine timber piles and the probability that these 90-year-old piles will break during the process. The firms indicated that extracting 60- and 70-foot-long creosoted timber piles are normally not a problem. The firms indicated that the piles tend to break in the tidal zone or just below the mudline where they have been either damaged by the sea, marine borers, or where they have deteriorated due to oxygenation. It is unlikely any piles would break and cause a greater environmental impact on the water quality than indicated herein.

5.7. Air Quality

The project may increase the short-term potential for the release of pollutants to ambient air from dust associated with pipeline installation activities, as well as short-term emission releases from construction vehicles at the site. Best construction practices would be employed to reduce the impacts to air quality. This may include watering down of the construction access road during especially windy and dry days and reducing the idling times of construction vehicles.

Due to the number of vehicles and duration of activity required to perform the work being limited, emissions are not anticipated to cause an exceedance of national or state air quality standards in the vicinity of the project site.

5.8. Noise

Temporarily, increased noise levels would occur during pipeline installation activities. Factors contributing to this noise would be construction equipment and construction vehicles at the site. To minimize noise impacts during construction, best management practices (BMPs) would be implemented, including the use of mufflers on construction equipment and vehicles.

5.9. Traffic and Transportation

For each of the locations listed below, MWRA will coordinate with DCR and the communities regard traffic management plans.

Intersection of Route 1A and Hanson Street (Lynn): Construction at this intersection will consist of the installation of a proposed water main across Route 1A. The water main will cross along the southern approach of the intersection and then continue down Hanson Street. proposed temporary traffic control setup will involve a sequence of single-lane closures to cross the intersection. Only a single lane will be closed at any given time in either direction to maintain traffic flow along Route 1A. Temporary traffic control setups will be in place during off-peak traffic hours (overnight). This will minimize the impact to travelers on Route 1A and impacts to access points for nearby businesses. Parking restrictions and detours will not be required for this area of work.

Hanson Street (Lynn): Construction on Hanson Street will consist of the installation of a proposed water main located in the southern shoulder. The proposed temporary traffic control setup will involve a sequence of shoulder closures along the south side of Hanson Street. To maintain existing driveway access points for businesses on Hanson Street, only one driveway will be blocked at any given time. Existing pedestrian facilities will be maintained, and a fence will be provided on the edge of the sidewalk. Temporary traffic control setups will be in place during off-peak traffic hours (6 pm to 6 am). Parking restrictions and detours will not be required for this area of work.

Rice Ave (Revere): Construction on Rice Ave will consist of the installation of a proposed water main located outside the roadway in the grass strip on the north side of Rice Avenue. There is approximately 250’ of proposed water main located within the roadway near the intersection of Rice Ave and Whitin Ave (northwest of the yacht club). The proposed temporary traffic control setup at the intersection of Whitin Ave and Rice Ave will involve narrowing the roadway and maintaining all existing traffic movements. Construction vehicles and equipment will be located off the roadway on the north side of Rice Ave to provide a minimum of one travel lane. The section of water main installation on Rice Ave between Whitin Ave and Fowler Ave will require a short section of alternating one-way traffic with a police officer to direct vehicles during construction hours. The roadway will be covered with steel plates at the end of each work shift so that no alternating one-way setup will be required during off-peak hours. No further traffic control setups are required.

5.10. Aesthetic Resources/Open Space/Recreational Resources

During construction, there would be aesthetic impacts in the immediate vicinity of Rice Avenue, Hanson Street, the HDD Staging Areas, and the timber pile removal site. In the long term, the area would return to its current aesthetics.

As identified in **Section 4.9.** DCR owns and maintains the verge between the Lynnway and North Shore Road, immediately west of the intersection between Rice Avenue and the Lynnway. MWRA is working with MassDCR to determine Article 97 applicability.

In Lynn, the area that appears to be used for passive recreation will be restricted from public access during construction activities. Following activities, the area would return to its current aesthetics.

5.11. Socioeconomic Characteristics / Environmental Justice

As discussed in **Section 4.11.3**, the Project Site is within two environmental justice populations, and the project's DGA is either in whole or in part within twenty-nine additional environmental justice populations. The EJ Screening Forms in **Attachment I** have maps that show EJ block groups within the DGA and are color-coded by EJ criteria. The complete list of environmental justice block groups within five miles of the project site can also be found in **Attachment I**. The project site is within two environmental justice block groups, those being Block Group 1, Census Tract 2072 (Lynn) and Block Group 1, Census Tract 1705.02 (Revere).

Because the proposed project would return to service the Section 56 water main, the primary long-term benefit to both EJ and non-EJ populations of this project would be water supply system redundancy and reliability. A reliable water supply system protects public health and environmental health. The project would also have beneficial short-term effects on the economy due to a temporary increase in construction-related jobs, increasing employment opportunities for the construction workforce, and increasing revenues of local businesses and government generated from construction activities and workers. However, any increase would be temporary, lasting only for the duration of the construction

The following impacts may affect environmental justice populations as well as the wider public and will be mitigated to the maximum extent practicable:

- Short-term impacts to traffic on Rice Avenue would impact residents on this street during the installation of the pipeline in the roadway. Increased activity in the vicinity of the project site, including the Point of Pines parking lot, would temporarily disrupt local traffic.
- Short-term impacts to traffic on Hanson Street would impact traffic patterns in the commercial/industrial vicinity during the installation of the pipeline in the roadway.
- Short-term impacts on air quality in the project area could result from the temporary operation of machinery associated with construction activities. Best management practices (BMPs) to control construction emissions would be implemented to minimize visible fugitive dust emissions at the property line.
- Short-term impacts to noise levels in the project area would occur during construction, primarily from mechanical equipment used for construction activities.
- Short-term impacts to the access to the Community Path of Lynn and a segment of a walking/biking trail that goes along the waterfront. This area would be restricted from public access due to its proximity to the project site.

These impacts are not expected to disproportionately impact EJ populations. The project would result in the following benefits to environmental justice populations as well as the wider public:

- MWRA's Section 56 Water Pipeline provides water to residents and businesses in the cities of Revere and Lynn. This project will ensure water system redundancy and reliability, which is crucial to protect both public health and environmental health. Replacement of this pipeline will ensure continued water supply for consumption, fire protection, and sanitation. The EJ populations served by this pipeline, as well as the wider community, will benefit from the security that this pipeline replacement will bring to the area's water supply.

As discussed in **Section 4.11.3**, **Attachment G** provides the output generated from the RMAT Climate Resilience Design Standards Tool. The RMAT Tool output indicates “High Exposure” preliminary climate change exposure and risk ratings for sea level rise/storm surge, extreme precipitation – urban flooding, and extreme heat, and notes that the proposed project is within a mapped environmental justice population. As previously discussed, once the construction is complete, the project will be underground. This inherent aspect of the project design mitigates risk to the infrastructure. The project will also ensure water system redundancy and increased resiliency to the impacts of climate change.

6. Cumulative Impacts

Any planned large projects in the area of the Saugus River Crossing that would occur around the same time as the proposed pipeline installation have the potential to interact with the proposed project, and, as such, are evaluated here for potential cumulative impact. The following projects have been identified as large-scale projects that will be occurring in the area in the same timeframe as the proposed river crossing:

- Lynn Landfill Cap Repair – The Lynn Landfill is a 22-acre site along the Lynn Harbor Shoreline (to the northeast of the proposed project site). The cap repair project seeks to ameliorate the landfill, which had been capped prior to Massachusetts enacting more stringent regulations. Coordination with this project includes citing the Lynn HDD Staging and Entry Area appropriately.
- Lynn Harbor Park – Following the Lynn Landfill Cap Repair, the City of Lynn (in partnership with the Massachusetts EOEEA) will develop a harbor park on the same site. At this point in time, the project has documented site conditions, put forth a conceptual plan, and is now undergoing a stakeholder engagement process. It is anticipated that work on the harbor park will begin in the next two to three years. The Lynn Harbor Park will be situated to the northwest of the Saugus River Crossing staging area and Hanson Street pipeline installation, such that the projects’ impacts will not directly overlap with one another. Only the proposed pipe string layout area extends far north enough to potentially overlap with construction activities for the Harbor Park. Coordination between the two projects will be required. The pipe string layout area (and the majority of the project area) are in Land Subject to Coastal Storm Flowage (LSCSF, coincident with the FEMA 100-Year Floodplain). If these two projects end up occurring simultaneously, temporary impacts to this resource area may be increased. Additionally, construction traffic in the area could be heightened.
- Lynn Harbor Property LLC – This is a proposed 550-unit residential development adjacent to the project area in Lynn on the site of the former Lynnway Mart. The project underwent

MEPA review between 2019 and 2021. MWRA is aware of the project intends to be closely coordinating with the project proponent.

7. Mitigation

Erosion and sedimentation controls would be employed, including installing coir wattles downslope limits of grading, to minimize the potential for offsite sedimentation and erosion. Details of typical controls are illustrated on Sheets C-1 and C-2 in **Attachment D**. In the event a barge will be used to extract the timber piles along the Lynn shoreline, bottoming out will be avoided by floating the barge further from the shoreline as low tide approaches. A turbidity curtain will be installed around the perimeter of the pile removal work. Temporary devices and structures to control erosion and sedimentation in and around the site would be properly maintained at all times and removed and properly disposed of as soon as the site is stabilized following activities to rectify impacts, but no later than November 1, three full growing seasons following the completion of site activities. Stockpiles of sediment will be surrounded by erosion controls. Any sediment collected by these devices would be removed and placed in an upland location in a manner that prevents erosion and transport to any waterway or wetland resource area. A frac-out plan will be prepared by the contractor and submitted to the local Conservation Commissions before construction activities commence. A traffic management plan will be prepared in consultation with DCR and the two communities to mitigate temporary traffic disruption.

Waste materials, debris, and trash would be cleaned from the work site at the end of each day and placed in trash barrels and/or dumpsters which would be disposed of off-site. At no time during construction is the dumping of spoils material, waste, or other debris allowed into any wetland area or other unspecified location. Concrete debris from demolition would be removed from wetland resource areas and stockpiled in the upland staging area while awaiting proper disposal.

General construction safety procedures would be followed to prevent accidents that could result in spills, releases, or other environmental damage. Activities such as fueling operations and hot work would be monitored and conducted away from sensitive resource areas when possible. As indicated above, mitigation for dust would include watering down the construction access road and vehicles, as needed, especially during especially windy and dry days, and reducing the idling times of construction vehicles. To minimize noise impacts during construction, best management practices (BMPs) would include mufflers on construction equipment and vehicles.

8. Required Permits

MWRA will coordinate closely with the local communities throughout the duration of the project to keep surrounding residents, businesses, and community organizations apprised of information regarding the project. The following permits/approvals are anticipated to be needed to implement the proposed project:

Local Permits

- Order of Conditions from the Lynn Conservation Commission under the Massachusetts Wetland Protection Act and the City of Lynn General Wetland Protection By-Law (following submission of a Notice of Intent)

- Order of Conditions from the Revere Conservation Commission under the Massachusetts Wetland Protection Act and City of Revere Code of Ordinances Chapter 16.04 (Wetlands Protection) (following submission of a Notice of Intent)
- City of Lynn Highway Engineering Department Street Opening Permit
- City of Revere Highway Engineering Department Street Opening Permit

State Permits

- Consistency Determination from the Massachusetts Office of Coastal Zone Management
- MassDEP Chapter 91 Waterways License
- MassDEP Distribution Modifications for systems
- MassDOT Permit to Access State Highway
- Department of Conservation and Recreation Access Permit
- Massachusetts Historical Commission Section 106 Review
- Division of Fisheries and Wildlife Natural Heritage and Endangered Species
- Massachusetts Water Resources Authority Section 8(m) permit
- Amended or new Massachusetts State Archaeology Permit
- Massachusetts Environmental Policy Act (MEPA) review thresholds require an Environmental Impact Report (EIR) for the alteration of 10 acres or more of any “other” wetlands (301 CMR 11.03(3)(1)(a) if a state Permit is required. As noted above, the proposed project would require multiple state permits. Although direct, permanent wetland impacts will not exceed 10 acres of alteration of any “other” wetlands, two MEPA thresholds are exceeded by this project. They are as follows:

  - 11.03(3)(b)(1)(e): “New fill or structure of Expansion of existing fill or structure, except a pile-supported structure in a velocity zone or regulatory floodway.”
  - 11.03(3)(b)(1)(a): this review threshold is met when a permit is required for the alteration of coastal dune, barrier beach or coastal bank.

  Because the project area is located within the Designated Geographic Area (DGA) around an Environmental Justice Population, an Environmental Impact Report (EIR) is required per 301 CMR 11.06(7)(b).

Federal Permits

- U.S. Army Corps of Engineers CWA Section 404/10 GP 6
- U.S. Army Corps of Engineers Section 408
- U.S. Environmental Protection Agency NPDES Construction General Permit
- U.S. Environmental Protection Agency NPDES Dewatering and Remediation General Permit
- U.S. Fish and Wildlife Service Section 7 Endangered Species Review
- National Marine Fisheries Section 7 Endangered Species Act and Essential Fish Habitat
- Advisory Council on Historic Preservation Section 106 National Historic Perseveration Act Historic Review

9. References

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ATTACHMENT B

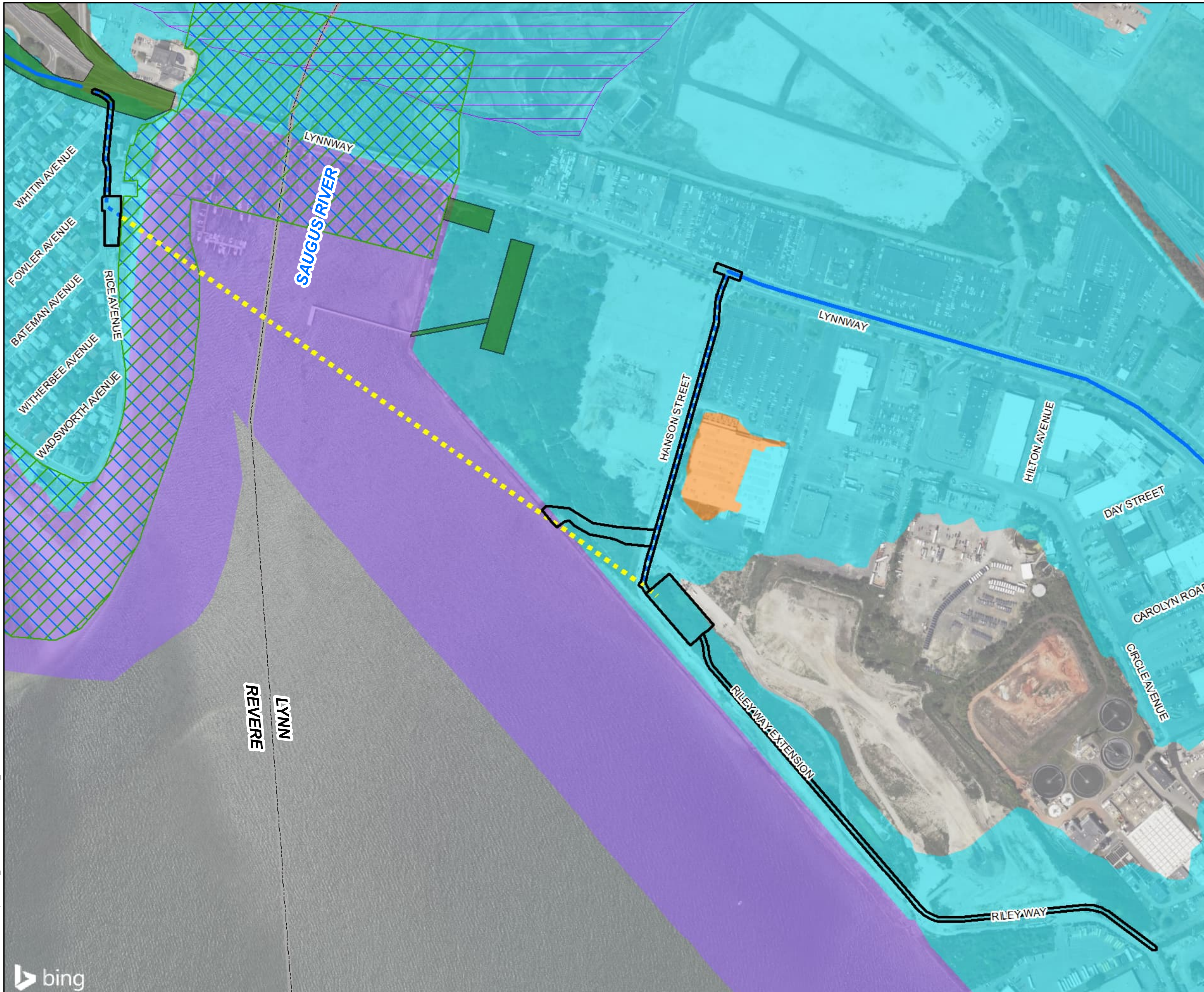
Locus Map, Environmental Constraints Maps, and Historic Properties Map

A:\Legacy\USCHL1FP002\Data\Library\GIS\Data\Projects\MUNI\60619578SAU_20230503\Maps\LocusMap.mxd

MWRA SECTION 56 WATER MAIN SAUGUS RIVER CROSSING

FIGURE 2A:

ENVIRONMENTAL CONSTRAINTS



Legend

- Existing MWRA Section 56 Water Pipeline
- Section 56 Replacement Water Pipeline: Land Portion
- Section 56 Replacement Water Pipeline: HDD Portion
- Project Area
- City Boundary
- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Species
- Areas of Critical Environmental Concern
- Article 97 Land

FEMA National Flood Hazard Layer

Flood Zone Designations

- AE: 1% Annual Chance of Flooding, with BFE
- VE: High Risk Coastal Area
- X: 0.2% Annual Chance of Flooding

NOTE: There are no water supply protection areas in or around the project site.

N

0 200 400 Feet

1 inch = 400 feet

AECOM

MWRA SECTION 56 WATER MAIN SAUGUS RIVER CROSSING

FIGURE 2B:

ENVIRONMENTAL CONSTRAINTS

Legend

- Existing MWRA Section 56 Water Pipeline
- Section 56 Replacement Water Pipeline: Land Portion
- Section 56 Replacement Water Pipeline: HDD Portion
- 200-foot Riverfront Area
- Mouth of River
- Project Area
- City Boundary

DEP Wetland Areas

- Marsh/Bog
- Salt Marsh
- Tidal Flats
- Beach/Dune

Wetland Areas

- Coastal Bank: Desktop Delineation
- Coastal Beach: Field Delineation
- 100 ft Buffer

NOTES:

There are no water supply protection areas in or around the project site.

Desktop and Field delineations were performed to identify coastal resource areas within 100 feet of the project site not included in the MassDEP Wetland Resource Area datalayer.

N

0 200 400 Feet

1 inch = 400 feet

AECOM

MWRA SECTION 56 WATER MAIN SAUGUS RIVER CROSSING

FIGURE 3:

MHC HISTORICAL INVENTORY: HISTORIC PROPERTIES

Legend

MassHistoric Commission Inventory

- Inventoried Property
- Inventoried Areas
- Existing MWRA Section 56 Water Pipeline
- Section 56 Replacement Water Pipeline: Land Portion
- Section 56 Replacement Water Pipeline: HDD Portion
- Project Area
- City Boundary

N

0 200 400 Feet

1 inch = 400 feet

AECOM

ATTACHMENT C

Site Photographs

Revere

Description: The intersection of Rice Avenue, Revere, and the Lynnway. This photograph was taken facing west towards the DCR-owned Article 97 land between North Shore Road and the Lynnway. The new pipeline will meet with the existing water main in this location.

Description: This photograph is of Rice Avenue and was taken on the north side of the street facing east. 28 Rice Avenue can be seen on the left-hand side (the blue building).

Description: This photograph was taken facing north (Lynn can be seen in the background across the mouth of the Saugus River). In the foreground is the 28 Rice Avenue parking lot, the proposed location of the HDD Exit Site and Staging area.

Lynn

Description: This photograph was taken facing north along an access road to the capped landfill. This road borders the western edge of the HDD Staging Area. Dominant plant species on the western edge of the HDD Staging area include phragmites and staghorn sumac.

Description: This photograph was taken facing south and shows the northern edge of the proposed HDD Entry Site and Staging area. Dominant species include phragmites, autumn olive (*Rhus typhina)*, and mixed grasses, among others.

Description: This photograph was taken facing north and shows Riley Way Extension. The eastern/seaward edge of the road is significantly deteriorated. The HDD pipe string will be laid out along the landward/western edge of Riley Way Extension prior to installation.

Description: A section of sparsely vegetated grassland between the timber pile removal site on the Lynn shoreline and Hanson Street. A small path on the right side of the image will be temporarily widened to create space for equipment to access the timber pile wall. This will involve clearing vegetation shown on the left side of the image.

Description: This photograph was taken facing south. The timber pile bulkhead can be seen in the background. The path shown in the above photo continues south as shown here on the right side of the image. Vegetation includes autumn olive (*Elaeagnus umbellata*), European buckthorn (*Rhamnus cathartica*), eastern cottonwood (*Populus deltoides*), and mixed grasses.

Description: This photograph was taken facing south (Revere can be seen in the background) and shows the dilapidated timber pile bulkhead along the Lynn shoreline. Construction equipment will access this cove via land to remove twelve timber piles that, due to their depth, would obstruct the HDD path.

Description: This photograph was taken facing north towards the timber pile removal site.

ATTACHMENT D

Project Plans

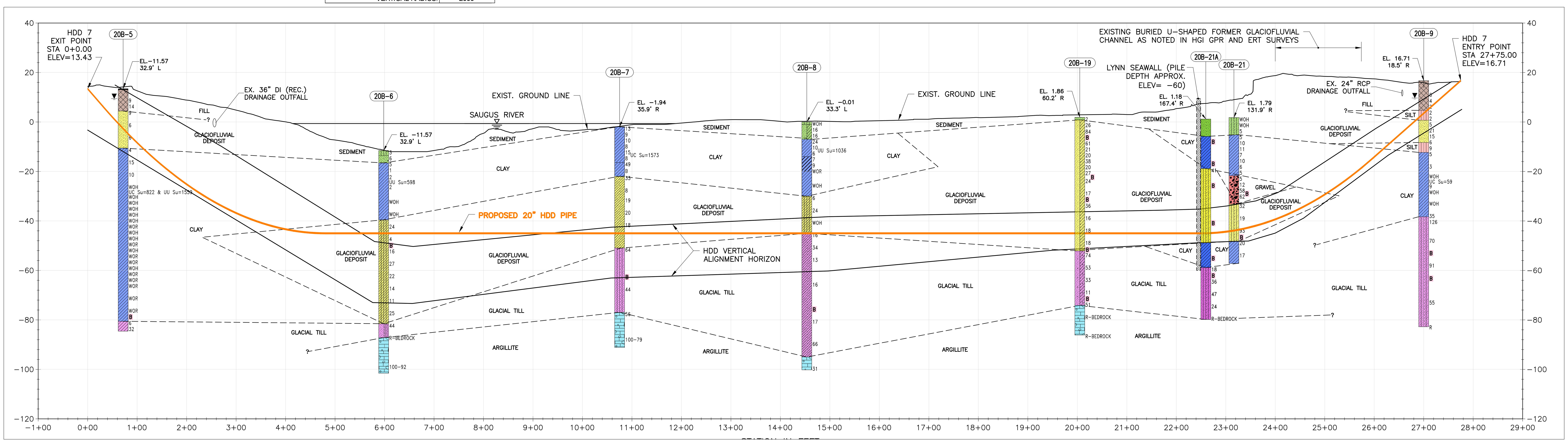
HDD 7 - All Materials		
DIRECTIONAL DRILL CURVE DATA		
DESCRIPTION	STATION (FT)	ELEVATION (FT)
DRILL ENTRY	27+75.00	16.71'
P.C.1	25+97.34	-14.62'
P.T.1	22+50.05	-45.00'
P.C.2	4+80.96	-45.00'
P.T.2	0+31.06	6.26'
DRILL EXIT	0+00.00	13.43'
ENTRY ANGLE (degrees):		10.0
EXIT ANGLE (degrees):		13.0
HORIZONTAL DISTANCE:		2775'
HDD LENGTH:		2784'
VERTICAL RADIUS:		2000'

PLAN

SCALE: 1" = 100'

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. C–1.



PROFILE

SCALE: 1" = 100' HOR.
1" = 20' VER.

HOR. SCALE IN FEET: 100 0 100 200

VER. SCALE IN FEET: 20 0 20 40

LEGEND

SOIL DEPOSIT TYPE:

- FILL
- GLACIOFLUVIAL DEPOSIT
- MARINE CLAY
- SILT
- RIVER SEDIMENT
- GRAVEL
- GLACIAL TILL
- ARGILLITE
- B BOULDERS

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO. : 7454
CAD FILE NO. : FM–HDD.dwg
ACCESSION NO. :
SECTION NO. :
DATE: SEPTEMBER 2021, DECEMBER 2022
DESIGNED BY: ....
DRAWN BY: ZB
CHECKED BY: ....
APPROVED BY: CC
SCALE: 1"=100' HOR. & 1"=20' VER.

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY :

AECOM

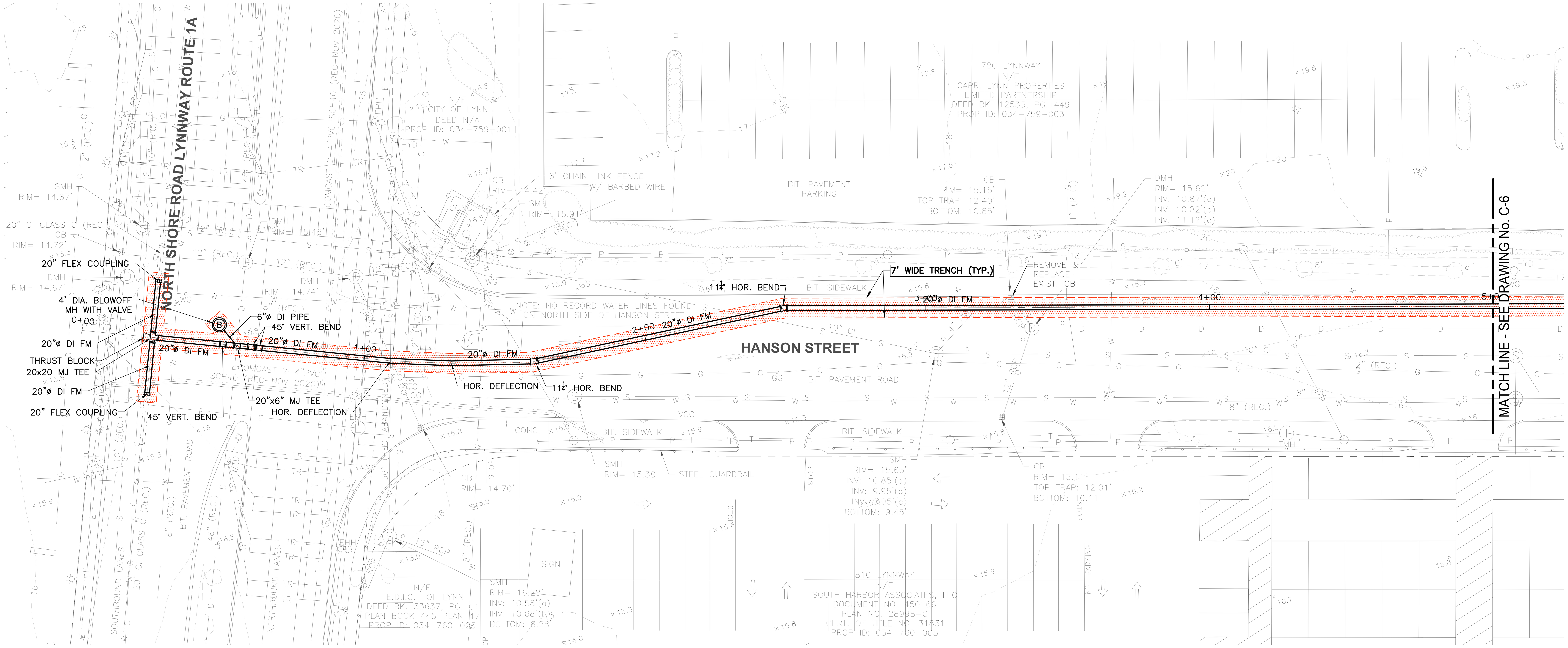
AECOM TECHNICAL SERVICES, INC.
250 APOLLO DRIVE
CHELMSFORD, MA 01824
PHONE: (978) 905-2100
www.aecom.com

FIGURE 5.5-1

HDD ROUTE 7 PLAN AND PROFILE

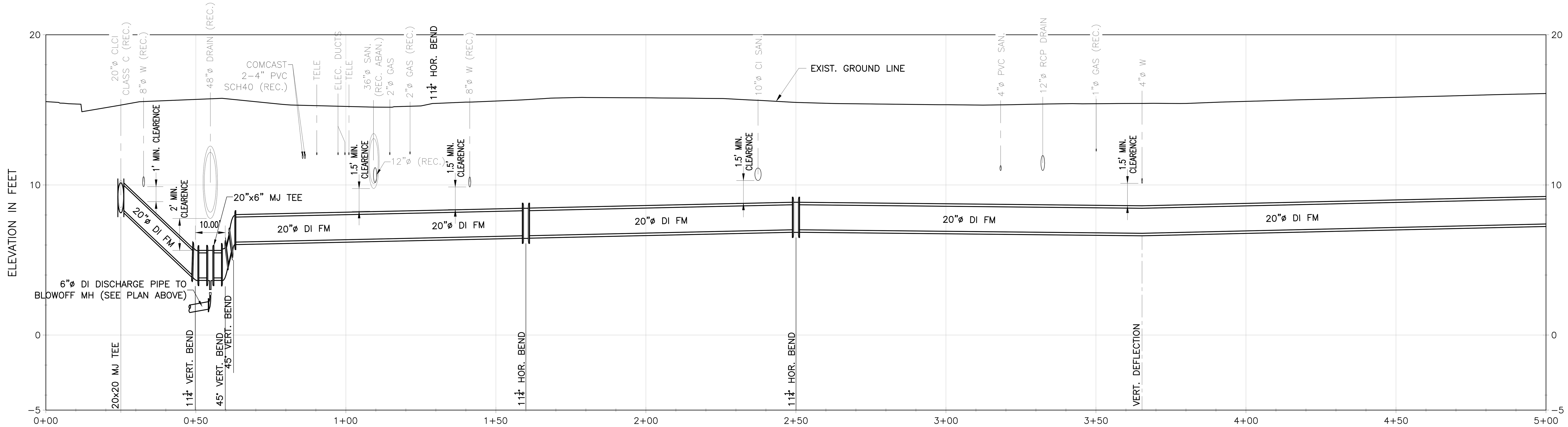
DRAWING NO. HDD7

C–9 OF ...



PLAN

SCALE: 1" = 20'



STATION IN FEET

PROFILE

SCALE: 1" = 20' HOR.
1" = 4' VER.

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. C-1.

HOR. SCALE IN FEET: 20 0 20 40

VER. SCALE IN FEET: 4 0 4 8

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454

CAD FILE NO.: Rev_FM.dwg

ACCESSION NO.:

SECTION NO.:

DATE: JANUARY 2023

DESIGNED BY: ___

DRAWN BY: ZB

CHECKED BY: ___

APPROVED BY: CC

SCALE: 1"=20' HOR. & 1"=4' VER.

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY:

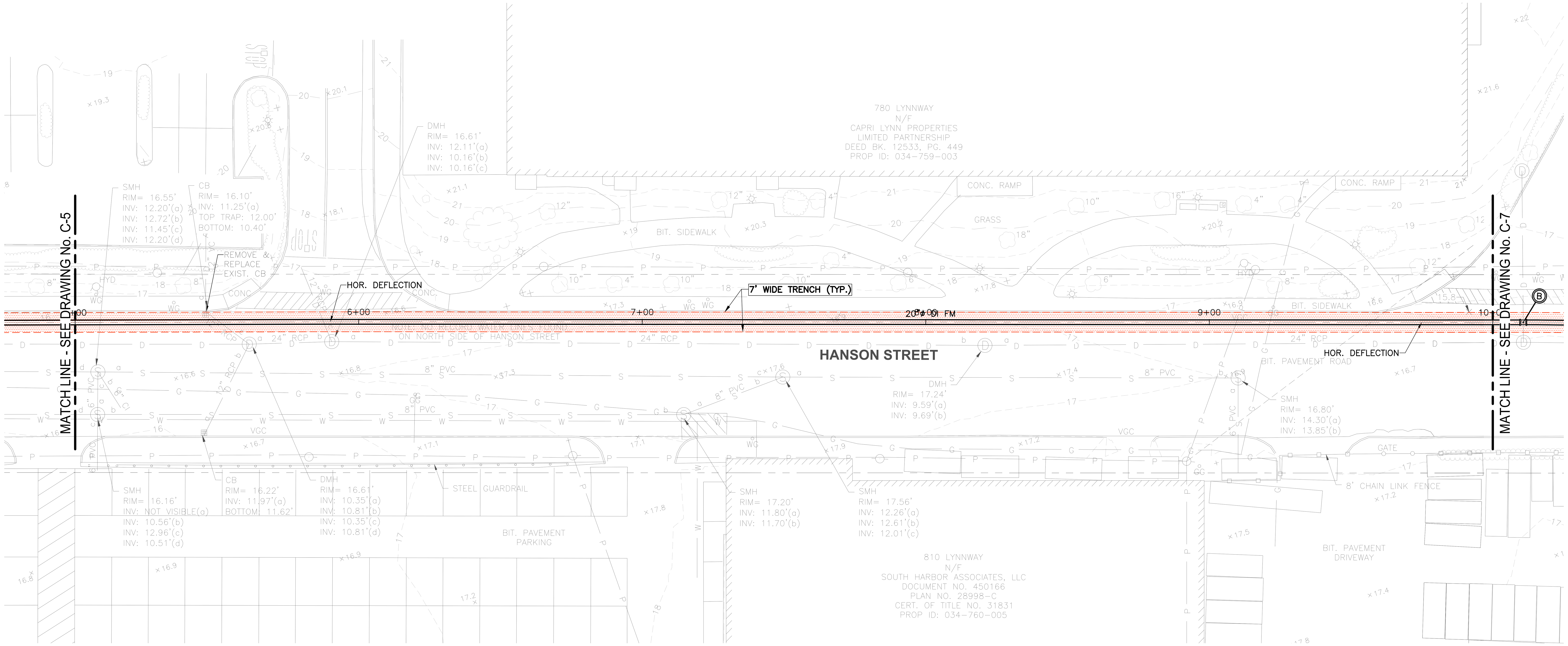
AECOM

AECOM TECHNICAL SERVICES, INC.
250 APOLLO DRIVE
CHELMSFORD, MA 01824
PHONE: (978) 905-2100
www.aecom.com

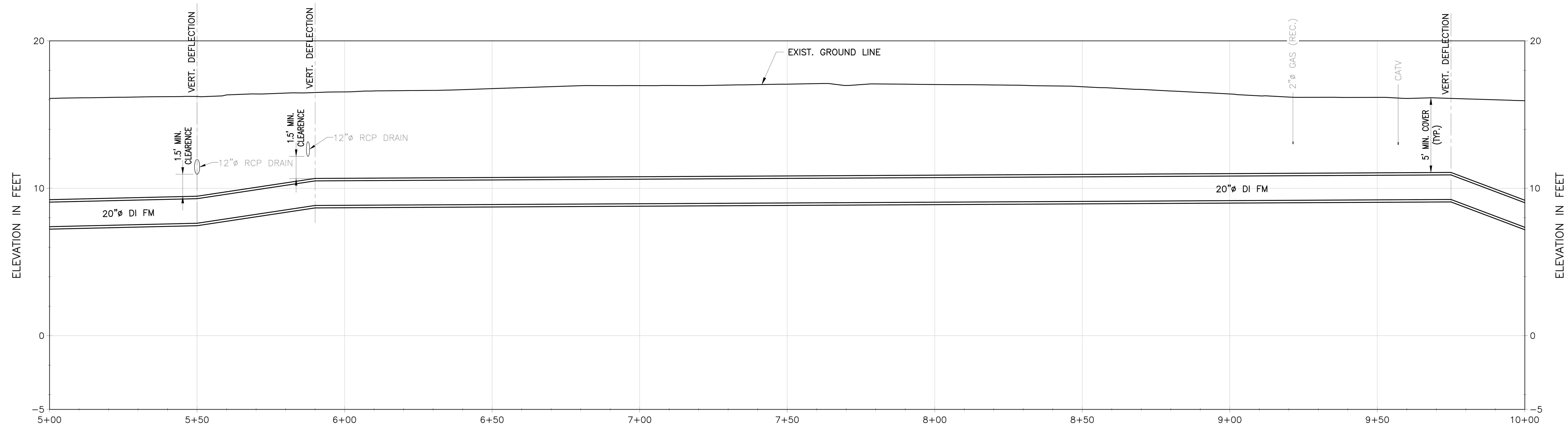
HANSON STREET FORCE MAIN
PLAN AND PROFILE I

DRAWING NO.

C-5 OF __



PLAN
SCALE: 1" = 20'



PROFILE
SCALE: 1" = 20' HOR.
1" = 4' VER.

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. C-1.

HOR. SCALE IN FEET
20 0 20 40
4 0 4 8
VER. SCALE IN FEET

NO.	DATE	BY	CHK'D	REVISION

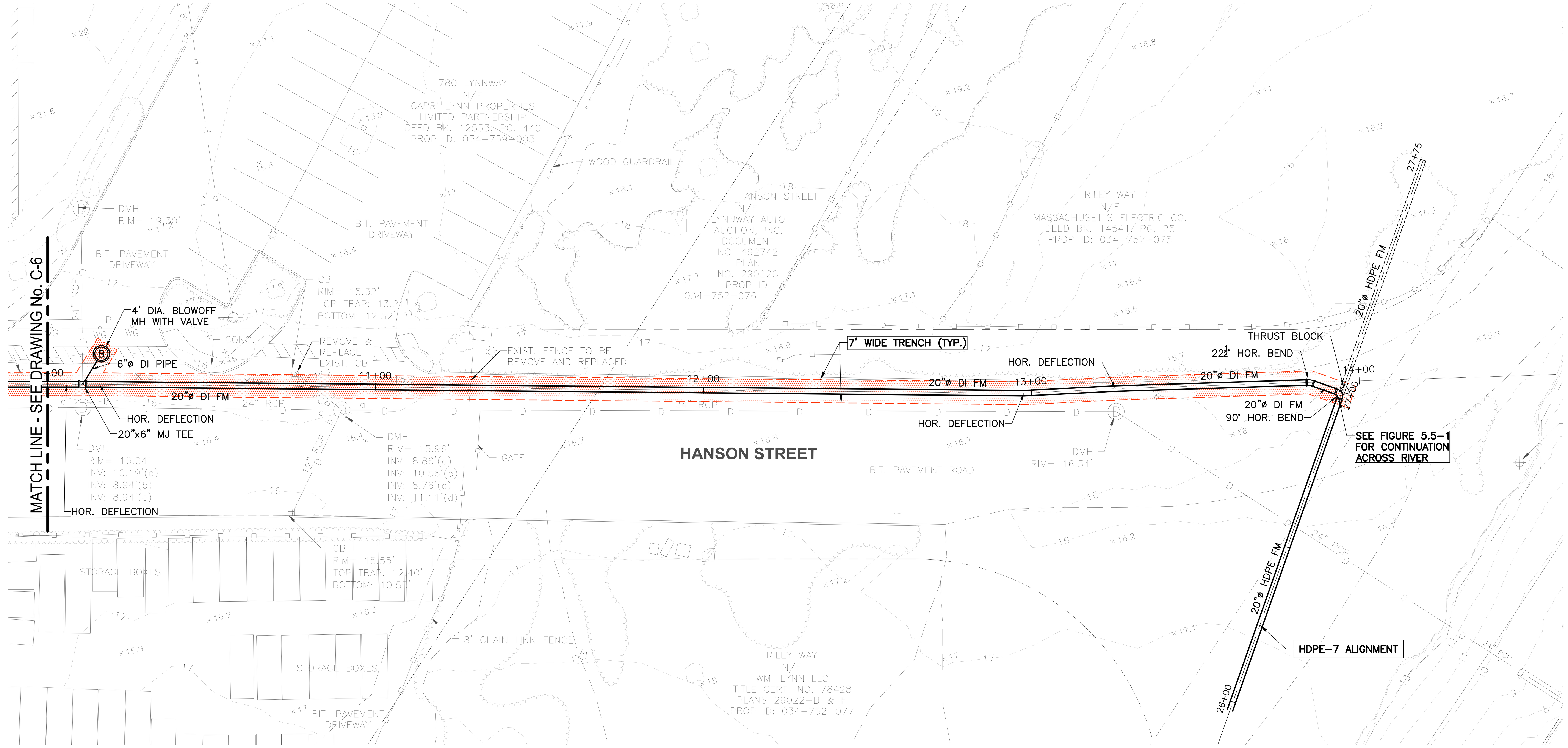
CONTRACT NO.: 7454
CAD FILE NO.: Rev_FM.dwg
ACCESSION NO.:
SECTION NO.:
DATE: JANUARY 2023
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: CC
SCALE: 1"=20' HOR. & 1"=4' VER.

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY:
AECOM
AECOM TECHNICAL SERVICES, INC.
250 APOLLO DRIVE
CHELMSFORD, MA 01824
PHONE: (978) 905-2100
www.aecom.com

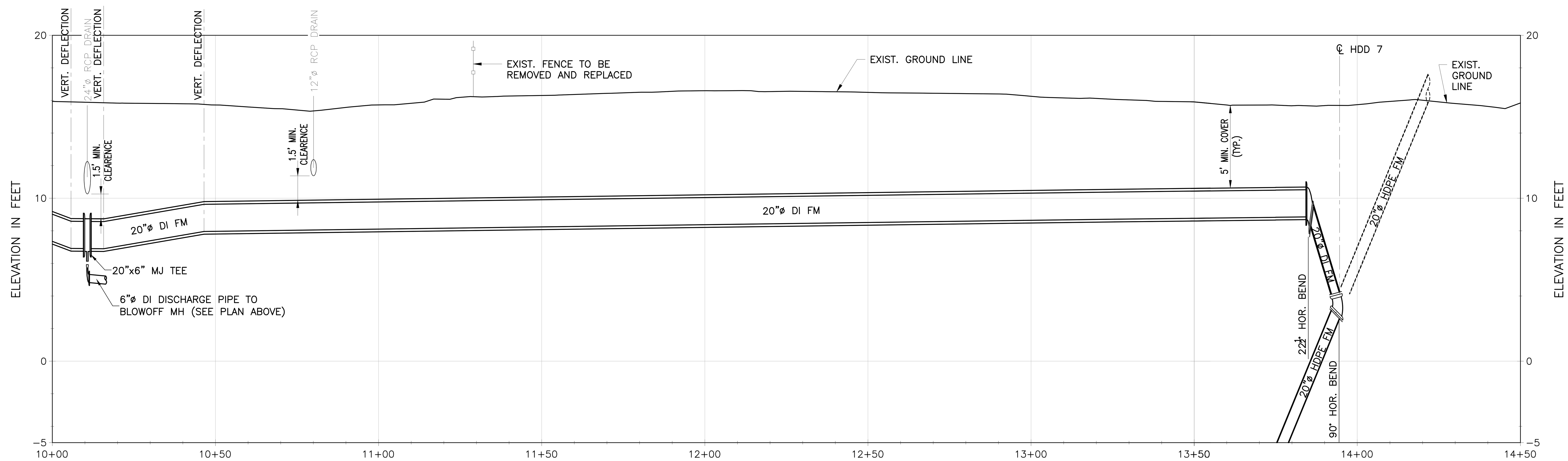
HANSON STREET FORCE MAIN
PLAN AND PROFILE II

DRAWING NO.
C-6 OF __



PLAN

SCALE: 1" = 20'



PROFILE

SCALE: 1" = 20' HOR.
1" = 4' VER.

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. C-1.

HOR. SCALE IN FEET: 20 0 20 40
VER. SCALE IN FEET: 4 0 4 8

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454 | CAD FILE NO.: Rev_FM.dwg
ACCESSION NO.: | SECTION NO.:
DATE: JANUARY 2023
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: CC
SCALE: 1"=20' HOR. & 1"=4' VER.

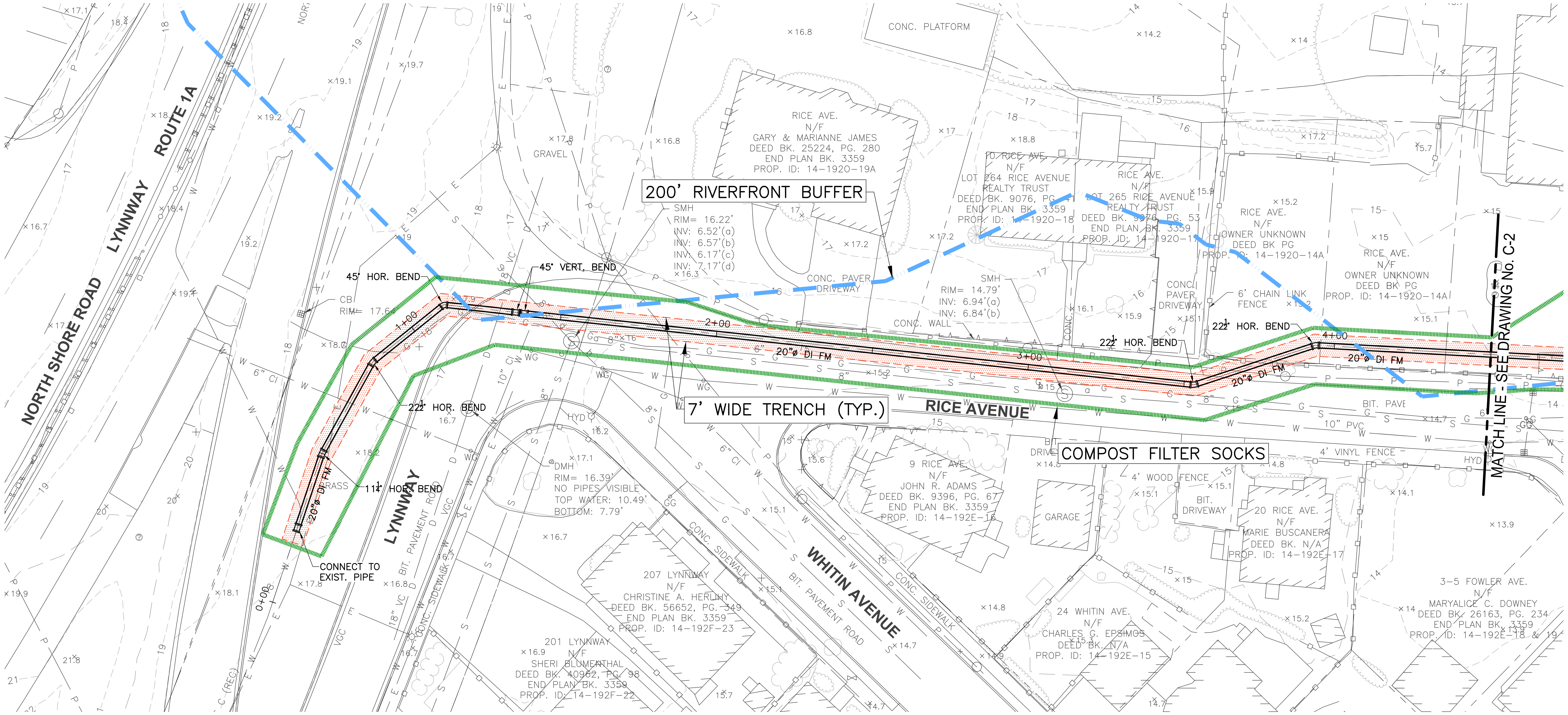
MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY: AECOM

AECOM TECHNICAL SERVICES, INC.
250 APOLLO DRIVE
CHELMSFORD, MA 01824
PHONE: (978) 905-2100
www.aecom.com

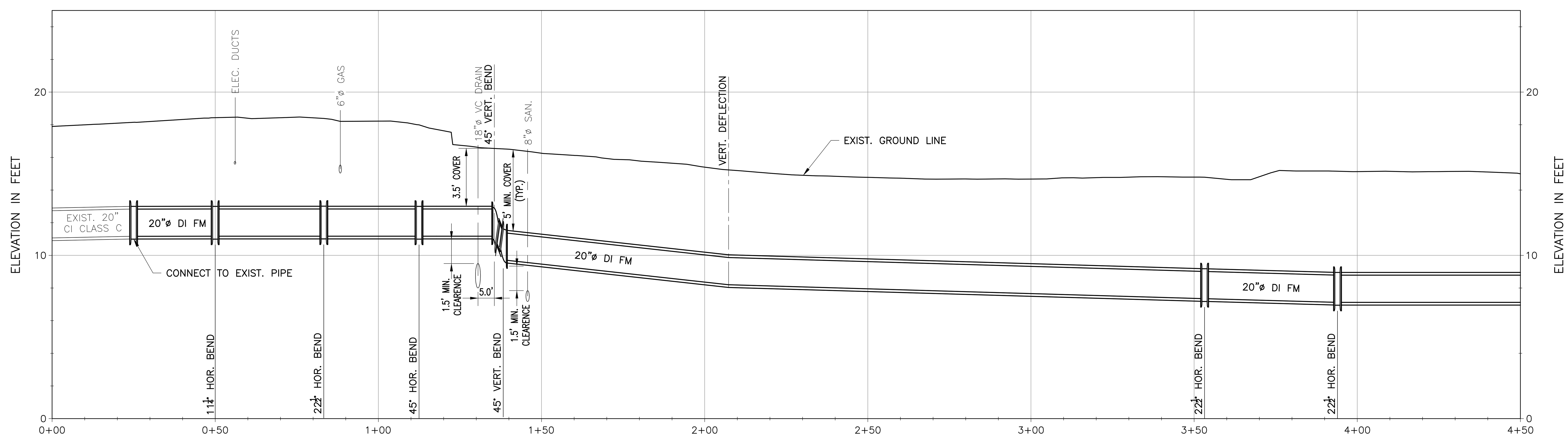
HANSON STREET FORCE MAIN
PLAN AND PROFILE III

DRAWING NO. C-7 OF __



PLAN

SCALE: 1" = 20'



PROFILE

SCALE: 1" = 20' HOR.
1" = 4' VER.

HOR. SCALE IN FEET 20 0 20 40

VER. SCALE IN FEET 4 0 4 8

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. C-1.
2. ENTIRE AREA IS WITHIN DEP MAPPED BARRIER BEACH/COASTAL DUNE AND LAND SUBJECT TO COASTAL STORM FLOWAGE.

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO. : 7454
CAD FILE NO. : Rev_FM.dwg
ACCESSION NO. :
SECTION NO. :
DATE: MARCH 2023
DESIGNED BY: __
DRAWN BY: ZB
CHECKED BY: __
APPROVED BY: CC
SCALE: 1"=20' HOR. & 1"=4' VER.

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY :

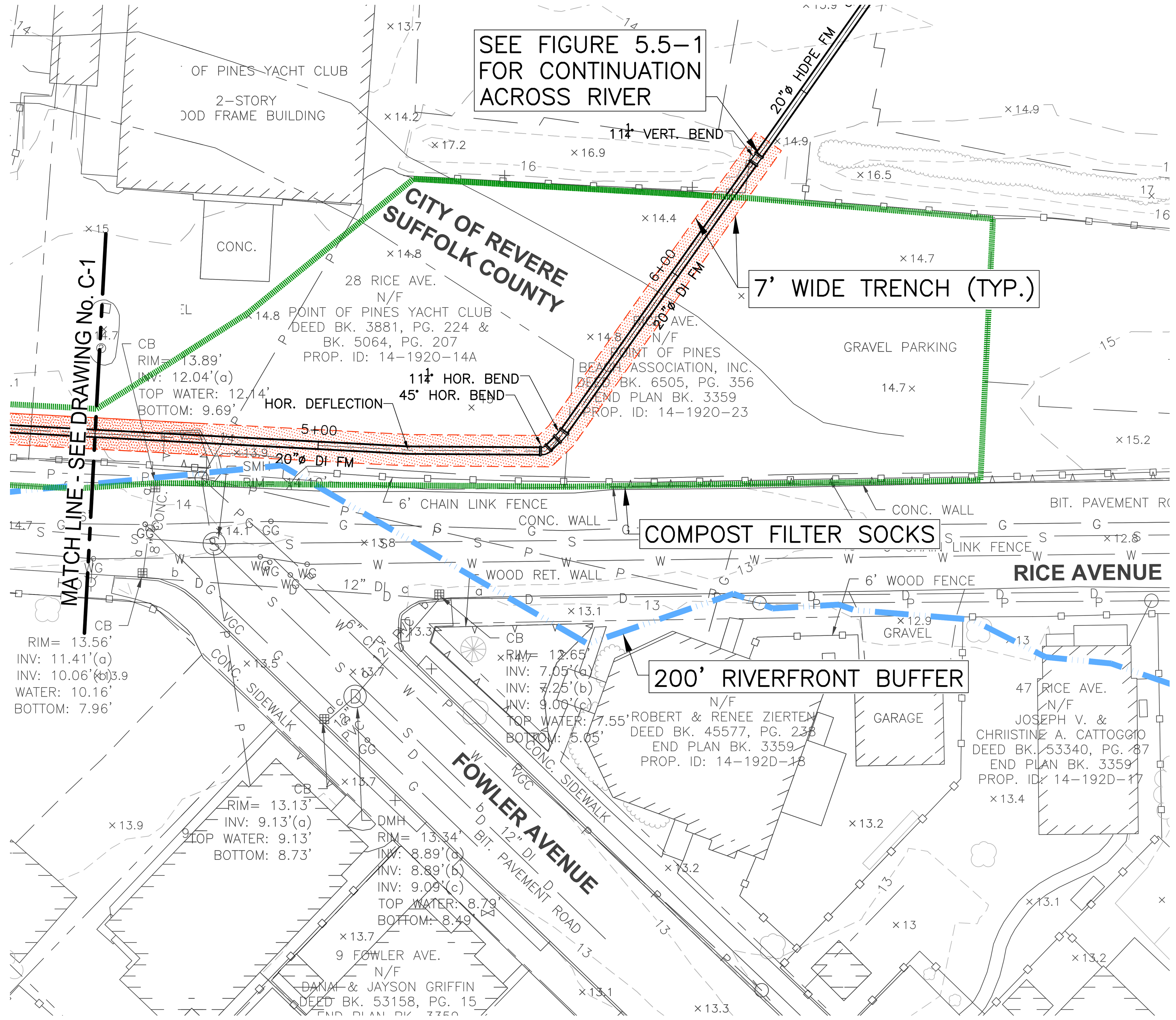
AECOM

AECOM TECHNICAL SERVICES, INC.
250 APOLLO DRIVE
CHELMSFORD, MA 01824
PHONE: (978) 905-2100
www.aecom.com

ALT 1

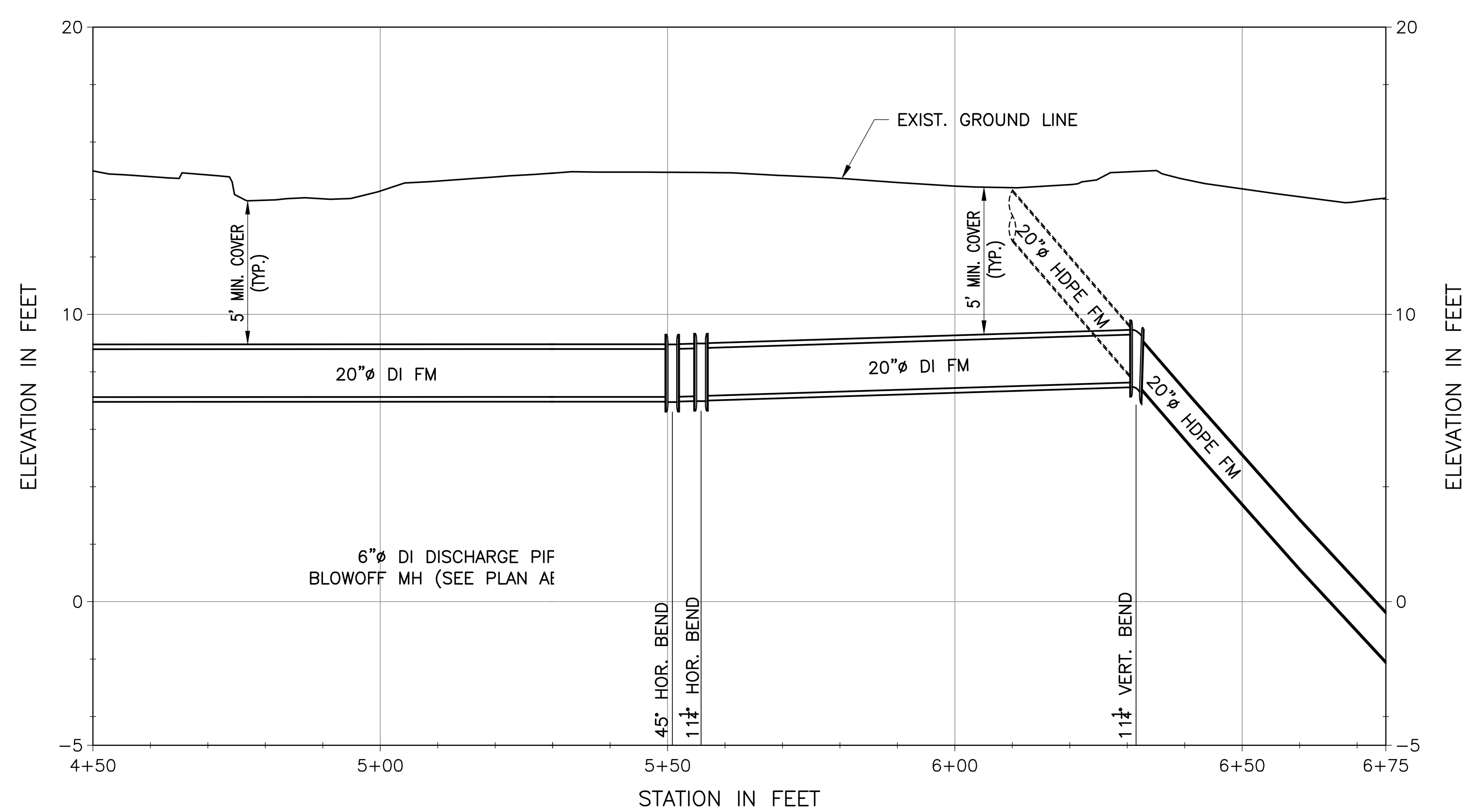
RICE AVENUE FORCE MAIN
PLAN AND PROFILE I

DRAWING NO.
C-1 OF __



PLAN

SCALE: 1" = 20'



PROFILE

SCALE: 1" = 20' HOR.
1" = 4' VER.

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. C-1.
2. ENTIRE AREA IS WITHIN DEP MAPPED BARRIER BEACH/COASTAL DUNE AND LAND SUBJECT TO COASTAL STORM FLOWAGE.

HOR. SCALE IN FEET 20 0 20 40
VER. SCALE IN FEET 4 0 4 8

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454
CAD FILE NO.: Rev_FM.dwg
ACCESSION NO.:
SECTION NO.:
DATE: MARCH 2023
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: CC
SCALE: 1"=20' HOR. & 1"=4' VER.

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY:

AECOM

AECOM TECHNICAL SERVICES, INC.
250 APOLLO DRIVE
CHELMSFORD, MA 01824
PHONE: (978) 905-2100
www.aecom.com

ALT 1

RICE AVENUE FORCE MAIN
PLAN AND PROFILE II

DRAWING NO.

C-2 OF __

NOTES:

1. THE ENTIRE PROJECT AREA IS LOCATED WITHIN LAND SUBJECT TO COASTAL STORM FLOWAGE AND BARRIER BEACH/COASTAL DUNE.
2. ANY WORK DONE BY BARGE WILL BE SURROUNDED BY SILT CURTAINS.

GRAPHIC SCALE
1" = 60'

0 60 120 Feet

HDD-7 ENTRY POINT
(MAJOR EQUIPMENT LAYOUT)
SAUGUS RIVER CROSSING
LYNN, MA
JUNE 2023

GRAPHIC SCALE
1" = 50

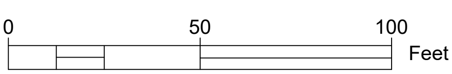


FIGURE 6.1-5A
HDD-7 EXIT POINT
(MAJOR EQUIPMENT - DRILLING PHASE)
SAUGUS RIVER CROSSING - REVERE, MA
June 2023

FIGURE 6.1-5B
HDD-7 EXIT POINT
(MAJOR EQUIPMENT - PIPE PULLBACK PHASE)
SAUGUS RIVER CROSSING - REVERE, MA
June 2023

ATTACHMENT E

MHC and BUAR Correspondence

The COMMONWEALTH OF MASSACHUSETTS
BOARD OF UNDERWATER ARCHAEOLOGICAL RESOURCES
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
251 Causeway Street, Suite 800, Boston, MA 02114-2136
Tel. (617) 626-1014 Fax (617) 626-1240
www.mass.gov/orgs/board-of-underwater-archaeological-resources

September 17, 2020

Jean B. Pelletier, MA, RPA
Principal Nautical Archaeologist & Geophysical Specialist
Impact Assessment & Permitting Group
AECOM Technical Services, Inc.
12420 Milestone Center Drive, Suite 150
Germantown, Maryland 20876

RE: Section 56 Water Main Saugus River Crossing Project, Lynn and Revere, MA
Provisional Approval of Special Use Permit 20-002

Dear Mr. Pelletier:

This letter confirms the acceptance and provisional approval by the Massachusetts Board of Underwater Archaeological Resources of the Special Use Permit application submitted by AECOM Technical Services, Inc. (AECOM) for marine archaeological reconnaissance/assessment and monitoring of geotechnical sampling in the Saugus River in Lynn and Revere as detailed in the research design and maps accompanying the application for the Section 56 Water Main Saugus River Crossing Project.

This provisional permit (No. 20-002) is effective upon issuance, 17 September 2020, for the duration of one year, but a formal approval of this permit will be considered by the Board at its next regularly scheduled meeting on 24 September 2020.

This permit is herein granted to AECOM, Inc., and is dependent upon compliance with the Board's Regulations (312 CMR 2.00). All work must be conducted in accordance with Board directives, standard conditions and the scope of work described in the application. Activities allowed under this permit include remote sensing, archaeological site examination and undertaking necessary recovery and documentation of these resources in the permit area. For projects subject to Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), permittees are directed to consult with and provide their proposed research design and methodology to the State Historic Preservation Office/Massachusetts Historical Commission and the lead federal agency in accordance with 36 CFR 800.4, prior to conducting the field investigation. This permit does not relieve the permittee or any other person of the necessity of complying with all other federal, state and local statutes, regulations, by-laws and ordinances

Review by the full Board of your provisional permit has been scheduled for Thursday, 24 September 2020 at 12:30 PM via video-conference. Instructions for accessing the meeting will be provided prior to the meeting.

If you should have any questions or need further assistance, do not hesitate to contact the Board at the address above or by email (david.s.robinson@mass.gov).

Sincerely,

David S. Robinson
Director

/dsr
Cc: Brona Simon, MHC
Robert Boeri and Kathryn Glenn, MCZM (via email attachment)
Bettina Washington, WTGH/A THPO (via email attachment)
David Weeden, MWT THPO (via email attachment)
Ed Morin, AECOM (via email attachment)

Printed on Recycled Paper

The COMMONWEALTH OF MASSACHUSETTS
BOARD OF UNDERWATER ARCHAEOLOGICAL RESOURCES
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
251 Causeway Street, Suite 800, Boston, MA 02114-2136
Tel. (617) 626-1014 Fax (617) 626-1240
www.mass.gov/orgs/board-of-underwater-archaeological-resources

October 5, 2020

Jean B. Pelletier, MA, RPA
Principal Nautical Archaeologist & Geophysical Specialist
Impact Assessment & Permitting Group
AECOM Technical Services, Inc.
12420 Milestone Center Drive, Suite 150
Germantown, Maryland 20876

RE: Section 56 Water Main Saugus River Crossing Project, Lynn and Revere, MA
Formal Approval of Special Use Permit 20-002

Dear Mr. Pelletier:

This letter confirms the vote taken by the Massachusetts Board of Underwater Archaeological Resources on 24 September 2020 to grant Special Use Permit 20-002 to AECOM Technical Services, Inc. (AECOM) for archaeological marine archaeological reconnaissance/assessment and monitoring of geotechnical sampling in the Saugus River in Lynn and Revere as detailed in the research design and maps accompanying the application for the Section 56 Water Main Saugus River Crossing Project. The duration of this permit shall be one year from the date of issuance with its expiration date as 24 September 2021.

This permit is herein granted dependent upon AECOM's compliance with the Board's Regulations (312 CMR 2.00). All work must be conducted in accordance with Board directives, standard conditions and the technical proposal included in the application. Activities allowed under this permit include remote sensing, geotechnical sampling, archaeological site examination and undertaking necessary recovery and documentation of these resources in the permit area. For projects subject to Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), permittees are directed to consult with and provide their proposed research design and methodology to the State Historic Preservation Office/Massachusetts Historical Commission and the lead federal agency in accordance with 36 CFR 800.4, prior to conducting the field investigation. This permit does not relieve the permittee or any other person of the necessity of complying with all other federal, state and local statutes, regulations, by-laws and ordinances.

If you should have any questions or need further assistance, do not hesitate to contact the Board at the address above or by email (david.s.robinson@mass.gov).

Sincerely,

David S. Robinson
Director

/dsr
Cc: Brona Simon, MHC
Robert Boeri and Kathryn Glenn, MCZM (via email attachment)
Bettina Washington, WTGH/A THPO (via email attachment)
David Weeden, MWT THPO (via email attachment)
Ed Morin, AECOM (via email attachment)

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The COMMONWEALTH OF MASSACHUSETTS
BOARD OF UNDERWATER ARCHAEOLOGICAL RESOURCES
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
251 Causeway Street, Suite 800, Boston, MA 02114-2136
Tel. (617) 626-1014 Fax (617) 626-1240
www.mass.gov/orgs/board-of-underwater-archaeological-resources

September 28, 2021

Elisabeth LaVigne, RPA (via email attachment)
Associate Vice President, Cultural Resource Department, East
Senior Geoarchaeologist
Design and Consulting Services Group
AECOM Technical Services, Inc.
437 High Street
Burlington, NJ 08016

RE: MBUAR Comment Letter- Draft Report for the MWRA Section 56 Water Main Saugus River Crossing Project, Lynn and Revere, MA (BUAR Special Use Permit 20-002)

Dear Ms. LaVigne:

The staff of the Massachusetts Board of Underwater Archaeological Resources (MBUAR) has completed its review of the above referenced project's report entitled *Section 56 Water Main Replacement Saugus River Crossing Draft Geoarchaeological Investigation Report Lynn and Revere, MA* (dated August 17, 2021) prepared for the Massachusetts Water Resources Authority (MWRA) by MWRA's archaeological consultant, AECOM Technical Services, Inc., under MBUAR Special Use Permit 20-002. The Board concurs with the reported results and conclusions.

The Board also acknowledges its receipt of the requested high-resolution images of the sidescan sonar and subbottom profiler survey data and core photographs with the report, so that this information may be added to the MBUAR's records and available for our future review of projects proposed in the lower Saugus River.

If you should have any questions or need further assistance, please do not hesitate to contact the MBUAR at the address above or by email (david.s.robinson@mass.gov).

Sincerely,

David S. Robinson
Director

/dsr
Cc: Brona Simon, MHC
John Colbert, Peter Grasso, Carolyn Fiore, and Michael Gove, MWRA (via email attachment)
Bettina Washington, WTGH/A (via email attachment)
David Weeden, MWT (via email attachment)
Edward Morin, AECOM (via email attachment)

Printed on Recycled Paper

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

April 22, 2020

John Colbert
Chief Engineer
Massachusetts Water Resources Authority
2 Griffin Way
Chelsea MA 02150

RE: MWRA Section 56 Water Main Saugus River Crossing, Revere and Lynn. MHC #RC.63748.

Dear Mr. Colbert:

Staff of the Massachusetts Historical Commission (MHC) have reviewed the Project Notification Form (PNF) submitted for the project referenced above, received by MHC on April 9, 2020.

The information provided indicates that AECOM proposes to conduct a "preliminary archaeological due diligence survey for both terrestrial and underwater portions of the project area."

In Massachusetts, archaeological consultants are required to notify the State Archaeologist of proposed archaeological survey. Field investigation permits are required for archaeological investigations for proposed projects reviewed by the MHC in compliance with state and/or federal historic preservation law (950 CMR 70).

The MHC requests that AECOM provide the State Archaeologist with the draft archaeological research design and methodology for the proposed terrestrial and underwater survey, as part of a State Archaeologist's permit application for reconnaissance survey.

The areas of impact for the proposed geotechnical investigations in addition to the two project alternatives with the HDD entry/exit locations, pipe laydown, and staging areas should be included in the proposed archaeological survey.

Please also provide the MHC with copies of any comments from the Tribal Historic Preservation Officers and the Massachusetts Board of Underwater Archaeological Resources.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), Massachusetts General Laws Chapter 9, Sections 26-27C (950 CMR 70-71), and 312 CMR 2. Please contact me if you have any questions.

Sincerely,

Edward L. Bell
Deputy State Historic Preservation Officer
Senior Archaeologist
Massachusetts Historical Commission

xc: David S. Robinson, BUAR

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

September 16, 2021

John Colbert
Chief Engineer
Massachusetts Water Resources Authority
2 Griffin Way
Chelsea MA 02150

Attn: Katherine Ronan

RE: MWRA Section 56 Water Main Saugus River Crossing, Revere and Lynn. MHC #RC.63748.

Dear Mr. Colbert:

Staff of the Massachusetts Historical Commission (MHC) have reviewed the archaeological report, *Section 56 Water Main Replacement, Saugus River Crossing Draft Geoarchaeological Investigation Report, Lynn and Revere, MA*, prepared and submitted by AECOM for the project referenced above.

Results of the archaeological investigation indicate that natural stratigraphy is present under modern fill deposits within portions of the proposed water main trench along Rice Avenue in Revere. AECOM has recommended archaeological monitoring within the Rice Avenue portion of the project to identify and evaluate any intact, significant archaeological resources that may be present within the buried natural stratigraphy.

The MHC looks forward to reviewing the request from AECOM, including a research design and methodology, to amend the State Archaeologist's permit (950 CMR 70) to conduct the program of archaeological monitoring within the water main trench portion of the project impact area in Revere.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), and Massachusetts General Laws Chapter 9, Sections 26-27C (950 CMR 70-71). If you have any questions, please contact Jonathan K. Patton at this office

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc: David S. Robinson, BUAR
Ed Morin, AECOM

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

ATTACHMENT F

Sediment Sampling Analysis Results

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

	MCP Reportable Concentrations		*Revere Borings*							
Sample Location			**20B-1(2-3)**	**20B-1 (9-11')**	**20B-5(3-5)**	**20B-5 (6-8)**	**20B-14MW(3-5)**	**20B-14MW(3-5)DUP**	**20B-14MW (10-12)**	**20B-15MW(3-5)**
Sampling Date			**10/14/2020**	**11/12/2020**	**10/14/2020**	**10/19/2020**	**10/14/2020**	**10/14/2020**	**11/9/2020**	**10/14/2020**
Lab ID			**20J0725**	**20K0635**	**20J0725**	**20J0937**	**20J0725**	**20J0725**	**20K0411**	**20J0725**
Parameter Sample Depth (feet)	**RCS-1**	**RCS-2**	**2 - 3**	**9 - 11**	**3 - 5**	**6 - 8**	**3 - 5**	**3 - 5**	**10 - 12**	**3 - 5**
MADEP EPH rev 2.1 (mg/Kg dry)										
C9-C18 ALIPHATICS	1000	3000	ND (11)	ND (12)	ND (11)	15	ND (10)	ND (10)	ND (12)	ND (10)
C19-C36 ALIPHATICS	3000	5000	ND (11)	14	ND (11)	73	17	11	ND (12)	11
C11-C22 AROMATICS	1000	3000	24	ND (12)	ND (11)	67	22	19	ND (12)	ND (10)
ACENAPHTHENE	4	3000	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.12)	ND (0.10)	ND (0.10)	ND (0.12)	ND (0.10)
ACENAPHTHYLENE	1	10	0.11	ND (0.12)	ND (0.11)	0.15	ND (0.10)	ND (0.10)	ND (0.12)	ND (0.10)
ANTHRACENE	1000	3000	0.12	ND (0.12)	ND (0.11)	ND (0.12)	0.13	0.10	ND (0.12)	ND (0.10)
BENZO(A)ANTHRACENE	7	40	0.49	ND (0.12)	ND (0.11)	0.43	0.42	0.39	ND (0.12)	0.21
BENZO(A)PYRENE	2	7	0.58	ND (0.12)	ND (0.11)	0.79	0.49	0.46	ND (0.12)	0.26
BENZO(B)FLUORANTHENE	7	40	0.85	ND (0.12)	ND (0.11)	0.93	0.66	0.64	ND (0.12)	0.32
BENZO(G,H,I)PERYLENE	1000	3000	0.43	ND (0.12)	ND (0.11)	0.61	0.32	0.29	ND (0.12)	0.16
BENZO(K)FLUORANTHENE	70	400	0.30	ND (0.12)	ND (0.11)	0.38	0.25	0.23	ND (0.12)	0.12
CHRYSENE	70	400	0.64	ND (0.12)	ND (0.11)	0.55	0.58	0.46	ND (0.12)	0.25
DIBENZ(A,H)ANTHRACENE	0.7	4	0.12	ND (0.12)	ND (0.11)	ND (0.12)	ND (0.10)	ND (0.10)	ND (0.12)	ND (0.10)
FLUORANTHENE	1000	3000	1.1	ND (0.12)	ND (0.11)	0.81	1.0	0.81	ND (0.12)	0.45
FLUORENE	1000	3000	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.12)	ND (0.10)	ND (0.10)	ND (0.12)	ND (0.10)
INDENO(1,2,3-CD)PYRENE	7	40	0.48	ND (0.12)	ND (0.11)	0.68	0.34	0.32	ND (0.12)	0.16
2-METHYLNAPHTHALENE	0.7	80	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.12)	ND (0.10)	ND (0.10)	ND (0.12)	ND (0.10)
NAPHTHALENE	4	20	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.12)	ND (0.10)	ND (0.10)	ND (0.12)	ND (0.10)
PHENANTHRENE	10	1000	0.49	ND (0.12)	ND (0.11)	0.19	0.67	0.34	ND (0.12)	0.20
PYRENE	1000	3000	1.1	ND (0.12)	ND (0.11)	0.96	1.1	0.86	ND (0.12)	0.50
MADEP-VPH-Feb 2018 Rev 2.1 (mg/Kg dry)										
C5-C8 ALIPHATICS	100	500	ND (13)	ND (12)	ND (12)	ND (12)	ND (11)	ND (11)	ND (13)	ND (12)
C9-C12 ALIPHATICS	1000	3000	ND (13)	ND (12)	ND (12)	ND (12)	ND (11)	ND (11)	ND (13)	ND (12)
C9-C10 AROMATICS	100	500	ND (13)	ND (12)	ND (12)	ND (12)	ND (11)	ND (11)	ND (13)	ND (12)
BENZENE	2	200	ND (0.064)	ND (0.061)	ND (0.059)	ND (0.060)	ND (0.053)	ND (0.055)	ND (0.063)	ND (0.058)
ETHYLBENZENE	40	1000	ND (0.064)	ND (0.061)	ND (0.059)	ND (0.060)	ND (0.053)	ND (0.055)	ND (0.063)	ND (0.058)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.064)	ND (0.061)	ND (0.059)	ND (0.060)	ND (0.053)	ND (0.055)	ND (0.063)	ND (0.058)
NAPHTHALENE	4	20	ND (0.32)	ND (0.31)	ND (0.29)	ND (0.30)	ND (0.26)	ND (0.27)	ND (0.31)	ND (0.29)
TOLUENE	30	1000	ND (0.064)	ND (0.061)	ND (0.059)	ND (0.060)	ND (0.053)	ND (0.055)	ND (0.063)	ND (0.058)
M/P-XYLENE	100	100	ND (0.13)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.11)	ND (0.11)	ND (0.13)	ND (0.12)
O-XYLENE	100	100	ND (0.064)	ND (0.061)	ND (0.059)	ND (0.060)	ND (0.053)	ND (0.055)	ND (0.063)	ND (0.058)
SM 2540G (% Wt)										
% Solids	--	--	93.4	84.6	86.9	82.7	98.4	98.3	85.9	95.1
SM21-22 2510B Modified (µmhos/cm)										
SPECIFIC CONDUCTANCE	--	--	4.8	6.3	3.9	8.4	5.2	3.8	32	16
SM2580 A (mV)										
OXIDATION/REDUCTION POTENTIAL	--	--	110	160	120	54	120	120	170	120
SW-846 1010A (°F)										
FLASHPOINT	--	--	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F
SW-846 6010D (mg/Kg dry) Metals Digestion										
ANTIMONY	20	30	ND (1.8)	ND (2.0)	ND (1.9)	ND (2.0)	ND (1.6)	ND (1.7)	ND (1.9)	ND (1.7)
ARSENIC	20	20	ND (3.6)	ND (4.0)	ND (3.8)	ND (3.9)	ND (3.3)	ND (3.3)	ND (3.9)	ND (3.5)
BARIUM	1000	3000	24	4.5	5.6	11	52	280	4.5	27
BERYLLIUM	90	200	0.18	ND (0.20)	ND (0.19)	ND (0.20)	ND (0.16)	ND (0.17)	ND (0.19)	ND (0.17)
CADMIUM	70	100	ND (0.36)	ND (0.40)	ND (0.38)	ND (0.39)	ND (0.33)	ND (0.33)	ND (0.39)	ND (0.35)
CHROMIUM	100	200	14	8.3	5.0	7.2	12	11	8.0	7.1
LEAD	200	600	45	1.3	1.9	9.3	170	**350**	2.4	150
NICKEL	600	1000	9.6	3.0	2.9	4.0	6.1	7.4	3.5	3.1
SELENIUM	400	700	ND (3.6)	ND (4.0)	ND (3.8)	ND (3.9)	ND (3.3)	ND (3.3)	ND (3.9)	ND (3.5)
SILVER	100	200	ND (0.36)	ND (0.40)	ND (0.38)	ND (0.39)	ND (0.33)	ND (0.33)	3.5	ND (0.35)
THALLIUM	8	60	ND (1.8)	ND (2.0)	ND (1.9)	ND (2.0)	ND (1.6)	ND (1.7)	ND (1.9)	ND (1.7)
VANADIUM	400	700	17	4.9	5.6	9.2	16	14	5.9	6.6
ZINC	1000	3000	46	9.7	14	23	52	97	22	41
SW-846 7196A (mg/Kg dry)										
CHROMIUM +6	100	200	ND (0.17)	ND (0.19)	ND (0.18)	ND (0.19)	ND (0.16)	ND (0.16)	ND (0.18)	ND (0.16)
SW-846 7471B (mg/Kg dry) Metals Digestion										
MERCURY	20	30	0.035	ND (0.029)	ND (0.029)	ND (0.030)	0.069	0.11	ND (0.028)	0.056

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

Sample Location	MCP Reportable Concentrations		*Revere Borings*							
			20B-1(2-3)	**20B-1 (9-11')**	**20B-5(3-5)**	**20B-5 (6-8)**	**20B-14MW(3-5)**	**20B-14MW(3-5)DUP**	**20B-14MW (10-12)**	**20B-15MW(3-5)**
Sampling Date			**10/14/2020**	**11/12/2020**	**10/14/2020**	**10/19/2020**	**10/14/2020**	**10/14/2020**	**11/9/2020**	**10/14/2020**
Lab ID			**20J0725**	**20K0635**	**20J0725**	**20J0937**	**20J0725**	**20J0725**	**20K0411**	**20J0725**
Parameter / Sample Depth (feet)	**RCS-1**	**RCS-2**	**2 - 3**	**9 - 11**	**3 - 5**	**6 - 8**	**3 - 5**	**3 - 5**	**10 - 12**	**3 - 5**
SW-846 8082A (mg/Kg dry)										
PCB 1016	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1221	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1232	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1242	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1248	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1254	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1260	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1262	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
PCB 1268	1	4	ND (0.086)	ND (0.095)	ND (0.092)	ND (0.097)	ND (0.081)	ND (0.081)	ND (0.093)	ND (0.084)
SW-846 8100 Modified (mg/Kg dry)										
TPH	1000	3000	100	10	13	630	87	89	ND (9.7)	67
SW-846 8260C-D (mg/Kg wet)										
ACETONE	6	50	ND (0.089)	ND (0.074)	ND (0.077)	ND (0.073)	ND (0.076)	ND (0.079)	ND (0.078)	ND (0.083)
TERT-AMYL METHYL ETHER	~	~	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
BENZENE	2	200	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
BROMOBENZENE	100	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
BROMOCHLOROMETHANE	--	--	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
BROMODICHLOROMETHANE	0.1	0.1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
BROMOFORM	0.1	1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
BROMOMETHANE	0.5	0.5	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
2-BUTANONE (MEK)	4	50	ND (0.036)	ND (0.030)	ND (0.031)	ND (0.029)	ND (0.031)	ND (0.032)	ND (0.031)	ND (0.033)
N-BUTYLBENZENE	--	--	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
SEC-BUTYLBENZENE	--	--	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
TERT-BUTYLBENZENE	100	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
TERT-BUTYLETHYL ETHER	--	--	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
CARBON DISULFIDE	100	1000	ND (0.0054)	ND (0.0044)	ND (0.0046)	ND (0.0044)	ND (0.0046)	ND (0.0047)	ND (0.0047)	ND (0.0050)
CARBON TETRACHLORIDE	5	5	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
CHLOROBENZENE	1	3	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
CHLORODIBROMOMETHANE	0.005	0.03	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
CHLOROETHANE	100	1000	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
CHLOROFORM	0.2	0.2	ND (0.0036)	ND (0.0030)	ND (0.0031)	ND (0.0029)	ND (0.0031)	ND (0.0032)	ND (0.0031)	ND (0.0033)
CHLOROMETHANE	100	1000	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
2-CHLOROTOLUENE	100	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
4-CHLOROTOLUENE	100	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,2-DIBROMO-3-CHLOROPROPANE	10	100	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,2-DIBROMOETHANE (EDB)	0.1	0.1	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
DIBROMOMETHANE	500	5000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,2-DICHLOROBENZENE	9	100	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,3-DICHLOROBENZENE	3	200	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,4-DICHLOROBENZENE	0.7	1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
DICHLORODIFLUOROMETHANE	1000	10000	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
1,1-DICHLOROETHANE	0.4	9	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,2-DICHLOROETHANE	0.1	0.1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,1-DICHLOROETHYLENE	3	40	ND (0.0036)	ND (0.0030)	ND (0.0031)	ND (0.0029)	ND (0.0031)	ND (0.0032)	ND (0.0031)	ND (0.0033)
CIS-1,2-DICHLOROETHYLENE	0.1	0.1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
TRANS-1,2-DICHLOROETHYLENE	1	1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,2-DICHLOROPROPANE	0.1	0.1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,3-DICHLOROPROPANE	500	5000	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
2,2-DICHLOROPROPANE	0.1	0.2	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,1-DICHLOROPROPENE	0.01	0.1	ND (0.0036)	ND (0.0015)	ND (0.0031)	ND (0.0015)	ND (0.0031)	ND (0.0032)	ND (0.0016)	ND (0.0033)
CIS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
TRANS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
DIETHYL ETHER	100	1000	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
DIISOPROPYL ETHER	100	1000	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
1,4-DIOXANE	0.2	6	ND (0.089)	ND (0.074)	ND (0.077)	ND (0.073)	ND (0.076)	ND (0.079)	ND (0.078)	ND (0.083)
ETHYLBENZENE	40	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
HEXACHLOROBUTADIENE	30	100	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
2-HEXANONE	100	1000	ND (0.018)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.016)	ND (0.016)	ND (0.017)
ISOPROPYLBENZENE	1000	10000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
P-ISOPROPYLTOLUENE	100	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.0036)	ND (0.0030)	ND (0.0031)	ND (0.0029)	ND (0.0031)	ND (0.0032)	ND (0.0031)	ND (0.0033)
METHYLENE CHLORIDE	0.1	4	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

			Revere Borings							
Sample Location	**MCP Reportable Concentrations**		**20B-1(2-3)**	**20B-1 (9-11')**	**20B-5(3-5)**	**20B-5 (6-8)**	**20B-14MW(3-5)**	**20B-14MW(3-5)DUP**	**20B-14MW (10-12)**	**20B-15MW(3-5)**
Sampling Date			**10/14/2020**	**11/12/2020**	**10/14/2020**	**10/19/2020**	**10/14/2020**	**10/14/2020**	**11/9/2020**	**10/14/2020**
Lab ID			**20J0725**	**20K0635**	**20J0725**	**20J0937**	**20J0725**	**20J0725**	**20K0411**	**20J0725**
Parameter Sample Depth (feet)	**RCS-1**	**RCS-2**	**2 - 3**	**9 - 11**	**3 - 5**	**6 - 8**	**3 - 5**	**3 - 5**	**10 - 12**	**3 - 5**
4-METHYL-2-PENTANONE (MIBK)	0.4	50	ND (0.018)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.016)	ND (0.016)	ND (0.017)
NAPHTHALENE	4	20	ND (0.0036)	ND (0.0030)	ND (0.0031)	ND (0.0029)	ND (0.0031)	ND (0.0032)	ND (0.0031)	ND (0.0033)
N-PROPYLBENZENE	100	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
STYRENE	3	4	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,1,1,2-TETRACHLOROETHANE	0.1	0.1	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,1,2,2-TETRACHLOROETHANE	0.005	0.02	ND (0.00089)	ND (0.00074)	ND (0.00077)	ND (0.00073)	ND (0.00076)	ND (0.00079)	ND (0.00078)	ND (0.00083)
TETRACHLOROETHYLENE	1	10	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
TETRAHYDROFURAN	500	5000	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
TOLUENE	30	1000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,2,3-TRICHLOROBENZENE	--	--	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,1,1-TRICHLOROETHANE	30	600	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,1,2-TRICHLOROETHANE	0.1	2	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
TRICHLOROETHYLENE	0.3	0.3	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
TRICHLOROFLUOROMETHANE	1000	10000	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
1,2,3-TRICHLOROPROPANE	100	1000	ND (0.0036)	ND (0.0015)	ND (0.0031)	ND (0.0015)	ND (0.0031)	ND (0.0032)	ND (0.0016)	ND (0.0033)
1,2,4-TRIMETHYLBENZENE	1000	10000	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
1,3,5-TRIMETHYLBENZENE	10	100	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
VINYL CHLORIDE	0.7	0.7	ND (0.0089)	ND (0.0074)	ND (0.0077)	ND (0.0073)	ND (0.0076)	ND (0.0079)	ND (0.0078)	ND (0.0083)
M/P-XYLENE	100	100	ND (0.0036)	ND (0.0030)	ND (0.0031)	ND (0.0029)	ND (0.0031)	ND (0.0032)	ND (0.0031)	ND (0.0033)
O-XYLENE	100	100	ND (0.0018)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0016)	ND (0.0017)
SW-846 8270D-E (mg/Kg dry)										
ACENAPHTHENE	4	3000	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
ACENAPHTHYLENE	1	10	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
ACETOPHENONE	1000	10000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
ANILINE	1000	10000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
ANTHRACENE	1000	3000	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
BENZO(A)ANTHRACENE	7	40	0.50	ND (0.20)	ND (0.20)	0.46	0.39	0.48	ND (0.20)	0.34
BENZO(A)PYRENE	2	7	0.62	ND (0.20)	ND (0.20)	0.69	0.45	0.48	ND (0.20)	0.35
BENZO(B)FLUORANTHENE	7	40	0.77	ND (0.20)	ND (0.20)	0.71	0.60	0.55	ND (0.20)	0.38
BENZO(G,H,I)PERYLENE	1000	3000	0.47	ND (0.20)	ND (0.20)	0.53	0.26	0.26	ND (0.20)	0.23
BENZO(K)FLUORANTHENE	70	400	0.29	ND (0.20)	ND (0.20)	0.28	0.23	0.21	ND (0.20)	ND (0.18)
BIS(2-CHLOROETHOXY)METHANE	500	5000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
BIS(2-CHLOROETHYL)ETHER	0.7	0.7	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
BIS(2-CHLOROISOPROPYL)ETHER	0.7	0.7	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
BIS(2-ETHYLHEXYL)PHTHALATE	90	600	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
4-BROMOPHENYL PHENYL ETHER	100	1000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
BUTYLBENZYLPHTHALATE	100	1000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
4-CHLOROANILINE	1	3	ND (0.71)	ND (0.78)	ND (0.76)	ND (0.80)	ND (0.67)	ND (0.67)	ND (0.77)	ND (0.69)
2-CHLORONAPHTHALENE	1000	10000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2-CHLOROPHENOL	0.7	100	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
CHRYSENE	70	400	0.60	ND (0.20)	ND (0.20)	0.42	0.42	0.48	ND (0.20)	0.33
DIBENZ(A,H)ANTHRACENE	0.7	4	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
DIBENZOFURAN	100	1000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
DI-N-BUTYLPHTHALATE	50	500	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
1,2-DICHLOROBENZENE	9	100	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
1,3-DICHLOROBENZENE	3	200	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
1,4-DICHLOROBENZENE	0.7	1	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
3,3'-DICHLOROBENZIDINE	3	20	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
2,4-DICHLOROPHENOL	0.7	40	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
DIETHYLPHTHALATE	10	200	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2,4-DIMETHYLPHENOL	0.7	100	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
DIMETHYLPHTHALATE	0.7	50	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2,4-DINITROPHENOL	3	50	ND (0.71)	ND (0.78)	ND (0.76)	ND (0.80)	ND (0.67)	ND (0.67)	ND (0.77)	ND (0.69)
2,4-DINITROTOLUENE	0.7	10	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2,6-DINITROTOLUENE	100	1000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
DI-N-OCTYLPHTHALATE	1000	10000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	50	500	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
FLUORANTHENE	1000	3000	0.99	ND (0.20)	ND (0.20)	0.81	0.73	0.95	ND (0.20)	0.66
FLUORENE	1000	3000	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
HEXACHLOROBENZENE	0.7	0.8	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
HEXACHLOROBUTADIENE	30	100	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
HEXACHLOROETHANE	0.7	3	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

			Revere Borings							
Sample Location	**MCP Reportable Concentrations**		**20B-1(2-3)**	**20B-1 (9-11')**	**20B-5(3-5)**	**20B-5 (6-8)**	**20B-14MW(3-5)**	**20B-14MW(3-5)DUP**	**20B-14MW (10-12)**	**20B-15MW(3-5)**
Sampling Date			**10/14/2020**	**11/12/2020**	**10/14/2020**	**10/19/2020**	**10/14/2020**	**10/14/2020**	**11/9/2020**	**10/14/2020**
Lab ID			**20J0725**	**20K0635**	**20J0725**	**20J0937**	**20J0725**	**20J0725**	**20K0411**	**20J0725**
Parameter Sample Depth (feet)	**RCS-1**	**RCS-2**	**2 - 3**	**9 - 11**	**3 - 5**	**6 - 8**	**3 - 5**	**3 - 5**	**10 - 12**	**3 - 5**
INDENO(1,2,3-CD)PYRENE	7	40	0.45	ND (0.20)	ND (0.20)	0.55	0.30	0.30	ND (0.20)	0.24
ISOPHORONE	100	1000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2-METHYLNAPHTHALENE	0.7	80	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
O-CRESOL	500	5000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
M/P-CRESOL	500	5000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
NAPHTHALENE	4	20	ND (0.18)	ND (0.20)	ND (0.20)	ND (0.21)	ND (0.17)	ND (0.17)	ND (0.20)	ND (0.18)
NITROBENZENE	500	5000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2-NITROPHENOL	100	1000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
4-NITROPHENOL	100	1000	ND (0.71)	ND (0.78)	ND (0.76)	ND (0.80)	ND (0.67)	ND (0.67)	ND (0.77)	ND (0.69)
PENTACHLOROPHENOL	3	10	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
PHENANTHRENE	10	1000	0.47	ND (0.20)	ND (0.20)	0.22	0.33	0.53	ND (0.20)	0.33
PHENOL	1	20	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
PYRENE	1000	3000	1.1	ND (0.20)	ND (0.20)	0.97	0.89	1.2	ND (0.20)	0.73
PYRIDINE	500	5000	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2,4,5-TRICHLOROPHENOL	4	600	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
2,4,6-TRICHLOROPHENOL	0.7	20	ND (0.36)	ND (0.40)	ND (0.39)	ND (0.41)	ND (0.35)	ND (0.35)	ND (0.40)	ND (0.36)
SW-846 9014 (mg/Kg)										
REACTIVE CYANIDE	--	--	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)	ND (3.9)	ND (4.0)	ND (4.0)
SW-846 9030A (mg/Kg)										
REACTIVE SULFIDE	--	--	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
SW-846 9045C (pH Units)										
PH	--	--	7.2	7.9	6.9	8.2	6.9	6.8	8.5	6.8

NOTES:
1. An asterisk (*) following a detection limit indicates that the minimum laboratory reporting limit exceeds one or more of the regulatory criteria.
2. ND = Not detected above the lab reporting limits shown in parenthesis.
3. Shaded values exceed the MCP Reportable Concentrations (RCs).

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

	MCP Reportable Concentrations		*Revere Borings*							
Sample Location			**20B-16MW(3-5)**	**20B-16MW(3-5)DUP**	**20B-16MW (7-9)**	**20B-17MW(1-3)**	**20B-17MW (6-8)**	**20B-18(3-5)**	**20B-18(3-5)DUP**	**20B-18MW (7-9)**
Sampling Date			**10/14/2020**	**10/14/2020**	**10/20/2020**	**10/14/2020**	**10/19/2020**	**10/14/2020**	**10/14/2020**	**11/10/2020**
Lab ID			**20J0725**	**20J0725**	**20J0986**	**20J0725**	**20J0937**	**20J0725**	**20J0725**	**20K0494**
Parameter Sample Depth (feet)	**RCS-1**	**RCS-2**	**3 - 5**	**3 - 5**	**7 - 9**	**1 - 3**	**6 - 8**	**3 - 5**	**3 - 5**	**7 - 9**
MADEP EPH rev 2.1 (mg/Kg dry)										
C9-C18 ALIPHATICS	1000	3000	ND (10)	ND (10)	ND (11)	ND (52)	ND (11)	ND (11)	ND (11)	ND (12)
C19-C36 ALIPHATICS	3000	5000	ND (10)	ND (10)	18	380	27	ND (11)	ND (11)	12
C11-C22 AROMATICS	1000	3000	ND (10)	ND (10)	22	360	48	ND (11)	ND (11)	14
ACENAPHTHENE	4	3000	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.52)	0.46	ND (0.11)	ND (0.11)	ND (0.12)
ACENAPHTHYLENE	1	10	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.52)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.12)
ANTHRACENE	1000	3000	ND (0.10)	ND (0.10)	0.11	ND (0.52)	0.83	ND (0.11)	ND (0.11)	ND (0.12)
BENZO(A)ANTHRACENE	7	40	ND (0.10)	0.12	0.26	0.93	0.95	ND (0.11)	ND (0.11)	ND (0.12)
BENZO(A)PYRENE	2	7	ND (0.10)	0.16	0.26	1.0	0.80	ND (0.11)	ND (0.11)	0.13
BENZO(B)FLUORANTHENE	7	40	ND (0.10)	0.19	0.32	1.5	0.78	ND (0.11)	ND (0.11)	0.15
BENZO(G,H,I)PERYLENE	1000	3000	ND (0.10)	0.12	0.23	ND (0.52)	0.39	ND (0.11)	ND (0.11)	ND (0.12)
BENZO(K)FLUORANTHENE	70	400	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.52)	0.26	ND (0.11)	ND (0.11)	ND (0.12)
CHRYSENE	70	400	ND (0.10)	0.16	0.30	1.0	0.97	ND (0.11)	ND (0.11)	ND (0.12)
DIBENZ(A,H)ANTHRACENE	0.7	4	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.52)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.12)
FLUORANTHENE	1000	3000	0.12	0.26	0.43	1.4	2.2	ND (0.11)	0.16	0.15
FLUORENE	1000	3000	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.52)	0.97	ND (0.11)	ND (0.11)	ND (0.12)
INDENO(1,2,3-CD)PYRENE	7	40	ND (0.10)	0.10	0.17	ND (0.52)	0.35	ND (0.11)	ND (0.11)	ND (0.12)
2-METHYLNAPHTHALENE	0.7	80	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.52)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.12)
NAPHTHALENE	4	20	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.52)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.12)
PHENANTHRENE	10	1000	ND (0.10)	ND (0.10)	0.33	0.68	4.5	ND (0.11)	ND (0.11)	ND (0.12)
PYRENE	1000	3000	0.17	0.38	0.61	2.3	2.8	ND (0.11)	0.16	0.19
MADEP-VPH-Feb 2018 Rev 2.1 (mg/Kg dry)										
C5-C8 ALIPHATICS	100	500	ND (10)	ND (11)	ND (8.4)	ND (15)	ND (9.4)	ND (12)	ND (11)	ND (12)
C9-C12 ALIPHATICS	1000	3000	ND (10)	ND (11)	ND (8.4)	ND (15)	ND (9.4)	ND (12)	ND (11)	ND (12)
C9-C10 AROMATICS	100	500	ND (10)	ND (11)	ND (8.4)	ND (15)	ND (9.4)	ND (12)	ND (11)	ND (12)
BENZENE	2	200	ND (0.051)	ND (0.056)	ND (0.042)	ND (0.077)	ND (0.047)	ND (0.058)	ND (0.057)	ND (0.062)
ETHYLBENZENE	40	1000	ND (0.051)	ND (0.056)	ND (0.042)	ND (0.077)	ND (0.047)	ND (0.058)	ND (0.057)	ND (0.062)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.051)	ND (0.056)	ND (0.042)	ND (0.077)	ND (0.047)	ND (0.058)	ND (0.057)	ND (0.062)
NAPHTHALENE	4	20	ND (0.25)	ND (0.28)	ND (0.21)	ND (0.38)	0.70	ND (0.29)	ND (0.29)	ND (0.31)
TOLUENE	30	1000	ND (0.051)	ND (0.056)	ND (0.042)	ND (0.077)	ND (0.047)	ND (0.058)	ND (0.057)	ND (0.062)
M/P-XYLENE	100	100	ND (0.10)	ND (0.11)	ND (0.084)	ND (0.15)	ND (0.094)	ND (0.12)	ND (0.11)	ND (0.12)
O-XYLENE	100	100	ND (0.051)	ND (0.056)	ND (0.042)	ND (0.077)	ND (0.047)	ND (0.058)	ND (0.057)	ND (0.062)
SM 2540G (% Wt)										
% Solids	--	--	94.9	95.5	92.3	95.8	86.4	87.4	88.6	83.5
SM21-22 2510B Modified (µmhos/cm)										
SPECIFIC CONDUCTANCE	--	--	19	12	3.5	2.5	4.4	52	46	71
SM2580 A (mV)										
OXIDATION/REDUCTION POTENTIAL	--	--	130	130	120	120	160	100	110	140
SW-846 1010A (°F)										
FLASHPOINT	--	--	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F
SW-846 6010D (mg/Kg dry) Metals Digestion										
ANTIMONY	20	30	ND (1.7)	ND (1.8)	ND (1.8)	ND (1.7)	ND (1.8)	ND (1.8)	ND (1.8)	ND (1.9)
ARSENIC	20	20	ND (3.4)	ND (3.5)	ND (3.5)	3.7	ND (3.6)	ND (3.7)	ND (3.6)	ND (3.8)
BARIUM	1000	3000	7.9	8.0	8.1	44	7.0	7.7	8.8	5.4
BERYLLIUM	90	200	ND (0.17)	ND (0.18)	ND (0.18)	0.26	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.19)
CADMIUM	70	100	ND (0.34)	ND (0.35)	ND (0.35)	ND (0.34)	ND (0.36)	ND (0.37)	ND (0.36)	ND (0.38)
CHROMIUM	100	200	5.0	7.1	7.3	17	10	6.6	7.3	6.5
LEAD	200	600	14	18	20	92	5.9	8.8	9.2	5.7
NICKEL	600	1000	9.2	5.6	4.3	14	4.2	4.9	4.6	3.9
SELENIUM	400	700	ND (3.4)	ND (3.5)	ND (3.5)	ND (3.4)	ND (3.6)	ND (3.7)	ND (3.6)	ND (3.8)
SILVER	100	200	ND (0.34)	ND (0.35)	0.70	ND (0.34)	ND (0.36)	ND (0.37)	ND (0.36)	0.62
THALLIUM	8	60	ND (1.7)	ND (1.8)	ND (1.8)	ND (1.7)	ND (1.8)	ND (1.8)	ND (1.8)	ND (1.9)
VANADIUM	400	700	7.8	11	9.3	29	7.0	9.7	11	8.3
ZINC	1000	3000	20	23	21	87	12	24	24	16
SW-846 7196A (mg/Kg dry)										
CHROMIUM +6	100	200	ND (0.16)	ND (0.16)	ND (0.17)	ND (0.16)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.19)
SW-846 7471B (mg/Kg dry) Metals Digestion										
MERCURY	20	30	ND (0.026)	0.031	ND (0.027)	0.13	ND (0.029)	ND (0.029)	ND (0.028)	ND (0.029)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

Sample Location	MCP Reportable Concentrations		*Revere Borings* 20B-16MW(3-5)	20B-16MW(3-5)DUP	20B-16MW (7-9)	20B-17MW(1-3)	20B-17MW (6-8)	20B-18(3-5)	20B-18(3-5)DUP	20B-18MW (7-9)
Sampling Date			10/14/2020	10/14/2020	10/20/2020	10/14/2020	10/19/2020	10/14/2020	10/14/2020	11/10/2020
Lab ID			20J0725	20J0725	20J0986	20J0725	20J0937	20J0725	20J0725	20K0494
Parameter / **Sample Depth (feet)**	**RCS-1**	**RCS-2**	3 - 5	3 - 5	7 - 9	1 - 3	6 - 8	3 - 5	3 - 5	7 - 9
SW-846 8082A (mg/Kg dry)										
PCB 1016	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1221	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1232	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1242	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1248	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1254	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1260	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1262	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
PCB 1268	1	4	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.093)	ND (0.092)	ND (0.089)	ND (0.096)
SW-846 8100 Modified (mg/Kg dry)										
TPH	1000	3000	18	19	83	690	89	24	70	46
SW-846 8260C-D (mg/Kg wet)										
ACETONE	6	50	ND (0.070)	ND (0.076)	ND (0.059)	ND (0.083)	ND (0.081)	ND (0.072)	ND (0.072)	ND (0.078)
TERT-AMYL METHYL ETHER	~	~	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
BENZENE	2	200	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
BROMOBENZENE	100	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
BROMOCHLOROMETHANE	--	--	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
BROMODICHLOROMETHANE	0.1	0.1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
BROMOFORM	0.1	1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
BROMOMETHANE	0.5	0.5	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
2-BUTANONE (MEK)	4	50	ND (0.028)	ND (0.030)	ND (0.024)	ND (0.033)	ND (0.032)	ND (0.029)	ND (0.029)	ND (0.031)
N-BUTYLBENZENE	--	--	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
SEC-BUTYLBENZENE	--	--	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
TERT-BUTYLBENZENE	100	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
TERT-BUTYLETHYL ETHER	--	--	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
CARBON DISULFIDE	100	1000	ND (0.0042)	ND (0.0045)	ND (0.0035)	ND (0.0050)	ND (0.0049)	ND (0.0043)	ND (0.0043)	ND (0.0047)
CARBON TETRACHLORIDE	5	5	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
CHLOROBENZENE	1	3	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
CHLORODIBROMOMETHANE	0.005	0.03	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
CHLOROETHANE	100	1000	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
CHLOROFORM	0.2	0.2	ND (0.0028)	ND (0.0030)	ND (0.0024)	ND (0.0033)	ND (0.0032)	ND (0.0029)	ND (0.0029)	ND (0.0031)
CHLOROMETHANE	100	1000	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
2-CHLOROTOLUENE	100	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
4-CHLOROTOLUENE	100	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,2-DIBROMO-3-CHLOROPROPANE	10	100	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,2-DIBROMOETHANE (EDB)	0.1	0.1	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
DIBROMOMETHANE	500	5000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,2-DICHLOROBENZENE	9	100	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,3-DICHLOROBENZENE	3	200	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,4-DICHLOROBENZENE	0.7	1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
DICHLORODIFLUOROMETHANE	1000	10000	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
1,1-DICHLOROETHANE	0.4	9	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,2-DICHLOROETHANE	0.1	0.1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,1-DICHLOROETHYLENE	3	40	ND (0.0028)	ND (0.0030)	ND (0.0024)	ND (0.0033)	ND (0.0032)	ND (0.0029)	ND (0.0029)	ND (0.0031)
CIS-1,2-DICHLOROETHYLENE	0.1	0.1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
TRANS-1,2-DICHLOROETHYLENE	1	1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,2-DICHLOROPROPANE	0.1	0.1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,3-DICHLOROPROPANE	500	5000	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
2,2-DICHLOROPROPANE	0.1	0.2	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,1-DICHLOROPROPENE	0.01	0.1	ND (0.0028)	ND (0.0030)	ND (0.0024)	ND (0.0033)	ND (0.0016)	ND (0.0029)	ND (0.0029)	ND (0.0016)
CIS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
TRANS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
DIETHYL ETHER	100	1000	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
DIISOPROPYL ETHER	100	1000	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
1,4-DIOXANE	0.2	6	ND (0.070)	ND (0.076)	ND (0.059)	ND (0.083)	ND (0.081)	ND (0.072)	ND (0.072)	ND (0.078)
ETHYLBENZENE	40	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
HEXACHLOROBUTADIENE	30	100	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
2-HEXANONE	100	1000	ND (0.014)	ND (0.015)	ND (0.012)	ND (0.017)	ND (0.016)	ND (0.014)	ND (0.014)	ND (0.016)
ISOPROPYLBENZENE	1000	10000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
P-ISOPROPYLTOLUENE	100	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.0028)	ND (0.0030)	ND (0.0024)	ND (0.0033)	ND (0.0032)	ND (0.0029)	ND (0.0029)	ND (0.0031)
METHYLENE CHLORIDE	0.1	4	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

Sample Location	MCP Reportable Concentrations		*Revere Borings* 20B-16MW(3-5)	20B-16MW(3-5)DUP	20B-16MW (7-9)	20B-17MW(1-3)	20B-17MW (6-8)	20B-18(3-5)	20B-18(3-5)DUP	20B-18MW (7-9)
Sampling Date			10/14/2020	10/14/2020	10/20/2020	10/14/2020	10/19/2020	10/14/2020	10/14/2020	11/10/2020
Lab ID			20J0725	20J0725	20J0986	20J0725	20J0937	20J0725	20J0725	20K0494
Parameter / Sample Depth (feet)	RCS-1	RCS-2	3 - 5	3 - 5	7 - 9	1 - 3	6 - 8	3 - 5	3 - 5	7 - 9
4-METHYL-2-PENTANONE (MIBK)	0.4	50	ND (0.014)	ND (0.015)	ND (0.012)	ND (0.017)	ND (0.016)	ND (0.014)	ND (0.014)	ND (0.016)
NAPHTHALENE	4	20	ND (0.0028)	ND (0.0030)	0.0078	ND (0.0033)	0.12	ND (0.0029)	ND (0.0029)	ND (0.0031)
N-PROPYLBENZENE	100	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
STYRENE	3	4	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,1,1,2-TETRACHLOROETHANE	0.1	0.1	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,1,2,2-TETRACHLOROETHANE	0.005	0.02	ND (0.00070)	ND (0.00076)	ND (0.00059)	ND (0.00083)	ND (0.00081)	ND (0.00072)	ND (0.00072)	ND (0.00078)
TETRACHLOROETHYLENE	1	10	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
TETRAHYDROFURAN	500	5000	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
TOLUENE	30	1000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,2,3-TRICHLOROBENZENE	--	--	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,1,1-TRICHLOROETHANE	30	600	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,1,2-TRICHLOROETHANE	0.1	2	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
TRICHLOROETHYLENE	0.3	0.3	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
TRICHLOROFLUOROMETHANE	1000	10000	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
1,2,3-TRICHLOROPROPANE	100	1000	ND (0.0028)	ND (0.0030)	ND (0.0024)	ND (0.0033)	ND (0.0016)	ND (0.0029)	ND (0.0029)	ND (0.0016)
1,2,4-TRIMETHYLBENZENE	1000	10000	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
1,3,5-TRIMETHYLBENZENE	10	100	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
VINYL CHLORIDE	0.7	0.7	ND (0.0070)	ND (0.0076)	ND (0.0059)	ND (0.0083)	ND (0.0081)	ND (0.0072)	ND (0.0072)	ND (0.0078)
M/P-XYLENE	100	100	ND (0.0028)	ND (0.0030)	ND (0.0024)	ND (0.0033)	ND (0.0032)	ND (0.0029)	ND (0.0029)	ND (0.0031)
O-XYLENE	100	100	ND (0.0014)	ND (0.0015)	ND (0.0012)	ND (0.0017)	ND (0.0016)	ND (0.0014)	ND (0.0014)	ND (0.0016)
SW-846 8270D-E (mg/Kg dry)										
ACENAPHTHENE	4	3000	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.20)	ND (0.19)	ND (0.19)	ND (0.20)
ACENAPHTHYLENE	1	10	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.20)	ND (0.19)	ND (0.19)	ND (0.20)
ACETOPHENONE	1000	10000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
ANILINE	1000	10000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
ANTHRACENE	1000	3000	ND (0.18)	ND (0.18)	0.19	0.36	0.40	ND (0.19)	0.37	ND (0.20)
BENZO(A)ANTHRACENE	7	40	ND (0.18)	ND (0.18)	0.43	1.6	0.48	ND (0.19)	0.63	ND (0.20)
BENZO(A)PYRENE	2	7	ND (0.18)	ND (0.18)	0.47	1.6	0.41	ND (0.19)	0.53	ND (0.20)
BENZO(B)FLUORANTHENE	7	40	ND (0.18)	ND (0.18)	0.44	1.6	0.36	ND (0.19)	0.58	ND (0.20)
BENZO(G,H,I)PERYLENE	1000	3000	ND (0.18)	ND (0.18)	0.33	0.97	0.25	ND (0.19)	0.29	ND (0.20)
BENZO(K)FLUORANTHENE	70	400	ND (0.18)	ND (0.18)	ND (0.18)	0.55	ND (0.20)	ND (0.19)	0.23	ND (0.20)
BIS(2-CHLOROETHOXY)METHANE	500	5000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
BIS(2-CHLOROETHYL)ETHER	0.7	0.7	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
BIS(2-CHLOROISOPROPYL)ETHER	0.7	0.7	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
BIS(2-ETHYLHEXYL)PHTHALATE	90	600	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
4-BROMOPHENYL PHENYL ETHER	100	1000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
BUTYLBENZYLPHTHALATE	100	1000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
4-CHLOROANILINE	1	3	ND (0.69)	ND (0.69)	ND (0.71)	ND (0.69)	ND (0.76)	ND (0.75)	ND (0.74)	ND (0.79)
2-CHLORONAPHTHALENE	1000	10000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2-CHLOROPHENOL	0.7	100	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
CHRYSENE	70	400	ND (0.18)	ND (0.18)	0.44	1.7	0.44	ND (0.19)	0.57	ND (0.20)
DIBENZ(A,H)ANTHRACENE	0.7	4	ND (0.18)	ND (0.18)	ND (0.18)	0.25	ND (0.20)	ND (0.19)	ND (0.19)	ND (0.20)
DIBENZOFURAN	100	1000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
DI-N-BUTYLPHTHALATE	50	500	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
1,2-DICHLOROBENZENE	9	100	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
1,3-DICHLOROBENZENE	3	200	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
1,4-DICHLOROBENZENE	0.7	1	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
3,3'-DICHLOROBENZIDINE	3	20	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.20)	ND (0.19)	ND (0.19)	ND (0.20)
2,4-DICHLOROPHENOL	0.7	40	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
DIETHYLPHTHALATE	10	200	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2,4-DIMETHYLPHENOL	0.7	100	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
DIMETHYLPHTHALATE	0.7	50	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2,4-DINITROPHENOL	3	50	ND (0.69)	ND (0.69)	ND (0.71)	ND (0.69)	ND (0.76)	ND (0.75)	ND (0.74)	ND (0.79)
2,4-DINITROTOLUENE	0.7	10	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2,6-DINITROTOLUENE	100	1000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
DI-N-OCTYLPHTHALATE	1000	10000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	50	500	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
FLUORANTHENE	1000	3000	ND (0.18)	ND (0.18)	0.72	2.4	1.1	0.20	1.4	ND (0.20)
FLUORENE	1000	3000	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	0.37	ND (0.19)	ND (0.19)	ND (0.20)
HEXACHLOROBENZENE	0.7	0.8	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
HEXACHLOROBUTADIENE	30	100	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
HEXACHLOROETHANE	0.7	3	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

			Revere Borings							
Sample Location	**MCP Reportable Concentrations**		**20B-16MW(3-5)**	**20B-16MW(3-5)DUP**	**20B-16MW (7-9)**	**20B-17MW(1-3)**	**20B-17MW (6-8)**	**20B-18(3-5)**	**20B-18(3-5)DUP**	**20B-18MW (7-9)**
Sampling Date			**10/14/2020**	**10/14/2020**	**10/20/2020**	**10/14/2020**	**10/19/2020**	**10/14/2020**	**10/14/2020**	**11/10/2020**
Lab ID			**20J0725**	**20J0725**	**20J0986**	**20J0725**	**20J0937**	**20J0725**	**20J0725**	**20K0494**
Parameter **Sample Depth (feet)**	**RCS-1**	**RCS-2**	**3 - 5**	**3 - 5**	**7 - 9**	**1 - 3**	**6 - 8**	**3 - 5**	**3 - 5**	**7 - 9**
INDENO(1,2,3-CD)PYRENE	7	40	ND (0.18)	ND (0.18)	0.30	0.78	0.20	ND (0.19)	0.31	ND (0.20)
ISOPHORONE	100	1000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2-METHYLNAPHTHALENE	0.7	80	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.20)	ND (0.19)	ND (0.19)	ND (0.20)
O-CRESOL	500	5000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
M/P-CRESOL	500	5000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
NAPHTHALENE	4	20	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.20)	ND (0.19)	ND (0.19)	ND (0.20)
NITROBENZENE	500	5000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2-NITROPHENOL	100	1000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
4-NITROPHENOL	100	1000	ND (0.69)	ND (0.69)	ND (0.71)	ND (0.69)	ND (0.76)	ND (0.75)	ND (0.74)	ND (0.79)
PENTACHLOROPHENOL	3	10	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
PHENANTHRENE	10	1000	ND (0.18)	ND (0.18)	0.54	1.4	2.2	ND (0.19)	1.5	ND (0.20)
PHENOL	1	20	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
PYRENE	1000	3000	0.22	0.24	1.0	3.8	1.4	0.21	1.5	ND (0.20)
PYRIDINE	500	5000	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2,4,5-TRICHLOROPHENOL	4	600	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
2,4,6-TRICHLOROPHENOL	0.7	20	ND (0.36)	ND (0.35)	ND (0.36)	ND (0.36)	ND (0.39)	ND (0.39)	ND (0.38)	ND (0.41)
SW-846 9014 (mg/Kg)										
REACTIVE CYANIDE	--	--	ND (4.0)	ND (3.9)	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)	ND (3.9)	ND (4.0)
SW-846 9030A (mg/Kg)										
REACTIVE SULFIDE	--	--	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
SW-846 9045C (pH Units)										
PH	--	--	7.4	7.4	8.2	7.2	7.0	7.0	7.1	7.3

NOTES:
1. An asterisk (*) following a detection limit indicates that the minimum laboratory reporting limit exceeds one or more of the regulatory criteria.
2. ND = Not detected above the lab reporting limits shown in parenthesis.
3. Shaded values exceed the MCP Reportable Concentrations (RCs).

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

	MCP Reportable Concentrations		Lynn Borings						
Sample Location			20B-9 (3-5)	20B-9 (7-9)	20B-10MW (3-5')	20B-10MW(7-9)	20B-11MW (3-5')	20B-11MW(8-10)	20B-12MW (3-5')
Sampling Date			10/27/2020	10/27/2020	10/13/2020	10/21/2020	10/13/2020	10/21/2020	10/13/2020
Lab ID			20J1488	20J1488	20J0631	20J1122	20J0631	20J1122	20J0631
Parameter / Sample Depth (feet)	RCS-1	RCS-2	3 - 5	7 - 9	3 - 5	7 - 9	3 - 5	8 - 10	3 - 5
MADEP EPH rev 2.1 (mg/Kg dry)									
C9-C18 ALIPHATICS	1000	3000	ND (11)	ND (12)	ND (12)	47	ND (12)	ND (12)	ND (13)
C19-C36 ALIPHATICS	3000	5000	ND (11)	ND (12)	18	61	16	32	16
C11-C22 AROMATICS	1000	3000	ND (11)	ND (12)	ND (12)	42	ND (12)	35	ND (13)
ACENAPHTHENE	4	3000	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.13)
ACENAPHTHYLENE	1	10	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.13)
ANTHRACENE	1000	3000	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	0.21	ND (0.13)
BENZO(A)ANTHRACENE	7	40	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	1.5	ND (0.13)
BENZO(A)PYRENE	2	7	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	1.7	ND (0.13)
BENZO(B)FLUORANTHENE	7	40	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	2.0	ND (0.13)
BENZO(G,H,I)PERYLENE	1000	3000	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	0.89	ND (0.13)
BENZO(K)FLUORANTHENE	70	400	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	0.78	ND (0.13)
CHRYSENE	70	400	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	1.8	ND (0.13)
DIBENZ(A,H)ANTHRACENE	0.7	4	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	0.26	ND (0.13)
FLUORANTHENE	1000	3000	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	2.2	ND (0.13)
FLUORENE	1000	3000	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.13)
INDENO(1,2,3-CD)PYRENE	7	40	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	0.85	ND (0.13)
2-METHYLNAPHTHALENE	0.7	80	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.13)
NAPHTHALENE	4	20	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.13)
PHENANTHRENE	10	1000	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	0.85	ND (0.13)
PYRENE	1000	3000	ND (0.11)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	2.2	ND (0.13)
MADEP-VPH-Feb 2018 Rev 2.1 (mg/Kg dry)									
C5-C8 ALIPHATICS	100	500	ND (12)	ND (12)	ND (13)	ND (11)	ND (13)	ND (12)	ND (16)
C9-C12 ALIPHATICS	1000	3000	ND (12)	ND (12)	ND (13)	14	ND (13)	ND (12)	ND (16)
C9-C10 AROMATICS	100	500	ND (12)	ND (12)	ND (13)	ND (11)	ND (13)	ND (12)	ND (16)
BENZENE	2	200	ND (0.062)	ND (0.058)	ND (0.066)	ND (0.055)	ND (0.067)	ND (0.061)	ND (0.079)
ETHYLBENZENE	40	1000	ND (0.062)	ND (0.058)	ND (0.066)	ND (0.055)	ND (0.067)	ND (0.061)	ND (0.079)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.062)	ND (0.058)	ND (0.066)	ND (0.055)	ND (0.067)	ND (0.061)	ND (0.079)
NAPHTHALENE	4	20	ND (0.31)	ND (0.29)	ND (0.33)	ND (0.28)	ND (0.34)	ND (0.31)	ND (0.40)
TOLUENE	30	1000	ND (0.062)	ND (0.058)	ND (0.066)	ND (0.055)	ND (0.067)	ND (0.061)	ND (0.079)
M/P-XYLENE	100	100	ND (0.12)	ND (0.12)	ND (0.13)	ND (0.11)	ND (0.13)	ND (0.12)	ND (0.16)
O-XYLENE	100	100	ND (0.062)	ND (0.058)	ND (0.066)	ND (0.0011)	ND (0.067)	ND (0.061)	ND (0.079)
SM 2540G (% Wt)									
% Solids	--	--	88.5	85.6	82.0	80.8	84.2	81.4	75.4
SM21-22 2510B Modified (μmhos/cm)									
SPECIFIC CONDUCTANCE	--	--	8.6	110	7.4	11	8.6	10	9.3
SM2580 A (mV)									
OXIDATION/REDUCTION POTENTIAL	--	--	120	65	180	67	120	140	110
SW-846 1010A (°F)									
FLASHPOINT	--	--	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F	> 212 °F
SW-846 6010D (mg/Kg dry) Metals Digestion									
ANTIMONY	20	30	ND (1.8)	ND (1.9)	ND (1.9)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.2)
ARSENIC	20	20	ND (3.7)	ND (3.8)	7.9	ND (4.1)	6.6	4.1	ND (4.5)
BARIUM	1000	3000	20	18	70	36	37	55	36
BERYLLIUM	90	200	0.21	0.20	0.76	0.32	0.41	0.49	0.32
CADMIUM	70	100	ND (0.37)	ND (0.38)	ND (0.38)	ND (0.41)	ND (0.40)	ND (0.40)	ND (0.45)
CHROMIUM	100	200	12	15	47	29	27	46	28
LEAD	200	600	4.0	4.6	12	10	11	14	9.8
NICKEL	600	1000	12	13	28	17	16	21	15
SELENIUM	400	700	ND (3.7)	ND (3.8)	ND (3.8)	ND (4.1)	ND (4.0)	ND (4.0)	ND (4.5)
SILVER	100	200	ND (0.37)	ND (0.38)	ND (0.38)	ND (0.41)	ND (0.40)	ND (0.40)	ND (0.45)
THALLIUM	8	60	ND (1.8)	ND (1.9)	ND (1.9)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.2)
VANADIUM	400	700	15	15	47	29	25	36	27
ZINC	1000	3000	19	19	63	34	38	50	42
SW-846 7196A (mg/Kg dry)									
CHROMIUM +6	100	200	ND (0.18)	ND (0.18)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.21)
SW-846 7471B (mg/Kg dry) Metals Digestion									
MERCURY	20	30	ND (0.029)	ND (0.029)	ND (0.030)	0.059	0.080	0.058	0.083

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

	MCP Reportable Concentrations		*Lynn Borings*						
Sample Location			20B-9 (3-5)	20B-9 (7-9)	20B-10MW (3-5')	20B-10MW(7-9)	20B-11MW (3-5')	20B-11MW(8-10)	20B-12MW (3-5')
Sampling Date			10/27/2020	10/27/2020	10/13/2020	10/21/2020	10/13/2020	10/21/2020	10/13/2020
Lab ID			20J1488	20J1488	20J0631	20J1122	20J0631	20J1122	20J0631
Parameter / Sample Depth (feet)	RCS-1	RCS-2	3 - 5	7 - 9	3 - 5	7 - 9	3 - 5	8 - 10	3 - 5
SW-846 8082A (mg/Kg dry)									
PCB 1016	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1221	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1232	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1242	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1248	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1254	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1260	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1262	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
PCB 1268	1	4	ND (0.45)	ND (0.45)	ND (0.098)	ND (0.099)	ND (0.095)	ND (0.098)	ND (0.11)
SW-846 8100 Modified (mg/Kg dry)									
TPH	1000	3000	ND (9.3)	11	24	450	33	100	59
SW-846 8260C-D (mg/Kg wet)									
ACETONE	6	50	ND (0.077)	ND (0.068)	ND (0.081)	ND (0.074)	ND (0.079)	ND (0.069)	ND (0.086)
TERT-AMYL METHYL ETHER	~	~	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
BENZENE	2	200	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
BROMOBENZENE	100	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
BROMOCHLOROMETHANE	--	--	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
BROMODICHLOROMETHANE	0.1	0.1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
BROMOFORM	0.1	1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
BROMOMETHANE	0.5	0.5	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
2-BUTANONE (MEK)	4	50	ND (0.031)	ND (0.027)	ND (0.032)	ND (0.030)	ND (0.032)	ND (0.027)	ND (0.034)
N-BUTYLBENZENE	--	--	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
SEC-BUTYLBENZENE	--	--	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
TERT-BUTYLBENZENE	100	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
TERT-BUTYLETHYL ETHER	--	--	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
CARBON DISULFIDE	100	1000	ND (0.0046)	ND (0.0041)	ND (0.0049)	ND (0.0045)	ND (0.0047)	ND (0.0041)	ND (0.0052)
CARBON TETRACHLORIDE	5	5	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
CHLOROBENZENE	1	3	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
CHLORODIBROMOMETHANE	0.005	0.03	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
CHLOROETHANE	100	1000	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
CHLOROFORM	0.2	0.2	ND (0.0031)	ND (0.0027)	ND (0.0032)	ND (0.0030)	ND (0.0032)	ND (0.0027)	ND (0.0034)
CHLOROMETHANE	100	1000	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
2-CHLOROTOLUENE	100	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
4-CHLOROTOLUENE	100	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2-DIBROMO-3-CHLOROPROPANE	10	100	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2-DIBROMOETHANE (EDB)	0.1	0.1	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
DIBROMOMETHANE	500	5000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2-DICHLOROBENZENE	9	100	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,3-DICHLOROBENZENE	3	200	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,4-DICHLOROBENZENE	0.7	1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
DICHLORODIFLUOROMETHANE	1000	10000	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
1,1-DICHLOROETHANE	0.4	9	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2-DICHLOROETHANE	0.1	0.1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,1-DICHLOROETHYLENE	3	40	ND (0.0031)	ND (0.0027)	ND (0.0032)	ND (0.0030)	ND (0.0032)	ND (0.0027)	ND (0.0034)
CIS-1,2-DICHLOROETHYLENE	0.1	0.1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
TRANS-1,2-DICHLOROETHYLENE	1	1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2-DICHLOROPROPANE	0.1	0.1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,3-DICHLOROPROPANE	500	5000	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
2,2-DICHLOROPROPANE	0.1	0.2	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,1-DICHLOROPROPENE	0.01	0.1	ND (0.0031)	ND (0.0027)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
CIS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
TRANS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
DIETHYL ETHER	100	1000	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
DIISOPROPYL ETHER	100	1000	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
1,4-DIOXANE	0.2	6	ND (0.077)	ND (0.068)	ND (0.081)	ND (0.074)	ND (0.079)	ND (0.069)	ND (0.086)
ETHYLBENZENE	40	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
HEXACHLOROBUTADIENE	30	100	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
2-HEXANONE	100	1000	ND (0.015)	ND (0.014)	ND (0.016)	ND (0.015)	ND (0.016)	ND (0.014)	ND (0.017)
ISOPROPYLBENZENE	1000	10000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
P-ISOPROPYLTOLUENE	100	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.0031)	ND (0.0027)	ND (0.0032)	ND (0.0030)	ND (0.0032)	ND (0.0027)	ND (0.0034)
METHYLENE CHLORIDE	0.1	4	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

	MCP Reportable Concentrations		*Lynn Borings*						
Sample Location			**20B-9 (3-5)**	**20B-9 (7-9)**	**20B-10MW (3-5')**	**20B-10MW(7-9)**	**20B-11MW (3-5')**	**20B-11MW(8-10)**	**20B-12MW (3-5')**
Sampling Date			**10/27/2020**	**10/27/2020**	**10/13/2020**	**10/21/2020**	**10/13/2020**	**10/21/2020**	**10/13/2020**
Lab ID			**20J1488**	**20J1488**	**20J0631**	**20J1122**	**20J0631**	**20J1122**	**20J0631**
Parameter Sample Depth (feet)	**RCS-1**	**RCS-2**	**3 - 5**	**7 - 9**	**3 - 5**	**7 - 9**	**3 - 5**	**8 - 10**	**3 - 5**
4-METHYL-2-PENTANONE (MIBK)	0.4	50	ND (0.015)	ND (0.014)	ND (0.016)	ND (0.015)	ND (0.016)	ND (0.014)	ND (0.017)
NAPHTHALENE	4	20	ND (0.0031)	ND (0.0027)	ND (0.0032)	ND (0.0030)	ND (0.0032)	ND (0.0027)	ND (0.0034)
N-PROPYLBENZENE	100	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
STYRENE	3	4	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,1,1,2-TETRACHLOROETHANE	0.1	0.1	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,1,2,2-TETRACHLOROETHANE	0.005	0.02	ND (0.00077)	ND (0.00068)	ND (0.00081)	ND (0.00074)	ND (0.00079)	ND (0.00069)	ND (0.00086)
TETRACHLOROETHYLENE	1	10	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
TETRAHYDROFURAN	500	5000	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
TOLUENE	30	1000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2,3-TRICHLOROBENZENE	--	--	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,1,1-TRICHLOROETHANE	30	600	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,1,2-TRICHLOROETHANE	0.1	2	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
TRICHLOROETHYLENE	0.3	0.3	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
TRICHLOROFLUOROMETHANE	1000	10000	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
1,2,3-TRICHLOROPROPANE	100	1000	ND (0.0031)	ND (0.0027)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,2,4-TRIMETHYLBENZENE	1000	10000	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
1,3,5-TRIMETHYLBENZENE	10	100	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
VINYL CHLORIDE	0.7	0.7	ND (0.0077)	ND (0.0068)	ND (0.0081)	ND (0.0074)	ND (0.0079)	ND (0.0069)	ND (0.0086)
M/P-XYLENE	100	100	ND (0.0031)	ND (0.0027)	ND (0.0032)	ND (0.0030)	ND (0.0032)	ND (0.0027)	ND (0.0034)
O-XYLENE	100	100	ND (0.0015)	ND (0.0014)	ND (0.0016)	ND (0.0015)	ND (0.0016)	ND (0.0014)	ND (0.0017)
SW-846 8270D-E (mg/Kg dry)									
ACENAPHTHENE	4	3000	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
ACENAPHTHYLENE	1	10	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
ACETOPHENONE	1000	10000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
ANILINE	1000	10000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
ANTHRACENE	1000	3000	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
BENZO(A)ANTHRACENE	7	40	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.45	ND (0.23)
BENZO(A)PYRENE	2	7	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.46	ND (0.23)
BENZO(B)FLUORANTHENE	7	40	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.52	ND (0.23)
BENZO(G,H,I)PERYLENE	1000	3000	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
BENZO(K)FLUORANTHENE	70	400	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.23	ND (0.23)
BIS(2-CHLOROETHOXY)METHANE	500	5000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
BIS(2-CHLOROETHYL)ETHER	0.7	0.7	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
BIS(2-CHLOROISOPROPYL)ETHER	0.7	0.7	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
BIS(2-ETHYLHEXYL)PHTHALATE	90	600	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
4-BROMOPHENYL PHENYL ETHER	100	1000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
BUTYLBENZYLPHTHALATE	100	1000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
4-CHLOROANILINE	1	3	ND (0.73)	ND (0.76)	ND (0.80)	ND (0.81)	ND (0.78)	ND (0.81)	ND (0.88)
2-CHLORONAPHTHALENE	1000	10000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2-CHLOROPHENOL	0.7	100	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
CHRYSENE	70	400	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.46	ND (0.23)
DIBENZ(A,H)ANTHRACENE	0.7	4	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
DIBENZOFURAN	100	1000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
DI-N-BUTYLPHTHALATE	50	500	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
1,2-DICHLOROBENZENE	9	100	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
1,3-DICHLOROBENZENE	3	200	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
1,4-DICHLOROBENZENE	0.7	1	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
3,3'-DICHLOROBENZIDINE	3	20	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
2,4-DICHLOROPHENOL	0.7	40	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
DIETHYLPHTHALATE	10	200	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2,4-DIMETHYLPHENOL	0.7	100	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
DIMETHYLPHTHALATE	0.7	50	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2,4-DINITROPHENOL	3	50	ND (0.73)	ND (0.76)	ND (0.80)	ND (0.81)	ND (0.78)	ND (0.81)	ND (0.88)
2,4-DINITROTOLUENE	0.7	10	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2,6-DINITROTOLUENE	100	1000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
DI-N-OCTYLPHTHALATE	1000	10000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	50	500	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
FLUORANTHENE	1000	3000	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.61	ND (0.23)
FLUORENE	1000	3000	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
HEXACHLOROBENZENE	0.7	0.8	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
HEXACHLOROBUTADIENE	30	100	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
HEXACHLOROETHANE	0.7	3	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

			Lynn Borings						
Sample Location	**MCP Reportable Concentrations**		**20B-9 (3-5)**	**20B-9 (7-9)**	**20B-10MW (3-5')**	**20B-10MW(7-9)**	**20B-11MW (3-5')**	**20B-11MW(8-10)**	**20B-12MW (3-5')**
Sampling Date			**10/27/2020**	**10/27/2020**	**10/13/2020**	**10/21/2020**	**10/13/2020**	**10/21/2020**	**10/13/2020**
Lab ID			**20J1488**	**20J1488**	**20J0631**	**20J1122**	**20J0631**	**20J1122**	**20J0631**
Parameter Sample Depth (feet)	**RCS-1**	**RCS-2**	**3 - 5**	**7 - 9**	**3 - 5**	**7 - 9**	**3 - 5**	**8 - 10**	**3 - 5**
INDENO(1,2,3-CD)PYRENE	7	40	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.22	ND (0.23)
ISOPHORONE	100	1000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2-METHYLNAPHTHALENE	0.7	80	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
O-CRESOL	500	5000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
M/P-CRESOL	500	5000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
NAPHTHALENE	4	20	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	ND (0.21)	ND (0.23)
NITROBENZENE	500	5000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2-NITROPHENOL	100	1000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
4-NITROPHENOL	100	1000	ND (0.73)	ND (0.76)	ND (0.80)	ND (0.81)	ND (0.78)	ND (0.81)	ND (0.88)
PENTACHLOROPHENOL	3	10	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
PHENANTHRENE	10	1000	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.28	ND (0.23)
PHENOL	1	20	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
PYRENE	1000	3000	ND (0.19)	ND (0.20)	ND (0.21)	ND (0.21)	ND (0.20)	0.71	ND (0.23)
PYRIDINE	500	5000	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2,4,5-TRICHLOROPHENOL	4	600	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
2,4,6-TRICHLOROPHENOL	0.7	20	ND (0.38)	ND (0.39)	ND (0.41)	ND (0.42)	ND (0.40)	ND (0.41)	ND (0.45)
SW-846 9014 (mg/Kg)									
REACTIVE CYANIDE	--	--	ND (3.9)	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)
SW-846 9030A (mg/Kg)									
REACTIVE SULFIDE	--	--	ND (19)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
SW-846 9045C (pH Units)									
PH	--	--	6.7	6.7	7.1	8.6	7.2	7.7	5.9

NOTES:
1. An asterisk (*) following a detection limit indicates that the minimum laboratory reporting limit exceeds one or more of the regulatory criteria.
2. ND = Not detected above the lab reporting limits shown in parenthesis.
3. Shaded values exceed the MCP Reportable Concentrations (RCs).

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

	MCP Reportable Concentrations		*Lynn Borings*		
Sample Location			**20B-12MW (10-12)**	**20B-13MW (3-5')**	**20B-13MW (6-8)**
Sampling Date			**10/22/2020**	**10/13/2020**	**10/22/2020**
Lab ID			**20J1248**	**20J0631**	**20J1248**
Parameter — Sample Depth (feet)	**RCS-1**	**RCS-2**	**10 - 12**	**3 - 5**	**6 - 8**
MADEP EPH rev 2.1 (mg/Kg dry)					
C9-C18 ALIPHATICS	1000	3000	ND (18)	ND (11)	ND (12)
C19-C36 ALIPHATICS	3000	5000	ND (18)	16	ND (12)
C11-C22 AROMATICS	1000	3000	ND (18)	ND (11)	ND (12)
ACENAPHTHENE	4	3000	**5.3**	ND (0.11)	ND (0.12)
ACENAPHTHYLENE	1	10	ND (0.18)	ND (0.11)	ND (0.12)
ANTHRACENE	1000	3000	ND (0.18)	ND (0.11)	ND (0.12)
BENZO(A)ANTHRACENE	7	40	ND (0.18)	ND (0.11)	ND (0.12)
BENZO(A)PYRENE	2	7	ND (0.18)	ND (0.11)	ND (0.12)
BENZO(B)FLUORANTHENE	7	40	ND (0.18)	0.12	ND (0.12)
BENZO(G,H,I)PERYLENE	1000	3000	ND (0.18)	ND (0.11)	ND (0.12)
BENZO(K)FLUORANTHENE	70	400	ND (0.18)	ND (0.11)	ND (0.12)
CHRYSENE	70	400	ND (0.18)	ND (0.11)	ND (0.12)
DIBENZ(A,H)ANTHRACENE	0.7	4	ND (0.18)	ND (0.11)	ND (0.12)
FLUORANTHENE	1000	3000	ND (0.18)	0.11	ND (0.12)
FLUORENE	1000	3000	ND (0.18)	ND (0.11)	ND (0.12)
INDENO(1,2,3-CD)PYRENE	7	40	ND (0.18)	ND (0.11)	ND (0.12)
2-METHYLNAPHTHALENE	0.7	80	ND (0.18)	ND (0.11)	ND (0.12)
NAPHTHALENE	4	20	ND (0.18)	ND (0.11)	ND (0.12)
PHENANTHRENE	10	1000	ND (0.18)	ND (0.11)	ND (0.12)
PYRENE	1000	3000	ND (0.18)	0.12	ND (0.12)
MADEP-VPH-Feb 2018 Rev 2.1 (mg/Kg dry)					
C5-C8 ALIPHATICS	100	500	ND (28)	ND (12)	ND (9.1)
C9-C12 ALIPHATICS	1000	3000	ND (28)	ND (12)	ND (9.1)
C9-C10 AROMATICS	100	500	ND (28)	ND (12)	ND (9.1)
BENZENE	2	200	ND (0.14)	ND (0.059)	ND (0.046)
ETHYLBENZENE	40	1000	ND (0.14)	ND (0.059)	ND (0.046)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.14) *	ND (0.059)	ND (0.046)
NAPHTHALENE	4	20	ND (0.71)	ND (0.30)	ND (0.23)
TOLUENE	30	1000	ND (0.14)	ND (0.059)	ND (0.046)
M/P-XYLENE	100	100	ND (0.28)	ND (0.12)	ND (0.091)
O-XYLENE	100	100	ND (0.14)	ND (0.059)	ND (0.046)
SM 2540G (% Wt)					
% Solids	--	--	54.4	94.0	81.6
SM21-22 2510B Modified (µmhos/cm)					
SPECIFIC CONDUCTANCE	--	--	20	4.3	20
SM2580 A (mV)					
OXIDATION/REDUCTION POTENTIAL	--	--	140	98	120
SW-846 1010A (°F)					
FLASHPOINT	--	--	> 212 °F	> 212 °F	> 212 °F
SW-846 6010D (mg/Kg dry) Metals Digestion					
ANTIMONY	20	30	ND (3.1)	ND (1.8)	ND (2.0)
ARSENIC	20	20	ND (6.2)	ND (3.5)	ND (4.0)
BARIUM	1000	3000	8.6	17	17
BERYLLIUM	90	200	ND (0.31)	ND (0.18)	ND (0.20)
CADMIUM	70	100	ND (0.62)	ND (0.35)	ND (0.40)
CHROMIUM	100	200	25	10	15
LEAD	200	600	6.0	21	17
NICKEL	600	1000	19	6.0	8.9
SELENIUM	400	700	ND (6.2)	ND (3.5)	ND (4.0)
SILVER	100	200	ND (0.62)	ND (0.35)	ND (0.40)
THALLIUM	8	60	ND (3.1)	ND (1.8)	ND (2.0)
VANADIUM	400	700	20	12	13
ZINC	1000	3000	19	34	28
SW-846 7196A (mg/Kg dry)					
CHROMIUM +6	100	200	ND (0.58)	ND (0.17)	ND (0.19)
SW-846 7471B (mg/Kg dry) Metals Digestion					
MERCURY	20	30	ND (0.046)	0.045	0.036

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

Sample Location / Sampling Date / Lab ID	MCP Reportable Concentrations		Lynn Borings		
Sample Location			20B-12MW (10-12)	20B-13MW (3-5')	20B-13MW (6-8)
Sampling Date			10/22/2020	10/13/2020	10/22/2020
Lab ID			20J1248	20J0631	20J1248
Parameter / Sample Depth (feet)	RCS-1	RCS-2	10 - 12	3 - 5	6 - 8
SW-846 8082A (mg/Kg dry)					
PCB 1016	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1221	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1232	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1242	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1248	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1254	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1260	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1262	1	4	ND (0.15)	ND (0.085)	ND (0.098)
PCB 1268	1	4	ND (0.15)	ND (0.085)	ND (0.098)
SW-846 8100 Modified (mg/Kg dry)					
TPH	1000	3000	59	40	41
SW-846 8260C-D (mg/Kg wet)					
ACETONE	6	50	ND (0.15)	ND (0.088)	ND (0.073)
TERT-AMYL METHYL ETHER	~	~	ND (0.0015)	ND (0.00088)	ND (0.00073)
BENZENE	2	200	ND (0.0030)	ND (0.0018)	ND (0.0015)
BROMOBENZENE	100	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
BROMOCHLOROMETHANE	--	--	ND (0.0030)	ND (0.0018)	ND (0.0015)
BROMODICHLOROMETHANE	0.1	0.1	ND (0.0030)	ND (0.0018)	ND (0.0015)
BROMOFORM	0.1	1	ND (0.0030)	ND (0.0018)	ND (0.0015)
BROMOMETHANE	0.5	0.5	ND (0.015)	ND (0.0088)	ND (0.0073)
2-BUTANONE (MEK)	4	50	ND (0.060)	ND (0.035)	ND (0.029)
N-BUTYLBENZENE	--	--	ND (0.0030)	ND (0.0018)	ND (0.0015)
SEC-BUTYLBENZENE	--	--	ND (0.0030)	ND (0.0018)	ND (0.0015)
TERT-BUTYLBENZENE	100	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
TERT-BUTYLETHYL ETHER	--	--	ND (0.0015)	ND (0.00088)	ND (0.00073)
CARBON DISULFIDE	100	1000	ND (0.0090)	ND (0.0053)	ND (0.0044)
CARBON TETRACHLORIDE	5	5	ND (0.0030)	ND (0.0018)	ND (0.0015)
CHLOROBENZENE	1	3	ND (0.0030)	ND (0.0018)	ND (0.0015)
CHLORODIBROMOMETHANE	0.005	0.03	ND (0.0015)	ND (0.00088)	ND (0.00073)
CHLOROETHANE	100	1000	ND (0.015)	ND (0.0088)	ND (0.0073)
CHLOROFORM	0.2	0.2	ND (0.0060)	ND (0.0035)	ND (0.0029)
CHLOROMETHANE	100	1000	ND (0.015)	ND (0.0088)	ND (0.0073)
2-CHLOROTOLUENE	100	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
4-CHLOROTOLUENE	100	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2-DIBROMO-3-CHLOROPROPANE	10	100	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2-DIBROMOETHANE (EDB)	0.1	0.1	ND (0.0015)	ND (0.00088)	ND (0.00073)
DIBROMOMETHANE	500	5000	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2-DICHLOROBENZENE	9	100	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,3-DICHLOROBENZENE	3	200	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,4-DICHLOROBENZENE	0.7	1	ND (0.0030)	ND (0.0018)	ND (0.0015)
DICHLORODIFLUOROMETHANE	1000	10000	ND (0.015)	ND (0.0088)	ND (0.0073)
1,1-DICHLOROETHANE	0.4	9	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2-DICHLOROETHANE	0.1	0.1	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,1-DICHLOROETHYLENE	3	40	ND (0.0060)	ND (0.0035)	ND (0.0029)
CIS-1,2-DICHLOROETHYLENE	0.1	0.1	ND (0.0030)	ND (0.0018)	ND (0.0015)
TRANS-1,2-DICHLOROETHYLENE	1	1	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2-DICHLOROPROPANE	0.1	0.1	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,3-DICHLOROPROPANE	500	5000	ND (0.0015)	ND (0.00088)	ND (0.00073)
2,2-DICHLOROPROPANE	0.1	0.2	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,1-DICHLOROPROPENE	0.01	0.1	ND (0.0030)	ND (0.0018)	ND (0.0015)
CIS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.0015)	ND (0.00088)	ND (0.00073)
TRANS-1,3-DICHLOROPROPENE	0.01	0.1	ND (0.0015)	ND (0.00088)	ND (0.00073)
DIETHYL ETHER	100	1000	ND (0.015)	ND (0.0088)	ND (0.0073)
DIISOPROPYL ETHER	100	1000	ND (0.0015)	ND (0.00088)	ND (0.00073)
1,4-DIOXANE	0.2	6	ND (0.15)	ND (0.088)	ND (0.073)
ETHYLBENZENE	40	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
HEXACHLOROBUTADIENE	30	100	ND (0.0030)	ND (0.0018)	ND (0.0015)
2-HEXANONE	100	1000	ND (0.030)	ND (0.018)	ND (0.015)
ISOPROPYLBENZENE	1000	10000	ND (0.0030)	ND (0.0018)	ND (0.0015)
P-ISOPROPYLTOLUENE	100	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
METHYL TERT-BUTYL ETHER (MTBE)	0.1	100	ND (0.0060)	ND (0.0035)	ND (0.0029)
METHYLENE CHLORIDE	0.1	4	ND (0.015)	ND (0.0088)	ND (0.0073)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

Sample Location	MCP Reportable Concentrations		*Lynn Borings* 20B-12MW (10-12)	20B-13MW (3-5')	20B-13MW (6-8)
Sampling Date			10/22/2020	10/13/2020	10/22/2020
Lab ID			20J1248	20J0631	20J1248
Parameter / Sample Depth (feet)	RCS-1	RCS-2	10 - 12	3 - 5	6 - 8
4-METHYL-2-PENTANONE (MIBK)	0.4	50	ND (0.030)	ND (0.018)	ND (0.015)
NAPHTHALENE	4	20	ND (0.0060)	ND (0.0035)	ND (0.0029)
N-PROPYLBENZENE	100	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
STYRENE	3	4	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,1,1,2-TETRACHLOROETHANE	0.1	0.1	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,1,2,2-TETRACHLOROETHANE	0.005	0.02	ND (0.0015)	ND (0.00088)	ND (0.00073)
TETRACHLOROETHYLENE	1	10	ND (0.0030)	ND (0.0018)	ND (0.0015)
TETRAHYDROFURAN	500	5000	ND (0.015)	ND (0.0088)	ND (0.0073)
TOLUENE	30	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2,3-TRICHLOROBENZENE	--	--	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,1,1-TRICHLOROETHANE	30	600	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,1,2-TRICHLOROETHANE	0.1	2	ND (0.0030)	ND (0.0018)	ND (0.0015)
TRICHLOROETHYLENE	0.3	0.3	ND (0.0030)	ND (0.0018)	ND (0.0015)
TRICHLOROFLUOROMETHANE	1000	10000	ND (0.015)	ND (0.0088)	ND (0.0073)
1,2,3-TRICHLOROPROPANE	100	1000	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,2,4-TRIMETHYLBENZENE	1000	10000	ND (0.0030)	ND (0.0018)	ND (0.0015)
1,3,5-TRIMETHYLBENZENE	10	100	ND (0.0030)	ND (0.0018)	ND (0.0015)
VINYL CHLORIDE	0.7	0.7	ND (0.015)	ND (0.0088)	ND (0.0073)
M/P-XYLENE	100	100	ND (0.0060)	ND (0.0035)	ND (0.0029)
O-XYLENE	100	100	ND (0.0030)	ND (0.0018)	ND (0.0015)
SW-846 8270D-E (mg/Kg dry)					
ACENAPHTHENE	4	3000	ND (0.31)	ND (0.18)	ND (0.21)
ACENAPHTHYLENE	1	10	ND (0.31)	ND (0.18)	ND (0.21)
ACETOPHENONE	1000	10000	ND (0.61)	ND (0.36)	ND (0.41)
ANILINE	1000	10000	ND (0.61)	ND (0.36)	ND (0.41)
ANTHRACENE	1000	3000	ND (0.31)	ND (0.18)	ND (0.21)
BENZO(A)ANTHRACENE	7	40	ND (0.31)	ND (0.18)	ND (0.21)
BENZO(A)PYRENE	2	7	ND (0.31)	ND (0.18)	ND (0.21)
BENZO(B)FLUORANTHENE	7	40	ND (0.31)	0.18	ND (0.21)
BENZO(G,H,I)PERYLENE	1000	3000	ND (0.31)	ND (0.18)	ND (0.21)
BENZO(K)FLUORANTHENE	70	400	ND (0.31)	ND (0.18)	ND (0.21)
BIS(2-CHLOROETHOXY)METHANE	500	5000	ND (0.61)	ND (0.36)	ND (0.41)
BIS(2-CHLOROETHYL)ETHER	0.7	0.7	ND (0.61)	ND (0.36)	ND (0.41)
BIS(2-CHLOROISOPROPYL)ETHER	0.7	0.7	ND (0.61)	ND (0.36)	ND (0.41)
BIS(2-ETHYLHEXYL)PHTHALATE	90	600	ND (0.61)	ND (0.36)	ND (0.41)
4-BROMOPHENYL PHENYL ETHER	100	1000	ND (0.61)	ND (0.36)	ND (0.41)
BUTYLBENZYLPHTHALATE	100	1000	ND (0.61)	ND (0.36)	ND (0.41)
4-CHLOROANILINE	1	3	ND (1.2) *	ND (0.70)	ND (0.80)
2-CHLORONAPHTHALENE	1000	10000	ND (0.61)	ND (0.36)	ND (0.41)
2-CHLOROPHENOL	0.7	100	ND (0.61)	ND (0.36)	ND (0.41)
CHRYSENE	70	400	ND (0.31)	ND (0.18)	ND (0.21)
DIBENZ(A,H)ANTHRACENE	0.7	4	ND (0.31)	ND (0.18)	ND (0.21)
DIBENZOFURAN	100	1000	ND (0.61)	ND (0.36)	ND (0.41)
DI-N-BUTYLPHTHALATE	50	500	ND (0.61)	ND (0.36)	ND (0.41)
1,2-DICHLOROBENZENE	9	100	ND (0.61)	ND (0.36)	ND (0.41)
1,3-DICHLOROBENZENE	3	200	ND (0.61)	ND (0.36)	ND (0.41)
1,4-DICHLOROBENZENE	0.7	1	ND (0.61)	ND (0.36)	ND (0.41)
3,3'-DICHLOROBENZIDINE	3	20	ND (0.31)	ND (0.18)	ND (0.21)
2,4-DICHLOROPHENOL	0.7	40	ND (0.61)	ND (0.36)	ND (0.41)
DIETHYLPHTHALATE	10	200	ND (0.61)	ND (0.36)	ND (0.41)
2,4-DIMETHYLPHENOL	0.7	100	ND (0.61)	ND (0.36)	ND (0.41)
DIMETHYLPHTHALATE	0.7	50	ND (0.61)	ND (0.36)	ND (0.41)
2,4-DINITROPHENOL	3	50	ND (1.2)	ND (0.70)	ND (0.80)
2,4-DINITROTOLUENE	0.7	10	ND (0.61)	ND (0.36)	ND (0.41)
2,6-DINITROTOLUENE	100	1000	ND (0.61)	ND (0.36)	ND (0.41)
DI-N-OCTYLPHTHALATE	1000	10000	ND (0.61)	ND (0.36)	ND (0.41)
1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	50	500	ND (0.61)	ND (0.36)	ND (0.41)
FLUORANTHENE	1000	3000	ND (0.31)	0.21	0.26
FLUORENE	1000	3000	ND (0.31)	ND (0.18)	ND (0.21)
HEXACHLOROBENZENE	0.7	0.8	ND (0.61)	ND (0.36)	ND (0.41)
HEXACHLOROBUTADIENE	30	100	ND (0.61)	ND (0.36)	ND (0.41)
HEXACHLOROETHANE	0.7	3	ND (0.61)	ND (0.36)	ND (0.41)

Table 1
Results of Soil Sampling and Analyses (2020)
MWRA Water Pipeline Project Section 56 – Revere/Lynn

	MCP Reportable Concentrations		*Lynn Borings*		
Sample Location			**20B-12MW (10-12)**	**20B-13MW (3-5')**	**20B-13MW (6-8)**
Sampling Date			**10/22/2020**	**10/13/2020**	**10/22/2020**
Lab ID			**20J1248**	**20J0631**	**20J1248**
Parameter / **Sample Depth (feet)**	**RCS-1**	**RCS-2**	**10 - 12**	**3 - 5**	**6 - 8**
INDENO(1,2,3-CD)PYRENE	7	40	ND (0.31)	ND (0.18)	ND (0.21)
ISOPHORONE	100	1000	ND (0.61)	ND (0.36)	ND (0.41)
2-METHYLNAPHTHALENE	0.7	80	ND (0.31)	ND (0.18)	ND (0.21)
O-CRESOL	500	5000	ND (0.61)	ND (0.36)	ND (0.41)
M/P-CRESOL	500	5000	ND (0.61)	ND (0.36)	ND (0.41)
NAPHTHALENE	4	20	ND (0.31)	ND (0.18)	ND (0.21)
NITROBENZENE	500	5000	ND (0.61)	ND (0.36)	ND (0.41)
2-NITROPHENOL	100	1000	ND (0.61)	ND (0.36)	ND (0.41)
4-NITROPHENOL	100	1000	ND (1.2)	ND (0.70)	ND (0.80)
PENTACHLOROPHENOL	3	10	ND (0.61)	ND (0.36)	ND (0.41)
PHENANTHRENE	10	1000	ND (0.31)	ND (0.18)	ND (0.21)
PHENOL	1	20	ND (0.61)	ND (0.36)	ND (0.41)
PYRENE	1000	3000	ND (0.31)	0.18	0.28
PYRIDINE	500	5000	ND (0.61)	ND (0.36)	ND (0.41)
1,2,4-TRICHLOROBENZENE	2	6	ND (0.61)	ND (0.36)	ND (0.41)
2,4,5-TRICHLOROPHENOL	4	600	ND (0.61)	ND (0.36)	ND (0.41)
2,4,6-TRICHLOROPHENOL	0.7	20	ND (0.61)	ND (0.36)	ND (0.41)
SW-846 9014 (mg/Kg)					
REACTIVE CYANIDE	--	--	ND (3.9)	ND (4.0)	ND (3.9)
SW-846 9030A (mg/Kg)					
REACTIVE SULFIDE	--	--	ND (20)	ND (20)	ND (19)
SW-846 9045C (pH Units)					
PH	--	--	7.7	6.5	7.1

NOTES:
1. An asterisk (*) following a detection limit indicates that the minimum laboratory reporting limit exceeds one or more of the regulatory criteria.
2. ND = Not detected above the lab reporting limits shown in parenthesis.
3. Shaded values exceed the MCP Reportable Concentrations (RCs).

ATTACHMENT G

RMAT Climate Resilience Design Standards Tools Project Report

Climate Resilience Design Standards Tool Project Report

Section 56 Water Pipeline Replacement Saugus River Crossing

Date Created: 4/14/2023 1:34:16 PM
Created By: kdschass
Date Report Generated: 4/14/2023 2:19:27 PM
Tool Version: Version 1.2
Project Contact Information: Peter Grasso (Peter.Grasso@MWRA.com)

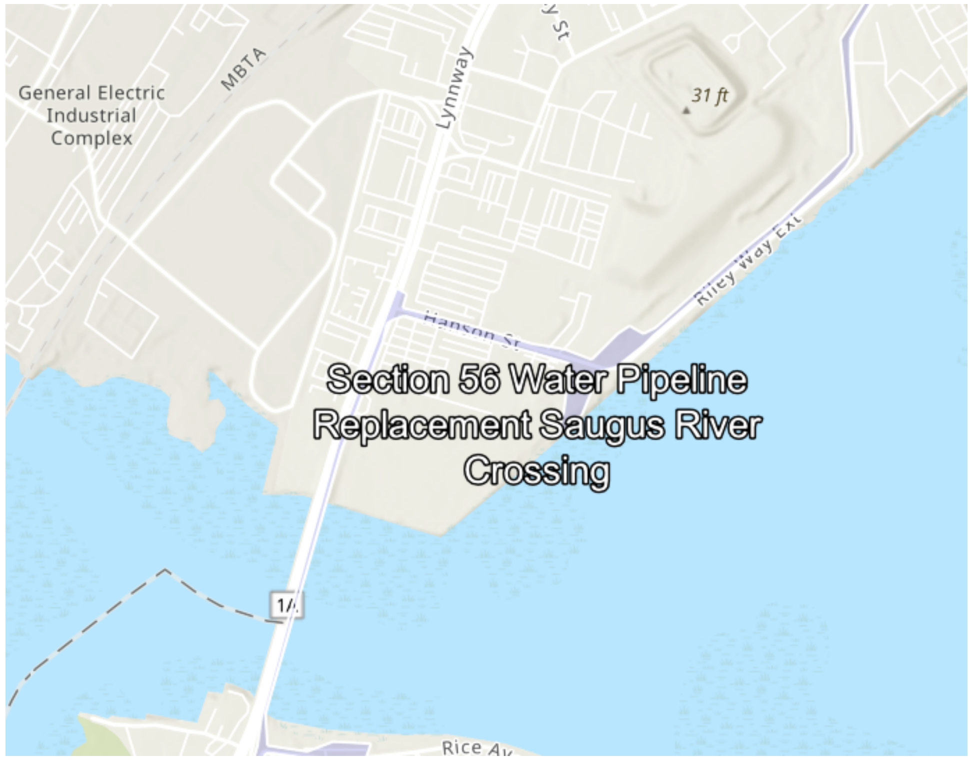
Project Summary

Link to Project

Estimated Capital Cost: $7000000.00
End of Useful Life Year: 2074
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	High Exposure
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Not Exposed
Extreme Heat	High Exposure



Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	High Risk	High Risk	Low Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2070	2050		50-yr (2%)	
Extreme Precipitation					
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2070			10-yr (10%)	Tier 2
Extreme Heat					
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2070		50th		Tier 2

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "High Exposure" because of the following:

- Located within the predicted mean high water shoreline by 2030
- Exposed to the 1% annual coastal flood event as early as 2030
- Historic coastal flooding at project site

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- No increase to impervious area
- Existing impervious area of the project site is between 10% and 50%

Extreme Precipitation - Riverine Flooding

This project received a "Not Exposed" because of the following:

- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is more than 500ft from a waterbody
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Less than 10% of the existing project site has canopy cover
- Located within 100 ft of existing water body
- No increase to the impervious area of the project site
- No tree removal

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.
Primary asset criticality factors influencing risk ratings for this asset:

- Asset can be inaccessible/inoperable more than a week after natural hazard event without consequences
- Loss/inoperability of the asset would have regional impacts
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would not be expected to result in injuries
- Inoperability may moderately impact other facilities, assets, or buildings, but is not expected to affect their ability to operate
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone. — Infrastructure

Sea Level Rise/Storm Surge — High Risk

Target Planning Horizon: 2070
Intermediate Planning Horizon: 2050
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

The projected values, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence.

Applicable Design Criteria

Projected Tidal Datums: APPLICABLE

Planning Horizon	MHHW	MHW	MTL	MLW	MLLW
	(ft-NAVD88)				
2050	7.7	7.3	2.5	-2.3	-2.6
2070	9.7	9.3	4.3	-0.6	-0.9

Projected Water Surface Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2050	2% (50-Year)	11.4	11.1	11.3
	2070		13.2	13.0	13.1

Projected Wave Action Water Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2050	2% (50-Year)	13.7	11.1	12.3
	2070		16.2	13.1	14.5

Projected Wave Heights: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
Return to service of the Section 56 Water Main that supplies potable	2050	2% (50-Year)	7.5	0.0	1.7

water to for the MWRA Northern High Service Zone.

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
	2070		7.5	0.0	2.2

ATTENTION: This project intersects areas influenced by wave overtopping based flooding. These areas are where flooding is caused by intermittent pulses that come from wave run-up and overtopping at a coastal structure. Additional site analyses are recommended to establish design values associated with design criteria.

Projected Duration of Flooding: APPLICABLE
Methodology to Estimate Projected Values

Projected Design Flood Velocity: APPLICABLE
Methodology to Estimate Projected Values

Projected Scour & Erosion: APPLICABLE
Methodology to Estimate Projected Values

Extreme Precipitation High Risk

Target Planning Horizon: 2070
Return Period: 10-yr (10%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2070	10-Year (10%)	6.8	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Sea Level Rise/Storm Surge Project Maps

The following three maps illustrate the Projected Water Surface Elevation for the 2030, 2050, and 2070 planning horizons corresponding to the lowest return period (largest design storm) recommended across the assets identified for this project in the Tool. For projects that only have Natural Resource assets, the maps will show the Projected Water Surface Elevations corresponding to the 5% (20-year) return period. Refer to the Climate Resilience Design Standards Output - Sea Level Rise/Storm Surge Section for additional values associated with other assets. The maps include the project area as drawn by the user with a 0.1 mile minimum buffer, but do not reflect the location of specific assets on the site.

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values and maps provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

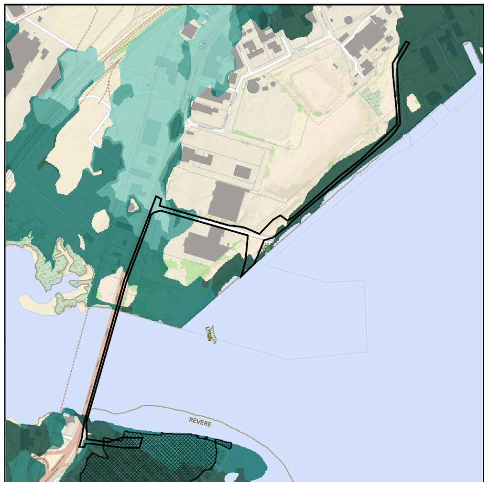
The projected values, maps, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence.

Legend

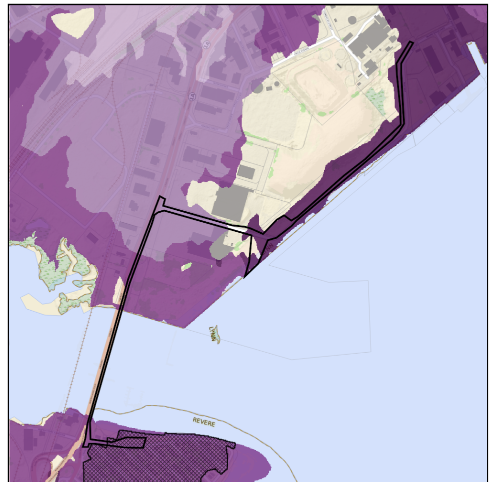
- Project Boundary
- Influenced by wave overtopping

Projected Water Surface Elevation (ft-NAVD88)

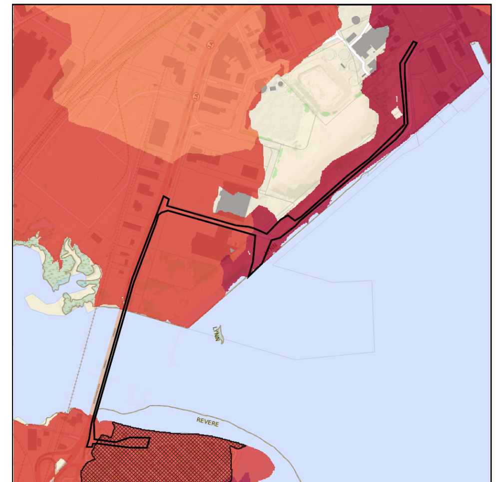
- ≤ 9.4
- 9.4 - 9.6
- 9.6 - 9.8
- 9.8 - 10.0
- 10.0 - 10.2
- 10.2 - 10.4
- 10.4 - 10.6
- 10.6 - 10.8
- 10.8 - 11.0
- 11.0 - 11.2
- 11.2 - 11.4
- 11.4 - 11.6
- 11.6 - 11.8
- 11.8 - 12.0
- 12.0 - 12.2
- 12.2 - 12.4
- 12.4 - 12.6
- 12.6 - 12.8
- 12.8 - 13.0
- 13.0 - 13.2
- ≥ 13.2



2030



2050



2070

Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2% (50-yr)

Project Name: Section 56 Water Pipeline Replacement Saugus River Crossing
Location (Town): Lynn, Revere

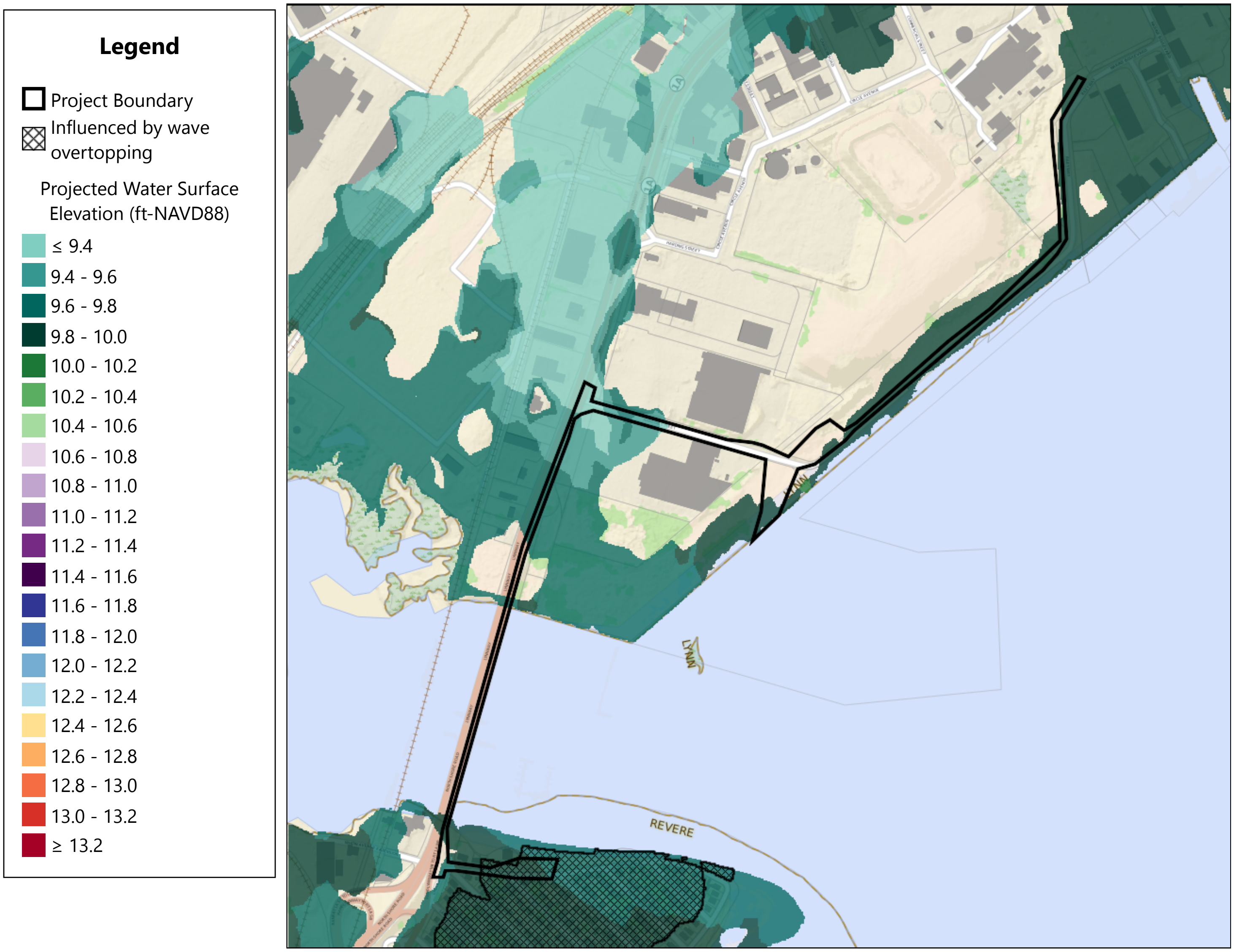
0.25 0.5 1.0 Miles

Created by: kdschass
Date Created: 4/14/2023
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average
			(ft-NAVD88)		
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2030	2% (50-yr)	9.9	9.4	9.7
	2050	2% (50-yr)	11.4	11.1	11.3
	2070	2% (50-yr)	13.2	13.0	13.1

ATTENTION: This project intersects areas influenced by wave overtopping based flooding. These areas are where flooding is caused by intermittent pulses that come from wave run-up and overtopping at a coastal structure. Additional site analyses are recommended to establish design values associated with design criteria.



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2030, 2% (50-yr)

Project Name: Section 56 Water Pipeline Replacement Saugus River Crossing
Location (Town): Lynn, Revere

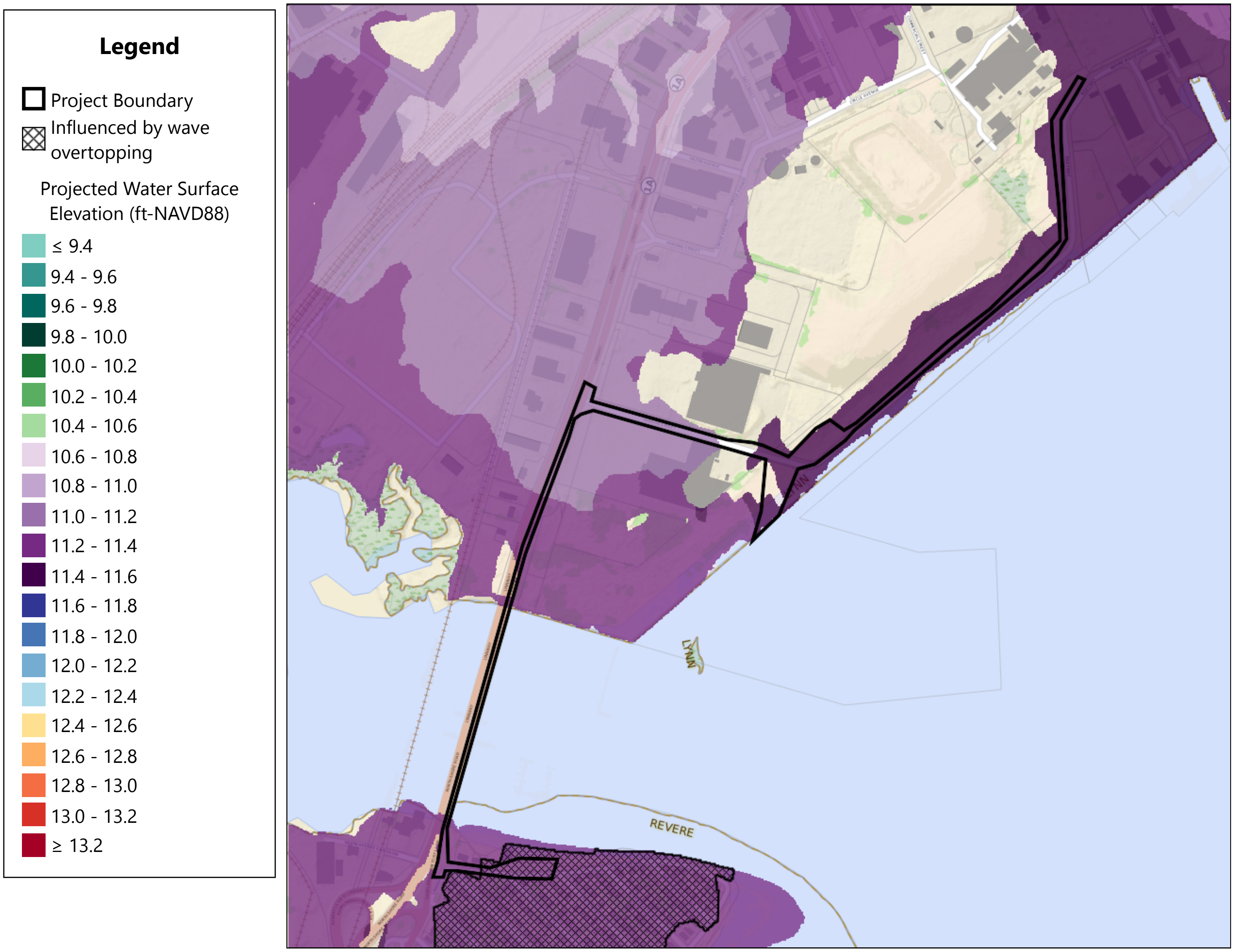
0.05 0.1 0.25 Miles

Created by: kdschass
Date Created: 4/14/2023
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average
			(ft-NAVD88)		
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2030	2% (50-yr)	9.9	9.4	9.7

ATTENTION: This project intersects areas influenced by wave overtopping based flooding. These areas are where flooding is caused by intermittent pulses that come from wave run-up and overtopping at a coastal structure. Additional site analyses are recommended to establish design values associated with design criteria.



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2050, 2% (50-yr)

Project Name: Section 56 Water Pipeline Replacement Saugus River Crossing
Location (Town): Lynn, Revere

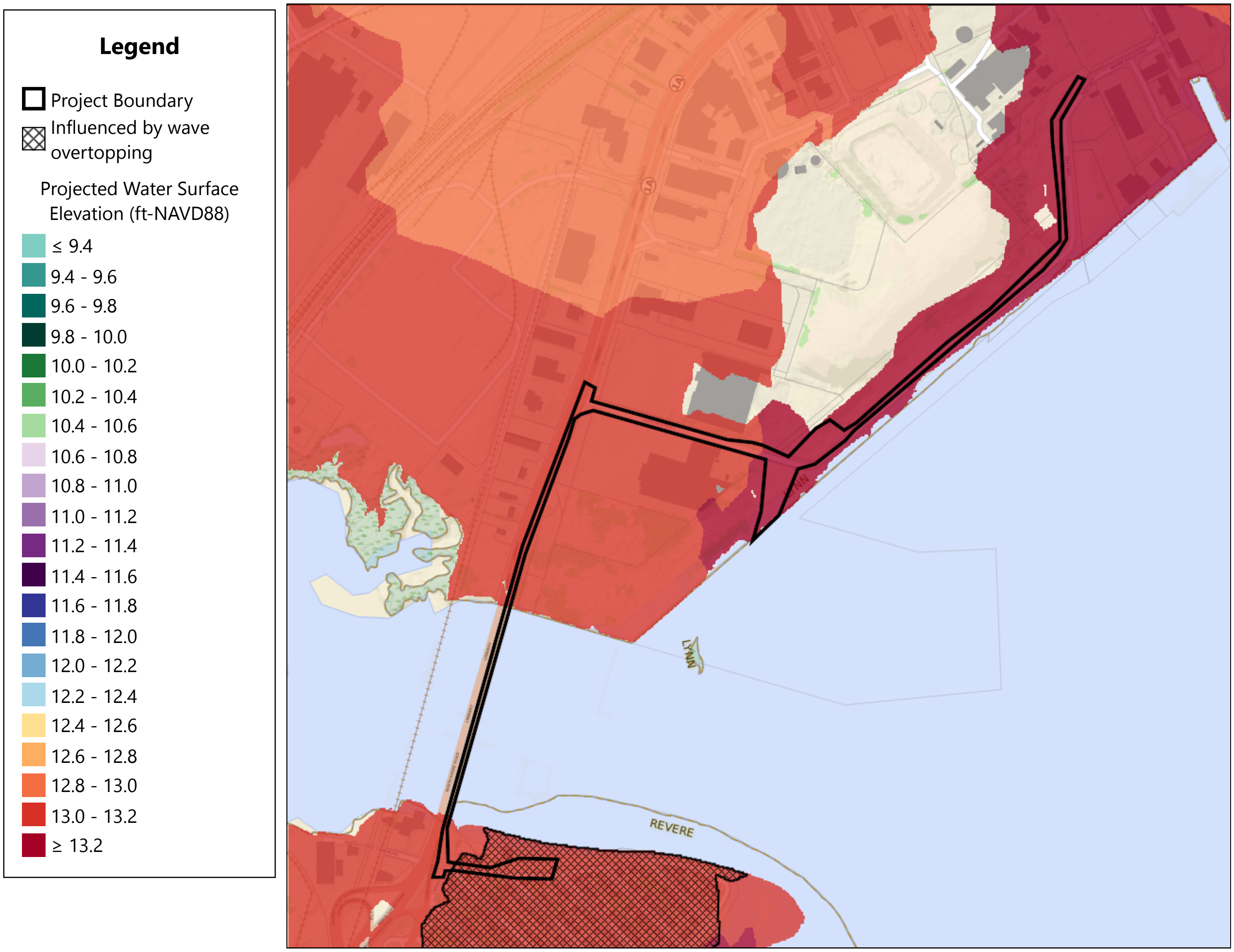
0.05 0.1 0.25 Miles

Created by: kdschass
Date Created: 4/14/2023
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average
			(ft-NAVD88)		
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2050	2% (50-yr)	11.4	11.1	11.3

ATTENTION: This project intersects areas influenced by wave overtopping based flooding. These areas are where flooding is caused by intermittent pulses that come from wave run-up and overtopping at a coastal structure. Additional site analyses are recommended to establish design values associated with design criteria.



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2070, 2% (50-yr)

Project Name: Section 56 Water Pipeline Replacement Saugus River Crossing
Location (Town): Lynn, Revere

0.05 0.1 0.25 Miles

Created by: kdschass
Date Created: 4/14/2023
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average
			(ft-NAVD88)		
Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.	2070	2% (50-yr)	13.2	13.0	13.1

ATTENTION: This project intersects areas influenced by wave overtopping based flooding. These areas are where flooding is caused by intermittent pulses that come from wave run-up and overtopping at a coastal structure. Additional site analyses are recommended to establish design values associated with design criteria.

Project Inputs

Core Project Information

Name:	Section 56 Water Pipeline Replacement Saugus River Crossing
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2074
Location of Project:	Lynn, Revere
Estimated Capital Cost:	$7,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resources Authority Peter Grasso (Peter.Grasso@MWRA.com)
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Permitting
Is climate resiliency a core objective of this project?	Yes
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	MWRA is proposing the replacement of the portion of the Section 56 water main below the riverbed of the Saugus River between Lynn and Revere to restore water supply redundancy. This section previously crossed the river via General Edwards Bridge and was removed from the system in 2019 due to severe corrosion. The section installed via HDD would tie into the existing water main via sections of water main installed by traditional cut and cover methods along Hanson Street and Rice Avenue in Lynn and Revere, respectively.
Project Submission Comments:	The purpose of this project is a return to service of an existing water main. A portion that previously crossed the Saugus River via the General Edwards Bridge was removed in 2019. Since then, the water supply system of the MWRA Northern High Service Zone has had no redundancy and has been vulnerable to failure. Because the replacement must tie into the existing pipeline, relocation of this project is not possible. Additionally, the entire project will be underground, with the only surface impacts being six manholes with existing paved roadways. Considerations regarding climate exposure are not particularly relevant to this project.

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Identify opportunities to prevent pollutants from impacting ecosystems

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	No
Recharges groundwater	No
Protects public water supply	Yes
Filters stormwater using green infrastructure	No
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	Maybe
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	No
Protects land containing shellfish	No
Provides pollinator habitat	No
Provides recreation	No

Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	Yes
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	Unsure
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	No

Project Assets

Asset: Return to service of the Section 56 Water Main that supplies potable water to for the MWRA Northern High Service Zone.
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: Major Repair/Retrofit
Construction Year: 2024
Useful Life: 50

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure may be inaccessible/inoperable more than a week after natural hazard event without consequences.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be regional (more than one municipality and/or surrounding region)

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 10,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
No

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the infrastructure would not be expected to result in injuries

If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million

Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
No

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure is not expected to reduce the ability to maintain government services

What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
No Impact

Report Comments

The purpose of this project is a return to service of an existing water main. A portion that previously crossed the Saugus River via the General Edwards Bridge was removed in 2019. Since then, the water supply system of the MWRA Northern High Service Zone has had no redundancy and has been vulnerable to failure. Because the replacement must tie into the existing pipeline, relocation of this project is not possible. Additionally, the entire project will be underground, with the only surface impacts being six manholes with existing paved roadways. Considerations regarding climate exposure are not particularly relevant to this project.

ATTACHMENT H

EENF Community-Based Organizations (CBOs) and MEPA Distribution List

Statewide Environmental Justice Community Based Organizations

First Name	Last Name	Title	Phone	Email	Affiliation
Julia	Blatt	Executive Director	(617) 714-4272	juliablatt@massriversalliance.org	Mass Rivers Alliance
Elvis	Mendez	Associate Director	508-505-6748	elvis@n2nma.org	Neighbor to Neighbor
Ben	Hellerstein	MA State Director	617-747-4368	ben@environmentmassachusetts.org	Environment Massachusetts
Claire	B.W. Muller	Movement Building Director	508 308-9261	claire@uumassaction.org	Unitarian Universalist Mass Action Network
Cindy	Luppi	New England Director	617-338-8131 x208	cluppi@cleanwater.org	Clean Water Action
Deb	Pasternak	Director, MA Chapter	617-423-5775	deb.pasternak@sierraclub.org	Sierra Club MA
Heather	Clish	Director of Conservation & Recreation Policy	(617) 523-0655	hclish@outdoors.org	Appalachian Mountain Club
Heidi	Ricci	Director of Policy	Not Provided	hricci@massaudubon.org	Mass Audubon
Kelly	Boling	MA & RI State Director	(617) 367-6200	kelly.boling@tpl.org	The Trust for Public Land
Kerry	Bowie	Board President	Not Provided	kerry@msaadapartners.com	Browning the GreenSpace
Nancy	Goodman	Vice President for Policy	Not Provided	ngoodman@environmentalleague.org	Environmental League of MA
Rob	Moir	Executive Director	Not Provided	rob@oceanriver.org	Ocean River Institute
Robb	Johnson	Executive Director	(978) 443-2233	robb@massland.org	Mass Land Trust Coalition
Sylvia	Broude	Executive Director	617 292-4821	sylvia@communityactionworks.org	Community Action Works

Indigenous Organizations

First Name	Last Name	Title	Phone	Email	Affiliation
Alma	Gordon	President	Not Provided	tribalcouncil@chappaquiddickwampanoag.org	Chappaquiddick Tribe of the Wampanoag Nation
Cheryll	Toney Holley	Chair	774-317-9138	crwritings@aol.com	Nipmuc Nation (Hassanamisco Nipmucs)
John	Peters, Jr.	Executive Director	617-573-1292	john.peters@mass.gov	Massachusetts Commission on Indian Affairs (MCIA)
Kenneth	White	Council Chairman	508-347-7829	acw1213@verizon.net	Chaubunagungamaug Nipmuck Indian Council
Melissa	Ferretti	Chair	(508) 304-5023	melissa@herringpondtribe.org	Herring Pond Wampanoag Tribe
Patricia	D. Rocker	Council Chair	Not Provided	rockerpatriciad@verizon.net	Chappaquiddick Tribe of the Wampanoag Nation, Whale Clan
Raquel	Halsey	Executive Director	(617) 232-0343	rhalsey@naicob.org	North American Indian Center of Boston
Cora	Pierce	Not Provided	Not Provided	Coradot@yahoo.com	Pocassett Wampanoag Tribe
Elizabth	Soloman	Not Provided	Not Provided	Solomon.Elizabeth@gmail.com	Massachusetts Tribe at Ponkapoag

Federally Recognized Tribes

First	Last	Title	Phone	Email	Affiliation	Notes
Bettina	Washington	Tribal Historic Preservation Officer	508-560-9014	thpo@wampanoagtribe-nsn.gov	Wampanoag Tribe of Gay Head (Aquinnah)	
Brian	Weeden	Chair	774-413-0520	Brian.Weeden@mwtribe-nsn.gov	Mashpee Wampanoag Tribe	

Local CBOs

Title	Service Area	Phone Number	Email	Affiliation
Director of Projects	Revere	Not Provided	david.queeley@mysticriver.org	Mystic River Watershed Association
Deputy Director	Revere	Not Provided	julie.wormser@mysticriver.org	Mystic River Watershed Association
Energy Justice Director	Lynn	Not provided	mbejjani8@gmail.com	Community Action Works
Not Provided	Lynn	Not provided	nguscott@lynnma.gov	Lynn Food and Fitness Alliance

Other

First Name	Last Name	Title	Service Area	Email	Affiliation
John	Shue	Conservation Commission	Revere	jshue@revere.org	Revere Conservation Commission
Jamie	Cerulli	Conservation Commission	Lynn	jcerulli@lynnma.gov	Lynn Conservation Commission
Angela	Sawaya	1st Vice President	Revere	Angela.sawaya@yahoo.com	Point of Pines Yacht Club
Andrew	Hall	DPW Commissioner	Lynn	ahall@lynnma.gov	Lynn Department of Public Works
n/a	n/a	n/a	Lynn	info@postroadresidential.com	Post Road Residential
Joel	Sklar	President & Principal	Lynn	jsklar@samuelsre.com	SEB Lynn Harbor Property LLC c/o Samuels & Associates
Robert	Delhome	President and Principal	Lynn	rdelhome@charter.us	Lynn Harbor Park LLC / Lynn Harbor Walk
Vinnie	Piccinni	Commodore	Revere	commodore@popyc.org	Point of Pines Yacht Club
Patrick	Keefe	Mayor	Revere	mayor@revere.org	City of Revere

Applicable Agencies from MEPA Distribution List

Agency	Email Address	Address
Massachusetts Environmental Policy Act (MEPA) Office	MEPA@mass.gov	MEPA Office 100 Cambridge Street, Suite 900 Boston, MA 02114
Department of Environmental Protection, Boston Office	helena.boccadoro@mass.gov	Commissioner's Office One Winter Street Boston, MA 02108
Department of Environmental Protection, Northeast Regional Office	john.d.viola@mass.gov	DEP/Northeast Regional Office Attn: MEPA Coordinator 150 Presidential Way Woburn, MA 01801
Massachusetts Department of Transportation - Boston	MassDOTPPDU@dot.state.ma.us	Public/Private Development Unit 10 Park Plaza, Suite #4150 Boston, MA 02116
Massachusetts Department of Transportation – District Office	timothy.paris@dot.state.ma.us	District #4 Attn: MEPA Coordinator 519 Appleton Street Arlington, MA 02476
Massachusetts Historical Commission	**Mail a hard copy of the filing to MHC**	The MA Archives Building 220 Morrissey Boulevard Boston, MA 02125
Metropolitan Area Planning Council (MAPC)	mpillsbury@mapc.org afelix@mapc.org	
EEA Environmental Justice Director	MEPA-EJ@mass.gov	MEPA Office Attn: EEA EJ Director 100 Cambridge Street, Suite 900 Boston, MA 02144
Coastal Zone Management	robert.boeri@mass.gov patrice.bordonaro@mass.gov	Coastal Zone Management Attn: Project Review Coordinator 100 Cambridge Street, Suite 900 Boston, MA 02144
Massachusetts Division of Marine Fisheries	DMF.EnvReview-North@mass.gov	From Hull to New Hampshire Border DMF – North Shore Attn: Environmental Reviewer 30 Emerson Avenue Gloucester, MA 01930
Natural Heritage and Endangered Species Program	melany.cheeseman@mass.gov emily.holt@mass.gov	Division of Fisheries & Wildlife 1 Rabbit Hill Road Westborough, MA 01581

DCR	andy.backman@mass.gov	DCR Attn: MEPA Coordinator 251 Causeway St. Suite 600 Boston MA 02114
Department of Public Health	dphtoxicology@massmail.state.ma.us	Department of Public Health Director of Environmental Health 250 Washington Street Boston, MA 02115
Lynn City Council	tyoung@lynnma.gov[1]	Lynn City Council, 3 City Hall Sqaure, Lynn, MA, 01901
Lynn Planning Board/Dept	jchiappini@lynnma.gov[1]	Lynn Planning Board, 3 City Hall Sqaure, Lynn, MA, 01901
Lynn Conservation Commission	jcerulli@lynnma.gov[1]	Lynn Conservation Commission, 3 City Hall Sqaure, Lynn, MA, 01901
Lynn BOH/Health Dept	mdesmarais@lynnma.gov[1]	Lynn Public Health Department, 3 City Hall Sqaure, Lynn, MA 01901
Revere City Council	**No email is available; a physical copy will be mailed.**	Revere City Council, 281 Boardway, Revere, MA, 02151
Revere Planning Board/Dept	**No email is available; a physical copy will be mailed.**	Revere Planning Board, 281 Boardway, Revere, MA, 02151
Revere Conservation Commission	concom@revere.org, jshue@revere.org[1]	249R Boardway, Conservation Commission, Revere, MA 02151

[1] A physical copy of the EENF is being mailed to this office as well as an electronic copy to the email listed.

ATTACHMENT I

Environmental Justice Screening Form (English, Russian, Khmer, Urdu, and Spanish Translations) and Five-Mile Radius EJ Block Groups List

<u>**Environmental Justice Screening Form**</u>

Project Name	**MWRA Section 56 Water Pipeline Replacement Project**
Anticipated Date of MEPA Filing	**June 30, 2023**
Proponent Name	**Massachusetts Water Resources Authority**
Contact Information (e.g., consultant)	**Katie Ronan, MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**
Public website for project or other physical location where project materials can be obtained (if available)	**https://www.mwra.com/projects/water/7454-section56-saugus-river/7454-update.html**
Municipality and Zip Code for Project (if known)	**City of Revere, 02151** **City of Lynn, 01905**
Project Type* (list all that apply)	**Water Supply – Treatment/conveyance**
Is the project site within a mapped 100-year FEMA flood plain? Y/N/ unknown	**Yes**
Estimated GHG emissions of conditioned spaces (click **here** for GHG Estimation tool)	**Not applicable.**

Project Description

1. Provide a brief project description, including overall size of the project site and square footage of proposed buildings and structures if known.

   The Massachusetts Water Resource Authority (MWRA) is proposing to replace a section of its existing Section 56 water pipeline. Section 56 provides water service to the cities of Lynn and Revere. The section of this water pipeline to be replaced was previously attached to the General Edwards Bridge over the Saugus River (which is also Lynn/Revere municipal border) but had to be removed in 2018 due to severe corrosion. MWRA now proposes to replace this section of water pipeline by installing a new section of water pipeline under the water of the Saugus River, using both open-cut and trenchless underwater pipeline construction methods. MWRA's Section 56 Water Pipeline Replacement Project will ensure water system redundancy and reliability for residents and businesses in these communities, which is crucial to protecting public and environmental health. After the construction is complete, the only existing surface impacts will be approximately six manholes, which will be flush with the paved surfaces of Rice Avenue in Revere and Hanson Street in Lynn and/or in a grassy traffic island at the entrance to North Shore Road in Revere.

   Specific project activities include:
   - **Installation of a 20-inch water main under the Saugus River using horizontal**

directional drilling (HDD) methods.

- **Installation of a 20-inch water main, including fittings, valves, air release valves, and blow-offs in Rice Avenue in Revere, from the Saugus River HDD crossing point at the Point of Pines Yacht Club to the existing Section 56 pipeline between the Route 1A northbound on-ramp and the Lynnway.**
- **Installation of 20-inch diameter water main and appurtenances, including fittings, valves, air release valves, and blow-offs in Hanson Street in Lynn, from the existing Section 56 pipeline in Route 1A to the Saugus River HDD crossing point at the end of Hanson Street/Riley Way Extension**
- **Installation of environmental controls and traffic management, replacement of utilities, surface restoration, road reconstruction/pavement restoration, and sidewalk reconstruction.**
- **The removal of twelve timber piles from the deteriorated seawall on the Lynn shoreline.**
- **Temporary staging/HDD entry/exit pits at the Point of Pines Yacht Club parking lot in Revere and at the end of Hanson Street/Riley Way Extension in Lynn.**

The total area of temporary disturbance is 2.9 acres. There are no proposed permanent above-ground buildings or structures.

2. List anticipated MEPA review thresholds (301 CMR 11.03) (if known)

- **301 CMR 11.03(3)(b)(1)(e), which states: "New fill or structure or Expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway."**
- **301 CMR 11.03(3)(b)(1)(a), regarding "alteration of coastal dune, barrier beach or coastal bank."**

3. List all anticipated state, local and federal permits needed for the project (if known)

MA WPA Notice of Intent (Order of Conditions anticipated from Revere and Lynn)
MassDEP 401 Water Quality Certification
Mass CZM Coastal Zone Consistency Determination
MWRA 8M Permit
MassDOT Street Opening Permit, Revere
MassDOT Street Opening Permit, Lynn
MassDCR Construction Access Permit
Massachusetts Historical Commission Project Notification Form (PNF) and National Historic Preservation Act Section 106 Compliance
US Army Corps of Engineers Section 404 and 408 Permits
Chapter 91 Massachusetts Public Waterfront Act License

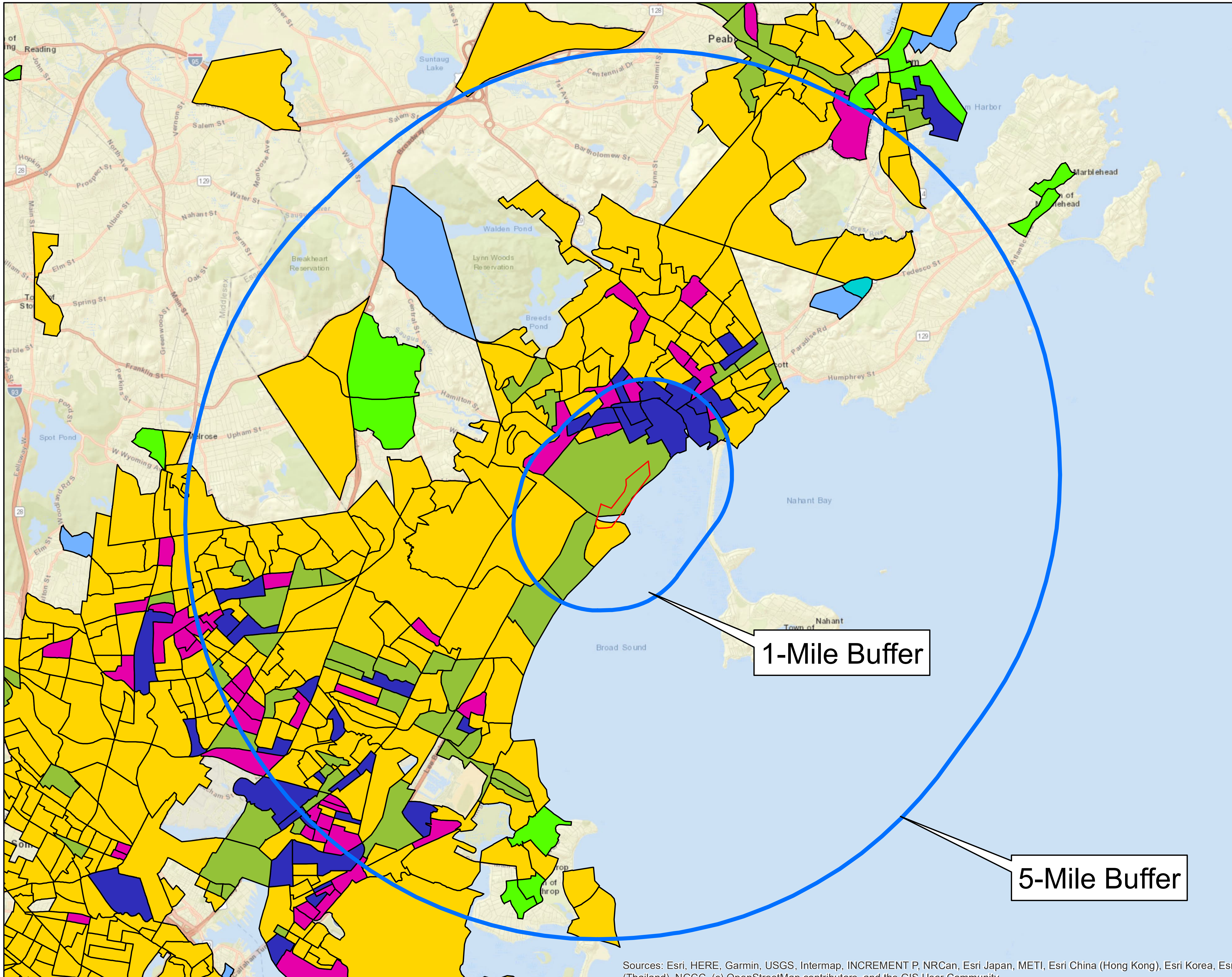
4. Identify EJ populations and characteristics (Minority, Income, English Isolation) within 5 miles of project site (can attach map identifying 5-mile radius from EJ Maps Viewer in lieu of narrative)

Within 5 miles of the project site, there are EJ block groups with the following characteristics: Minority; Income; English isolation; Minority and income; Minority and English isolation; Income and English isolation; Minority, Income, and English isolation. The attached map shows the 5-mile radius from the EJ Maps Viewer.

5. Identify any municipality or census tract meeting the definition of "vulnerable health EJ criteria" in the DPH EJ Tool located in whole or in part within a 1-mile radius of the project site **There are three municipalities in part within a 1-mile radius of the project site. These are Lynn, Revere, and Saugus.** • **Lynn meets two of the Vulnerable Health EJ Criteria: Lead Poisoning (29 BLL >= ug/dL Prevalence per 1,000) and Asthma ED Visits (130 per 10,000). For these two criteria, the rate or prevalence in Lynn is greater than 110% the rate or prevalence for the state as a whole.** • **Revere also meets two Criteria: Heart Attack (30%) and Asthma ED Visits (111 Visits per 10,000). For these two criteria, the rate or prevalence in Revere is greater than 110% the rate or prevalence for the state as a whole.** • **Saugus does not exceed any of the four Vulnerable Health EJ Criteria. For all four criteria, the rate or prevalence in Saugus is less than 110% the rate or prevalence for the state as a whole.**
6. Identify potential short-term and long-term environmental and public health impacts that may affect EJ Populations and any anticipated mitigation **The following impacts may affect EJ populations as well as the wider public:** - **Short-term impacts to traffic on Rice Avenue would impact residents on this street during the installation of pipeline in the roadway. Increased activity in the vicinity of the project site, including the Point of Pines parking lot, would temporarily disrupt local traffic.** - **Short-term impacts to traffic on Hanson Street would impact traffic patterns in the commercial/industrial vicinity during the installation of pipeline in the roadway.** - **Short-term impacts to air quality in the project area could result from the temporary operation of machinery associated with construction activities. Best management practices (BMPs) to control construction emissions would be implemented to minimize dust and emission.** - **Short-term impacts to noise levels in the project area would occur during construction, primarily from mechanical equipment used for construction activities. Noise impacts will be minimized to the extent feasible through measures including preventing unnecessary vehicle idling.** - **Short-term impacts to public access to the Community Path of Lynn and a segment of adjacent waterfront walking/biking trail during construction.** **These impacts are not expected to disproportionately impact EJ populations.**
7. Identify project benefits, including "Environmental Benefits" as defined in 301 CMR 11.02, that may improve environmental conditions or public health of the EJ population **The project would result in the following benefits to EJ populations as well as the wider public:** - **MWRA's Section 56 Water Pipeline provides water to residents and businesses in the cities of Revere and Lynn. This project will ensure water system redundancy and reliability, which is crucial to protecting public and environmental health. Replacement of this pipeline will ensure continued water supply for consumption, fire protection, and sanitation. The EJ populations served by this pipeline, as well as the wider community, will**

benefit from the security that this pipeline replacement will bring to the area's water supply.
8. Describe how the community can request a meeting to discuss the project, and how the community can request oral language interpretation services at the meeting. Specify how to request other accommodations, including meetings after business hours and at locations near public transportation. **To request accommodations, please email or call the following:** **Katie Ronan, MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**

SECTION 56 SAUGUS RIVER CROSSING: 2020 ENVIRONMENTAL JUSTICE BLOCK GROUPS



Legend

Limit of Work

2020 Environmental Justice Block Groups

EJ Criteria

- Minority
- Income
- English isolation
- Minority and Income
- Minority and English isolation
- Income and English isolation
- Minority, Income and English isolation

0 3,000 6,000 Feet

1 inch = 6,016 feet

AECOM

Date: 3/7/2023

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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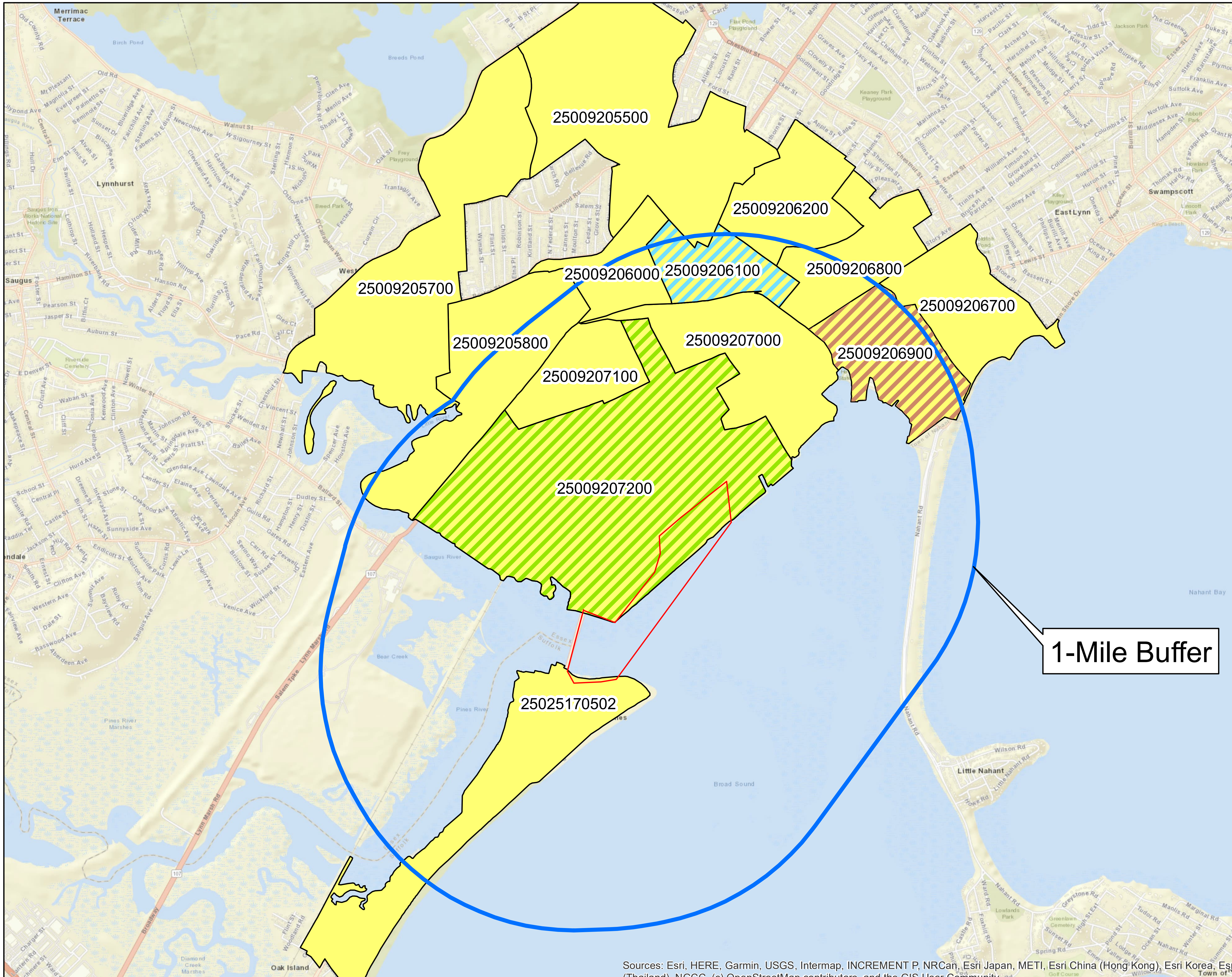

SECTION 56 SAUGUS RIVER CROSSING: LANGUAGES SPOKEN BY >5% OF PEOPLE THAT SPEAK ENGLISH LESS THAN "VERY WELL"

Legend

- Limit of Work
- Spanish or Spanish Creole
- Mon-Khmer, Cambodian
- Other Indic languages
- Russian

0 1,000 2,000 Feet

1 inch = 2,000 feet

AECOM

Date: 3/7/2023

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Форма проверки экологической справедливости

Название проекта	**MWRA, участок 56, проект по замене водопроводных труб**
Ожидаемая дата подачи заявления в соответствии с Законом об экологической политике штата Массачусетс (MEPA)	**30 июня 2023 г.**
Название инициатора	**Управление водных ресурсов штата Массачусетс (MWRA)**
Контактная информация (например, консультант)	**Кэти Ронан, MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**
Публичный веб-сайт проекта или другое физическое место, где можно получить материалы по проекту (при наличии)	**https://www.mwra.com/projects/water/7454-section56-saugus-river/7454-update.html**
Муниципалитет и почтовый индекс по проекту (если известно)	**Город Ревир, 02151** **Город Линн, 01905**
Тип проекта* (перечислите всё, что применимо)	**Водоснабжение — очистка/подача**
Находится ли участок проекта в пределах 100-летней затапливаемой территории, указанной на карте Федерального агентства по управлению в чрезвычайных ситуациях (FEMA)? Да/нет/неизвестно	**Да**
Расчётные выбросы парниковых газов в кондиционируемых помещениях (щёлкните **здесь,** чтобы воспользоваться Инструментом оценки выбросов парниковых газов)	**Не применимо.**

Описание проекта

1. Предоставьте краткое описание проекта, включая общую площадь участка проекта и площадь в квадратных футах предполагаемых зданий и сооружений, если известно.

   Управление водных ресурсов штата Массачусетс (MWRA) предполагает заменить часть существующего водопровода на участке 56. Участок 56 обеспечивает водоснабжение городов Линн и Ревир. Участок водопровода, подлежащий замене, ранее был прикреплён к мосту генерала Эдвардса через реку Саугус (который также является муниципальной границей городов Линн/Ревир), но в 2018 году его пришлось демонтировать из-за сильной коррозии. MWRA теперь предполагает заменить эту часть водопровода путём прокладки нового участка водопровода под водами реки Саугус, используя как открытый, так и бестраншейный способ строительства подводных трубопроводов. «MWRA, участок 56, проект по замене водопроводных труб» обеспечит

резервирование и надёжность водоснабжения для жителей и предприятий в этих населённых пунктах, что имеет решающее значение для защиты здоровья людей и окружающей среды. После завершения строительства единственным следом на поверхности останутся приблизительно шесть люков, которые будут располагаться вровень с асфальтированными поверхностями Райс Авеню в Ревире и Хэнсон Стрит в Линне, и (или) на травянистом островке безопасности на въезде на Норт Шор Роуд в Ревире.

Конкретные мероприятия по проекту включают:

- **Прокладывание 20-дюймовых водопроводных труб под рекой Саугус с использованием методов горизонтально-направленного бурения (ГНБ).**
- **Прокладывание 20-дюймовых водопроводных труб, включая соединительные детали, клапаны, выпускные воздушные клапаны и продувочные устройства, на Райс Авеню в Ревире, от места пересечения ГНБ реки Саугус у яхт-клуба «Пойнт оф Пайнс» до существующего участка 56 трубопровода между северным выездом на шоссе 1А и Линнуэй.**
- **Прокладывание водопроводных труб диаметром 20 дюймов и вспомогательных элементов, включая соединительные детали, клапаны, выпускные воздушные клапаны и продувочные устройства, на Хэнсон Стрит в Линне, от существующего участка 56 трубопровода на шоссе 1А до места пересечения ГНБ реки Саугус в конце Хэнсон Стрит/Райли Уэй Экстеншн**
- **Установка систем экологического контроля и управления движением, замена коммуникаций, восстановление поверхности, реконструкция дорог/восстановление дорожного покрытия и реконструкция тротуаров.**
- **Демонтаж двенадцати деревянных свай из разрушенной набережной вдоль береговой линии Линна.**
- **Временное размещение входа/выхода котлованов ГНБ на стоянке яхт-клуба «Пойнт оф Пайнс» в Ревире и в конце Хэнсон Стрит/Райли Уэй Экстеншн в Линне.**

Общая площадь территории с временными неудобствами для жителей составит 2,9 акров. Возведение постоянных надземных зданий или сооружений не предполагается.

2. Перечислите предполагаемые минимальные требования к рассмотрению в соответствии с MEPA (Кодекс нормативных актов штата Массачусетс (CMR), раздел 301, 11.03) (если известно)

- **CMR, раздел 301, 11.03(3)(b)(1)(e), который гласит: «Новая отсыпка, или сооружение, или расширение существующей отсыпки или сооружения, за исключением сооружений на свайных опорах, в скоростной зоне или нормативной полосе затопления».**
- **CMR, раздел 301, 11.03(3)(b)(1)(a), касательно «изменения прибрежной дюны, барьерного пляжа или прибрежной насыпи».**

3. Перечислите все предполагаемые разрешения штата, местные и федеральные разрешения, необходимые для проекта (если известно)

Уведомление о намерениях MA WPA (ожидается постановление об условиях из Ревира и Линна)
Сертификация качества воды 401 MassDEP
Определение соответствия прибрежной зоны Mass CZM
Разрешение 8M MWRA
Разрешение на работы на улице, Ревир, MassDOT

Разрешение на работы на улице, Линн, MassDOT
Разрешение на доступ к строительству, MassDCR
Форма уведомления о проекте (PNF) Исторической комиссии штата Массачусетс и соблюдение требований раздела 106 Закона о сохранении национальных исторических памятников
Инженерный корпус армии США, разрешения согласно разделу 404 и 408
Глава 91, лицензия согласно Закону об общественных набережных штата Массачусетс

4. Определите группы населения с особыми требованиями к экологической справедливости и их характеристики (меньшинство, доход, изолированность от английского языка) в пределах 5 миль от участка проекта (можно приложить карту с указанием радиуса в 5 миль из Просмотра карт экологической справедливости вместо описания)

В пределах 5 миль от участка проекта существуют блоковые группы с особыми требованиями к экологической справедливости со следующими характеристиками: Меньшинство; доход; изолированность от английского языка; меньшинство и доход; меньшинство и изолированность от английского языка; доход и изолированность от английского языка; меньшинство, доход и изолированность от английского языка. На прилагаемой карте показан 5-мильный радиус из Просмотра карт экологической справедливости.

5. Определите любой муниципалитет или район переписи населения, отвечающий определению «критериев экологической справедливости для уязвимого здоровья населения» при помощи Инструмента экологической справедливости Департамента общественного здоровья (DPH) , расположенный полностью или частично в радиусе 1 мили от участка проекта

Существуют три муниципалитета, частично расположенные в радиусе 1 мили от участка проекта. Это Линн, Ревир и Саугус.

- **Линн соответствует двум критериям экологической справедливости для уязвимого здоровья населения: Отравление свинцом (уровень свинца в крови 29 >= мкг/дл, распространённость на 1000 человек) и посещения отделения неотложной помощи в связи с астмой (130 на 10 000 человек). По этим двум критериям уровень или распространённость в Линне более чем на 110% превышает уровень или распространённость в штате в целом.**
- **Ревир также соответствует двум критериям: Сердечный приступ (30%) и посещения отделения неотложной помощи в связи с астмой (111 посещений на 10 000 человек). По этим двум критериям уровень или распространённость в Ревире более чем на 110% превышает уровень или распространённость в штате в целом.**
- **В Саугусе не превышен ни один из четырёх критериев экологической справедливости для уязвимого здоровья населения. По всем четырём критериям уровень или распространённость в Саугусе меньше, чем 110% от уровня или распространённости в штате в целом.**

6. Определите потенциальное краткосрочное и долгосрочное воздействие на окружающую среду и общественное здоровье, которое может затронуть население с особыми требованиями к экологической справедливости, и любые предполагаемые меры по минимизации такого воздействия.

Следующие виды воздействия могут затронуть население с особыми требованиями к экологической справедливости, а также более широкую общественность:

- **Краткосрочное воздействие на движение транспорта по Райс Авеню затронет**

жителей этой улицы во время прокладки водопроводных труб на проезжей части. Повышенная активность вблизи участка проекта, включая стоянку у яхт-клуба «Пойнт оф Пайнс», может временно нарушить местное движение.

- **Краткосрочное воздействие на движение транспорта по Хэнсон Стрит повлияет на схему движения в близлежащем коммерческом/промышленном районе во время прокладки водопроводных труб на проезжей части.**
- **Может иметь место краткосрочное воздействие на качество воздуха в районе выполнения проекта из-за временной работы техники в связи со строительными работами. Для контроля строительных выбросов будут применяться передовые методы управления (BMP), чтобы минимизировать пыль и выбросы.**
- **Во время строительства будет иметь место краткосрочное воздействие на уровни шума в районе выполнения проекта, в основном от механического оборудования, используемого для строительных работ. Шумовое воздействие будет сведено к минимуму, насколько это возможно, при помощи конкретных мер, включая предотвращение ненужного простоя транспортных средств.**
- **Краткосрочное воздействие на доступ населения к Общественной тропе Линна и участку прилегающей пешеходной/велосипедной дорожки на набережной во время строительства.**

Ожидается, что эти виды воздействия не окажут непропорционального влияния на население с особыми требованиями к экологической справедливости.

7. Определите преимущества проекта, включая «Преимущества для окружающей среды», согласно определению, приведённому в CMR, раздел 301, 11.02, которые могут улучшить экологические условия или общественное здоровье населения с особыми требованиями к экологической справедливости

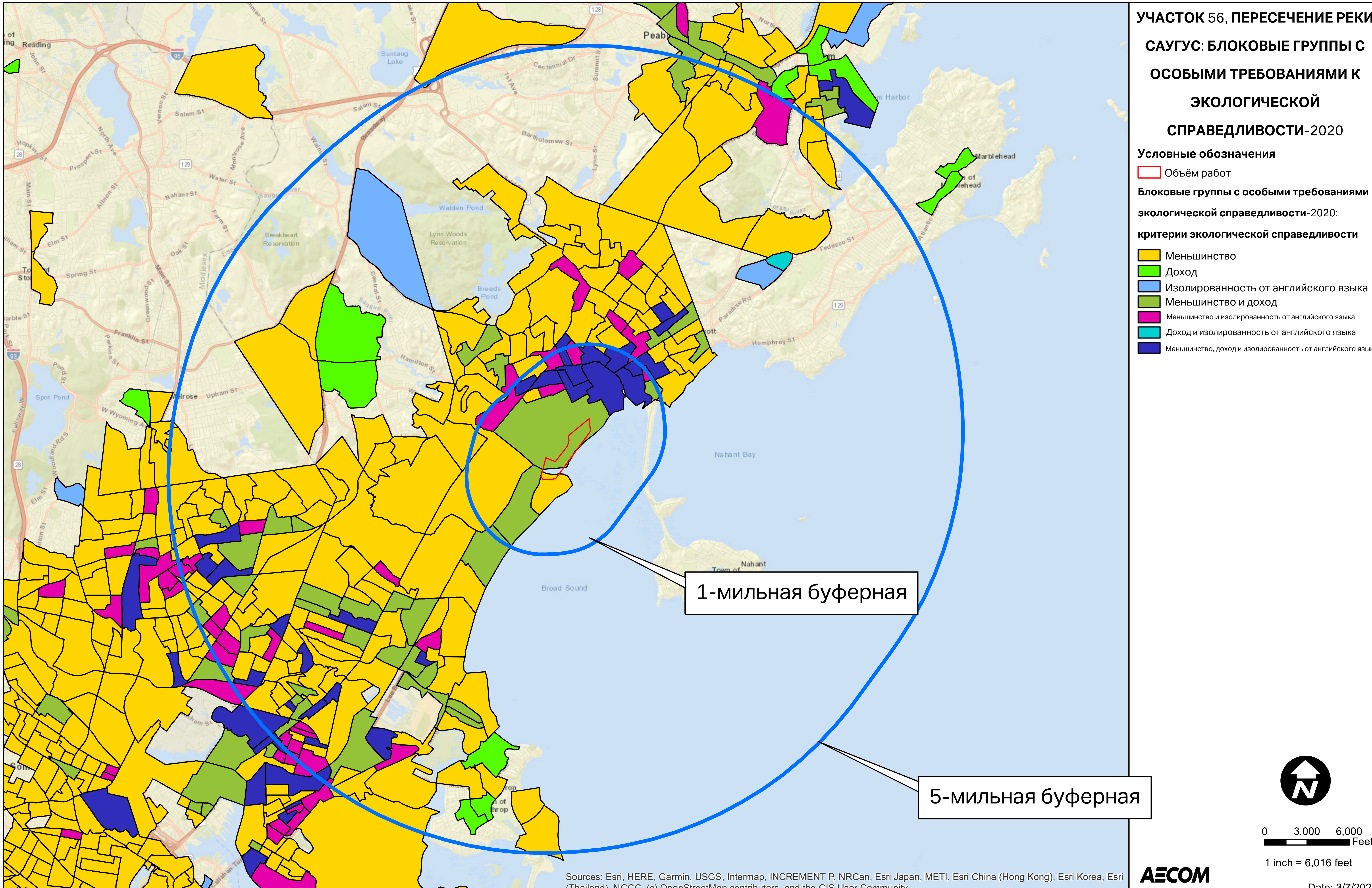
В результате проекта будут достигнуты следующие преимущества для населения с особыми требованиями к экологической справедливости, а также для более широкой общественности:

- **«MWRA, участок 56, проект по замене водопроводных труб» предоставляет водоснабжение для жителей и предприятий в городах Ревир и Линн. Данный проект обеспечит резервирование и надёжность водоснабжения, что имеет решающее значение для защиты здоровья людей и окружающей среды. Замена водопроводных труб обеспечит непрерывное водоснабжение для личного потребления, противопожарной безопасности и улучшения санитарии. Население с особыми требованиями к экологической справедливости, обслуживаемое этим водопроводом, а также сообщество в целом получат пользу от повышенной безопасности и надёжности, которую обеспечит замена трубопровода для водоснабжения района.**

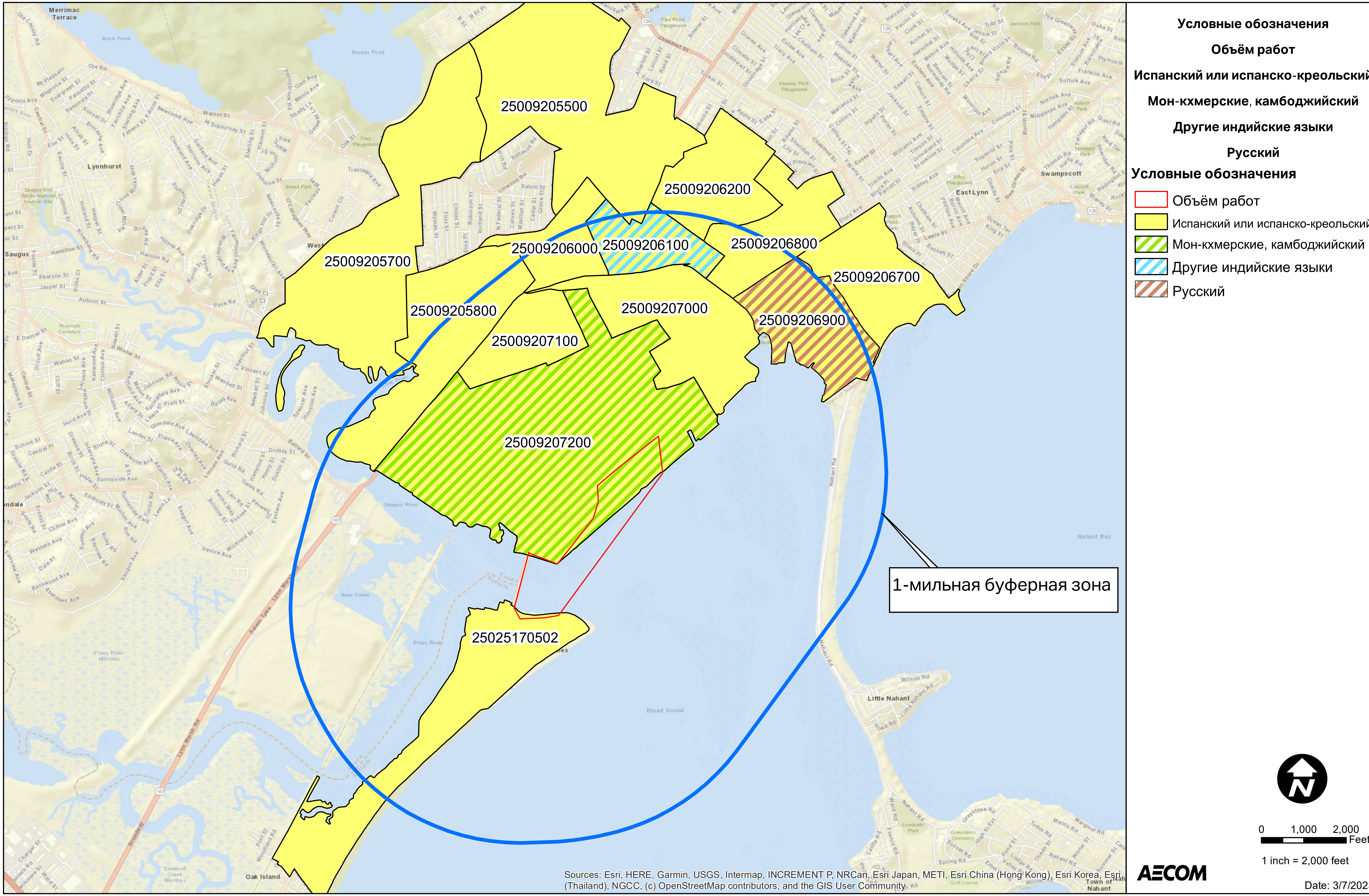
8. Укажите, как сообщество может запросить встречу для обсуждения этого проекта и как оно может запросить услуги устного перевода в ходе этой встречи. Укажите, как запросить другие удобства, включая встречи в нерабочее время и в местах, расположенных рядом с общественным транспортом.

Для того чтобы запросить необходимые удобства, пожалуйста, напишите на электронную почту или позвоните по телефону:

Кэти Ронан, MWRA
(617) 788-1177
katherine.ronan@mwra.com



УЧАСТОК 56, ПЕРЕСЕЧЕНИЕ РЕКИ САУГУС: БЛОКОВЫЕ ГРУППЫ С ОСОБЫМИ ТРЕБОВАНИЯМИ К ЭКОЛОГИЧЕСКОЙ СПРАВЕДЛИВОСТИ-2020
Условные обозначения
Объём работ
Блоковые группы с особыми требованиями к экологической справедливости-2020: критерии экологической справедливости
Меньшинство
Доход
Изолированность от английского языка
Меньшинство и доход
Меньшинство и изолированность от английского языка
Доход и изолированность от английского языка
Меньшинство, доход и изолированность от английского языка
1-мильная буферная
5-мильная буферная
Nahant Bay
Broad Sound
0 3,000 6,000 Feet
1 inch = 6,016 feet
AECOM
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Date: 3/7/2023



Условные обозначения
Объём работ
Испанский или испанско-креольский
Мон-кхмерские, камбоджийский
Другие индийские языки
Русский
Условные обозначения
Объём работ
Испанский или испанско-креольский
Мон-кхмерские, камбоджийский
Другие индийские языки
Русский
25009205500
25009206200
25009205700
25009206000
25009206100
25009206800
25009206700
25009205800
25009207000
25009206900
25009207100
25009207200
25025170502
1-мильная буферная зона
Nahant Bay
Broad Sound
Little Nahant
Lynnhurst
Saugus
East Lynn
Swampscott
Oak Island
0
1,000
2,000
Feet
1 inch = 2,000 feet
AECOM
Date: 3/7/2023
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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ទម្រង់ត្រួតពិនិត្យយុត្តិធម៌បរិស្ថាន

ឈ្មោះគម្រោង	MWRA ផ្នែកទី 65 គម្រោងផ្លាស់ប្តូរបំពង់ទឹក
កាលបរិច្ឆេទដែលរំពឹងទុកនៃការដាក់ឯកសារ MEPA	ថ្ងៃទី 30 ខែមិថុនា ឆ្នាំ 2023
ឈ្មោះអ្នកគាំទ្រ	អាជ្ញាធរធនធានទឹករដ្ឋម៉ាសសាចជូសេត
ព័ត៌មានទំនាក់ទំនង (ឧ. អ្នកប្រឹក្សា)	**Katie Ronan, MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**
គេហទំព័រសាធារណៈសម្រាប់គម្រោង ឬទីតាំងរូបវន្តផ្សេងទៀត ដែលសម្ភារៈគម្រោងអាចទទួលបាន (ប្រសិនបើមាន)	**https://www.mwra.com/projects/water/7454-section56-saugus-river/7454-update.html**
ក្រុង និងលេខកូដប្រៃសណីយ៍សម្រាប់គម្រោង (ប្រសិនបើដឹង)	ទីក្រុង **Revere**, **02151** ទីក្រុង **Lynn**, **01905**
ប្រភេទគម្រោង* (រាយបញ្ជីទាំងអស់ដែលអនុវត្ត)	ការផ្គត់ផ្គង់ទឹក - ប្រព្រឹត្តិកម្ម/ការដឹកជញ្ជូន
តើទីតាំងគម្រោងស្ថិតនៅក្នុងតំបន់ទំនាបទឹកជំនន់កំណត់ក្នុង FEMA 100 ឆ្នាំដែរឬទេ? បាទ/ចាស/ទេ/មិនដឹង	បាទ/ចាស
ចន្លោះលក្ខខណ្ឌនៃការប៉ាន់ស្មានបំភាយ GHG (ចុច **ទីនេះ**សម្រាប់ឧបករណ៍ប៉ាន់ស្មាន GHG)	មិនអាចអនុវត្តបាន។

ការពណ៌នាអំពីគម្រោង

1. ផ្តល់ការពណ៌នាសង្ខេបអំពីគម្រោង រួមទាំងទំហំទាំងមូលនៃទីតាំងគម្រោង និងផ្ទៃក្រឡាការ៉េនៃអគារ និងរចនាសម្ព័ន្ធដែលបានស្នើឡើង ប្រសិនបើដឹង។

   អាជ្ញាធរធនធានទឹករដ្ឋម៉ាសសាចជូសេត (MWRA) កំពុងស្នើប្តូរផ្នែកមួយនៃបំពង់ទឹកផ្នែកទី 56 ដែលមានស្រាប់របស់ខ្លួន។

   ផ្នែកទី 56 ផ្តល់សេវាទឹកដល់ទីក្រុង **Lynn** និង **Revere**។ ផ្នែកនៃបំពង់ទឹកនេះដែលត្រូវផ្លាស់ប្តូរពីមុនត្រូវបានភ្ជាប់នឹងស្ពាន General Edwards

ឆ្លងកាត់ទន្លេ Saugus (ដែលជាព្រំប្រទល់ក្រុង Lynn/Revere ផងដែរ) ប៉ុន្តែត្រូវដកចេញនៅឆ្នាំ 2018 ដោយសារតែការច្រេះធ្ងន់ធ្ងរ។
ឥឡូវនេះ MWRA ស្នើឱ្យប្តូរផ្នែកនៃបំពង់ទឹកនេះដោយការដំឡើងផ្នែកថ្មីនៃបំពង់ទឹកនៅក្រោមទឹកនៃទន្លេ Saugus ដោយប្រើវិធីសាស្ត្រសាងសង់បំពង់បង្ហូរក្រោមទឹកដែលកាត់ចំហ និងគ្មានការជីកស្នាមភ្លោះ។
គម្រោងការប្តូរបំពង់ទឹកផ្នែកទី 56 របស់ MWRA នឹងធានានូវប្រព័ន្ធទឹកប្រើប្រាស់ដដែលៗ និងភាពជឿជាក់សម្រាប់អ្នករស់នៅ និងអាជីវកម្មនៅក្នុងសហគមន៍ទាំងនេះ ដែលមានសារៈសំខាន់ខ្លាំងណាស់ក្នុងការការពារសុខភាពសាធារណៈ និងបរិស្ថាន។
បន្ទាប់ពីការសាងសង់ត្រូវបានបញ្ចប់ ផលប៉ះពាល់លើផ្ទៃដែលមានស្រាប់នឹងបណ្តាលឱ្យមានរន្ធប្រាំមួយ ដែលនឹងត្រូវហូរចេញជាមួយនឹងផ្ទៃក្រៅនៃផ្លូវ Rice Avenue នៅ Revere និងនៅមហាវិថី Hanson ក្នុងទីក្រុង Lynn និង/ឬនៅលើកោះចរាចរណ៍ដែលមានស្មៅនៅផ្លូវចូល North Shore Road នៅ Revere ។

សកម្មភាពគម្រោងជាក់លាក់រួមមាន៖

- ការដំឡើងមេទឹកទំហំ 20 អ៊ីញនៅក្រោមទន្លេ Saugus ដោយប្រើវិធីសាស្ត្រខួងទិសផ្តេក (HDD)។
- ការដំឡើងមេទឹកទំហំ 20 អ៊ីញ រួមទាំងបរិក្ខារ សន្ទះបិទបើក សន្ទះបិទបើកខ្យល់ និងសន្ទះផ្លុំនៅផ្លូវ Rice Avenue ក្នុងទីក្រុង Revere ពីចំណុចឆ្លងកាត់ HDD ទន្លេ Saugus River នៅឯ Point of Pines Yacht Club ទៅកាន់បំពង់បង្ហូរប្រេងផ្នែកទី 56 ដែលមានស្រាប់រវាងផ្លូវលំ 1A ទៅខាងជើង និងផ្លូវ **Lynnway**។
- ការដំឡើងមេ និងបរិក្ខារផ្គត់ផ្គង់ទឹកដែលមានអង្កត់ផ្ចិត 20 អ៊ីញ រួមទាំងបរិក្ខារ សន្ទះបិទបើក សន្ទះបិទបើកខ្យល់ និងសន្ទះផ្លុំនៅផ្លូវ Hanson ក្នុងទីក្រុង Lynn ពីបំពង់ផ្នែកទី 56 ដែលមានស្រាប់ក្នុងផ្លូវលេខ 1A ទៅកាន់ចំណុចឆ្លងកាត់ទន្លេ Saugus HDD នៅចុងបញ្ចប់នៃផ្នែកបន្ថែមផ្លូវ Hanson/Riley Way
- ការដំឡើងការគ្រប់គ្រងបរិស្ថាន និងការគ្រប់គ្រងចរាចរណ៍ ការជំនួសឧបករណ៍ប្រើប្រាស់ ការស្តារផ្ទៃ ការស្ថាបនាផ្លូវថ្នល់ឡើងវិញ/ការស្តារឡើងវិញចិញ្ចើមផ្លូវអ្នកដើរ និងការស្ថាបនាឡើងវិញនូវចិញ្ចើមផ្លូវ។
- ការរុះរើគំនរឈើចំនួន 12 ដុំពីជញ្ជាំងសមុទ្រដែលខូចគុណភាពនៅច្រាំងទន្លេ Lynn។
- ទីតាំងបណ្តោះអាសន្ន/ រន្ធចូល HDD /រន្ធចេញនៅចំណុចចំណតរបស់ក្លឹប Pines Yacht Club ក្នុង Revere និងនៅខាងចុងនៃ Hanson Street/Riley Way Extension ក្នុងក្រុង Lynn។

ផ្ទៃដីសរុបនៃការរំខានបណ្តោះអាសន្នគឺ 2.9 acres
មិនមានអគារ ឬសំណង់អចិន្ត្រៃយ៍សង់ពីលើដី ដែលត្រូវបានស្នើឡើង។

2. រាយបញ្ជីកម្រិតពិនិត្យ MEPA ដែលរំពឹងទុក (301 CMR 11.03) (ប្រសិនបើដឹង)

- 301 CMR 11.03(3)(b)(1)(e) ដែលចែងថា៖
 “ការបំពេញ ឬរចនាសម្ព័ន្ធថ្មី ឬការពង្រីកការបំពេញ ឬរចនាសម្ព័ន្ធដែលមានស្រាប់ លើកលែងតែរចនាសម្ព័ន្ធដែលគាំទ្រដោយគំនរ នៅក្នុងតំបន់លឿន ឬផ្លូវទឹកជំនន់តាមបទប្បញ្ញត្តិ។”
- **301 CMR 11.03(3)(b)(1)(a)** ទាក់ទងនឹង "ការកែប្រែឆ្នេរខ្សាច់ របាំងឆ្នេរ ឬច្រាំងទន្លេ។”

3. រាយបញ្ជីលិខិតអនុញ្ញាតរំពឹងទុកទាំងអស់ដែលរដ្ឋ អាជ្ញាធរក្នុងតំបន់ និងសហព័ន្ធត្រូវការសម្រាប់គម្រោង (ប្រសិនបើដឹង)

សេចក្តីជូនដំណឹងអំពីសុឆន្ទៈរបស់ MAWPA (បទបញ្ញាលក្ខខណ្ឌដែលបានរំពឹងទុកពី Revere និង Lynn)

វិញ្ញាបនប័ត្រគុណភាពទឹក MassDEP 401

ការកំណត់សង្គតិភាពនៃតំបន់ឆ្នេរ Mass CZM

លិខិតអនុញ្ញាត MWRA 8M

លិខិតអនុញ្ញាតបើកផ្លូវ MassDOT, Revere

លិខិតអនុញ្ញាតបើកផ្លូវ MassDOT, Lynn

លិខិតអនុញ្ញាតសាងសង់ MassDCR

ទម្រង់ការជូនដំណឹងអំពីគម្រោងរបស់គណៈកម្មការប្រវត្តិសាស្ត្ររដ្ឋម៉ាសសាចជូសេត (PNF) និងច្បាប់អភិរក្សប្រវត្តិសាស្ត្រជាតិ ផ្នែកទី 106 អនុលោមភាព

អង្គភាពវិស្វករកងទ័ពអាមេរិក ផ្នែកទី 404 និង លិខិតអនុញ្ញាតលេខ 408

ជំពូកទី 91 អាជ្ញាប័ណ្ណច្បាប់មាត់ទឹកសាធារណៈរដ្ឋម៉ាសសាចជូសេត

4. កំណត់ចំនួនប្រជាជន និងលក្ខណៈរបស់ EJ (ជនជាតិភាគតិច ប្រាក់ចំណូល ភាពឯកោនៃភាសាអង់គ្លេស) ក្នុងចម្ងាយ 5 ម៉ាយល៍ពីតំបន់គម្រោង (អាចភ្ជាប់ផែនទីកំណត់កាំ 5 ម៉ាយល៍ពី [កម្មវិធីមើលផែនទី EJ](#) ជំនួសឱ្យការនិទានរឿង)

ក្នុងចម្ងាយ 5 ម៉ាយល៍ពីតំបន់គម្រោង មានក្រុមប្លុក EJ ដែលមានលក្ខណៈដូចខាងក្រោម៖
ជនជាតិភាគតិច ប្រាក់ចំណូល ភាពឯកោនៃភាសាអង់គ្លេស
ជនជាតិភាគតិចនិងប្រាក់ចំណូល ជនជាតិភាគតិច និងភាពឯកោនៃភាសាអង់គ្លេស
ប្រាក់ចំណូលនិងភាពឯកោនៃភាសាអង់គ្លេស ជនជាតិភាគតិច ប្រាក់ចំណូល និងភាពឯកោនៃភាសាអង់គ្លេស។
ផែនទីដែលបានភ្ជាប់បង្ហាញកាំ 5 ម៉ាយល៍ពី EJ Maps Viewer។

5. កំណត់អត្តសញ្ញាណក្រុង ឬផ្លូវជាកុងសុងស៊ីសណាមួយដែលត្រូវនឹងនិយមន័យនៃ "លក្ខខណ្ឌសុខភាព EJ ដែលងាយរងគ្រោះ" នៅក្នុង [DPH EJ Tool](#) ដែលមានទីតាំងនៅទាំងមូល ឬមួយផ្នែកក្នុងចម្ងាយរង្វង់កាំ 1 ម៉ាយល៍ នៃទីតាំងគម្រោង

មានក្រុងចំនួនបីនៅក្នុងផ្នែកមួយក្នុងរង្វង់កាំ 1 ម៉ាយល៍នៃទីតាំងគម្រោង។ ទាំងនេះគឺ Lynn, Revere និង Saugus។

- Lynn បំពេញតាមលក្ខណៈវិនិច្ឆ័យ EJ សុខភាពដែលងាយរងគ្រោះចំនួនពីរ៖ ការបំពុលនាំមុខ (29 BLL >= ug/dL ប្រេវ៉ាឡង់ក្នុង 1,000) និងការមកពិនិត្យជំងឺហឺត ED (130 ក្នុង 10,000)។ សម្រាប់លក្ខណៈវិនិច្ឆ័យទាំងពីរនេះ អត្រា ឬអត្រាប្រេវ៉ាឡង់នៅ **Lynn** គឺធំជាង 110% នៃអត្រា ឬប្រេវ៉ាឡង់សម្រាប់រដ្ឋទាំងមូល។

- Revere ក៏បំពេញលក្ខខណ្ឌពីរដែរ៖ ការគាំងបេះដូង (30%) និងការពិនិត្យជំងឺហឺត ED (មកពិនិត្យ 111 ក្នុង 10,000)។ សម្រាប់លក្ខណៈវិនិច្ឆ័យទាំងពីរនេះ អត្រា ឬអត្រាប្រេវ៉ាឡង់នៅក្នុង Revere គឺធំជាង 110% អត្រា ឬប្រេវ៉ាឡង់សម្រាប់រដ្ឋទាំងមូល។

- Saugus មិនលើសពីលក្ខណៈវិនិច្ឆ័យ EJ ដែលងាយរងគ្រោះទាំងបួន។ សម្រាប់លក្ខណៈវិនិច្ឆ័យទាំងបួន អត្រា ឬអត្រាប្រេវ៉ាឡង់នៅក្នុង Saugus គឺតិចជាង 110% នៃអត្រា ឬប្រេវ៉ាឡង់សម្រាប់រដ្ឋទាំងមូល។

6. កំណត់ផលប៉ះពាល់បរិស្ថាន និងសុខភាពសាធារណៈរយៈពេលខ្លី និងរយៈពេលវែងដែលអាចប៉ះពាល់ដល់ចំនួនប្រជាជន EJ និងការបន្ធូរបន្ថយដែលរំពឹងទុក

ផលប៉ះពាល់ខាងក្រោមអាចប៉ះពាល់ដល់ប្រជាជន EJ ក៏ដូចជាសាធារណជនទូទៅ៖

- ផលប៉ះពាល់រយៈពេលខ្លីចំពោះចរាចរណ៍នៅលើផ្លូវ Rice Avenue នឹងប៉ះពាល់ដល់អ្នករស់នៅតាមដងផ្លូវនេះ អំឡុងពេលដំឡើងបំពង់បង្ហូរនៅតាមដងផ្លូវ។ ការបង្កើនសកម្មភាពនៅតំបន់ជុំវិញទីតាំងគម្រោង រួមទាំងចំណតរថយន្ត Point of Pines នឹងរំខានដល់ចរាចរណ៍ក្នុងតំបន់ជាបណ្ដោះអាសន្ន។

- ផលប៉ះពាល់រយៈពេលខ្លីចំពោះចរាចរណ៍នៅលើមហាវិថី Hanson នឹងប៉ះពាល់ដល់គំរូចរាចរណ៍នៅក្នុងតំបន់ពាណិជ្ជកម្ម/ឧស្សាហកម្ម អំឡុងពេលដំឡើងបំពង់បង្ហូរ នៅក្នុងផ្លូវ។

- ផលប៉ះពាល់រយៈពេលខ្លីចំពោះគុណភាពខ្យល់នៅក្នុងតំបន់គម្រោងអាចបណ្ដាលមកពីប្រតិបត្តិការបណ្ដោះអាសន្ននៃគ្រឿងម៉ាស៊ីនដែលទាក់ទងនឹងសកម្មភាពសំណង់។ ការអនុវត្តការគ្រប់គ្រងល្អបំផុត (BMPs) ដើម្បីគ្រប់គ្រងការបំភាយឧស្ម័នសំណង់នឹងត្រូវបានអនុវត្តដើម្បីកាត់បន្ថយធូលី និងការបំភាយឧស្ម័ន។

- ផលប៉ះពាល់រយៈពេលខ្លីចំពោះកម្រិតសំឡេងរំខាននៅក្នុងតំបន់គម្រោងនឹងកើតឡើងអំឡុ

ងពេលសាងសង់
ជាចម្បងពីឧបករណ៍មេកានិចដែលប្រើប្រាស់សម្រាប់សកម្មភាពសាងសង់។

ផលប៉ះពាល់នៃសំឡេងនឹងត្រូវបានបង្រួមអប្បបរមាក្នុងកម្រិតដែលអាចធ្វើទៅបានតាមរយៈវិធានការនានា រួមទាំងការការពារការឈប់រថយន្តដែលមិនចាំបាច់។

- ផលប៉ះពាល់រយៈពេលខ្លីដល់ការចូលប្រើប្រាស់សាធារណៈទៅកាន់ផ្លូវសហគមន៍ Lynn និងផ្នែកនៃផ្លូវដើរ/ជិះកង់នៅមាត់ទឹកដែលនៅជាប់នោះអំឡុងពេលសាងសង់។

ផលប៉ះពាល់ទាំងនេះមិនត្រូវបានគេរំពឹងថានឹងប៉ះពាល់ដល់ប្រជាជន EJ ដោយមិនសមាមាត្រទេ។

7. កំណត់អត្ថប្រយោជន៍គម្រោង រួមទាំង "អត្ថប្រយោជន៍បរិស្ថាន" ដូចដែលបានកំណត់ក្នុង 301 CMR 11.02 ដែលអាចធ្វើឱ្យប្រសើរឡើងនូវលក្ខខណ្ឌបរិស្ថាន ឬសុខភាពសាធារណៈរបស់ប្រជាជន EJ

គម្រោងនេះនឹងផ្តល់អត្ថប្រយោជន៍ដូចខាងក្រោមដល់ប្រជាជន EJ ក៏ដូចជាសាធារណជនទូទៅ៖

- ផ្នែកទី 56 បំពង់ទឹករបស់ MWRA ផ្តល់ទឹកដល់អ្នករស់នៅ និងអាជីវកម្មនៅក្នុងទីក្រុង Revere និង Lynn។ គម្រោងនេះនឹងធានាបាននូវប្រព័ន្ធទឹកប្រើប្រាស់ដដែលៗ និងភាពជឿជាក់ ដែលជាកត្តាសំខាន់ក្នុងការការពារសុខភាពសាធារណៈ និងបរិស្ថាន។ ការជំនួសបំពង់នេះនឹងធានាបាននូវការផ្គត់ផ្គង់ទឹកបន្តសម្រាប់ការប្រើប្រាស់ ការការពារអគ្គិភ័យ និងអនាម័យ។ ប្រជាជន EJ ដែលបម្រើដោយបំពង់នេះ ក៏ដូចជាសហគមន៍កាន់តែទូលំទូលាយ នឹងទទួលបានអត្ថប្រយោជន៍ពីសុវត្ថិភាព ដែលការជំនួសបំពង់នេះនឹងនាំទៅដល់ការផ្គត់ផ្គង់ទឹកក្នុងតំបន់។

8. ពណ៌នាអំពីរបៀបដែលសហគមន៍អាចស្នើសុំការប្រជុំដើម្បីពិភាក្សាអំពីគម្រោង និងរបៀបដែលសហគមន៍អាចស្នើសុំសេវាបកប្រែភាសាផ្ទាល់មាត់នៅឯកិច្ចប្រជុំ។ បញ្ជាក់ពីរបៀបស្នើសុំកន្លែងស្នាក់នៅផ្សេងទៀត រួមទាំងការប្រជុំបន្ទាប់ពីម៉ោងធ្វើការ និងនៅទីតាំងជិតមធ្យោបាយដឹកជញ្ជូនសាធារណៈ។

ដើម្បីស្នើសុំការស្នាក់នៅ សូមផ្ញើអ៊ីមែល ឬទូរស័ព្ទមកលេខខាងក្រោម៖

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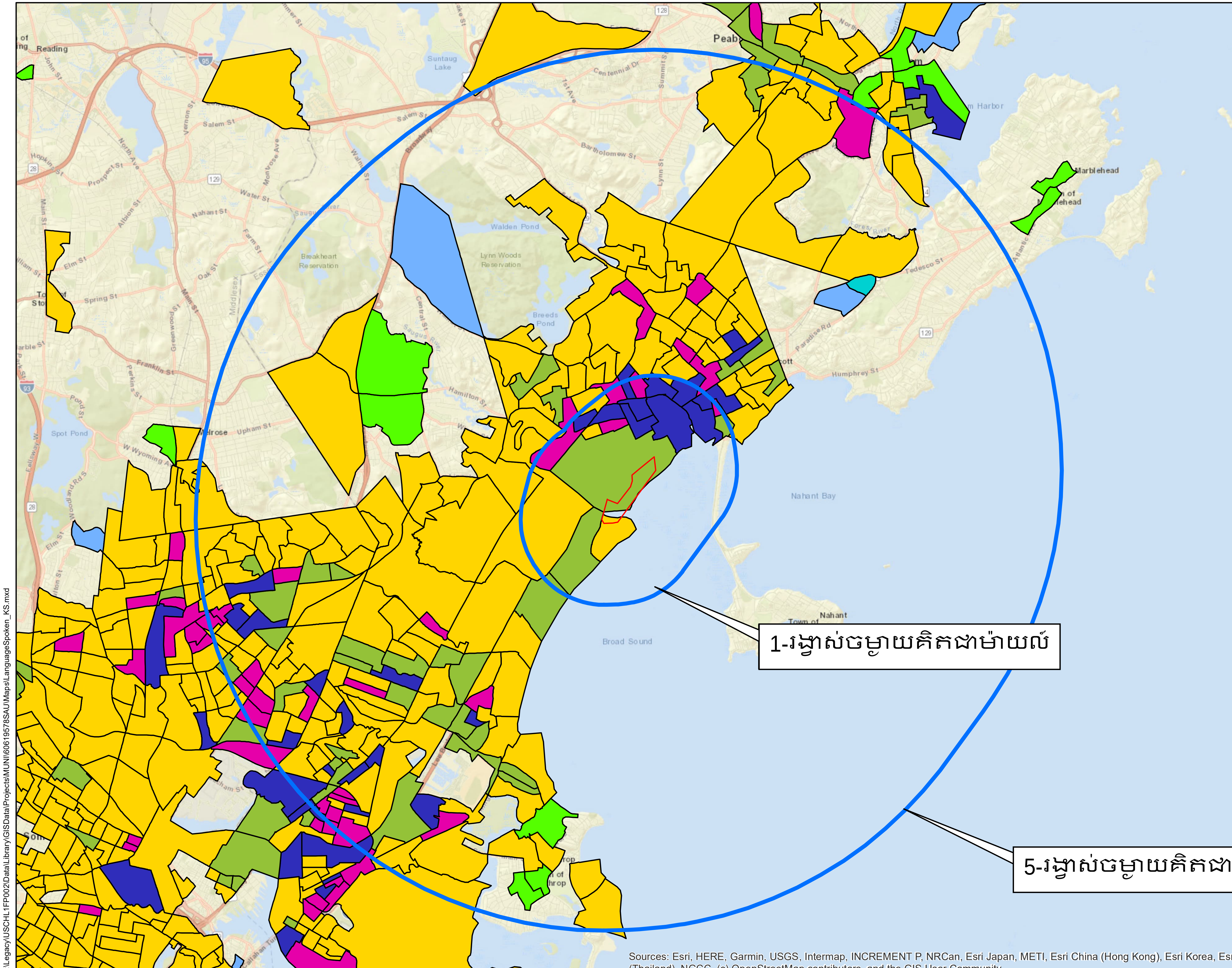


ផ្នែកទី 56 ការឆ្លងកាត់ទន្លេ SAUGUS៖ ក្រុមប្លក់យុត្តិធម៌បរិស្ថានឆ្នាំ 2022

ចំណាងជើង

- ដែនកំណត់ការងារ

លក្ខណៈវិនិច្ឆ័យ EJ ក្រុមប្លក់យុត្តិធម៌បរិស្ថានឆ្នាំ 2020

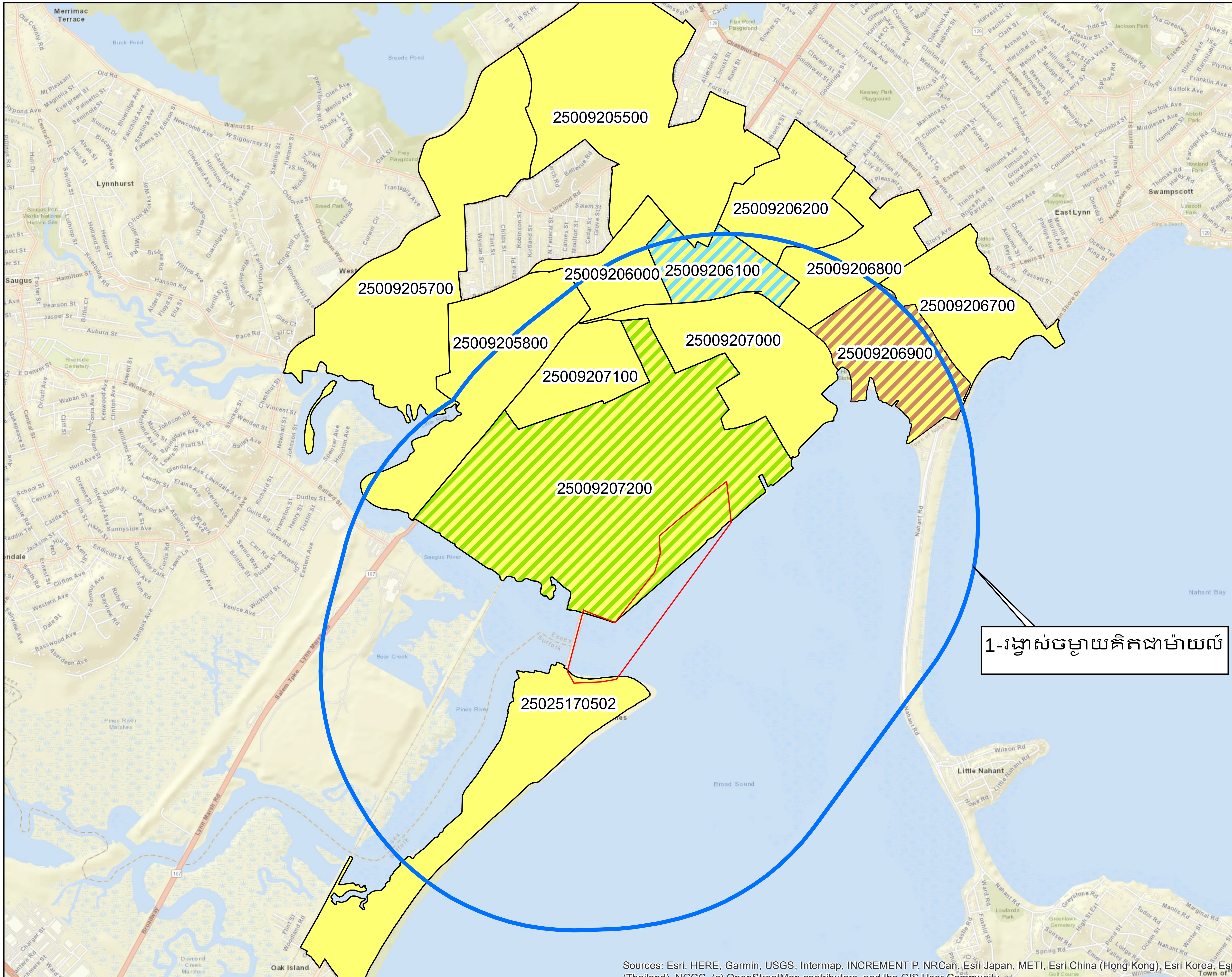
- ជនជាតិភាគតិច
- ប្រាក់ចំណូល
- ភាពឯកោនៃភាសាអង់គ្លេស
- ប្រាក់ចំណូល និងជនជាតិភាគតិច
- ជនជាតិភាគតិច និងភាពឯកោនៃភាសាអង់គ្លេស
- ប្រាក់ចំណូល និង ភាពឯកោនៃភាសាអង់គ្លេស
- ជនជាតិភាគតិច ប្រាក់ចំណូល និងភាពឯកោភាសាអង់គ្លេស

0 3,000 6,000 Feet

1 inch = 6,016 feet

AECOM

Date: 3/7/2023



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

ផ្នែកទី 56 ការឆ្លងកាត់ទន្លេ SAUGUS៖ ភាសាដែលនិយាយដោយ>5% នៃមនុស្សដែលនិយាយភាសាអង់គ្លេសតិចជាង "ល្អណាស់"

ចំណាំងជើង

- ដែនកំណត់ការងារ
- ភាសាអេស្ប៉ាញ ឬភាសាអេស្ប៉ាញ Creole
- ភាសាមនខ្មែរ ភាសារបស់កម្ពុជា
- ភាសាឥណ្ឌាអឺរ៉ុបផ្សេងទៀត
- ភាសារុស្ស៊ី

0 1,000 2,000 Feet

1 inch = 2,000 feet

AECOM

Date: 3/7/2023

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انوارنمنٹل جسٹس اسکریننگ فارم

پروجیکٹ کا نام	**MWRA کا سیکشن 56 کی پانی پائپ لائن کی تبدیلی کا پروجیکٹ**
MEPA جمع کرانے کی متوقعہ تاریخ	**جون 30، 2023**
تجویز کنندہ کا نام	**میساچوسٹس واٹر ریسورسز اتھارٹی**
رابطہ کی معلومات (مثلاً، صلاح کار)	**کیٹی رونن، MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**
پروجیکٹ کے لیےعوامی ویب سائٹ یا دیگر فزیکل لوکیشن جہاں پروجیکٹ کے مواد حاصل کیے جا سکتے ہیں (اگر دستیاب ہو)	**https://www.mwra.com/projects/water/7454-section56-saugus-river/7454-update.html**
پروجیکٹ کے لیے میونسپلٹی اور زپ کوڈ (اگر معلوم ہو)	**سٹی آف ریور، 02151** **سٹی آف لین، 01905**
پروجیکٹ کی نوعیت* (ان تمام کو ذکر کریں جن کا اطلاق ہوتا ہو)	**پانی سپلائی – ٹریٹمنٹ / پہنچانے کا عمل**
کیا پروجیکٹ سائٹ کسی متعین کردہ 100 سالہ FEMA سیلابی میدان کے اندر ہے؟ ہاں / نہیں / معلوم نہیں	**ہاں**
حالات کے لیے تیار کردہ جگہوں کا متوقعہ GHG اخراج (GHG تخمینہ کے ٹول کے لیے یہاں کلک کریں)	**نا قابل اطلاق۔**

پروجیکٹ کی وضاحت

1. پروجیکٹ کی ایک مختصر وضاحت فراہم کریں، بشمول پروجیکٹ سائٹ کا مجموعی سائز اور مجوزہ عمارتوں اور تعمیرات کا اسکوائر فٹ اگر معلوم ہو۔

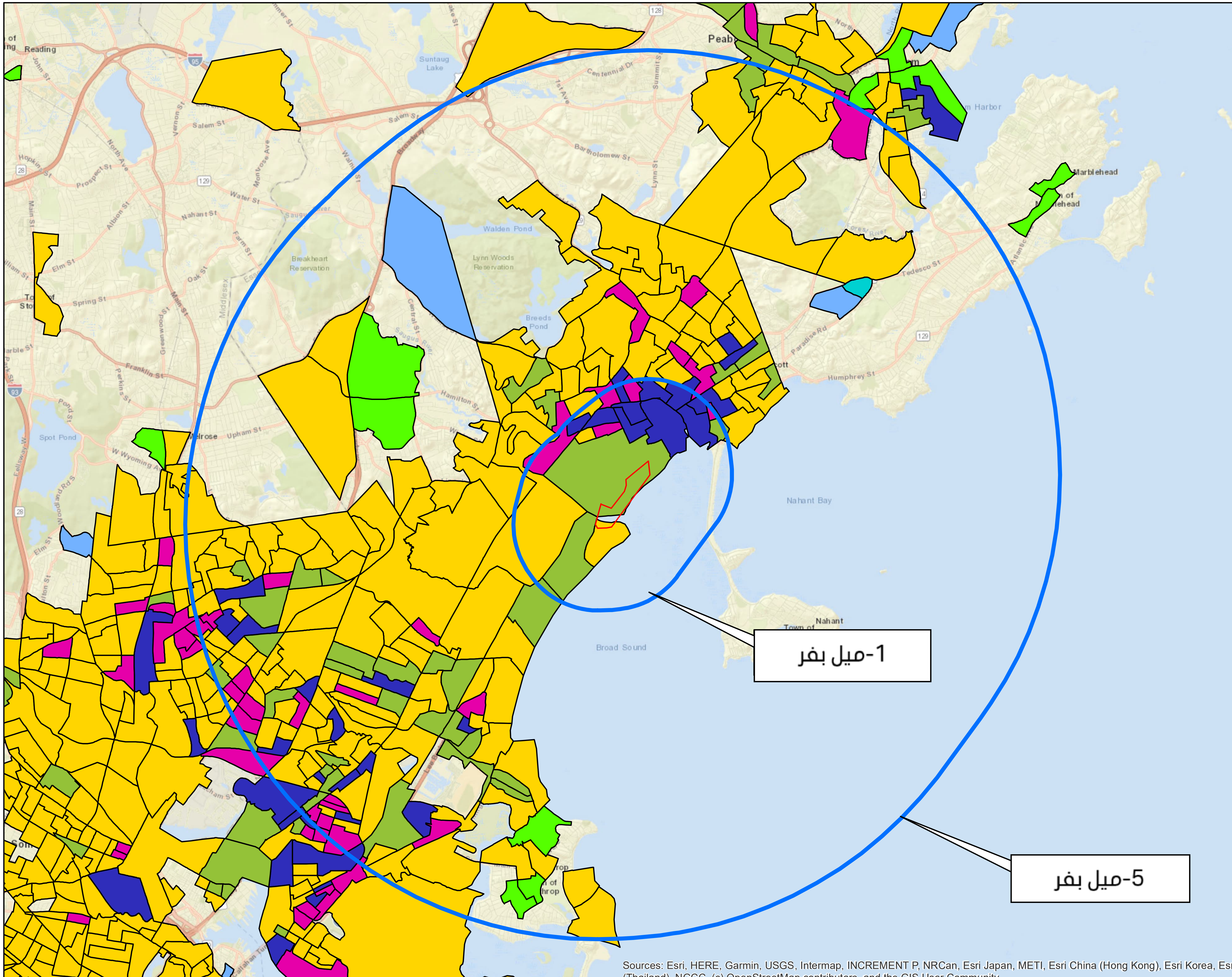
میساچوسٹس واٹر ریسورسز اتھارٹی (Massachusetts Water Resource Authority ، MWRA) سیکشن 56 کی اپنی پرانی پانی پائپ لائن کو تبدیل کرنے کی تجویز پیش کر رہی ہے۔ سیکشن 56 لن (Lynn) اور ریور (Revere) کے شہروں کو پانی کی خدمات فراہم کرتا ہے۔ اس پانی پائپ لائن کا وہ سیکشن جسے تبدیل کیا جانا ہے پہلے سوگس ندی (Saugus River) پر جنرل ایڈوارڈز برج (General Edwards Bridge) سے منسلک تھا (جو کہ لین/ ریور میونسپل بارڈر بھی ہے) لیکن بہت زیادہ گل جانے کی وجہ سے اس کو 2018 میں ہٹانا پڑا تھا۔ MWRA کی اب پانی پائپ لائن کے اس سیکشن کو سوگس ندی کے پانی کے نیچے، اوپن-کٹ اور ٹرینچ زیر پانی تعمیراتی طریقوں کا استعمال کرتے ہوئے ایک نیا سیکشن انسٹال کرکے تبدیل کرنے کی تجویز ہے۔ MWRA کے سیکشن 56 کی پانی پائپ لائن کی تبدیلی کا پروجیکٹ ان کمیونٹیوں میں مکینوں اور کاروباروں کے لیے پانی کے نظام کی فراوانی اور بھروسہ مندی کو یقینی بنائے گا، جو کہ عوام اور ماحولیاتی تحفظ کے لیے انتہائی اہم ہے۔ تعمیر مکمل ہو جانے کے بعد، سطح زمین پر اثرات کم وبیش صرف چھ مین ہولز ہوں گے، جو کہ لین میں ریور اور ہینسن اسٹریٹ میں رائس اوینو کی ہموار کردہ سطحوں کے برابر اور / یا ریور میں نارتھ شور روڈ میں داخلہ کے مقام پر سرسبز ٹریفک آئی لینڈ میں ہوں گے۔

پروجیکٹ کی مخصوص سرگرمیوں میں شامل ہیں:

- **ہورائزنٹل ڈائریکشنل ڈرلنگ (HDD) کا استعمال کرتے ہوئے سوگس ندی کے نیچے 20 انچ کا واٹر مین انسٹال کرنا۔**
- **ریور میں رائس اوینو میں ایک 20 انچ کا واٹر مین انسٹال کرنا، بشمول فٹنگس، والوز، ہوا ریلیز کرنے کے والوز، اور بلو-آفس، پوائنٹ آف پائنس یخت کلب میں سوگس ندی کے HDD کراسنگ پوائنٹ سے آن ریمپ اور لین وے کے روٹ A1 نارتھ باؤنڈ کے درمیان سیکشن 56 کی موجودہ پائپ لائن تک۔**
- **لین میں ہینسٹن اسٹریٹ میں 20 انچ قطر کا واٹر مین اور ضروری آلات انسٹال کرنا، بشمول فٹنگس، والوز، ہوا ریلیز کرنے کے والوز اور بلو-آفس، روٹ A1 میں سیکشن 56 کی موجودہ پائپ لائن سے ہینسٹن**

اسٹریٹ / ریلے وے ایکسٹنشن کے اخیر میں سوگس ندی HDD کراسنگ پوائنٹ تک۔ • ماحولیاتی کنٹرولز اور ٹریفک مینجمنٹ انسٹال کرنا، یوٹیلٹیز کو بحال کرنا، سطح کو درست کرنا، سڑک دوبارہ تعمیر کرنا / پیادہ راستہ کو بحال کرنا، اور بغلی راستے کو دوبارہ تعمیر کرنا۔ • لین میں خط ساحل پر ٹوٹی ہوئی سمندری دیوار سے بارہ لکڑیکے پائلز کو ہٹانا۔ • ریور میں پوائنٹ آف پائنس یخت کلب پارکنگ کی جگہ پر اور لین میں بینسٹن اسٹریٹ / ریلے وے ایکسٹنشن کے اختتام پر عارضی اسٹیجنگ / HDD داخل ہونے / باہر نکلنے کے گڑھے۔ **عارضی خلل کا کل رقبہ 2.9 ایکڑ ہے۔ زمین کے اوپر کوئی مجوزہ دائمی عمارتیں یا تعمیرات نہیں ہوں گی۔**
2. متوقعہ MEPA جائزہ کی حدیں (301 CMR 11.03) ذکر کریں (اگر معلوم ہو) • **301 CMR 11.03(3)(b)(1)(e)، جو صراحت کرتا ہے کہ: نئی فل یا اسٹرکچر یا موجودہ فل یا اسٹرکچر کی توسیع، سوائے ایک پائل کے سہارا والے اسٹرکچر کے، ایک ویلوسٹی زون یا ریگولیٹری فلڈ وے میں۔"** • **301 CMR 11.03(3)(b)(1)(a) ، بسلسلہ "ساحلی ریت کے انبار، بیریئر بیچ یا ساحلی کنارے کی تبدیلی"۔**
3. پروجیکٹ کے لیے تمام متوقعہ ریاستی، مقامی اور وفاقی پرمٹس کی فہرست ذکر کریں (اگر معلوم ہو) **MA WPA کا ارادے کا نوٹس (ریور اور لین سے متوقعہ شرائط کی ترتیب)** **میساچوسٹس کا ڈیپارٹمنٹ آف انوارنمنٹل پروٹیکشن (DEP) 401 پانی کے معیار کا تصدیق نامہ** **میساچوسٹس کوسٹل زون مینجمنٹ (CZM) کوسٹل زون کی ہم آہنگی کا تعین** **MWRA 8M پرمٹ** **میساچوسٹس ڈیپارٹمنٹ آف ٹریفک (DOT) اسٹریٹ اوپننگ پرمٹ، ریور** **میساچوسٹس ڈیپارٹمنٹ آف ٹریفک (DOT) اسٹریٹ اوپننگ پرمٹ، لین** **میساچوسٹس ڈیپارٹمنٹ آف کنزرویشن اینڈ ری کریئیشن (DCR) کنسٹرکشن ایکسس پرمٹ** **میساچوسٹس تاریخی کمیشن کا پروجیکٹ نوٹیفیکشن فارم (Project Notification Form, PNF) اور قومی تاریخی تحفظ کا قانون (National Historic Preservation Act) کے سیکشن 106 کی تعمیل** **یو ایس آرمی کورپس آف انجنئرز سیکشن 404 اور 408 پرمٹس** **باب 91 میساچوسٹس پبلک واٹرفرنٹ ایکٹ لائسنس**
4. پروجیکٹ سائٹ سے 5 میل کے اندر EJ کی آبادیوں اور خصوصیات (مائنارٹی، آمدنی، انگلش آئسولیشن) کی شناخت کریں (بیانیہ کے بدلہ EJ میپس ویئور سے 5 میل کے دائرے کی شناخت کرنے والا نقشہ منسلک کر سکتے ہیں) **پروجیکٹ سائٹ سے 5 میل کے اندر، مندرجہ ذیل خصوصیات والے EJ بلاک گروپس ہیں: مائنارٹی؛ آمدنی؛ انگلش آئسولیشن؛ مائنارٹی اور آمدنی؛ مائنارٹی اور انگلش آئسولیشن؛ آمدنی اور انگلش آئسولیشن؛ مائنارٹی، آمدنی اور انگلش آئسولیشن۔ منسلکہ نقشہ EJ میپس ویئور سے 5 میل کے دائرے کو ظاہر کرتا ہے۔**
5. پروجیکٹ سائٹ سے 1 میل کے دائرہ کے اندر کلی یا جزوی طور پر واقع DPH EJ ٹول میں "زد پذیر صحت سے متعلق EJ کا معیار" کی تعریف پر پورا اترنے والے کسی میونسپلٹی یا مردم شماری کے علاقے کی شناخت کریں۔ **پروجیکٹ سائٹ سے 1 میل کے دائرہ میں جزوی طور پر تین میونسپلٹیاں ہیں۔ جو کہ لین، ریور، اور سوگس پر مشتمل ہیں۔** • **لین زد پذیر صحت سے متعلق EJ کے دو معیاروں کو پورا کرتا ہے: سیسے کی زہر آلودگی (BLL >= 29 ug/dL کی موجودگی فی 1,000) اور دمہ کی وجہ سے ایمرجنسی ڈیپارٹمنٹ (ED) کے دورے (130 فی 10,000)۔ ان دو معیاروں کے لیے، لین میں موجودگی کی شرح مجموعی طور پر ریاست میں موجودگی کی شرح سے 110% زیادہ ہے۔** • **ریور بھی دو معیاروں کو پورا کرتا ہے: دل کا دورہ (30%) اور دمہ کی وجہ سے ایمرجنسی ڈیپارٹمنٹ (ED) کے دورے (111 دورے فی 10,000)۔ ان دو معیاروں کے لیے، ریور میں موجودگی کی شرح مجموعی طور پر ریاست میں موجودگی کی شرح سے 110% زیادہ ہے۔** • **سوگس زد پذیر صحت سے متعلق EJ کے چاروں معیاروں میں سے کسی کو بھی تجاوز نہیں کرتا ہے۔ ان چاروں معیاروں کے لیے، سوگس میں موجودگی کی شرح مجموعی طور پر ریاست میں موجودگی کی شرح سے 110% کم ہے۔**
6. ممکنہ مختصر مدتی اور طویل مدتی ماحولیاتی اور عوامی صحت سے متعلق ان اثرات کی شناخت کریں جو EJ آبادیوں کو متاثر کر سکتے ہیں اور کوئی متوقعہ تخفیف **مندرجہ ذیل اثرات EJ آبادیوں نیز وسیع تر عوام کو متاثر کر سکتے ہیں:** **- رائس اوینو میں ٹریفک کے لیے مختصر مدتی اثرات روڈ وے میں پائپ لائن بچھانے کے دوران اس سڑک کا استعمال**

کرنے والے مکینوں کو متاثر کریں گے۔ پروجیکٹ سائٹ کے آس پاس کے علاقے میں زیادہ سرگرمی، جس میں پوائنٹ آف پائنس پارکنگ کی جگہ شامل ہے، عارضی طور پر مقامی ٹریفک کو متاثر کرے گی۔ - **ہینسن اسٹریٹ پر ٹریفک کے لیے مختصر مدتی اثرات روڈ وے میں پائپ لائن بچھانے کے دوران تجارتی اور صنعتی علاقے میں ٹریفک کی آمد ورفت کو متاثر کریں گے۔** - **پروجیکٹ کے علاقے میں ہوا کے معیار پر مختصر مدتی اثرات جو کہ تعمیراتی سرگرمیوں سے وابستہ مشینوں کے عارضی آپریشن کی وجہ سے پیدا ہو سکتے ہیں۔ تعمیراتی اخراج کو کنٹرول کرنے کے بہترین انتظامی معمولات (BMPs) کا استعمال کیا جائے گا تاکہ گرد وغبار کو کم سے کم کیا جا سکے۔** - **پروجیکٹ کے علاقے میں بنیادی طور پر تعمیراتی سرگرمیوں میں استعمال ہونے والے آلات کی وجہ سے شوروغل کی سطحوں پر مختصر مدتی اثرات مرتب ہو سکتے ہیں۔ شور وغل کے اثرات کو ممکنہ حد تک تدبیریں کرکے کم سے کم کیا جائے گا، جس میں غیر ضروری گاڑیاں چالو رکھنے کی روک تھام کرنا شامل ہے۔** - **لین کے کمیونٹی پاتھ اور قریبی واٹرفرنٹ چہل قدمی/ بائکنگ ٹریل کے ایک حصّہ تک عوامی رسائی پر مختصر مدتی اثرات۔** **امید کی جاتی ہے کہ یہ اثرات EJ آبادیایوں کو نامتناسب طور پر متاثر نہیں کریں گے۔**
7. پروجیکٹ کے فوائد کی شناخت کریں، بشمول "ماحولیاتی فوائد" جیسا کہ 301 CMR 11.02 میں بیان کیا گیا ہے، جو کہ EJ آبادی کی ماحولیاتی حالتوں یا عوامی صحت کو بہتر بنا سکتے ہیں۔ **اس پروجیکٹ سے EJ آبادیوں نیز وسیع تر عوام کو مندرجہ فوائد حاصل ہوں گے:** - **MWRA کے 56 سیکشن کی پانی پائپ لائن ریور اور لین کے شہروں میں مکینوں اور کاروباروں کو پانی فراہم کرے گی۔ یہ پروجیکٹ پانی کے نظام کی فراوانی اور بھروسہ مندی کو یقینی بنائے گا جو کہ عوامی اور ماحولیاتی صحت کے تحفظ کے لیے انتہائی اہم ہے۔ اس پائپ لائن کی تبدیلی پینے، آگ کی صورت میں تحفظ، اور صفائی ستھرائی کے لیے پانی کی مسلسل سپلائی کو یقینی بنائے گا۔ اس پائپ لائن کے ذریعہ جن EJ آبادیوں کو خدمات فراہم کی جائیں گی، نیز وسیع تر کمیونٹی کو، اس تحفظ سے فائدہ ہوگا جو اس پائپ لائنکی تبدیلی علاقے کی پانی سپلائی کے لیے لے کر آئے گی۔**
8. وضاحت کریں کہ کس طرح کمیونٹی پروجیکٹ پر بات کرنے کے لیے کوئی میٹنگ طلب کر سکتی ہے، اور کس طرح کمیونٹی میٹنگ میں منہ زبانی ترجمہ کی خدمات کی درخواست کر سکتی ہے۔ دیگر سہولیات کی درخواست کرنے کے طریقے کی وضاحت کریں، جس میں کام کے گھنٹوں کے بعد میٹنگیں اور پبلک ٹرانسپورٹیشن کے آس پاس کی جگہوں کا انتخاب شامل ہیں۔ **سہولتوں کی درخواست کرنے کے لیے، براہ کرم ای میل کریں یا ذیل کو کال کریں:** **کیٹی رونن، MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**



سیکشن 56 سوگس ندی کراسنگ: 2020 انوارنمنٹل جسٹس بلاک گروپس

لیجنڈ

کام کی حد

2020 انوارنمنٹل جسٹس بلاک گروپس EJ معیار

- آمدنی
- انگلش آئسولیشن
- مائنارٹی اور آمدنی
- مائنارٹی اور انگلش آئسولیشن
- آمدنی اور انگلش آئسولیشن
- مائنارٹی، آمدنی اور انگلش آئسولیشن

0 3,000 6,000 Feet

1 inch = 6,016 feet

AECOM

Date: 3/7/2023

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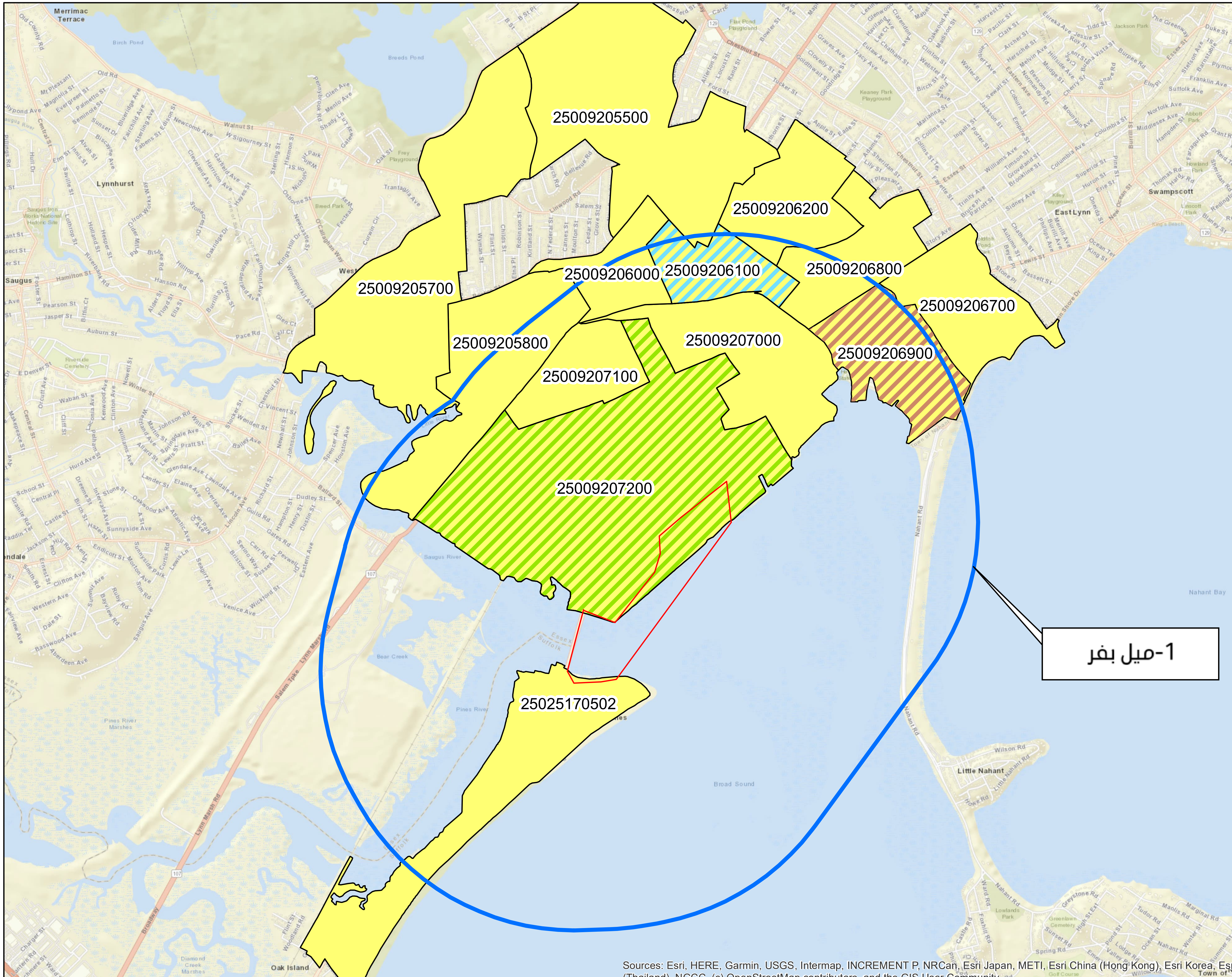


سیکشن 56 سوگس ندی کراسنگ: >5% لوگوں کے ذریعہ بولی جانے والی زبانیں جو انگریزی "بہت اچھی" نہیں بولتے ہیں۔

لیجنڈ

- کام کی حد
- ہسپانوی یا ہسپانوی کریول
- مان-خمیر، کمبوڈیائی
- دیگر انڈک زبانیں
- روسی

0 1,000 2,000 Feet

1 inch = 2,000 feet

AECOM

Date: 3/7/2023

Formulario de Evaluación de Justicia Ambiental

Nombre del Proyecto	**Proyecto de Sustitución de Tuberías de Agua de la Sección 56 de la MWRA**
Fecha Prevista de Presentación ante la MEPA	**30 de junio de 2023**
Nombre del Proponente	**Massachusetts Water Resources Authority**
Información de Contacto (por ejemplo, consultor)	**Katie Ronan, MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**
Sitio de internet público para el proyecto u otra ubicación física donde se puedan obtener los materiales del proyecto (si está disponible)	**https://www.mwra.com/projects/water/7454-section56-saugus-river/7454-update.html**
Municipio y Código Postal ZIP del Proyecto (si se conocen)	**Ciudad de Revere, 02151** **Ciudad de Lynn, 01905**
Tipo de Proyecto* (indique todos los que correspondan)	**Suministro de Agua - Tratamiento/Traslado**
¿Se encuentra el sitio del proyecto dentro de una llanura propensa a inundaciones de la FEMA de 100 años registrada en mapas? S/N/No se sabe	**Sí**
Emisiones estimadas de gases de efecto invernadero (GEI) de los espacios acondicionados (haga clic **aquí** para la herramienta de estimación de GEI)	**No se aplica.**

Descripción del Proyecto:

1. Proporcione una breve descripción del proyecto, incluyendo el tamaño total del sitio del proyecto y las áreas en pies cuadrados de las estructuras y los edificios propuestos, si se conocen.

   Massachusetts Water Resources Authority (MWRA), que es a autoridad de recursos hídricos de Massachusetts, propone sustituir una sección de su actual tubería de agua de la Sección 56. La Sección 56 suministra agua a las ciudades de Lynn y Revere. La sección de esta tubería de agua que se reemplazará estaba previamente unida al Puente General Edwards sobre el Río Saugus (que también es frontera municipal entre Lynn y Revere), pero tuvo que ser retirada en 2018 debido a una severa corrosión. MWRA ahora propone reemplazar esta sección de tubería de agua instalando una nueva sección de tubería de agua bajo el agua del Río Saugus, utilizando métodos de construcción de tuberías submarinas tanto a cielo abierto como sin zanjas. El proyecto de reemplazo de la tubería de agua de la Sección 56 de la MWRA asegurará la redundancia y confiabilidad del sistema de agua para los residentes y las empresas de estas comunidades, lo cual es crucial para proteger la salud pública y ambiental. Una vez finalizada la construcción, los únicos impactos superficiales existentes serán aproximadamente seis pozos de registro que quedarán al ras de las superficie pavimentada de Rice Avenue en Revere y Hanson Street en Lynn y/o en una isla de tráfico con césped a la entrada de North Shore Road en Revere.

Entre las actividades específicas del proyecto se incluyen:

- **Instalación de una tubería principal de agua de 20 pulgadas (50 cm) bajo el Río Saugus utilizando métodos de Perforación Direccional Horizontal (HDD).**
- **Instalación de una tubería principal de agua de 20 pulgadas (50 cm), incluyendo accesorios, válvulas, válvulas de purga de aire y purgadores en Rice Avenue en Revere, desde el punto de cruce de la HDD del Río Saugus en el club de yates Point of Pines hasta la tubería existente de la Sección 56 entre la rampa de acceso en dirección norte de la Route 1A y Lynnway.**
- **Instalación de una tubería principal de agua de 20 pulgadas (50 cm) de diámetro y sus accesorios, incluyendo válvulas, válvulas de purga de aire y purgadores en Hanson Street en Lynn, desde la tubería existente de la Sección 56 en la Route 1A hasta el punto de cruce de la HDD del Río Saugus al final de Hanson Street/Riley Way Extension.**
- **Instalación de controles ambientales y gestión del tráfico, reemplazo de servicios públicos, restauración de la superficie, reconstrucción del camino/restauración del pavimento y reconstrucción de las aceras.**
- **Retirada de doce pilotes de madera del malecón deteriorado en la costa de Lynn.**
- **Fosos temporales de entrada/salida de la HDD en el aparcamiento del club de yates Point of Pines en Revere y al final de Hanson Street/Riley Way Extension en Lynn.**

El área total de perturbación temporal es de 2.9 acres (1.17 hectáreas). No se proponen edificios ni estructuras permanentes sobre el suelo.

2. Enumere los umbrales de revisión previstos de la MEPA (301 CMR 11.03) (si se conocen)

- **301 CMR 11.03(3)(b)(1)(e), que establece: "Nuevo relleno o estructura o expansión de relleno o estructura existente, excepto una estructura soportada por pilotes, en una zona de velocidad o vía de inundación reglamentaria".**
- **301 CMR 11.03(3)(b)(1)(a), relativa a la "alteración de duna costera, playa de barrera o banco costero".**

3. Enumere todos los permisos estatales, locales y federales previstos necesarios para el proyecto (si se conocen)

Notificación de Intención de la ley de protección de humedales MA WPA (Orden de condiciones previstas de Revere y Lynn)
Certificación de Calidad del Agua MassDEP 401
Determinación de Consistencia de la Zona Costera de Mass CZM
Permiso 8M de la MWRA
Permiso de MassDOT para Apertura de Calle, Revere
Permiso de MassDOT para Apertura de Calle, Lynn
Permiso de MassDCR para Acceso a la Construcción
Formulario de Notificación de Proyecto (PNF) de la comisión histórica Massachusetts Historical Commission y cumplimiento de la Sección 106 de la ley de preservación histórica National Historic Preservation Act
Permisos de la Sección 404 y 408 del cuerpo de ingenieros militares US Army Corps of Engineers.
Licencia del Capítulo 91 de la ley de malecones públicos Massachusetts Public Waterfront Act

4. Identifique las poblaciones y características de Justicia Ambiental (Environmental Justice (EJ)) (minorías, ingresos, aislamiento del inglés) en un radio de 5 millas (8 km) del lugar del proyecto (se puede adjuntar un mapa que identifique el radio de 5 millas (8 km) desde el visualizador de mapas EJ Maps Viewer en lugar de la descripción).

Dentro de un radio de 5 millas (8 km) del sitio del proyecto, hay grupos de bloques de Justicia Ambiental (EJ) con las siguientes características: Minoría; Ingresos; Aislamiento del Inglés; Minoría e Ingresos; Minoría y Aislamiento del Inglés; Ingresos y Aislamiento del Inglés; Minoría, Ingresos y Aislamiento del Inglés. El mapa adjunto muestra el radio de 5 millas (8 km) del visualizador EJ Maps Viewer.

5. Identifique con la herramienta DPH EJ Tool cualquier municipio o tramo censal que cumpla con la definición de "criterios de Justicia Ambiental de salud vulnerable" y que esté ubicado total o parcialmente dentro de un radio de 1 milla (1.6 km) del sitio del proyecto.

Hay tres municipios que están en parte dentro de un radio de 1 milla (1.6 km) del lugar del proyecto. Estos son Lynn, Revere y Saugus.

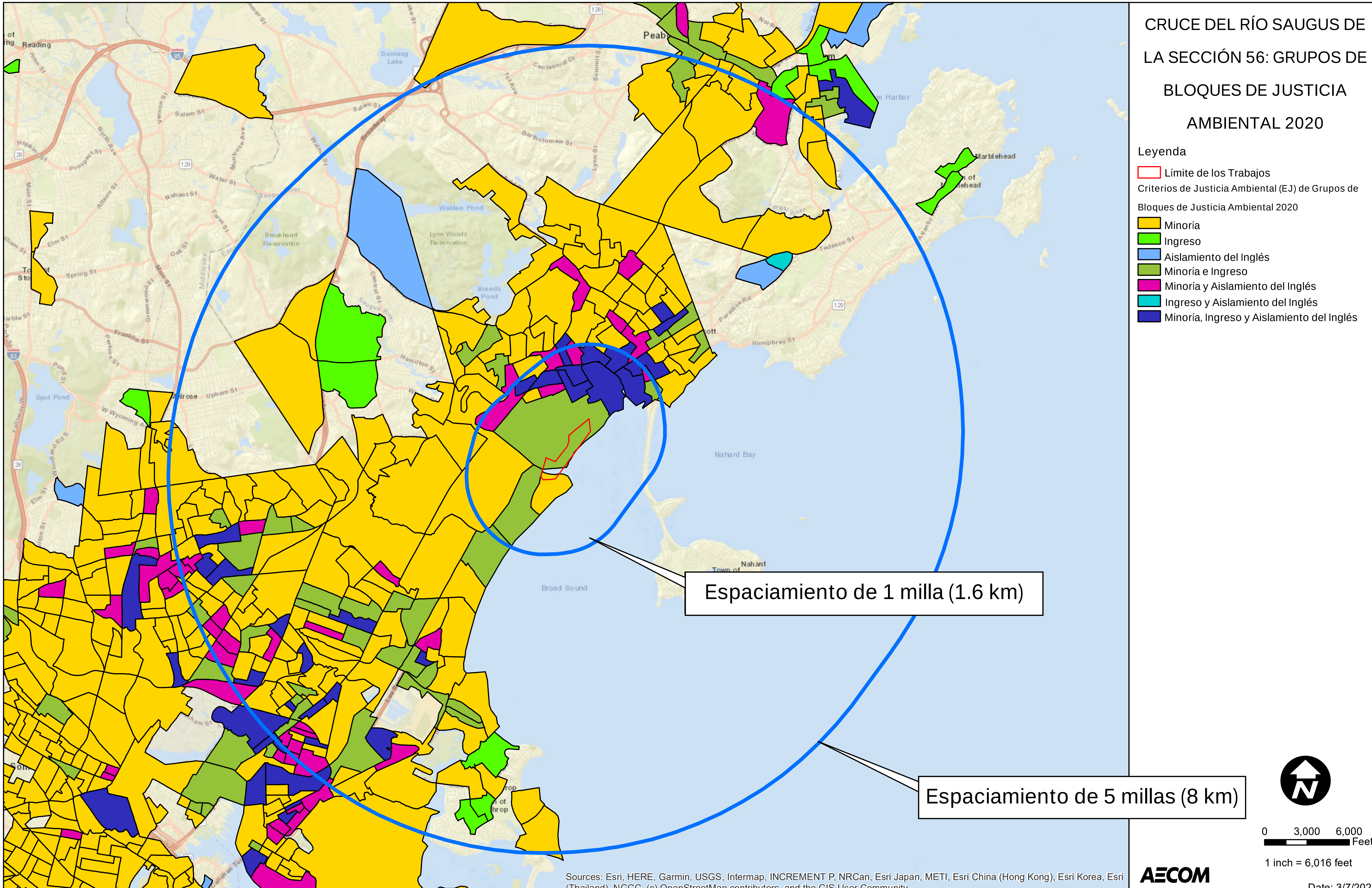
- **Lynn cumple con dos de los criterios de Justicia Ambiental de salud vulnerable: Envenenamiento por plomo (29 BLL >= ug/dL de Prevalencia por cada 1,000) y Visitas al Departamento de Urgencias (ED) por Asma (130 por cada 10,000). Para estos dos criterios, la tasa o prevalencia en Lynn es superior al 110% de la tasa o prevalencia en el estado en su conjunto.**
- **Revere también cumple dos criterios: Ataque cardíaco (30%) y Visitas al Departamento de Urgencias por Asma (111 visitas por cada 10,000). Para estos dos criterios, la tasa o prevalencia en Revere es superior al 110% de la tasa o prevalencia para el estado en su conjunto.**
- **Saugus no excede ninguno de los cuatro Criterios de Justicia Ambiental de Salud Vulnerable. Para los cuatro criterios, la tasa o prevalencia en Saugus es inferior al 110% de la tasa o prevalencia para el estado en su conjunto.**

6. Identifique los posibles impactos ambientales y de salud pública a corto y largo plazo que puedan afectar a las poblaciones de Justicia Ambiental y cualquier mitigación anticipada

Los siguientes impactos pueden afectar a las poblaciones de Justicia Ambiental así como al público en general:

- **Los impactos a corto plazo en el tráfico en Rice Avenue afectarían a los residentes de esta avenida durante la instalación de la tubería en el camino. El aumento de la actividad en las inmediaciones del sitio del proyecto, incluyendo el aparcamiento de Point of Pines, perturbaría temporalmente el tráfico local.**
- **Los impactos a corto plazo sobre el tráfico en Hanson Street afectarían a los patrones de tráfico en la vecindad comercial/industrial durante la instalación de la tubería en el camino.**
- **Podría haber impactos a corto plazo en la calidad del aire en el área del proyecto por el funcionamiento temporal de la maquinaria utilizada en las actividades de construcción. Se aplicarían las mejores prácticas de gestión (BMP) para controlar las emisiones de la construcción con el fin de minimizar el polvo y las emisiones.**
- **A corto plazo, habría un impacto en los niveles de ruido en la zona del proyecto durante la construcción, principalmente por los equipos mecánicos utilizados para las actividades de construcción. Los impactos sonoros se minimizarán en la medida de lo posible con medidas que incluyan la prevención de la actividad innecesaria de los motores en ralentí de los vehículos.**
- **Impactos a corto plazo en el acceso público al Sendero Comunitario de Lynn y a un segmento del sendero adyacente para peatones y ciclistas a orillas del agua durante la construcción.**

No se espera que estos impactos afecten de manera desproporcionada a las poblaciones de Justicia Ambiental.
7. Identifique los beneficios del proyecto, incluyendo los "Beneficios Ambientales", tal como se definen en la norma 301 CMR 11.02, que pueden mejorar las condiciones ambientales o la salud pública de la población de Justicia Ambiental **El proyecto traería consigo los siguientes beneficios para las poblaciones de Justicia Ambiental, así como para el público en general:** - **La tubería de agua de la Sección 56 de la MWRA suministra agua a los residentes y negocios de las ciudades de Revere y Lynn. Con este proyecto se asegurará la redundancia y fiabilidad del sistema de agua, que es crucial para proteger la salud pública y ambiental. Al reemplazar esta tubería se asegurará el suministro continuo de agua para el consumo, la protección contra incendios y el saneamiento. Las poblaciones de Justicia Ambiental que recibirán servicio por esta tubería, así como la comunidad en general, se beneficiarán por la seguridad que este reemplazo de tuberías dará al suministro de agua para la zona.**
8. Describa cómo puede la comunidad solicitar una reunión para debatir el proyecto y cómo puede solicitar servicios de interpretación oral en la reunión. Especifique cómo solicitar otros ajustes, incluyendo reuniones fuera del horario laboral y en lugares cercanos al transporte público. **Para solicitar ajustes, envíe un mensaje por correo electrónico o llame a:** **Katie Ronan, MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**



CRUCE DEL RÍO SAUGUS DE LA SECCIÓN 56: GRUPOS DE BLOQUES DE JUSTICIA AMBIENTAL 2020
Leyenda
Límite de los Trabajos
Criterios de Justicia Ambiental (EJ) de Grupos de Bloques de Justicia Ambiental 2020
Minoría
Ingreso
Aislamiento del Inglés
Minoría e Ingreso
Minoría y Aislamiento del Inglés
Ingreso y Aislamiento del Inglés
Minoría, Ingreso y Aislamiento del Inglés
Espaciamiento de 1 milla (1.6 km)
Espaciamiento de 5 millas (8 km)
Nahant Bay
Broad Sound
Nahant
Marblehead
0 3,000 6,000 Feet
1 inch = 6,016 feet
AECOM
Date: 3/7/2023
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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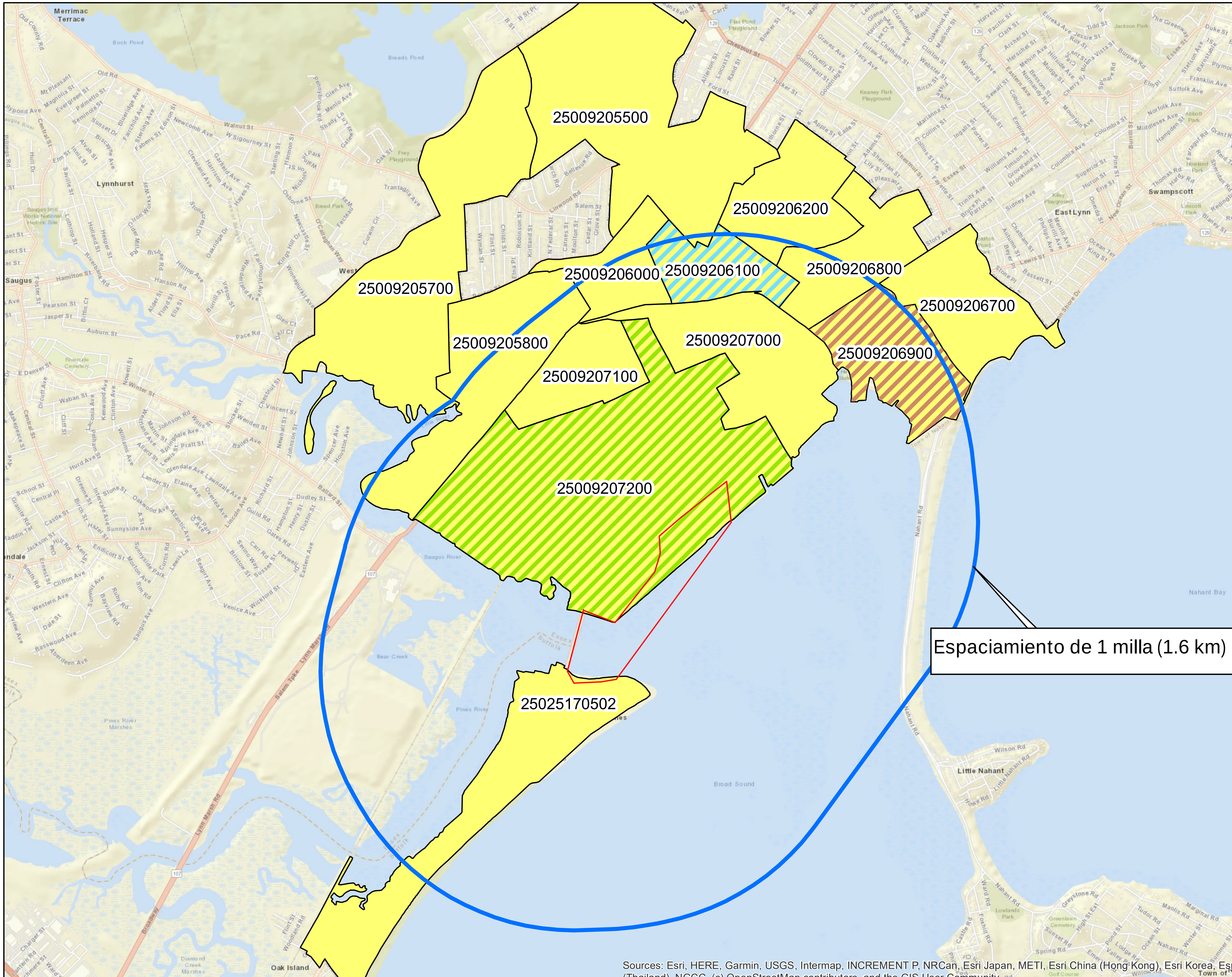

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CRUCE DEL RÍO SAUGUS DE LA SECCIÓN 56: IDIOMAS HABLADOS POR >5% DE LAS PERSONAS QUE HABLAN INGLÉS MENOS QUE "MUY BIEN"

Leyenda

- Límite de los Trabajos
- Español o Criollo Español
- Mon-khmer, Camboyano
- Otras lenguas índicas
- Ruso

0 1,000 2,000 Feet

1 inch = 2,000 feet

AECOM

Date: 3/7/2023

Environmental Justice Block Groups within a Five-Mile Radius of the Project Site

Summary by Municipality

Municipality	EJ Status	Total
Boston	Minority	5
	Minority and English isolation	2
	Minority and income	1
	Minority, income and English isolation	2
Boston Total		10
Chelsea	Minority	14
	Minority and English isolation	6
	Minority and income	4
	Minority, income and English isolation	8
Chelsea Total		32
Everett	Minority	14
	Minority and English isolation	6
	Minority and income	4
	Minority, income and English isolation	2
Everett Total		26
Lynn	Minority	41
	Minority and English isolation	9
	Minority and income	7
	Minority, income and English isolation	13
Lynn Total		70
Malden	Minority	20
	Minority and English isolation	5
	Minority and income	4
	Minority, income and English isolation	3
Malden Total		32
Melrose	Minority	2
Melrose Total		2
Peabody	Minority	4
	Minority and income	2
Peabody Total		6
Revere	Minority	25
	Minority and English isolation	3
	Minority and income	14
	Minority, income and English isolation	2
Revere Total		44
Salem	Income	1
	Minority	10

	Minority and English isolation	1
Salem Total		12
Saugus	English isolation	1
	Income	2
	Minority	9
Saugus Total		12
Swampscott	English isolation	1
	Income and English isolation	1
Swampscott Total		2
Winthrop	Income	3
	Minority	4
Winthrop Total		7

List of Block Groups (255)

Municipality	Block Group	Census Tract	EJ Status
Chelsea	Block Group 1	Census Tract 1601.02	Minority and English isolation
Chelsea	Block Group 2	Census Tract 1601.02	Minority and English isolation
Chelsea	Block Group 3	Census Tract 1601.02	Minority
Chelsea	Block Group 4	Census Tract 1601.02	Minority, income and English isolation
Chelsea	Block Group 1	Census Tract 1601.03	Minority and English isolation
Chelsea	Block Group 2	Census Tract 1601.03	Minority and English isolation
Chelsea	Block Group 3	Census Tract 1601.03	Minority
Chelsea	Block Group 4	Census Tract 1601.03	Minority and English isolation
Chelsea	Block Group 1	Census Tract 1602	Minority and English isolation
Chelsea	Block Group 2	Census Tract 1602	Minority, income and English isolation
Chelsea	Block Group 1	Census Tract 1604	Minority, income and English isolation
Chelsea	Block Group 2	Census Tract 1604	Minority, income and English isolation
Chelsea	Block Group 3	Census Tract 1604	Minority
Chelsea	Block Group 4	Census Tract 1604	Minority and income
Chelsea	Block Group 1	Census Tract 1605.01	Minority
Chelsea	Block Group 2	Census Tract 1605.01	Minority and income
Chelsea	Block Group 3	Census Tract 1605.01	Minority
Chelsea	Block Group 4	Census Tract 1605.01	Minority, income and English isolation
Chelsea	Block Group 5	Census Tract 1605.01	Minority and income
Chelsea	Block Group 1	Census Tract 1605.02	Minority, income and English isolation
Chelsea	Block Group 3	Census Tract 1605.02	Minority
Chelsea	Block Group 4	Census Tract 1605.02	Minority, income and English isolation
Chelsea	Block Group 5	Census Tract 1605.02	Minority
Chelsea	Block Group 1	Census Tract 1606.01	Minority and income
Chelsea	Block Group 2	Census Tract 1606.01	Minority
Chelsea	Block Group 3	Census Tract 1606.01	Minority
Chelsea	Block Group 4	Census Tract 1606.01	Minority
Chelsea	Block Group 1	Census Tract 1606.02	Minority
Chelsea	Block Group 2	Census Tract 1606.02	Minority

Chelsea	Block Group 3	Census Tract 1606.02	Minority
Chelsea	Block Group 4	Census Tract 1606.02	Minority, income and English isolation
Chelsea	Block Group 5	Census Tract 1606.02	Minority
Revere	Block Group 1	Census Tract 1701.01	Minority
Revere	Block Group 2	Census Tract 1701.01	Minority
Revere	Block Group 3	Census Tract 1701.01	Minority
Revere	Block Group 1	Census Tract 1701.02	Minority and English isolation
Revere	Block Group 2	Census Tract 1701.02	Minority
Revere	Block Group 3	Census Tract 1701.02	Minority
Revere	Block Group 4	Census Tract 1701.02	Minority and income
Revere	Block Group 1	Census Tract 1702	Minority and income
Revere	Block Group 2	Census Tract 1702	Minority, income and English isolation
Revere	Block Group 3	Census Tract 1702	Minority and income
Revere	Block Group 4	Census Tract 1702	Minority and income
Revere	Block Group 1	Census Tract 1703.01	Minority
Revere	Block Group 2	Census Tract 1703.01	Minority
Revere	Block Group 3	Census Tract 1703.01	Minority
Revere	Block Group 4	Census Tract 1703.01	Minority
Revere	Block Group 1	Census Tract 1703.02	Minority
Revere	Block Group 2	Census Tract 1703.02	Minority
Revere	Block Group 3	Census Tract 1703.02	Minority
Revere	Block Group 1	Census Tract 1704	Minority
Revere	Block Group 2	Census Tract 1704	Minority and income
Revere	Block Group 3	Census Tract 1704	Minority and income
Revere	Block Group 4	Census Tract 1704	Minority and English isolation
Revere	Block Group 5	Census Tract 1704	Minority
Revere	Block Group 1	Census Tract 1705.02	Minority
Revere	Block Group 2	Census Tract 1705.02	Minority and income
Revere	Block Group 3	Census Tract 1705.02	Minority and income
Revere	Block Group 1	Census Tract 1705.03	Minority
Revere	Block Group 1	Census Tract 1705.04	Minority
Revere	Block Group 2	Census Tract 1705.04	Minority
Revere	Block Group 1	Census Tract 1706.01	Minority
Revere	Block Group 2	Census Tract 1706.01	Minority
Revere	Block Group 3	Census Tract 1706.01	Minority
Revere	Block Group 4	Census Tract 1706.01	Minority and income
Revere	Block Group 1	Census Tract 1707.01	Minority and income
Revere	Block Group 2	Census Tract 1707.01	Minority
Revere	Block Group 1	Census Tract 1707.02	Minority, income and English isolation
Revere	Block Group 2	Census Tract 1707.02	Minority and income
Revere	Block Group 3	Census Tract 1707.02	Minority and income
Revere	Block Group 4	Census Tract 1707.02	Minority and English isolation
Revere	Block Group 5	Census Tract 1707.02	Minority
Revere	Block Group 1	Census Tract 1708	Minority
Revere	Block Group 2	Census Tract 1708	Minority and income
Revere	Block Group 3	Census Tract 1708	Minority and income
Revere	Block Group 4	Census Tract 1708	Minority

Winthrop	Block Group 3	Census Tract 1801.01	Income
Winthrop	Block Group 4	Census Tract 1801.01	Minority
Winthrop	Block Group 1	Census Tract 1802	Minority
Winthrop	Block Group 2	Census Tract 1802	Income
Winthrop	Block Group 3	Census Tract 1802	Income
Winthrop	Block Group 1	Census Tract 1805	Minority
Winthrop	Block Group 3	Census Tract 1805	Minority
Swampscott	Block Group 4	Census Tract 2021.04	Income and English isolation
Swampscott	Block Group 5	Census Tract 2021.04	English isolation
Salem	Block Group 2	Census Tract 2041.01	Minority
Salem	Block Group 3	Census Tract 2041.01	Minority
Salem	Block Group 2	Census Tract 2041.02	Minority
Salem	Block Group 2	Census Tract 2042	Minority
Salem	Block Group 4	Census Tract 2042	Minority
Salem	Block Group 5	Census Tract 2042	Income
Salem	Block Group 1	Census Tract 2047.01	Minority
Salem	Block Group 2	Census Tract 2047.01	Minority
Salem	Block Group 3	Census Tract 2047.01	Minority and English isolation
Salem	Block Group 2	Census Tract 2047.02	Minority
Salem	Block Group 3	Census Tract 2047.02	Minority
Salem	Block Group 4	Census Tract 2047.02	Minority
Lynn	Block Group 1	Census Tract 2051	Minority
Lynn	Block Group 2	Census Tract 2051	Minority
Lynn	Block Group 3	Census Tract 2051	Minority and English isolation
Lynn	Block Group 4	Census Tract 2051	Minority
Lynn	Block Group 5	Census Tract 2051	Minority
Lynn	Block Group 1	Census Tract 2052	Minority
Lynn	Block Group 2	Census Tract 2052	Minority
Lynn	Block Group 3	Census Tract 2052	Minority
Lynn	Block Group 4	Census Tract 2052	Minority
Lynn	Block Group 5	Census Tract 2052	Minority and English isolation
Lynn	Block Group 1	Census Tract 2053	Minority
Lynn	Block Group 2	Census Tract 2053	Minority
Lynn	Block Group 4	Census Tract 2053	Minority
Lynn	Block Group 3	Census Tract 2054	Minority
Lynn	Block Group 1	Census Tract 2055	Minority
Lynn	Block Group 2	Census Tract 2055	Minority
Lynn	Block Group 1	Census Tract 2056	Minority and income
Lynn	Block Group 2	Census Tract 2056	Minority
Lynn	Block Group 3	Census Tract 2056	Minority
Lynn	Block Group 4	Census Tract 2056	Minority
Lynn	Block Group 1	Census Tract 2057	Minority
Lynn	Block Group 2	Census Tract 2057	Minority
Lynn	Block Group 3	Census Tract 2057	Minority and income
Lynn	Block Group 4	Census Tract 2057	Minority
Lynn	Block Group 5	Census Tract 2057	Minority
Lynn	Block Group 1	Census Tract 2058	Minority

Lynn	Block Group 2	Census Tract 2058	Minority, income and English isolation
Lynn	Block Group 3	Census Tract 2058	Minority and English isolation
Lynn	Block Group 1	Census Tract 2059	Minority
Lynn	Block Group 2	Census Tract 2059	Minority
Lynn	Block Group 3	Census Tract 2059	Minority
Lynn	Block Group 1	Census Tract 2060	Minority, income and English isolation
Lynn	Block Group 2	Census Tract 2060	Minority and English isolation
Lynn	Block Group 1	Census Tract 2061	Minority, income and English isolation
Lynn	Block Group 2	Census Tract 2061	Minority and English isolation
Lynn	Block Group 1	Census Tract 2062	Minority and English isolation
Lynn	Block Group 2	Census Tract 2062	Minority
Lynn	Block Group 3	Census Tract 2062	Minority
Lynn	Block Group 1	Census Tract 2063	Minority
Lynn	Block Group 2	Census Tract 2063	Minority
Lynn	Block Group 3	Census Tract 2063	Minority
Lynn	Block Group 4	Census Tract 2063	Minority
Lynn	Block Group 1	Census Tract 2064	Minority, income and English isolation
Lynn	Block Group 2	Census Tract 2064	Minority
Lynn	Block Group 3	Census Tract 2064	Minority
Lynn	Block Group 4	Census Tract 2064	Minority
Lynn	Block Group 1	Census Tract 2065	Minority and income
Lynn	Block Group 2	Census Tract 2065	Minority, income and English isolation
Lynn	Block Group 3	Census Tract 2065	Minority and income
Lynn	Block Group 1	Census Tract 2066	Minority
Lynn	Block Group 2	Census Tract 2066	Minority and income
Lynn	Block Group 3	Census Tract 2066	Minority
Lynn	Block Group 4	Census Tract 2066	Minority
Lynn	Block Group 1	Census Tract 2067	Minority
Lynn	Block Group 2	Census Tract 2067	Minority
Lynn	Block Group 3	Census Tract 2067	Minority
Lynn	Block Group 4	Census Tract 2067	Minority, income and English isolation
Lynn	Block Group 1	Census Tract 2068	Minority and English isolation
Lynn	Block Group 2	Census Tract 2068	Minority, income and English isolation
Lynn	Block Group 1	Census Tract 2069	Minority, income and English isolation
Lynn	Block Group 2	Census Tract 2069	Minority and income
Lynn	Block Group 3	Census Tract 2069	Minority, income and English isolation
Lynn	Block Group 4	Census Tract 2069	Minority and English isolation
Lynn	Block Group 1	Census Tract 2070	Minority, income and English isolation
Lynn	Block Group 2	Census Tract 2070	Minority, income and English isolation
Lynn	Block Group 1	Census Tract 2071	Minority, income and English isolation
Lynn	Block Group 2	Census Tract 2071	Minority and English isolation
Lynn	Block Group 3	Census Tract 2071	Minority
Lynn	Block Group 1	Census Tract 2072	Minority and income
Lynn	Block Group 2	Census Tract 2072	Minority, income and English isolation
Saugus	Block Group 2	Census Tract 2081.01	Minority
Saugus	Block Group 3	Census Tract 2081.01	Minority
Saugus	Block Group 4	Census Tract 2081.01	Minority

Saugus	Block Group 1	Census Tract 2081.02	Minority
Saugus	Block Group 2	Census Tract 2081.02	Minority
Saugus	Block Group 3	Census Tract 2081.02	Minority
Saugus	Block Group 4	Census Tract 2081.02	Minority
Saugus	Block Group 3	Census Tract 2082	Income
Saugus	Block Group 1	Census Tract 2083.01	Income
Saugus	Block Group 1	Census Tract 2083.02	English isolation
Saugus	Block Group 1	Census Tract 2084.01	Minority
Saugus	Block Group 2	Census Tract 2084.02	Minority
Peabody	Block Group 1	Census Tract 2103.02	Minority
Peabody	Block Group 1	Census Tract 2106	Minority
Peabody	Block Group 1	Census Tract 2107	Minority
Peabody	Block Group 2	Census Tract 2107	Minority and income
Peabody	Block Group 3	Census Tract 2107	Minority and income
Peabody	Block Group 4	Census Tract 2107	Minority
Melrose	Block Group 1	Census Tract 3364.04	Minority
Melrose	Block Group 2	Census Tract 3364.04	Minority
Malden	Block Group 4	Census Tract 3413.01	Minority and English isolation
Malden	Block Group 2	Census Tract 3414	Minority and English isolation
Malden	Block Group 3	Census Tract 3414	Minority
Malden	Block Group 1	Census Tract 3415	Minority
Malden	Block Group 2	Census Tract 3415	Minority and English isolation
Malden	Block Group 3	Census Tract 3415	Minority
Malden	Block Group 4	Census Tract 3415	Minority
Malden	Block Group 5	Census Tract 3415	Minority and English isolation
Malden	Block Group 1	Census Tract 3416	Minority
Malden	Block Group 2	Census Tract 3416	Minority
Malden	Block Group 3	Census Tract 3416	Minority
Malden	Block Group 4	Census Tract 3416	Minority
Malden	Block Group 6	Census Tract 3416	Minority
Malden	Block Group 1	Census Tract 3417	Minority
Malden	Block Group 2	Census Tract 3417	Minority
Malden	Block Group 3	Census Tract 3417	Minority
Malden	Block Group 4	Census Tract 3417	Minority and income
Malden	Block Group 5	Census Tract 3417	Minority
Malden	Block Group 1	Census Tract 3418	Minority and English isolation
Malden	Block Group 2	Census Tract 3418	Minority and income
Malden	Block Group 3	Census Tract 3418	Minority
Malden	Block Group 4	Census Tract 3418	Minority, income and English isolation
Malden	Block Group 5	Census Tract 3418	Minority, income and English isolation
Malden	Block Group 6	Census Tract 3418	Minority, income and English isolation
Malden	Block Group 1	Census Tract 3419.01	Minority
Malden	Block Group 2	Census Tract 3419.01	Minority
Malden	Block Group 1	Census Tract 3419.03	Minority
Malden	Block Group 2	Census Tract 3419.03	Minority
Malden	Block Group 3	Census Tract 3419.03	Minority
Malden	Block Group 1	Census Tract 3419.04	Minority

Malden	Block Group 2	Census Tract 3419.04	Minority and income
Malden	Block Group 3	Census Tract 3419.04	Minority and income
Everett	Block Group 1	Census Tract 3421.01	Minority and income
Everett	Block Group 2	Census Tract 3421.01	Minority
Everett	Block Group 3	Census Tract 3421.01	Minority, income and English isolation
Everett	Block Group 4	Census Tract 3421.01	Minority and English isolation
Everett	Block Group 1	Census Tract 3421.02	Minority
Everett	Block Group 2	Census Tract 3421.02	Minority
Everett	Block Group 3	Census Tract 3421.02	Minority
Everett	Block Group 4	Census Tract 3421.02	Minority
Everett	Block Group 1	Census Tract 3422.01	Minority and income
Everett	Block Group 2	Census Tract 3422.01	Minority and English isolation
Everett	Block Group 3	Census Tract 3422.01	Minority and English isolation
Everett	Block Group 4	Census Tract 3422.01	Minority
Everett	Block Group 1	Census Tract 3422.02	Minority and income
Everett	Block Group 2	Census Tract 3422.02	Minority
Everett	Block Group 3	Census Tract 3422.02	Minority
Everett	Block Group 1	Census Tract 3423.01	Minority
Everett	Block Group 2	Census Tract 3423.01	Minority
Everett	Block Group 3	Census Tract 3424.01	Minority
Everett	Block Group 3	Census Tract 3424.02	Minority and English isolation
Everett	Block Group 1	Census Tract 3425.01	Minority and English isolation
Everett	Block Group 2	Census Tract 3425.01	Minority and income
Everett	Block Group 1	Census Tract 3425.02	Minority and English isolation
Everett	Block Group 2	Census Tract 3425.02	Minority
Everett	Block Group 1	Census Tract 3426	Minority
Everett	Block Group 2	Census Tract 3426	Minority, income and English isolation
Everett	Block Group 3	Census Tract 3426	Minority
Boston	Block Group 1	Census Tract 509.01	Minority and English isolation
Boston	Block Group 3	Census Tract 509.01	Minority, income and English isolation
Boston	Block Group 1	Census Tract 510	Minority
Boston	Block Group 2	Census Tract 510	Minority and income
Boston	Block Group 3	Census Tract 510	Minority
Boston	Block Group 1	Census Tract 511.01	Minority and English isolation
Boston	Block Group 2	Census Tract 511.01	Minority, income and English isolation
Boston	Block Group 3	Census Tract 511.01	Minority
Boston	Block Group 4	Census Tract 511.01	Minority
Boston	Block Group 1	Census Tract 9813	Minority

ATTACHMENT J

Gradation Results

MWRA #7454 Section 56 Replacement Saugus River Crossing, Revere/Lynn

MWRA Contract No. 7454

Table 3 - Summary of Soil Laboratory Testing Results by Soil Stratification

Boring No.	Depth, ft	Sample No.	Moisture Content, %	Organic Matter, %	Atterberg Limits: Plastic Limit (PL)	Atterberg Limits: Liquid Limit (LL)	Atterberg Limits: Plasticity Index (PI)	Grain Size: Gravel, %	Grain Size: Sand, %	Grain Size: Fines, %	USCS	UC/UU S_u, psf	1-D Consolidation
River Sediment													
20B-2	0 - 0.8	20B-2	22	0.4				14.4	82.6	3	SP		
20B-3	0 - 4.5	20B-3	51	3	25	42	17	0	41.1	58.9	CL		
20B-4	0 - 3.75	20B-4	72	4.8	30	62	32	4.8	15.3	79.9	CH		
20B-7	0 - 1.1	20B-7	30	0.3	18	31	13	0	6.1	93.9	CL		
20B-8	0-2	20B-8	27	1.3				0.7	69.4	29.9	SM		
20B-19	0 - 1.16	20B-19	25	0.8				0	62.2	37.8	SM		
Fill / Sand													
20B-1	19-21	SS6	21	0.6				7.5	84.3	8.2	SP		
20B-9	9-11	SS5	29.7					0	59.2	40.8	SM		
20B-9	11-13	SS6, Bot 8	31.3	1.4							ML		
20B-11MW	8-10	SS4B	19.1					3	79.7	17.3	SM		
20B-11MW	14-16	SS6	10.9					10.4	47.2	42.4	SM		
20B-12MW	6-8	SS4	30.5					0	61.1	38.9	SM		
20B-13MW	12-14	SS6	20.5	0.6				1.7	91.7	6.6	SW-SM		
20B-14MW	3-4	SS2						55.1	39.8	5.1	GP-GM		
20B-14MW	10-12	SS6	17					6.1	88.2	5.7	SP-SM		
20B-14MW	19-21	SS8	26					7	66.4	26.6	SM		
20B-15MW	1-3	SS1	6					0.6	92.6	6.8	SP-SM		
20B-16MW	9-11	SS5	27					0	88.6	11.4	SP-SM		
20B-17MW	6-8	SS3B	7					45.4	51.9	2.7	SW		
20B-17MW	19-21	SS6	28					0	86.2	13.8	SP-SM		
20B-19	7-9	SS4						40.2	40.6	19.2	SM		
20B-21	4-6	SS3						3.1	92.6	4.3	SP		
Clay													
20B-1	35-37	S12	36		23	44	21				CL		
20B-1	41-43	ST1	42		24	50	26				CL/CH	504 (UCS)	
20B-1	54-56	ST2	47		22	48	26				CL	549.1 (UUTx)	
20B-1	68-70	S17	40		23	47	24				CL		
20B-1	80-82	ST3	40		21	43	22				CL	479 (UUTx)	
20B-1	97-99	S23	26		17	28	11				CL		
20B-2	4-6	SS3	41		21	48	27				CL		
20B-2	8-10	ST1	45		22	50	28				CL	743 (UCS)	ASTM D2435, Method B
20B-2	10-12	SS5	43		22	49	27				CL		
20B-2	30-32	SS9	41		21	45	24				CL		
20B-2	32-34	ST2	45		22	48	26				CL	502 (UUTx)	
20B-2	55-57	SS14	32		17	33	16				CL		
20B-3	8-10	ST1	32		21	45	24				CL		ASTM D2435, Method B
20B-3	14-16	SS6	37		22	47	25				CL		
20B-3	30-32	S11	45		24	50	26				CH		
20B-3	32-34	ST2	41		22	51	29				CH	460 (UUTx)	
20B-3	57-59	ST4	37		21	43	22				CL	466 (UCS)	ASTM D2435, Method B
20B-3	59-61	SS17	38		19	39	20				CL		
20B-4	SS4	11-13	33		19	42	23				CL		
20B-4	ST1	13-15	18		15	26	11				CL	1012 (UCS)	ASTM D2435, Method B
20B-4	19-21	SS7	13					11.3	38.9	49.8	SM		
20B-4	45-47	SS11	10					9.1	42.6	48.3	SM		
20B-5	41-43	ST1	38		21	47	26				CL	822 (UCS) 1559 (UUTx)	
20B-6	6-8	SS4	40		23	47	24				CL		
20B-6	12-14	ST1	37		23	52	29				CH	598 (UUTx)	
20B-6	20-22	SS7	41		22	46	24				CL		
20B-7	10-12	ST1	25								CL	1573 (UCS)	
20B-7	12-14	SS6	30		20	40	22				CL		
20B-8	8-10	SS5	32		20	46	26	0	3.2	96.8	CL		
20B-8	10-12	ST1	27		19	40	21				CL	1036 (UUTx)	
20B-8	25-27	SS10	37		20	41	21				CL		
20B-8	40-42	SS13	20		14	20	6				CL		
20B-9	38-40	SS15	41		22	43	21				CL		
20B-9	40-42	ST2	30		22	50	28				CL	59 (UCS)	ASTM D2435, Method B
20B-9	49-51	SS18	38		20	36	16				CL		
20B-10MW	13-15	SS7	57	6.1							ML		

20B-10MW	24-26	SS10	23.5					0	18.7	81.3	CL		
20B-12MW	8-10	SS5	84	8.1							ML		
20B-12MW	29-31	SS12	38		21	42	21				CL		
20B-13MW	24-26	SS9B	30		19	35	16				CL		
20B-16MW	24-26	SS9B	26		18	36	18				CL		
20B-19	17-19	SS9						26.1	25	48.9	SC		
20B-19	45-47	SS15	16		13	24	11	5.8	23.6	70.6	CL		
20B-20	6-8	ST1	27		20	40	20				CL	537 (UCS)	
20B-20	10-12	ST2	37								CL	701 (UCS)	
20B-20	12-14	SS5	35		21	45	24				CL		
20B-20	15-17	ST3	34		22	49	27				CL	726 (UCS)	
20B-20	20-22	ST4	33		21	46	25				CL	684 (UCS) 525(UUTx)	ASTM D2435, Method B
20B-20	38-40	SS10	39		21	48	27				CL		
20B-21	8-10	SS5	30		20	44	24				CL		
20B-21	18-20	SS10	37		22	46	24				CL		
Silty Sand and Gravel													
20B-4	59-61	SS14						36.1	33.7	30.2	GM		
20B-4	74-76	SS16	11					36	43.1	20.9	SM		
20B-6	45-47	SS12						37.9	39.3	22.8	SM		
20B-7	20-22	SS8	11					32.8	41.3	25.9	SM		
20B-7	25-27	SS9	10					11	46.5	42.5	SM		
20B-8	65-67	SS17	23		14	22	8				CL		
20B-21	35-37	SS15						39.8	43.4	16.8	SM		
20B-21A	20-22	SS1						35.1	37.2	27.7	SM		
20B-21A	65-67	SS3						24.7	44.6	30.7	SM		
20B-21A	75-77	SS5						39.9	33.1	27	SM		
Glacial Till													
20B-5	96-98	SS31	12.5					18.5	31.1	50.4	CL		
20B-6	70-72	SS17						40.1	52.3	7.6	SW-SM		
20B-7	49-51	SS13	10					16.4	46.6	37	SM		
20B-9	64-66	SS21	9.1					11.4	66.1	22.5	SM		
20B-9	89-91	SS24	13					2.5	53.7	43.8	SM		
20B-19	60-62	SS18						38.3	40.3	21.4	SM		
20B-19	75-77	SS21						39.3	36	24.7	GM		
20B-20	70-72	SS15						14.8	49.1	36.1	SC		
20B-21	55-57	SS19	22		18	36	18				CL		

Note: UCS stands for "Unconfined Compression Stregth Test". UUTx stands for "Unconsolidated Undrained Triaxial Shear Test".

ATTACHMENT K

Existing Chapter 91 License for Existing Pipe on General Edwards Bridge

Form WD 54.
1M sets-12-'28. No. 4178-2a.

The Commonwealth of Massachusetts

No. 1464.

Whereas, the Metropolitan District Commission,---------

of Boston---------, in the County of Suffolk------------ and Commonwealth aforesaid, has applied to the Department of Public Works for license to build and maintain a water pipe tunnel in, under and across the channel of Saugus River on the westerly side of the new Point of Pines Bridge, authorized by Chapter 241 of the Acts of 1932, in the cities of Lynn and Revere,---

and has submitted plans of the same; and whereas due notice of said application, and of the time and place fixed for a hearing thereon, has been given, as required by law, to the ------------Mayors and Aldermen-------of the cities- of Lynn and Revere-------------;

Now, said Department, having heard all parties desiring to be heard, and having fully considered said application, hereby, subject to the approval of the Governor and Council, authorizes and licenses the said

Metropolitan District Commission-------, subject to the provisions of the ninety-first chapter of the General Laws, and of all laws which are or may be in force applicable thereto, to build and maintain a water pipe tunnel in, under and across the channel of Saugus River on the westerly side of the new Point of Pines Bridge, authorized by Chapter 241 of the Acts of 1932, in the cities of Lynn and Revere, in conformity with the accompanying plan No. 1464.

Across the channel at the draw span of said bridge the water pipe tunnel shall consist of a siphon with its top $42\frac{1}{2}$ feet below mean low water, in the location shown on said plan and in accordance with the details of construction there indicated. Dredging may be done in said channel to allow the siphon to be laid to the depth shown on said plan.

This license is granted subject to the provisions of Sections 52 to 56, inclusive, of Chapter 91 of the General Laws, which provide, in part, that the transportation and dumping of the dredged material shall be done under the supervision of the Department of Public Works, and that the licensee shall be held liable to pay the cost of said supervision whenever the owner of the dredge or excavating machine fails to pay for the same within ten days after notification in writing from the Treasurer of the Commonwealth that the same is due.

This license is granted subject to the laws of the United States, and upon the express condition that the licensee shall, upon request in writing by the Department of Public Works or its successors, change the location of said water pipe tunnel or lower it to such depth as said Department may prescribe, or remove said siphon entirely from tide water whenever such changes or removal become necessary to provide for the dredging of channels for the improvement of navigation in Saugus River, and the acceptance of this license by the Metropolitan District Commission shall constitute an agreement by the licensee to comply with this condition.--

The plan of said work, numbered -------------1 4 6 4,---------is on file in the office of said Department, and duplicate of said plan accompanies this License, and is to be referred to as a part hereof.

~~The amount of tide-water displaced by the work hereby authorized shall be ascertained by said~~ Department, and compensation therefor shall be ~~made by the said~~

~~heirs, successors~~

Form WD 54
1M sets-12-'28. No. 4178-2b.

~~and assigns, by paying into the treasury of the Commonwealth~~

cents for each ~~cubic yard so displaced, being the amount hereby assessed~~

~~by said Department~~

Nothing in this License shall be so construed as to impair the legal rights of any person.

This License shall be void unless the same and the accompanying plan are recorded within one year from the date hereof, in the Regist~~ry~~ries of Deeds for the ---------Southern District of the County of Essex and the County of Suffolk.

In Witness Whereof, said Department of Public Works have hereunto set their hands this seventh----------------------day of February,---------------in the year nineteen hundred and thirty-three.

F E Lyman
Richard K Hale
H A MacDonald

Department of Public Works

THE COMMONWEALTH OF MASSACHUSETTS

~~This license is approved in consideration of the payment into the treasury of the Commonwealth by the said~~

~~of the further sum of~~

~~,~~

~~the amount determined by the Governor and Council as a just and equitable charge for rights and privileges hereby granted in land of the Commonwealth.~~

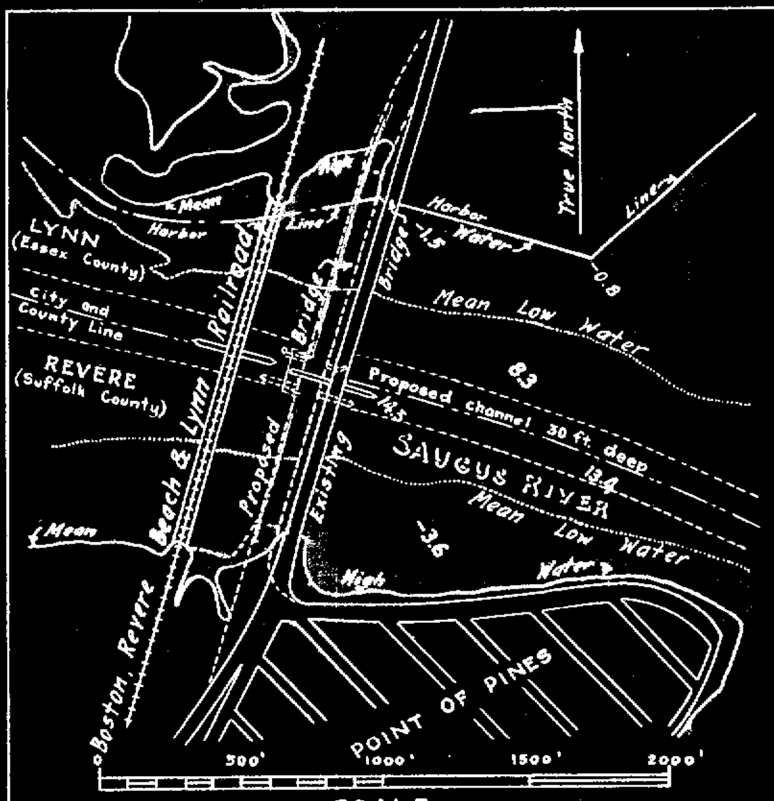
Boston, February 9, 1933

Approved by the Governor and Council.

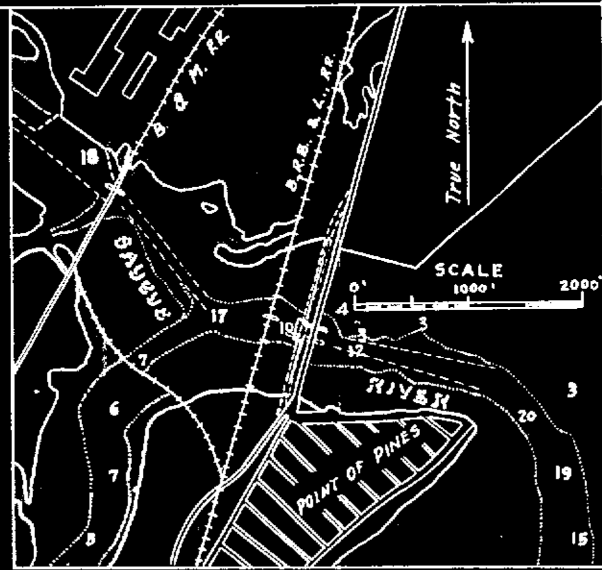
William L. Reed
Executive Secretary.

A true copy. Attest: Mary A. Riley *Secretary.*

No. 1 4 6 4.

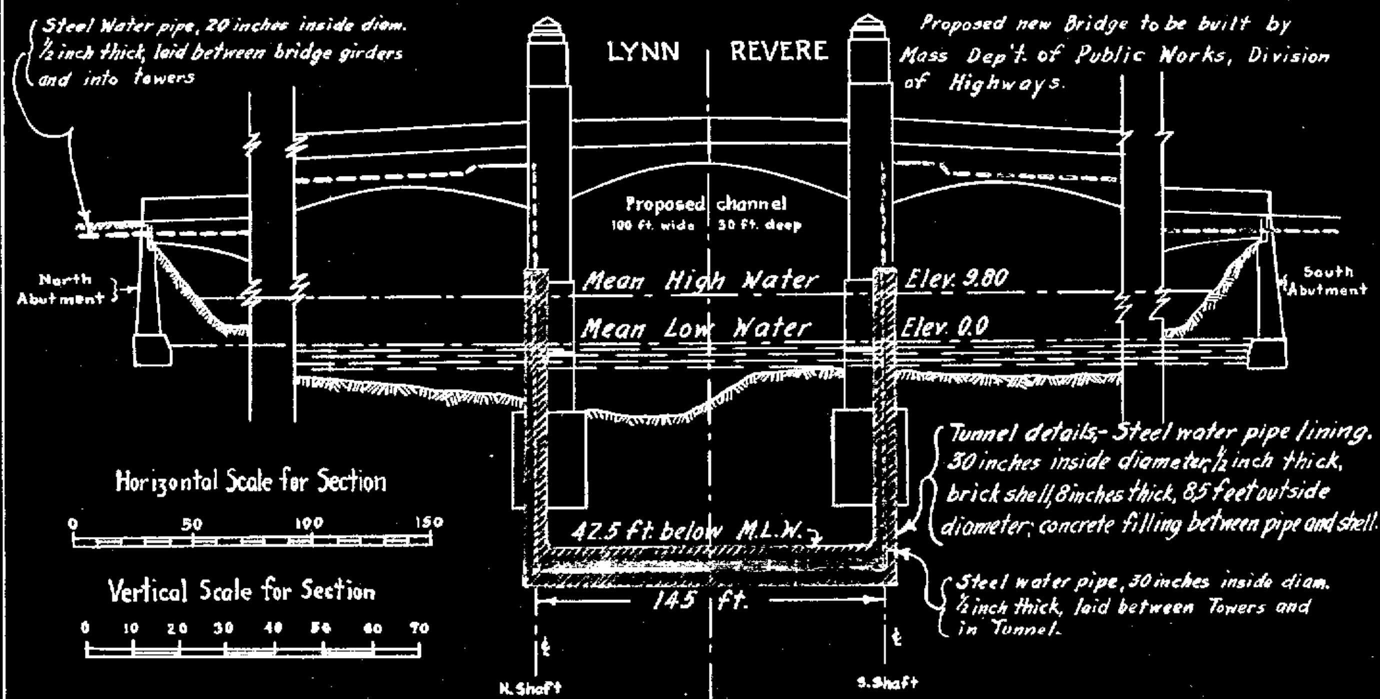


PLAN



From C. & G.S. Chart No. 240
Soundings are in feet and refer to mean low water.

Proposed Tunnel is part of the Northern High Service Pipe Lines and will supply Swampscott and Nahant.



PLAN ACCOMPANYING PETITION OF

METROPOLITAN DISTRICT COMMISSION
WATER DIVISION

TO CONSTRUCT A WATER PIPE TUNNEL UNDER

SAUGUS RIVER AT POINT OF PINES
REVERE - LYNN

JANUARY 9, 1933.

NO. 1464
APPROVED BY DEPARTMENT OF PUBLIC WORKS
FEBRUARY 7 1933

COMMISSIONER OF PUBLIC WORKS

ASSOCIATE COMMISSIONERS

ATTACHMENT L

Traffic Assessment and Control Memorandum

AECOM
250 Apollo Drive
Chelmsford, MA 01824
aecom.com

Project name:
Section 56 Replacement Saugus River Crossing

Project ref:
MWRA 7454 Saugus

To:
Peter Grasso (MWRA)

CC:
Chris Costello (AECOM)

From:
Isaac Almy (AECOM Traffic)
Arianna Mickee-Seguin (AECOM Traffic PM)

Date:
December 30, 2022

Memo

Subject: Traffic Assessment and Control

AECOM has prepared a Traffic Assessment and Control memo for review and approval by the Massachusetts Water Resource Authority (MWRA). The Traffic Assessment and Control memo provides a comprehensive investigation and evaluation of all traffic related aspects of the Project. This includes:

- Traffic impacts associated with temporary traffic control setups.
- Construction vehicle routes.
- Impacts to on street parking.
- Construction work hour restrictions.

Project Description

The Section 56 Main Saugus River Crossing is a water main replacement project over the Saugus River between Lynn and Revere Massachusetts. The proposed water main will cross Route 1A at the intersection of Hanson Street and Route 1A then run parallel to Hanson Street on the south side. The water main will then cross the Saugus River at the end of Hanson Street (Lynn, MA) and connect to Rice Ave (Revere, MA). The water main will run parallel to Rice Ave on the north side and connect to the existing water main near the intersection of Whitin Ave and Lynnway. A figure of the proposed water main location is shown in Figure 1.

Figure 1 – Proposed Water Main Location

Description of Roadways

The impacted roadways due to construction is shown in Table 1 with roadway classification and jurisdiction indicated.

Route 1A: Route 1A is a multi-lane roadway that runs in the North/South direction connecting Boston in the South to Northeastern Massachusetts, New Hampshire, and Maine in the North. The area of construction for this project occurs at the intersection of Route 1A and Hanson Street in Lynn, MA. This intersection is located in a commercially developed area with several businesses in the immediate vicinity. Business hours are generally 7AM to 9PM for businesses within 1,000 feet of the area of construction. There is no parking allowed on Route 1A. The lane configuration for each approach is as follows:

- Route 1A Northbound: Three through lanes.
- Hanson Street Westbound: One left turn lane and one right turn lane.
- Route 1A Southbound: Three through lanes and one southbound left turn lane.

Hanson Street: Hanson Street is approximately forty-five feet wide with one lane of traffic in each direction and two-hour parking allowed on both sides. Hanson street is a local street that provides access to two business developments from Route 1A. Hanson Street provides no connections to other roadways and is terminated on one end. At the road terminus there is a gate blocking vehicle access. There is a sidewalk on both sides of the road. Pedestrians may continue beyond the gate and access the Lynn Community Path.

Rice Ave: Rice Ave ranges between approximately eighteen feet wide to twenty-two feet wide with one lane of traffic in each direction. No parking is permitted on Rice Ave. Rice Ave is a local street in a dense residential neighborhood. There is a non-continuous sidewalk on the north side of the street. Several side streets intersect with Rice Ave. These side streets are all one-way southbound roadways.

Intersection of Rice Ave, Whitin Ave and Lynnway: Lynnway is a one-way street that provides access to Rice Ave and Whitin Ave from Route 1A. Whitin Ave is a one-way street in the southbound direction. Rice Ave is a two-direction street. Vehicles entering the intersection from Rice Ave must make a left turn on to Whitin Ave.

Table 1. Functional Classification and Jurisdiction of Impacted Roadways

Impacted Roadway(s)	Functional Classification	Jurisdiction
Route 1A NB	Rural or urban principal arterial	Massachusetts Department of Transportation (MassDOT)
Route 1A SB	Rural or urban principal arterial	Department of Conservation and Recreation (DCR)
Hanson Street	Local	Lynn, MA
Rice Ave	Local	Revere, MA
Lynnway	Local	Revere, MA
Whitin Ave	Local	Revere, MA

Source: Massachusetts geoDOT GIS application portal

Construction Activities

In order to understand the traffic impacts during construction, this memo has been prepared as a comprehensive document that details the logistics related to the construction of the water main on impacted roadways. A description of work, proposed traffic control setup, proposed working hours, parking restrictions, and detours for each impacted roadway are described in the following sections.

Intersection of Route 1A and Hanson Street (Lynn, MA)

Construction at this intersection will consist of installation of a proposed water main across Route 1A. The water main will cross along the southern approach of the intersection then continue down Hanson Street.

Proposed traffic control setup: The proposed temporary traffic control setup will involve a sequence of single lane closures to cross the intersection. Only a single lane will be closed at any given time in either direction to maintain traffic flow along Route 1A.

Proposed working hours: Temporary traffic control setups will be in place during off-peak traffic hours (overnight). This will minimize the impact to travelers on Route 1A and impacts to access points for nearby businesses.

Parking restrictions and detours: Parking restrictions and detours will not be required for this area of work.

Hanson Street (Lynn, MA)

Construction on Hanson Street will consist of installation of a proposed water main located in the southern shoulder.

Proposed traffic control setup: The proposed temporary traffic control setup will involve a sequence of shoulder closures along the south side of Hanson Street. To maintain existing driveway access points for businesses on Hanson Street, only one driveway will be blocked at any given time. Existing pedestrian facilities will be maintained, and a fence will be provided on the edge of the sidewalk.

Proposed working hours: Temporary traffic control setups will be in place during off-peak traffic hours (6pm to 6am).

Parking restrictions and detours: Parking restrictions and detours will not be required for this area of work.

Rice Ave (Revere, MA)

Construction on Rice Ave will consist of installation of a proposed water main located outside the roadway in the grass strip on the north side of Rice Avenue. There is approximately 250' of proposed water main located within the roadway near the intersection of Rice Ave and Whitin Ave (northwest of the yacht club).

Proposed traffic control setup: The proposed temporary traffic control setup at the intersection of Whitin Ave and Rice Ave will involve narrowing the roadway and maintaining all existing traffic movements. Construction vehicles and equipment will be located off the roadway on the north side of Rice Ave to provide a minimum of one travel lane.

The section of water main installation on Rice Ave between Whitin Ave and Fowler Ave will require a short section of alternating one-way traffic with a police officer to direct vehicles during construction hours. The roadway will be covered with steel plates at the end of each work shift, so that no alternating one-way setup will be required during off-peak hours. No further traffic control setups are required for HDD Route 7.

Special consideration if HDD Route 3 is selected

In the instance that HDD Route 3 is selected, the installation of a water main along the full length of Rice Ave will require additional setup for traffic control with detours. The proposed temporary traffic control setup along Rice Ave will involve a sequence of eastbound traffic closures. Equipment and vehicles will be located on the north side of Rice Ave (in the westbound travel lane) and westbound traffic will be shifted to the south side of Rice Ave in the eastbound travel lane. Traffic will move in the westbound direction only for each work area. Segments will be short enough to maintain existing driveway and side street access. For every segment of construction, detour signage will be provided at the nearest upstream side street to re-route traffic down the side street and to Rice Ave westbound. Pedestrian sidewalks will be maintained through the duration of construction. Figure 2 below shows a typical work setup along Rice Ave with Rice Ave WB traffic shifted and Rice Ave EB traffic detoured down the nearest upstream side street.

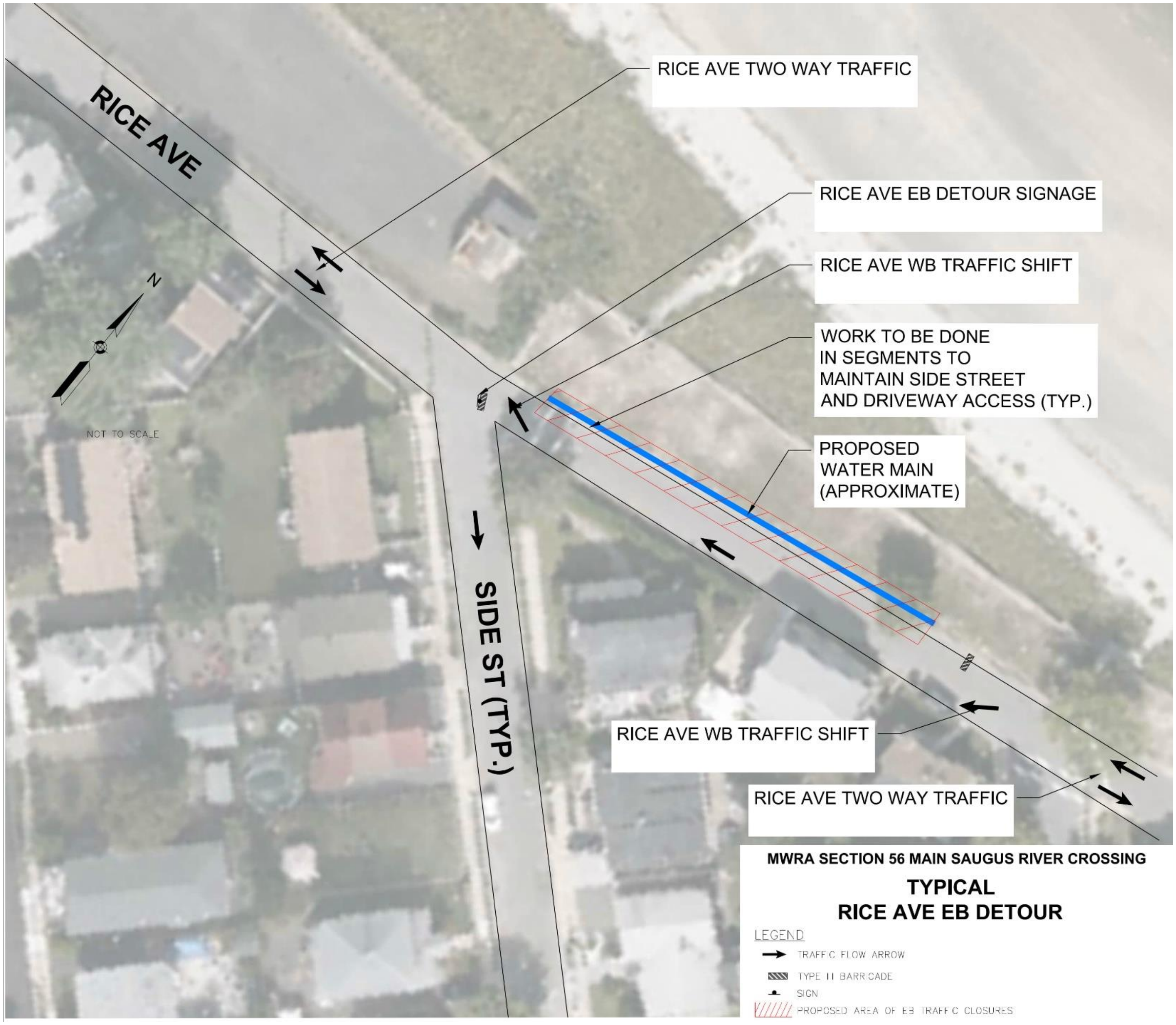


Figure 2 - Typical Rice Ave EB Detour

Additionally, equipment staging at the end of Rice Ave will be required to install the water main across the Saugus River. Figure 3 below depicts the necessary equipment locations and space requirements to install the pipe across the Saugus River. This setup is only required for a short duration but will require a partial road closure and detour. Approximately five residences will lose vehicle access to their driveway and will require temporary off-site parking. Residents will need to access their home via the sidewalk from the off-site parking location. Construction schedules will be communicated in advance to these residences, so that they may plan accordingly.

Figure 3 - Equipment Staging for HDD Route 3

Proposed working hours: Construction activities will take place during daytime hours (8am to 5pm).

Parking restrictions: There is currently no parking allowed on Rice Ave. This will be strictly enforced during construction to allow activities to take place.

Detours: A detour will be required if HDD Route 3 is selected and provided for each segment of construction along Rice Ave as needed. Vehicles will be rerouted down a side street off Rice Ave and directed to make a left at the end of the street to Rice Ave and continue on Rice Ave WB until their destination. At the HDD-3 Exit Point, residential traffic will be rerouted for off-site parking.

The standard temporary traffic control details that will be utilized during construction have been attached at the end of this memo.

Construction Vehicle Access

Construction vehicles are needed to remove debris from the site and to deliver new construction materials as the project proceeds.

The impact of construction traffic in the peak hours is expected to be marginal due to off-hour deliveries and debris load-out. Truck activity is expected to be uniform for each area of construction work hours.

In the case where HDD Route 7 is selected, construction vehicle access will be straightforward and construction vehicles will be able to drive to the construction site directly with little impact to surrounding residents. Construction vehicles will be able to have enough room to maneuver at the Point of Pines Yacht Club and thereby limit the need for specific routes for construction vehicles.

Special consideration if HDD Route 3 is selected

In the event HDD Route 3 is selected, AECOM is requiring trucks use specific routes to access each work zone. A truck circulation plan is provided in Figure 4 that depicts the truck routes. These selected truck routes are based upon:

- The directionality of side streets.
- The narrow width of Rice Ave and inability of trucks to reverse direction.

It is anticipated that all trucks arriving at the work site on Rice Ave will not be able to reverse direction. For this reason, arrival routes will have two categories: trucks arriving from the west and trucks arriving from the east (Figure 4 Green Routes).

Trucks arriving on Rice Ave from the west:

- Make a left on to Lynnway from Route 1A exit ramp
- Make right on to Rice Ave

Trucks arriving on Rice Ave from the east:

- Make a left on to Lynnway from Route 1A exit ramp
- Make a right on to Whitin Ave
- Make a left on to Rice Ave

Similarly, it is anticipated that departing trucks will not be able to reverse direction. For this reason, departing routes will have two categories: trucks departing Rice Ave and going west and trucks departing Rice Ave and going east (Figure 4 Red Routes).

Westbound trucks departing Rice Ave:

- Continue on Rice Ave
- Turn left to Whitin Ave
- Turn Right to Rice Ave
- Turn Right to Chamberlain Ave
- Turn to Route 1A

Eastbound trucks departing Rice Ave:

- Continue on Rice Ave
- Turn right to Chamberlain Ave
- Turn right to Lynnway
- Turn to Route 1A

Figure 4- Proposed Construction Vehicle Circulation Plan

ATTACHMENT M

Feasibility Study

EXHIBIT 3

Feasibility Study

5 Centennial Drive, Peabody, MA 01960 (HQ)
Tel: 978.532.1900

MWRA Contract No. 7500
Weston & Sampson Project No. 2150821

June 09, 2017

Geetha Mathiyalakan
Program Manager
MWRA – Engineering & Construction
2 Griffin Way
Chelsea, MA 02150

Re: Subtask 3.3 - Final Report
MWRA Contract No. 7500

Dear Mrs. Mathiyalakan,

In accordance with Contract No 7500 Subtasks 3.3 please find attached the Feasibility Study Final Report.

This content was prepared by Weston & Sampson with the assistance of our subcontractors McMillen Jacobs Associates, Inc, and Green International Affiliates. This submittal has been reviewed in accordance with the Quality Assurance and Quality Control procedures for this project and the submittal is complete.

If you have any questions, please call.

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.

Bruce W. Adams, P.E.
Vice President

Attachments/Enclosures

O:\MWRA\2150821-BRIDGE CROSSING FS\C7500 FILE\13 SUBTASKS\3.3 FINAL FEASIBILITY STUDY\00 COVER LETTER.DOCX

Weston & Sampson

westonandsampson.com

5 Centennial Drive
Peabody, MA 01960 (HQ)
tel: 978.532.1900

REPORT

June 2017

Massachusetts Water Resources Authority

Engineering Services to Conduct Feasibility Study for Section 56 General Edwards Bridge Crossing of the Saugus River

Contract No. 7500

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EXECUTIVE SUMMARY

The Massachusetts Water Resources Authority (MWRA) Section 56 water transmission main supplies meters in the City of Revere and the City of Lynn, and provides service to the Northern High Service Zone communities of Lynn, Nahant, Swampscott and Marblehead. The 20-inch diameter steel water transmission main has been taken out-of-service at its crossing of the Saugus River due to a history of leaks and bursts. The MWRA wishes to evaluate options to restore reliable water transmission through Section 56 at its crossing of the Saugus River.

The MWRA secured Weston & Sampson to perform a feasibility study to evaluate rehabilitation and replacement alternatives for a future capital improvements project. The Weston & Sampson project team, including sub consultants McMillen Jacobs Associates and Green International Affiliates, performed feasibility study services from December 2015 to May 2017. Tasks included field reconnaissance, review of existing conditions records, evaluation of installation methods and route alternatives, screening and ranking of alternatives, and detailed study of the two highly ranked route alternatives. The team coordinated progress with the MWRA through memoranda detailing work progress and periodic project meetings.

Field reconnaissance and pipe inspection revealed that the existing pipe and pipe supports are generally in poor condition. The existing conditions review identified known environmental releases in the area, subsurface conditions near the bridge alignment, general nature of historic and existing structures, applicable resource area limits, abutters, and development interests in the project area. Eight (8) potential pipe replacement route alignments were identified in the project area. Four (4) pipe installation methods were considered, including open trench river crossing, horizontal directional drilling, microtunneling, and removal and replacement on the bridge. Route alternatives were screened with respect to pipeline performance, program risks, cost, and schedule.

Screening and ranking identified two highly rated horizontal directional drilling (HDD) pipe replacement alternatives extending from Hanson Street in the City of Lynn to Rice Avenue in the City of Revere (Route 3 and Route 7). The microtunneling alternative was rated favorably from a performance and risk perspective, but had the highest cost and a longer schedule duration. The open trench river crossing alternative was comparable in cost to HDD options, but included greater environmental risk, greater permitting difficulty, and a longer schedule duration. The pipe replacement on bridge alternative scored less favorably due to reduced protection against damage, hydraulic limitations, greater technical complexity, and greater construction risk.

Weston & Sampson recommends that Route 3 and Route 7 be carried forward into preliminary design. Both HDD routes shares drill entry on Hanson Street in Lynn. Route 3 has drill exit near the end of the Point of Pines on Rice Avenue, and Route 7 has drill exit near the Point of Pines Yacht Club off Rice Avenue. Route 3 is viewed as having less risk of conflict with known and unknown structures due to its orientation relative to the Lynn Seawall and other obstructions, as well as its location outside of the historically developed areas inside the mouth of the Saugus River, among other advantages. Route 7 is of lower cost and lower construction duration, among other advantages. Risks associated with obstruction by the seawall, easement acquisition, and abutter concerns will be fully evaluated and better understood in preliminary design after execution of the recommended subsurface exploration program, engagement of abutters, and initiation of access/easement negotiation. Route 3 has an estimated program cost of $10,651,147, requires 7-months of construction operations, and has an estimated project completion date in October 2021. Route 7 has an estimated program cost of $9,947,248, requires about 6-months of construction operations, and has an estimated project completion date in September 2021.

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1.0 INTRODUCTION

The MWRA wishes to evaluate the most feasible, cost-effective, methodology for replacing the Section 56 water main where it crosses the Saugus River on the General Edwards Bridge between the City of Revere and the City of Lynn, Massachusetts. Weston & Sampson was retained under Contract 7500, *Engineering Services to Conduct Feasibility Study for Section 56 General Edwards Bridge Crossing of the Saugus River* (the Project), to perform professional services in support of this goal.

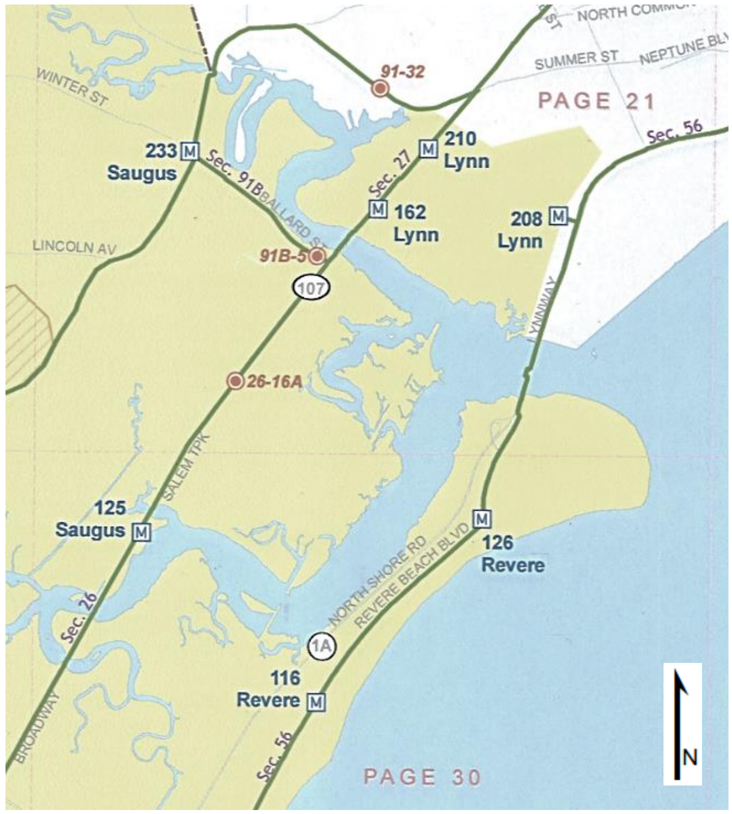

Figure 1 – Overview of Section 56

1.1 General

Section 56 at the General Edwards Bridge was constructed in 1934. The water main is buried 20-inch diameter cast iron pipe in its approaches to the bridge in the City of Revere (Revere Beach Boulevard and the Lynnway) and the City of Lynn (the Lynnway). The water main crosses the Saugus River supported by the General Edwards Bridge superstructure, except through the navigation channel, where the water main passes below the existing navigation channel via a tunnel. The buried 20-inch diameter cast iron pipe in streets transitions to 20-inch diameter flanged steel pipe on the General Edwards Bridge and 30-inch diameter steel pipe at the tunnel system.

Section 56 supplies water to residential, commercial and industrial properties in Revere and Lynn, and provides redundancy for Sections 27 and 91 that service the Northern High Service Zone communities of Lynn, Nahant, Swampscott and Marblehead. Section 56 has experienced several leaks and bursts, with a considerable number at the bridge crossing, where the above-grade portions of the pipe have experienced severe corrosion. Section 56 is currently shutdown at meter 126 because of the leaks and bursts.

Section 27 and Section 91 cross the Saugus River north of its confluence with the Pines River. Section 26 is currently out of service at the Salem Turnpike river crossing.

1.2 Purpose

The MWRA wishes to restore reliable water transmission through Section 56 at its crossing of the Saugus River. This feasibility study was to evaluate pipe rehabilitation and replacement alternatives and recommend the most favorable alternative that meets the MWRA's long term goals for reliable water system performance in the project area. Alternatives evaluation was to include water main replacement on the bridge, open trench water main installation, and water main installation via trenchless installation methods.

Alternatives were evaluated for technical feasibility, estimated costs, potential environmental impacts, permit requirements, easement/land acquisition requirements, potential utility conflicts, traffic impacts, connections to the existing pipe, installation of valves and other appurtenances and estimated construction schedule. The results of this study are intended to be used to guide the design of the Section 56 water main replacement. The project does not address replacing existing below-grade portions of Section 56 in Revere or Lynn.

1.3 Project Team

The Project team included Weston & Sampson as the engineering lead and McMillen Jacobs Associates and Green International Affiliates as subconsultants. Weston & Sampson's organization and management approach for was intended to maximize the expertise brought by each team member. A Quality Assurance and Quality Control Manual was prepared to detailed staff organization and role responsibility. The majority of work was provided by Weston & Sampson from their headquarters in Peabody, Massachusetts. Support evaluating trenchless technology options was provided by McMillen Jacobs Associates from their Burlington Massachusetts office. Inspection of the existing Section 56 water main, and support of the on bridge pipe replacement alternative, was provided by Green International Affiliates, from their Westford Massachusetts office.

1.4 Schedule Overview

Figure 2- General Edwards Bridge North Elevation

The Project Notice to Proceed was issued on December 4, 2015. Field reconnaissance began on December 14, 2015, and concluded with a memorandum dated February 25, 2016. Review of existing records was performed in the first quarter of 2016. Memoranda summarizing environmental and geotechnical records review were submitted in April 2016. Installation methods and route alignments were evaluated in the first and second quarters of 2016. A draft memorandum summarizing installation methods and route alternatives was submitted in April 2016. Screening and ranking of alternatives was performed in the second quarter of 2016 and results were submitted in July 2016. A workshop was held in September 2016 to discuss installation methods, route alternatives, and screening and ranking. In the months following the workshop, various meetings with stakeholders were conducted. In November 2016, revised route alternatives and screening and ranking memoranda were finalized. The MWRA authorized Weston & Sampson to proceed with a detailed review of the recommended alternative in January 2017. The MWRA expanded the scope of detailed review in February 2017 via contract Task Order 3. Detailed review deliverables were submitted in March 2017. This Final Report was submitted in June 2017.

1.5 Project References

Project references acquired throughout the course of the feasibility study have been logged and saved to the project file for record. Appendix A, Reference Library, provides an index of project references that were compiled and reviewed in preparation of this feasibility study. For each reference saved to file, the Reference Library indicates the name, the number of sheets, organization, date, and a brief description.

1.6 Contents of Report

This report is sequenced to describe existing conditions, broadly characterize routes and installation method alternatives, screen and rank alternatives, and detail recommended alternatives, and summarize conclusions. Sections of the report are as follows:

Section 1 – Introduction
- Introduces the problem, the purpose of contract, the project team, and schedule

Section 2 - Existing Bridge and Pipeline
- Describes the existing bridge, pipeline inspection efforts, and insulation/coating analysis

Section 3 - Study Area
- Characterizes existing conditions within the study area

Section 4 - River Crossing Methods
- Describes methods for river crossing pipe installation

Section 5 - Route Alternatives
- Identifies route alternatives and describes advantages/disadvantages

Section 6 - Screening & Ranking
- Describes approach for alternatives screening, screening results, and ranking

Section 7 - Recommended Pipe Replacement Alternatives
- Includes a detailed review of cost, schedule, subsurface exploration, risks and risk mitigation for the recommended alternatives

Section 8 - Conclusions
- Summarizes the conclusions of the feasibility study

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2.0 EXISTING BRIDGE AND PIPELINE

Field reconnaissance and pipeline inspection were performed at the General Edwards Bridge as part of the Project. Inspection revealed that the existing Section 56 water main supported on the General Edwards Bridge is in poor to serious condition. Typical pitting on the exterior of the water main was 0.125 to 0.25 inches deep. Three (3) locations of previous pipe blowout were observed. Pipe extending to tunnel shafts, as well as at the top of each tunnel shaft, were observed in poor condition. Many pipe supports were observed in poor condition.

2.1 Overview

The General Edwards Memorial Bridge, L-18-015(4D7), (the Bridge) was built in 1934 and is a bascule bridge (also referred to as a drawbridge). The Bridge spans the Saugus River between the City of Lynn and the City of Revere. The south abutment of the Bridge is in the City of Revere and the north abutment is in the City of Lynn. The Bridge is part of Massachusetts State Route 1A and has been under the jurisdiction of the Massachusetts Department of Transportation (MassDOT) since 2009, when it was transferred from Massachusetts Department of Conservation and Recreation (DCR) jurisdiction.

Figure 3- Orthophoto of General Edwards Bridge

Massachusetts State Route 1A North is named “the Lynnway” north of the General Edwards Bridge in Lynn, and “North Shore Road” south of the General Edwards Bridge in Revere. Massachusetts State Route 1A is a multi-lane arterial roadway and provides regional connection along the shoreline between East Boston/Revere to the south and Swampscott/Salem to the north. The Lynnway is under DCR jurisdiction and North Shore Road is under MassDOT jurisdiction.


Figure 4 - Typical Configuration of Pipe, Support Beams, and Timber Plank Walkway

The Section 56 water main at the Saugus River crossing was built when the bridge was constructed. The pipe is mounted on the under-side of the bridge and is a 20” diameter flanged steel pipe with 1/2” wall thickness. The pipe is supported by the bridge structure in the spans approaching the bascule. In these spans, the pipe rests on radially cut I-beams welded to bridge support beams. There are no pipe rollers associated with this system, so the pipe can slide within each radially cut beam section. At the movable leaf of the bascule bridge, bends orient the water main to within the bridge towers, across bridge fenders, and into the tunnel system, as shown in Figure 5, Tunnel Plan 1934.

2.2 Pipeline Inspection

The Section 56 water main on the General Edwards Bridge was inspected by Green International in December 2015 as part of the feasibility study. Access to the structure was gained by using an under-bridge inspection unit (a “snooper” truck) and ladders at the bridge ends. The MWRA inspection was performed December 14, 15, 16, and 23, 2015. Green International Affiliates performed a subsequent inspection as part of a MassDOT inspection contract on January 28 and 29, 2016. The remainder of report Section 2.2 is taken from the Green International Affiliates memorandum to Weston & Sampson titled “Water Main Condition Findings”, dated February 25, 2016.

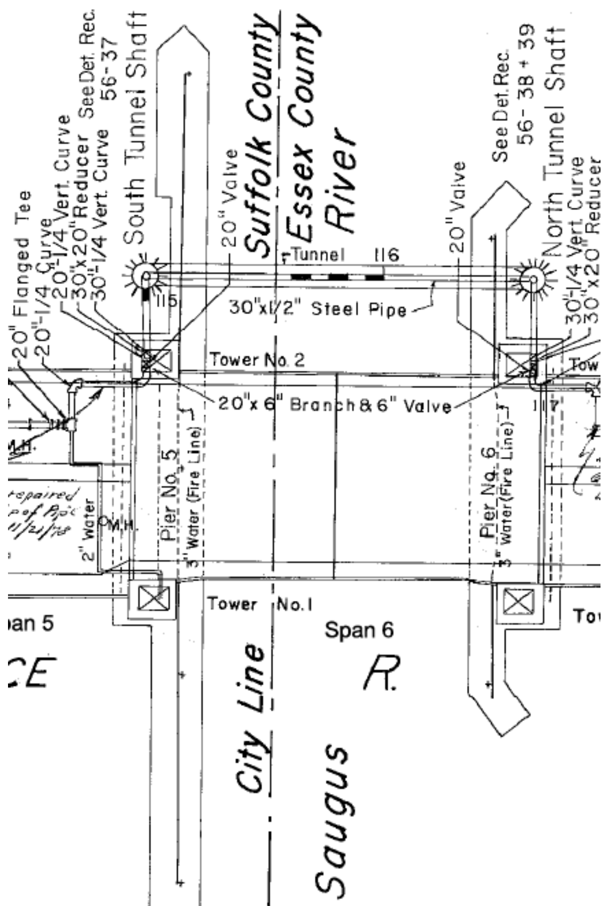

Figure 5 - Tunnel Plan 1934

Green International Affiliates performed a hands-on inspection of the entire exposed length of the existing water main, its supports and end connections throughout the bridge approach spans, the tower transition areas, and the water pipe tunnel entrance shafts. They compared available record plan information with what was found and measured in the field. Areas of deterioration were identified on a framing plan from the applicable record drawings, as attached in Appendix B.

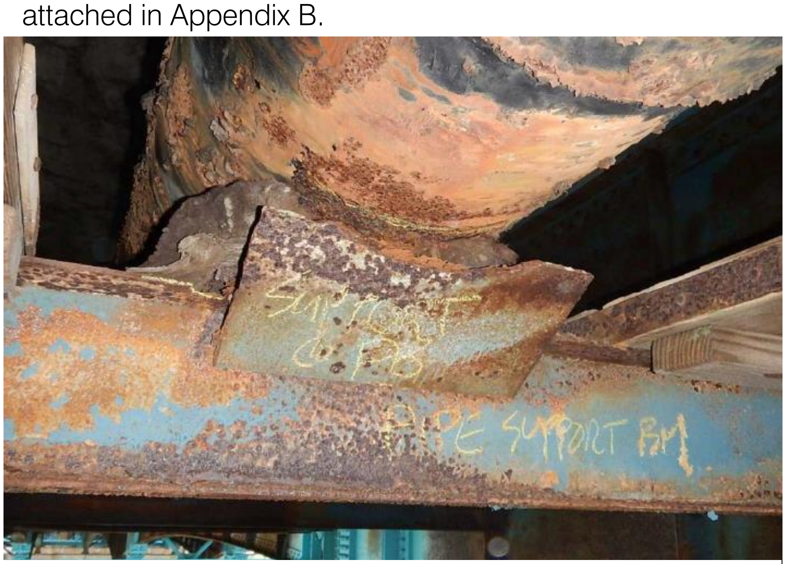

Figure 6 – Typical Deteriorated Pipe Support and Support Beams

At the time of the inspection, material samples were taken by the Green International Affiliates inspection team and an MWRA welding crew in the form of steel pipe coupons, insulation samples and bridge steel and pipe coatings. These samples, aside from the steel coupon, were taken to identify possible hazardous material content.

Select photographs, sketches, and field notes from the pipeline inspection are attached to this report in Appendix B.

2.2.1 Pipe in Bridge Approach Spans

The water main pipe, supported by the bridge superstructure, was found to be in poor condition with three failure areas noted. There are numerous areas of damaged or removed insulation wrap in each span. The exposed steel pipe in these areas typically has rusted and pitted surfaces all around the pipe, as shown in Figure 7, Typical Exposed Pipe Condition. The typical pitted surfaces were up to 15% of the outer perimeter and up to 1/8" deep. There is a black protective tar coating (deteriorated) on the outside of the pipe.

Figure 7 - Typical Exposed Pipe Condition

Figure 8 - Pipe Blowout Area Span 10 with Coupon Cutout

Pipe blowout or rupture areas were found on the bridge in spans 8, 10, & 13. One rupture is shown in Figure 8, Pipe Blowout Area Span 10 with Coupon Cutout. Failure appeared to have been a result of the pipe splitting along a seam weld. There were several areas of exposed pipe where there was up to 0.25 inch deep pitting of the steel pipe over approximately 70% of the pipe perimeter. Similarly pitted areas were found at the pipe blowout/rupture locations and direct caliper measurements of 0.25 inch remaining steel thickness were taken.

The pipe has a series of 90-degree bends in spans 5 and 7 where the pipe turns to the west then turns into the bridge towers, as shown in Figure 9, Insulated Pipe at Bend. The insulation layer in these bend lengths of pipe was of a different material type than the main horsehair type insulation and was typically deteriorating.

Figure 9 - Insulated Pipe at Bend and Twisted/Deteriorated Support Beams at Span 5

2.2.2 Pipe Inside Towers

The pipe inside the towers was found to have a combination insulation layer and was generally intact or had been maintained with repairs made. Both tower water main sections were found to be in satisfactory condition, as shown in Figure 10, South Tower Pipe Condition.

Figure 10 - South Tower Pipe Condition

2.2.3 Pipe to Tunnel Shaft

The pipe outside the south tower was found to have a replacement protective layer installed and the pipe was not visible for inspection. The north tower pipe was exposed and has a similar pitted condition as was found on the approach span exposed pipes, as shown in Figure 11, North Exposed Pipe Section to Tunnel Shaft. The tunnel shaft was inspected from the top of each shaft structure. The tunnel pipe was not inspected as part of the project. Within both tunnel shafts water was found pooling on top of the pipe and the surrounding concrete fill. The South Tunnel Shaft has an access opening cut from the concrete slab on top of the shaft, as shown in Figure 12, Inside South Tunnel Shaft. The measured top of the water surface was approximately 56” from the underside of the concrete cap slab with an average water depth of 40” to solid concrete fill. There was soft material at the east shaft with a maximum depth to solid concrete of 52” or 96” from the underside of the concrete cap to solid concrete. A sketch depicting these measurements is included in Appendix B.

Figure 11 – North Exposed Pipe Section to Tunnel Shaft

The North Tunnel Shaft manhole was opened but measurements were more difficult to obtain. The distance from the underside of the manhole frame to the solid concrete was found to be approximately 74” with an 8” average water depth. A maximum water depth in soft material was found to be 21”.

Figure 12 - Inside South Tunnel Shaft

Both pipe conditions were as expected inside the shaft area and were deteriorated similar to the other typical exposed pipe areas with 0.25” deep pitting. The pipe visible inside the shafts is in poor condition.

2.2.4 Supports and Support Beams

The pipe supports and support beams were found to be in poor condition overall throughout the approach spans. Typically, when the pipe support was found to be excessively deteriorated, the corresponding support beam was also found to be excessively deteriorated. Four (4) specific locations in Spans 3, 5, 10, & 12 were found to have deteriorated to a point where no loads are recommended to be placed on the support beams.

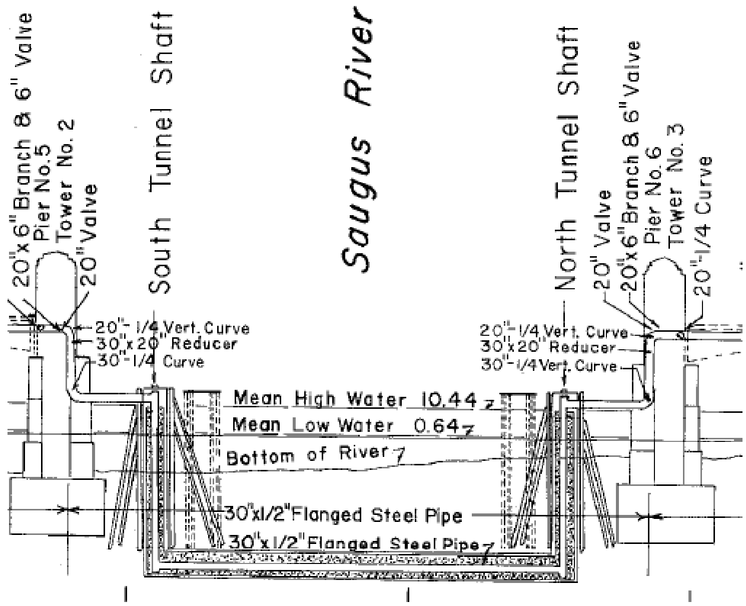

Figure 13 - Tunnel Shaft Profile 1934

A total of seven (7) pipe stabilizer frames were installed in spans 3, 5, 7, 9, and 11 per the 1935 design plans. Stabilizer frames were located at the pipe expansion joint flanges to maintain alignment at the joints. The stabilizer frames were positively attached to the pipe itself (typically bolted to a flange) and secured to the bridge by way of welds to the adjacent girder web. All of the girder webs at the welded connections where cracked welds were found were bulged by the apparent pulling or pushing against the girder web from the stabilizer frame ends. Some of these cracked welds were found to have propagated into the girder webs in spans 5, 9, & 11, as shown in Figure 14, Cracked Girder Web Span 11.

The cracked welds and girder webs were immediately brought to the attention of the MWRA and MassDOT by the project team. Subsequent inspection of the stabilizer to girder connections was performed on January 28 and 29, 2016, by Green International Affiliates through a separate contract with MassDOT.

Figure 14 - Cracked Girder Web Span 11

2.2.5 Conclusions

The water main in the bridge approach spans is in poor to serious condition with typical pitted surfaces 0.125 inch deep and up to 0.25 inch deep with three blowout areas. The tower portions of the pipe were not visible for inspection. The tunnel shaft exposed pipe areas are in poor condition.

2.3 Analysis of Coatings & Insulation

Inspection in December 2015 revealed pipe insulation and coatings which might contain asbestos and/or metals of concern. Under feasibility study Additional Services Task Order No. 2, Weston & Sampson collected samples of readily available deteriorated materials to test pipe coatings for asbestos and lead, pipe insulations for asbestos, and pipe support coatings for RCRA 8 metals. The intent of sampling was to inform ongoing operations and maintenance on the Section 56 water main, inform the water main replacement feasibility study so that program scope, cost, and permitting could be estimated more accurately, and to inform future water main replacement design scope of work. The remainder of Section 2.3 of this report includes excerpt from the Weston & Sampson Memorandum "Hazardous Building Materials Investigation Services", finalized June 29, 2016, as attached to this report as Appendix C.

2.3.1 Asbestos

Weston & Sampson performed the bulk sampling in the area according to methods outlined in the U.S. Environmental Protection Agency guidance document titled, "Guidance for Controlling Asbestos-Containing Materials in Buildings" (Document No. 560/5-85/024). The U.S. Environmental Protection Agency (EPA) defines an Asbestos-Containing Material as a material that contains greater than one percent (1%) asbestos. The Massachusetts Department of Environmental Protection defines an Asbestos-Containing Material ("ACM") as a material that contains greater than or equal to one percent (1%) asbestos. Asbestos in concentrations greater than or equal to one percent (1%) was detected in four (4) of the materials sampled by Weston & Sampson. The following insulations were identified as asbestos-containing materials during the investigation:

- Tar paper and horsehair insulation, typical of most indoor and outdoor pipeline installation. The horsehair, while not asbestos containing itself, should be treated as part of an asbestos containing material because it is impractical to separate it from the asbestos containing tar paper.
- Fibrous insulations, typically at joints, sometimes wrapped in tar paper

Figure 15 - Fibrous Insulation Sample Location No 4

The presence of asbestos on the property does not necessarily mean that the health of abutters or operators at the site are endangered. Asbestos fibers present a serious health hazard only when they become airborne after being released from the material in which they are bound. ACMs are most likely to be disturbed during maintenance, repair, or renovation activities. Future pipeline rehabilitation or demolition work must address the proper handling and disposal of both the asbestos containing materials and metals (described further below) identified at the site. The generation of an asbestos abatement removal specification is recommended in order to identify acceptable means and methods of performing asbestos abatement under EPA and Massachusetts regulations.

2.3.2 Lead

Lead screening of pipe coatings revealed that neither sample contained levels of lead greater than the EPA residential standard of 0.50% lead by weight. The results of the samples ranged from 0.011% lead by weight to 0.079% lead by weight. However, the Occupational Health and Safety Administration

(OSHA) Lead in Construction Standard 29 CFR 1926.62 considers any detectable level of lead to be a potential for exposure if dust is generated from disturbance of surfaces coated with paint containing lead. OSHA defines any detectable concentration of lead in paint as a potential lead exposure hazard to workers doing construction/demolition-type work on these surfaces as even small concentrations of lead can result in unacceptable employee exposures depending upon the method of removal and other workplace conditions. Since these conditions can vary greatly, the lead-in-construction standard was written to require exposure monitoring or the use of historical or objective data to ensure that employee exposures do not exceed the Action Level of 30 micrograms per cubic meter of air (µg/m3). The contractor must provide respiratory protection, protective work clothing and equipment, change areas, hand washing facilities, biological monitoring, and training until an exposure assessment has determined that the work activity will result in an exposure below the permissible exposure limit. Additional requirements under this standard include a written compliance program as well as record keeping.

2.3.3 Metals (RCRA-8)

The Resource Conservation and Recovery Act (RCRA) monitors contaminants that are considered environmentally hazardous because they exhibit characteristics of corrosivity, toxicity, ignitability, or reactivity. Weston & Sampson performed metals testing of a pipe support coating for RCRA-8 metals that are commonly found in industrial coatings.

Analyte	Result (mg/Kg)	"20 Time Rule" TCLP Analysis Threshold (mg/Kg)
Arsenic	ND	100
Barium	**3,700**	2,000
Cadmium	11	20
Chromium	**1,200**	100
Lead	**180,000**	100
Selenium	5.3	20
Silver	ND	100
Mercury	1.1	4

Table 1 - RCRA-8 Metals Sample Results

Barium, Chromium and Lead concentrations were greater than "20 times" their hazardous waste toxicity threshold (i.e. the 20-times rule). If pipe coatings are to be removed and disposed, Toxicity Characteristic Leaching Procedure (TCLP) analyses should be performed to determine requirements. If the metal and coatings are removed as a whole component (metal with coatings still applied) and recycled, TCLP is not necessary, as bulk scrap metal items being recycled are not subject to MassDEP Hazardous Waste Regulations (310 CMR 30.202(5)f). Should any of the analytes fail TCLP analyses, the pipe support coating will be considered a hazardous waste and disposal will be governed by RCRA and MassDEP Hazardous Waste Regulations. The coating should be handled as a hazardous waste until further testing, using the TCLP analysis, confirms the waste's toxicity characteristic results. Given that handling method impacts disposal requirements it is recommended that a project specific specification for removal and disposal of coatings containing metals be prepared to define acceptable means and methods for removal and disposal in accordance with EPA and Massachusetts regulations.

Typically, metals in coatings present a health hazard only when disturbed during maintenance, repair, or renovation activities. The handling of these materials must be performed in accordance with the health and safety measures outlined in OSHA regulations. Contractors should be informed prior to working when coatings containing metals exist on a work premise. Due to the presence of several of the metals in elevated concentrations, a contractor will likely be required to provide respiratory protection, protective work clothing and equipment, change areas, hand washing facilities, biological monitoring, and training until an exposure assessment has determined that the work activity will result in an exposure below the permissible exposure limit for any of the materials listed above.

Figure 16 - Accessing Section 56 via Snooper Truck

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3.0 STUDY AREA

The area around General Edwards Bridge has a rich and varied land use history and is subject to several ongoing development initiatives. The study area is also within various state and federal resource areas which will impact requirements of water main installation. This section of the report details the study area abutting the Section 56 crossing of the Saugus River at the General Edwards Bridge.

3.1 Site Features

Site features and existing conditions will impact cost and feasibility of replacement alternatives at the Section 56 at the crossing of the Saugus River. Site features were identified in records review and field reconnaissance and compiled for presentation in the "Route Alternatives of Existing Conditions Plan", attached in Appendix D.

3.1.1 General Edwards Bridge Condition

An overview of the General Edwards Bridge was briefly described in Section 2.0 of this report. The Federal Highway Administration National Bridge Inventory (available online) indicates that the last inspection of the General Edwards Bridge was performed in June 2014 and that deck, superstructure, and substructure condition ratings were "5", "5", and "4", respectively. A structurally deficient bridge is one for which the deck, superstructure, or substructure is rated 4 or less. This is based on a scale of 1 to 9, with a score of 9 being "excellent" and 0 being "imminent failure". Therefore, the bridge is currently rated "structurally deficient". The National Bridge Inventory identifies that the Bridge was last reconstructed in 1990, that the "Bridge is not eligible for the National Register of Historic Places", and that recommended work includes "Replacement of bridge or other structure because of substandard load carrying capacity or substandard bridge roadway geometry". MassDOT has an open project number 608396, titled "Lynn-Revere Bridge Reconstruction". Per an exchange between the MWRA and MassDOT in September 2016, a representative from MassDOT indicated that funds to design this project have not been secured, and that it is not likely to happen within the next 10 years. General Edwards Bridge replacement is a risk to the MWRA Section 56 water main in the existing bridge corridor.

3.1.2 Historic Wood Deck Bridge

An existing wood deck bridge pre-dated the General Edwards Bridge and occupied a space immediately to the east of the exiting Bridge. Figure 17, Historic Bridge Alignment, indicates in a 1933 conceptual rendering the existing bridge immediately to the east of the proposed bridge. Similar to the General Edwards Bridge, this bridge had fenders extending laterally from the bridge alignment and likely rested on an extensive subsurface support system comprised of wooden piers.

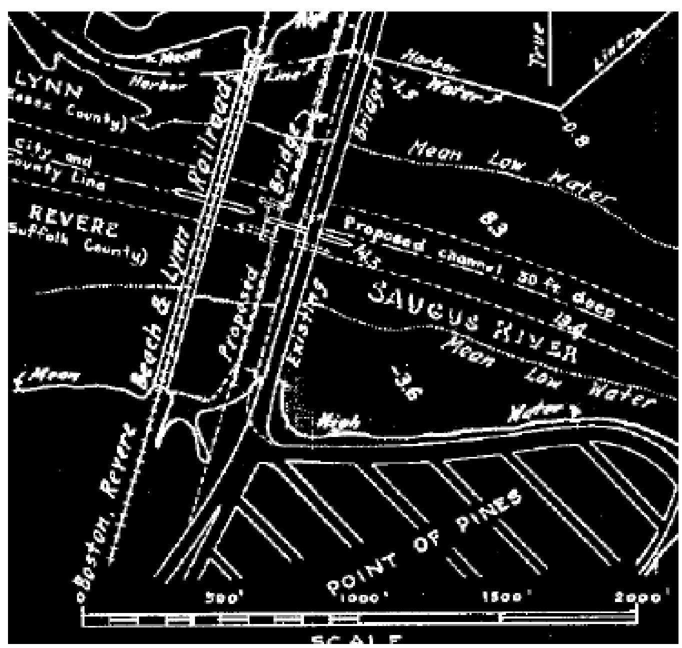

Figure 17 - Historic Bridge Alignment

3.1.3 Historic Railroad Bridge

West of the General Edwards Bridge exists a historic railroad bridge which has been repurposed as a fishing pier and cooling water intake to the now-closed GE Gearworks Plant. The railroad bridge at one time had a rotating platform to provide passage over the navigation channel and large fenders to protect and guide boats through the channel.

Figure 18 - Historic Railroad Bridge (North)

3.1.4 Existing and Historic Electric Transmission Assets

Overhead and submarine electric transmission assets cross the Saugus River west of the General Edwards Bridge. The submarine cable is located immediately west of the Bridge in the north half of the river, then it shifts to the west of the historic railroad bridge around the middle of the river. Overhead transmission assets exist west of the submarine cable and cross the Saugus River on a diagonal.

Figure 19 - Historic Power Lines in Harbor Area

On land, electric transmission assets run north in an easement immediately behind premises west of the Lynnway. Historically, these electrical transmission assets crossed the Lynnway just north of the Bridge and occupied the harborfront parcels east of the General Edwards Bridge. The overhead power lines were relocated through a local, state, and private effort oriented towards taking Lynn Harbor back for beneficial use. Power line relocation from the shore was performed in 2010 with funding, in-part, by a state Massworks grant. The Lynn Harbor parcels cleared of powerlines have not been developed for alternative land use at the time of this study.

3.1.5 Lynn Fishing Pier

The DCR owns and maintains a fishing pier to the east of the General Edwards Bridge referred to as Lynn Fishing Pier. The pier is accessed by footpath from the Lynnway. The DCR has easements to maintain footpath access to the fishing pier.

Figure 20 - Lynn Fishing Pier (DCR)

3.1.6 Seasonal Boat Moorings

Seasonal boat moorings exist in Revere to the east of the General Edwards Bridge. The moorings are associated with the Point of Pines Yacht Club and are used for recreational maritime activities.

Figure 21 - Seasonal Moorings

3.1.7 Existing and Historic Piles

The existing Bridge, historic bridge, historic railroad bridge, all bridge fender systems, and all fishing and boating piers in the area are likely supported by significant numbers of piles. Record Drawings indicate vertical and battered timber piles supporting the existing General Edwards Bridge, with battered piles radiating laterally from the supported structure at 1:4 angle.

Figure 22 - Bridge Fenders (West) and Railroad Bridge (South)

Figure 23 - Bridge Fenders (East)

3.1.8 Revere Seawall

A seawall exists in Revere east of the General Edwards Bridge between Rice Avenue and the shore. The seawall is of unknown dimensions and construction.

Figure 24 - Revere Seawall (East)

3.1.9 Lynn Seawall

A seawall exists in Lynn east and west of the General Edwards Bridge for the entire Lynn shoreline within the project area. The date of construction and depth is unknown. The 1973 Fish Pier drawings indicate the wall is a timber bulkhead with horizontal tie rods to a deadman anchor wall 30-feet inland. The seawall is observed to be in poor condition, with the bulkhead washed out in many locations and evidence of resulting shoreline erosion. The Lynn Economic Development and Industrial Corporation (EDIC) indicates that there may be an effort in the future to replace a section of the seawall.

Figure 25 - Lynn Seawall (East)

3.1.10 Historic Municipal Landfill

A closed municipal landfill exists on parcels owned by National Grid north of Hanson Street on the Lynn Harbor shoreline. The landfill was capped in 1986 and no known alternative use of the space is ongoing. The municipal landfill resides about 150 feet from the Lynn seawall bulkhead.

3.1.11 Historic Industrial Land Use at the GE Gearworks Facility

Parcels to the west of the Lynnway once comprised an industrial site owned by GE, named Gearworks. The 500,000 square foot plant was developed in 1941 and manufactured main propulsion gear boxes for destroyers, nuclear carriers, and submarines. The Gearworks plant was closed and demolished in 2011 and has remained vacant since that time. Development proposed at this property is described in Section 3.5.5. At this time, several utility-related buildings and tanks are scheduled to remain near the shoreline, and the remainder of the site is scheduled for mixed-use commercial/residential development. This site will be subject to extensive construction operations and change of use in the coming years as the development plan is executed.

3.2 Regulatory and Resource Areas

The General Edwards Bridge is within a tidally influenced zone just prior to the confluence of the Saugus River and Lynn Harbor. Immediately upstream of the Bridge is the Rumney Marsh and the confluence of the Pines River and the Saugus River. The site is subject to various regulatory and resource restrictions that will impact construction operations and permit requirements. These resource areas were considered in identification of probable permits required of route alternatives. Boundaries of areas are identified in the "Route Alternatives Over Existing Conditions Plan", attached in Appendix D, where applicable.

3.2.1 ACOE Navigation Channel

The General Edwards Bridge area is tidally influenced and contains a US Army Corps of Engineers ("ACOE") Federal Navigation Project ("FNP"). The Saugus River FNP has an "Authorized Project Depth" 8.0 feet below mean lower low water (MLLW) 1983-2001 Tidal Epoch. MLLW is 5.00 feet below mean sea level (MSL). The FNP through the project area is typically about 150-feet wide, though it narrows at the channel under the General Edwards Bridge. Per guidance for the Army Corps General Permit for Massachusetts *"Subsurface utility lines must be installed at a sufficient depth to avoid damage from anchors, dredging, etc., and to prevent exposure from erosion and stream adjustment*" and *"as an absolute minimum, the bottom cover associated with the initial installation of utility lines under navigable waters and navigation channels shall be 48-inches in soil or 24-inches in rock excavation in competent rock unless specified in a written determination. These minimum bottom cover requirements for pipelines and cables shall be measured from the maximum depth of dredging to the top of the utility. The maximum depth of dredging, in waterways having existing Corps FNPs, is generally considered to be the authorized project depth plus any allowance for advanced maintenance and the allowable overdepth for dredging tolerances."* Sounding information from the US Army Corps last survey of the Saugus River channel (drawings dated 3/27/2008) suggests the actual depth at the center of the channel is typically 11 to 17 feet below MLLW. Given that actual channel depth, as of last sounding survey, is substantially deeper than the authorized project depth, it is likely that the actual river bottom depth plus water main cover requirements would satisfy the depth required of water main installation.

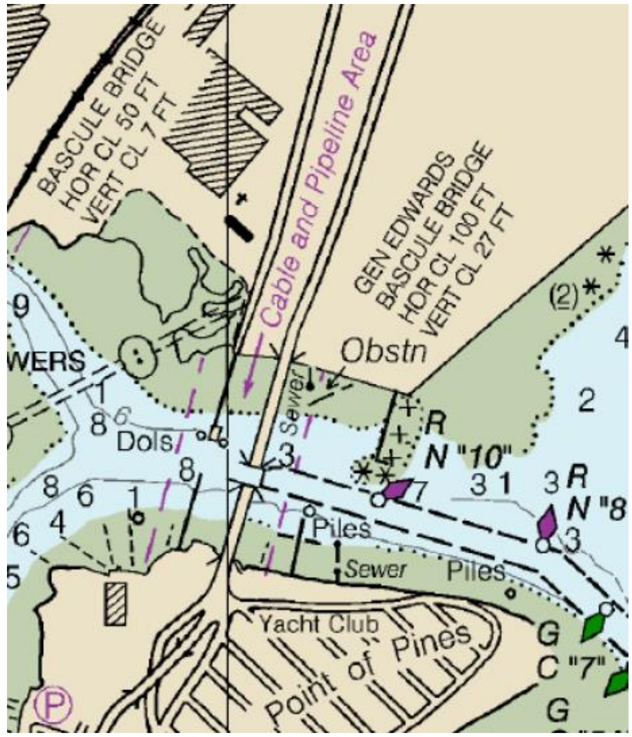

Figure 26 - Excerpt NOAA Salem & Lynn Harbors Map 13275

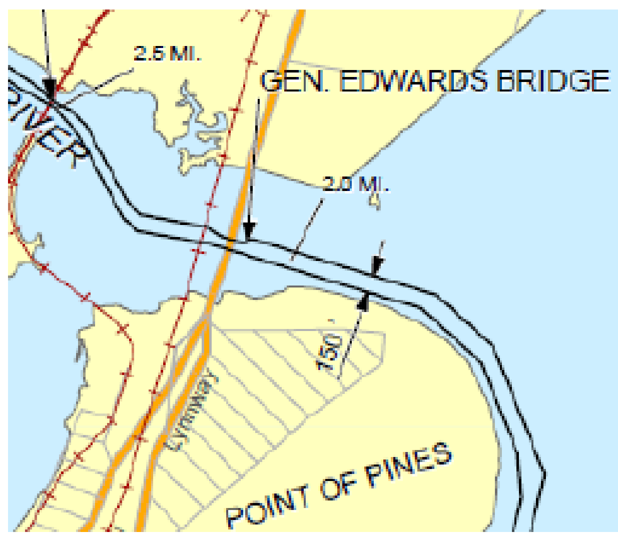

Figure 27 – Excerpt ACOE Map of Saugus River FNP

3.2.2 Habitats for Species of Concern

The project area includes a habitat for a Species of Special Concern and a habitat for a Threatened Species. Figure 28 shows the "Core Habitat Species of Special Concern" data layer from MassGIS.

The Species of Special Concern is a bird that roosts in the General Edwards Bridge area. The Threatened Species is a bird that occupies the Atlantic-facing barrier beach on the Point of Pines.

Figure 28 - Habitat Species of Special Concern MassGIS

3.2.3 ACEC Rumney Marshes

Rumney Marsh is located west of the General Edwards Bridge and is an Area of Critical Environmental Concern ("ACEC"). Rumney Marsh is located in the southern portions of the Saugus River watershed. The region was designated by the state as an ACEC in 1988 to preserve its critical environmental value as one of the most biologically significant salt marshes north of Boston. The marsh provides valuable habitat and feeding grounds for a wide variety of fish, shellfish, birds, and mammals. The limit of the Rumney Marsh near the project area is the westerly limit of the railroad bridge crossing right-of-way.

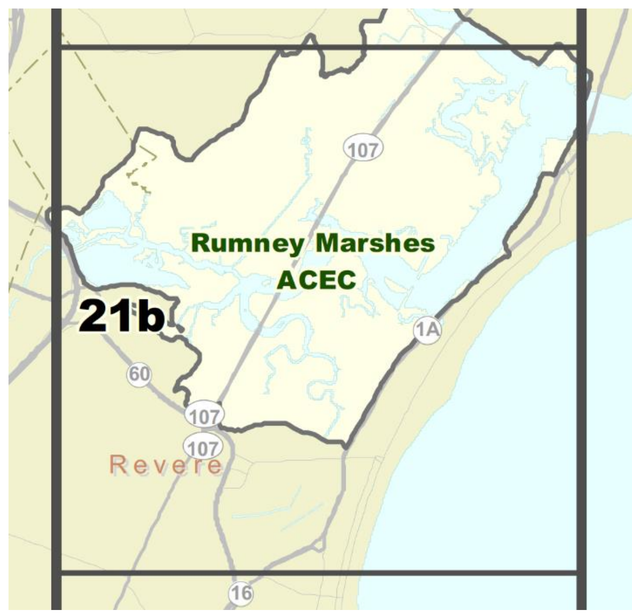

Figure 29 – Rumney Marshes ACEC Index Map

3.2.4 100-Year Flood Plain

The Federal Emergency Management Agency ("FEMA") published updated Flood Insurance Rate Maps ("FIRM") in March 2016 for the City of Revere and in July 2014 for the City of Lynn. Most of the area abutting the General Edwards Bridge is within the Special Flood Hazard Area Subject to Inundation by the one percent (1%) Annual Chance Flood. The one percent annual chance event is also commonly referred to as a "100-year event". This area is indicated in Figures 30 and 31 with a light blue dot overlay. "Zone AE" in the figures indicate that a "Base Flood Elevation" has been determined. "Zone VE" in the figures indicate a "Coastal flood zone with velocity hazard (wave action)" and that base flood elevation has been determined

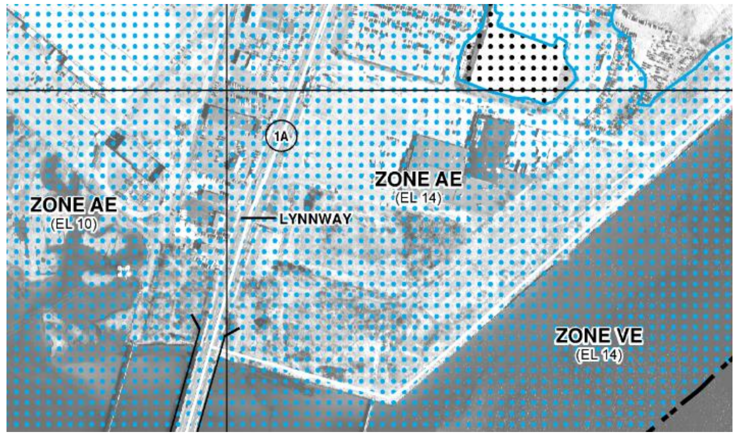

Figure 30 - FEMA FIRM Lynn

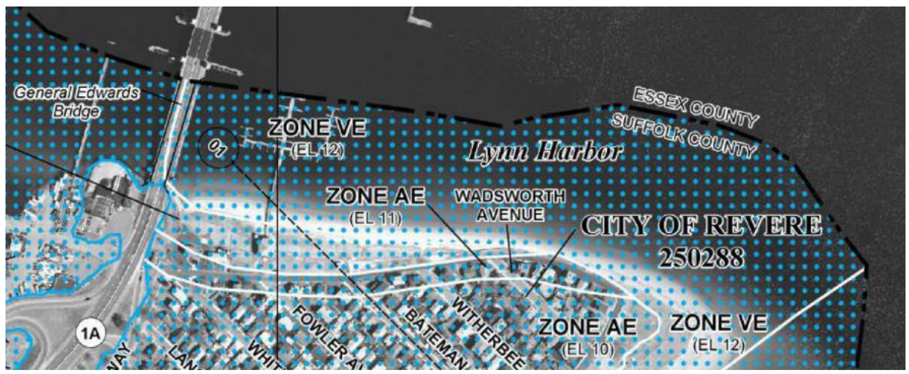

Figure 31 - FEMA FIRM Revere

3.2.5 Tide Elevation, Tidelands, and Wetlands

Tidal datum for Lynn, taken from NOAA Lynn Harbor gage (Station #443187) (NOAA 2016a), establishes mean high water elevation at 4.35', mean sea level elevation at -0.15', mean low water elevation at -4.81', and mean lower low water elevation at -5.15', all per North American Vertical Datum of 1988. The "Lynn Coastal Resiliency Assessment", prepared by Weston & Sampson for the City of Lynn Economic Development and Industrial Corporation, dated July 2016, indicates an estimated sea level rise of 0.75 feet by 2041 and 1.86 feet by 2066, per NOAA Intermediate High method.

MassDEP defines "Flowed Tidelands" as lands that are in, on, over, and under tidal waters seaward of the current mean high tide line. This jurisdiction extends seaward to the Commonwealth's 3-mile limit of territorial jurisdiction. Chapter 91 Authorization is required for the placement of any structure or activity located seaward and within 3 miles from the current mean high tide line. MassDEP defines "Filled Tidelands" as former submerged lands and tidal flats which are no longer subject to tidal action due to the presence of fill. Chapter 91 authorization is required for activities on filled tidelands if located in: (a) Designated Port Areas; or (b) between the first public way and the present mean high shoreline, or between 250 feet and the shore, whichever is further from the water.

Flowed tidelands exist throughout the project area seaward of the high tide line. Filled tidelands and filled wetlands exist on the Lynn shoreline east and west of the General Edwards Bridge, as described in Section 3.4.2, as well on the Revere shoreline west of the General Edwards Bridge. The substantial change in shoreline and wetlands limits are highlighted in comparison of Figure 32, an early 1900s topographic map, and Figure 32, a current MassGIS rendering. MassDEP designated wetlands in the project area include salt marsh, tidal flats, coastal beaches, and coastal dunes. The MassGIS Chapter 91 jurisdictional limit is presented in Appendix D "Route Alternatives Over Existing Conditions Plan". Chapter 91 Licenses near the project area were acquired by the MWRA and reviewed by the project team. Licenses secured are listed in Appendix A as references #59 to #65.

Figure 32 - Historic Topographic Map

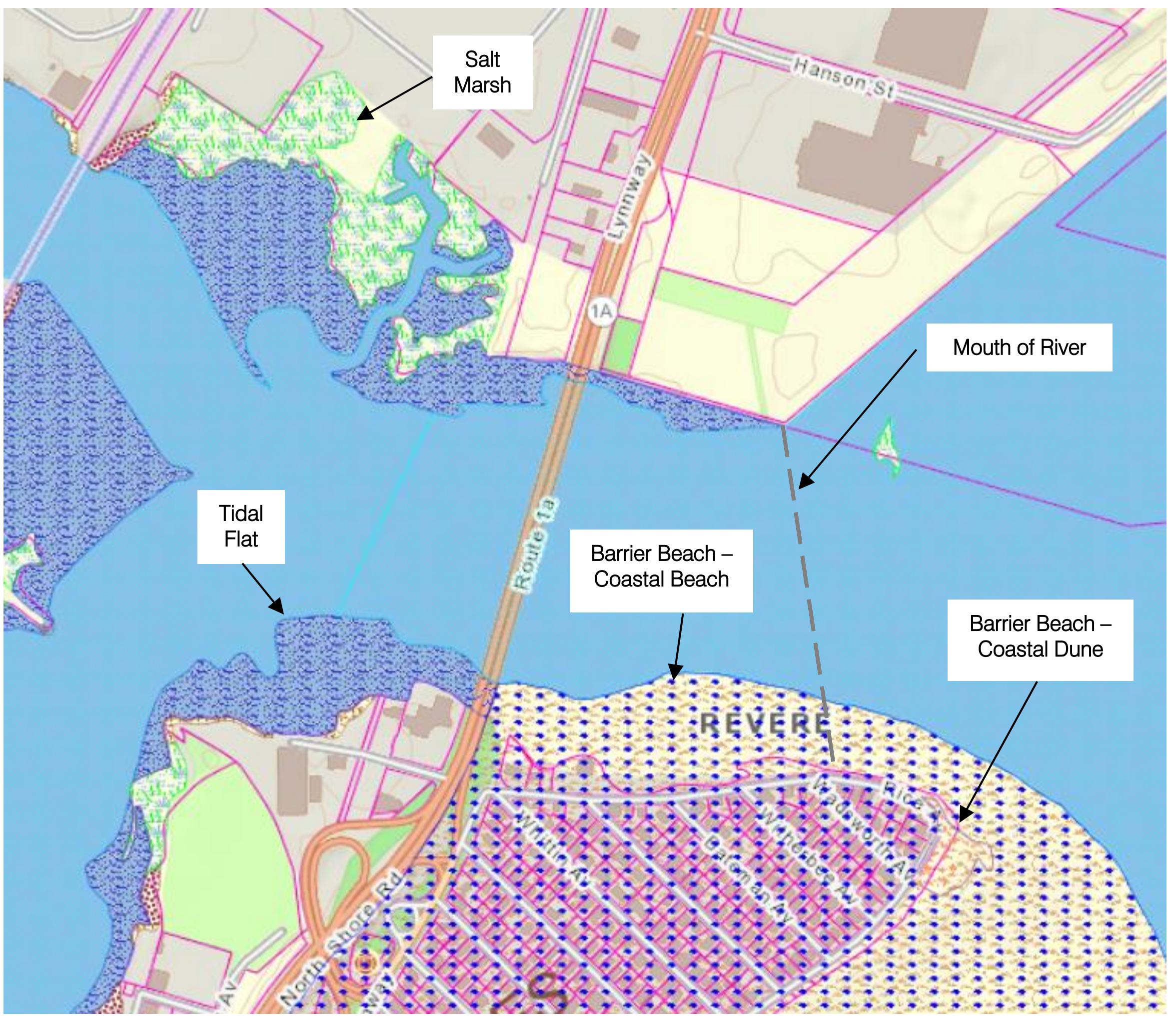

Figure 33 – DEP Wetlands MassGIS

3.2.6 Other Areas

The project area is not within a Designated Port Area. The DEP Wetlands Program delineates the Mouth of River as shown in Figure 33. This feasibility study did not include a complete environmental assessment nor delineation of resource areas. It is assumed a complete assessment and delineation will be performed in Preliminary Design prior to preparation of notices and permitting may be thoroughly informed.

3.3 Subsurface Conditions

Weston & Sampson reviewed available "historical" records of subsurface conditions near the Project site. Most of the records were test boring logs provided to Weston & Sampson by the MWRA from their files. Weston & Sampson added logs of explorations conducted near the project area from previous Weston & Sampson projects in the area. The purpose of reviewing and presenting a discussion of historical exploration data was to provide the project team with a generalized understanding of subsurface conditions appropriate for a feasibility study. The information contained herein should not be interpreted as an engineering analysis of subsurface conditions for project design.

3.3.1 Historic Exploration Data

The historical exploration data were collected at different times, by a variety of exploration contractors using different exploration equipment and methods. No engineering reports were available to describe how the data were collected. Weston & Sampson was not involved in collecting the majority of the information. Under these conditions, it is our opinion that placing strong emphasis on quantitative comparisons of these data sets is not appropriate and could be misleading. For example, "blow counts" shown on test borings logs may or may not represent standard penetration testing. Accordingly, we have purposely left out discussion of available blow count data from the explorations since we cannot verify that the information is indicative of SPT N-values. Another issue is lack of information on elevation datum on the logs, which suggests caution when comparing the test boring data in subsurface profiles. Nonetheless, the information is considered suitable for supporting a generalized qualitative discussion of subsurface conditions for this feasibility study.

Based on initial review of the available exploration logs listed below, the project alignment can be divided into the North Bank Area (Lynn Side), the River Channel Area, and the South Bank Area (Revere Side). Explorations have been categorized according to the year drilled and the area they represent. A brief description of the explorations and sources of information are provided below. A figure indicating approximate locations of referenced borings, and the attached logs for more detailed information, are attached in Appendix E.

<u>1934 Borings (River Channel Area)</u>

A total of 32 test borings labeled #1 through #32 were drilled for design of the existing General Edwards bridge pier foundations. The boring logs are presented in the form of a hand-drafted subsurface profile on the drawing titled "Location of Borings," Sheet 4 of 50 Sheets, dated September 25, 1934, prepared by J.R. Worcester & Co. These borings were drilled in the Saugus River to between El. -40 and El. -118 (Mean Low Water Datum). Note that these borings were referenced on the September 1967 drawings titled "Proposed Fishing Pier at General Edwards Bridge, Revere, "Site Plan," (Sheet 1 of 5 Sheets). No additional borings were drilled for the 1967 project.

1954 Borings (North Bank Area)

Three test borings labeled Boring No. 1, 2 and 37 were drilled near the north end of the General Edwards Bridge for design of the Lynnway highway construction project in 1954. The boring locations and logs are included on Sheets 49, 50 and 51 of 51 Sheets titled "Lynnway," dated March 1, 1954 prepared by Edwards, Kelcey and Beck Consulting Engineers. The borings were drilled to between approximately 22 ft. to 35 ft. below ground surface (bgs). Ground surface elevations are listed on the logs but the elevation datum is not indicated.

1970 Borings (South Bank Area)

Twelve test borings labeled No. 21 through No. 32 were drilled for design and construction of Route 1-A in Revere. The borings were drilled for the Commonwealth of Massachusetts Department of Public Works project titled "State Highway in the City of Revere, Suffolk County, Federal Aid Project U.S. – 153(3)," dated 1970. Boring locations and logs are included on project drawings labeled Sheets 2 and 3 of 63 Sheets titled "Key Plan & Boring Locations" and "Boring Data," respectively. The borings were drilled by New England Test Boring Corp. to depths between approximately 10.4 ft. and 125.5 ft. bgs. Elevations are listed on the logs but the elevation datum is not indicated.

1973 Borings (River Channel Area)

Four test borings labeled B-1 through B-4 were drilled for design of a Fishing Pier east of the General Edwards Bridge extending south into the Saugus River from the timber bulkhead on the Lynn side of the river. Boring locations and logs are included on Sheets 1 and 7 of 7 Sheets titled, "Proposed Fishing Pier Near General Edwards Bridge, Lynn," dated May 1973, prepared by Brask & Standley Engineering Company. The borings were drilled to between approximately 30 ft. to 60 ft. below mudline at the boring locations in the Saugus River. No information was provided on ground surface elevations at the boring locations. However, soundings data shown on Sheet 2 of 7 of the drawing set indicates most boring locations were within a few feet of Mean Low Water.

1983 Borings (North Bank Area)

Nine borings labeled #1 through #9 were drilled near the north end of the General Edwards Bridge for the roadway rehabilitation of the Lynnway. The boring locations and logs are included on Sheets 3 and 4 of 288 Sheets titled, "Rehabilitation of the Lynnway-Carroll Highway," dated May 4, 1988 (5 years after the borings were drilled) prepared by the Commonwealth of Massachusetts, Metropolitan District Commission, Parks Engineering and Construction Division. The borings were drilled by Carr-Dee Test Boring and Construction Company in October 1983 to between approximately 3.5 ft. to 5 ft. bgs., apparently for evaluating pavement subgrade conditions, only. Ground surface elevations shown on the logs are referenced to the U.S.C.&G.S. Mean Sea Level Datum of 1929, which is the National Geodetic Vertical Datum (NGVD).

2011 Borings (North Bank Area)

Four borings labeled B-1 through B-4 were drilled for the renovations to the Pride Motor Group Kia Dealership located at 793 Lynnway, north of the General Edwards Bridge. The boring locations and logs are included in a report prepared by Weston & Sampson Engineers, "Geotechnical Engineering Report: Proposed Renovations to the Pride Motor Group Kia Dealership," dated March 3, 2011. The borings were drilled by Crawford Drilling Services, LLC to depths between 37 ft. and 47 ft. bgs. The elevation datum is not indicated on the test boring logs.

3.3.2 Generalized Subsurface Conditions

Generalized characteristics of subsurface conditions for the River Channel Area, North Bank Area and South Bank Area based on available subsurface information are described below. Refer to Appendix E for approximate locations of borings and the attached logs for more detailed information at specific locations.

River Channel Area

Based on the 1934 borings, the generalized soil profile of the River Channel Area from the mudline downward consists of approximately 5 to 20 ft. of silty SAND with varying organic content overlying approximately 30 ft. to 95 ft. of medium stiff to soft blue CLAY. The clay stratum is underlain by what appears to be dense GLACIAL TILL (sand, gravel and clay described on the logs as “hardpan”). The hardpan is typically identified in the bottom 3 ft. to 5 ft. of each boring.

The upper silty SAND layer is typically 5 ft. to 10 ft. thick in borings #13 through #24 located in approximately the southern half of the river channel. The upper silty SAND was typically 5 ft. to 20 ft. thick in borings #1 through #12 located in approximately the northern half of the river channel with layer thicknesses generally increasing closer to the northern shore. Borings #1 through #5, which are near the northern shore, also encountered between approximately 2 ft. and 10 ft. of peat and organic silt underlying the upper silty SAND layer.

The CLAY stratum appears to have an approximately 5 ft. to 10 ft. thick “medium blue clay” upper layer with the underlying material generally described as soft. The CLAY stratum thickness appears greatest in the northern half of the river channel with thicknesses ranging from approximately 85 ft. to 95 ft., whereas the clay thickness decreases from about 90 ft. near the center of the channel to approximately 30 ft. near the southern shore.

The 1934 boring logs were presented in the form of a subsurface profile, which is attached to this memorandum.

The 1973 borings encountered similar soil conditions as those encountered by the 1934 borings. However, 1973 borings B-1, B-2 and B-3 encountered between 3 ft. and 23 ft. of the upper sand layer, then penetrated into and were terminated in the clay layer between 30 ft. and 60 ft. below mudline. The 1973 boring B-4 encountered approximately 3. 5 ft. of silt and sand overlying stiff clay to about 20 ft. below grade, where the boring encountered very dense sand and gravel (GLACIAL TILL). The general stratum description on the log indicated boulders might be present in the GLACIAL TILL. This boring was terminated at 32 ft. below grade with refusal conditions encountered (100 blows of a 200 lb. hammer on an open end a-rod).

North Bank Area

Borings in the North Bank Area include the 1954 borings, the 1983 borings and the 2011 borings. The 1983 borings penetrated only 3.5 to 5 ft. below grade so are of limited value to the project. The 1954 borings were drilled in the Lynnway between Hanson Street and the approach ramp to the General Edwards Bridge to depths ranging from 22 ft. to 35 ft., and the 2011 borings were drilled on the Pride Kia property on the west side of the Lynnway across from Hanson Street. Thee data sets provide useful information for understanding the subsurface profile in the North Bank Area.

Based on the 1954 and 2011 borings subsurface conditions in the North Bank Area generally consist of between approximately 10 ft. and 16 ft. of loose to medium dense SAND FILL with variable amounts of gravel, silt, cinders, ash and debris including brick fragments and miscellaneous trash. The FILL is also intermixed with and layered with ORGANIC SILT in some locations.

The FILL generally overlies a naturally deposited loose to dense SAND containing varying amounts of gravel and silt to between 21 and 31 ft. bgs. Where the SAND is fully penetrated, the underlying stratum can generally be described as medium stiff to very soft CLAY with little silt and trace fine sand to the depths explored (between approximately 35 ft. and 47 ft. below grade). The CLAY consistency generally becomes softer with depth.

South Bank Area

Based on the 1970 Borings, the subsurface conditions in the South Bank Area consist of approximately 5 ft. to 10 ft. of SAND FILL at the ground surface. The FILL overlies variable thicknesses of naturally deposited loose to dense silty SAND. Where fully penetrated by the borings, the silty SAND extended to between approximately 25 ft. and 50 ft. below ground surface. Thin layers of Organic SILT and PEAT were noted on some of the logs near the bottom of the SAND FILL and within the native silty SAND layer.

The silty SAND overlies stiff to soft silty CLAY where the silty SAND layer was fully penetrated by the borings. Where fully penetrated by the borings, the CLAY layer varied from less than 10 ft. thick to over 40 ft. thick and generally has a stiff consistency near the top of the layer, becoming softer with depth. Where the clay was fully penetrated, the underlying soils are generally medium dense to dense SILTY SAND with gravel and boulders (GLACIAL TILL).

Test boring 29, which was drilled to approximately 125 ft. below grade, encountered approximately 30 ft. of organic SILT with shells from about 30 to 60 ft. below grade but did not encounter the CLAY layer and went directly into the dense GLACIAL TILL soils. The boring extended through the GLACIAL TILL to approximately 115 ft. below grade where two 5 ft. rock cores were obtained. The logs indicate the rock core recovery was only about 15 to 20 percent in the two core runs. No information was provided to indicate Rock Quality Designations.

3.4 Environmental Records

Weston & Sampson obtained existing soil and groundwater data from the Project Area by reviewing available information from the Massachusetts Department of Environmental Protection (MassDEP) Reportable Release Database, which includes files detailing the extent of response actions conducted under the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000, to address known releases of oil and hazardous materials to the environment. The review identified 14 releases within the Project area. The impacted media, contaminants of concern, completed remedial actions and regulatory status for each release are summarized in tables and figures attached in Appendix F.

3.4.1 Review of Existing MassDEP Records

Review identified four reported releases on the Revere side of the Saugus River. In general, these releases were limited to small releases of petroleum products to soil and groundwater and the extent of contamination was relatively limited. While these releases achieved regulatory closure under the MCP, some residual contamination in soil and groundwater exists; however, based on the data provided in historic reports, contamination is expected to be localized to areas where the releases occurred. A summary of the analytical sampling results and areas of contamination for releases on the Revere side of the Saugus River are provided in Appendix F.

Our findings suggest impacted soil is present on the Lynn side of the Saugus River. Several environmental reports listed the Project Area in Lynn as an area filled with dredged sediment and municipal wastes between the 1920s and 1930s. These fill materials may extend up to 12 feet below grade and include coal, coal ash, brick, glass, wood and other debris. Based on our review of the historic reports, fill materials were identified at properties on the eastern and western sides of the Lynnway (see Figure 1 in Appendix F), including the following sites identified by address and release tracking number (RTN):

- 671 Lynnway (RTN 3-15603)
- 715 The Lynnway (RTN 3-13417)
- 770 Lynnway (RTN 3-11033)
- 777-793 Lynnway (RTN 3-4663 & 3-24567)
- 715 The Lynnway (RTN 3-3329)
- Harding Street LC7 (RTN 3-12511)

Soil sampling indicates the fill contains concentrations of metals, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs) polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons (TPH). In addition to historic fill on the Lynn side of the Saugus River, Weston & Sampson notes there are four sites within the Project Area where non-fill related residual contamination may also exist, which has the potential to impact off-property areas. A summary of the conditions for these sites is provided below. A summary of the analytical sampling results and areas of contamination for the most significant reported releases on the Lynn side of the Saugus River are provided in Attachment B.

715 The Lynnway (3-13417)

In addition to historic fill containing VOCs, SVOCs, metals and TPH, groundwater at this property was noted to contain concentrations of chlorinated VOCs, including1,2-dichloroethylene (1,2-DCE) and vinyl chloride (VC). VC concentrations were present at levels up to 2,000 micrograms per liter, well in excess of applicable MCP Method 1 GW-2 standards. Groundwater flow was also noted to flow south from the property towards our selected Project Area.

Environmental records for this release noted that remediating the fill or contaminated groundwater was infeasible. To achieve regulatory closure, an Activity and Use Limitation (AUL) was placed on the property to restrict future excavation activities. Based on the existing data and nature of contamination documented at this site, there is the potential for this property to impact future utility construction, depending on the design and route.

Mobil Gasoline Station, 700 Lynnway (3-4486)
In 1992, faulty underground storage tank (UST) supply lines were identified to have released gasoline to soil and groundwater. The release of gasoline to groundwater resulted in a plume of gasoline constituents on the property. In situ chemical oxidation (ISCO) treatment was performed in 2005 and 2007 to address the dissolved phase groundwater plume; however, groundwater samples collected as recently as 2014 indicated elevated concentrations of volatile petroleum hydrocarbon (VPH) fractions at one location persist above applicable MCP Method 1 GW-2 standards.

In 2015, the existing gas station was closed and three 10,000-gallon USTs and associated piping were removed. Following UST removal, impacted soils were excavated and approximately 1,008 tons of petroleum-impacted soils were transported for off-Site recycling. Approximately 32,000 gallons of dewatering fluids were also treated and discharged to the Lynn sewer system during the removal. Based on the site files for this release, the site is currently being evaluated for closure under the MCP but has not achieved regulatory closure.

Based on the existing data, age of the release, and nature of contamination documented at this site, potential gasoline-impacted groundwater may have migrated off-Site and impacted down-gradient areas. As such, there is the potential for this release to impact future utility construction, depending on the design and route.

811 Lynnway (3-2326)
In 1988, 60 cubic yards (CY) of oil-impacted soil was stockpiled on the Site. These soils were excavated during the removal of two leaking 275 gallon USTs. In 1991, these soils were prepared to be removed from the Site; however, there is no record of actual removal. Our review of the existing documentation suggests the 1988 removal of the leaking USTs may not have been in compliance with applicable MassDEP regulations. In addition, staging of petroleum impacted soils for an extended period of time may have results in impacts to soils and groundwater, which have not been evaluated. It is possible that petroleum impacts are still present at this property and could impact future utility construction depending on the final design route.

671 Lynnway (3-15603)
Historic investigation of this site identified VOCs, SVOCs, Polychlorinated Biphenyls (PCBs), metals, and TPH impacts in soil and groundwater. These contaminants were attributed to two sources of contamination: the historic fill prevalent in the area and historic releases of petroleum from historic aboveground and underground storage tanks. Petroleum impacts to soil and groundwater were discovered in the 1992 from the release of waste oil from an aboveground storage tank (AST) and in 1998 during the decommissioning of six USTs. Site file indicate the property also has a history as a railroad bed prior to 1880, which may be a contributing source of contamination to this site and surrounding area.

An AUL was filed for the property in 2002 and requires the maintenance of asphalt barrier to prevent exposure to impacted soils/fill at this property. As residual impacts to soil and groundwater remain, there is the potential for this property to impact the Project, depending on the final design and route.

3.4.2 Filled Lands and Unknown Contamination

As noted above, the southeastern extent of Lynn was reportedly filled with dredged sediment and municipal wastes between 1920s and 1930s. In addition to metals, VOCs, SVOCs, PCBs and petroleum hydrocarbons, historic fill from the 1920 and 1930s was not analyzed for but may have included asbestos waste. Weston & Sampson also notes our review of existing soil and groundwater data is based on review of MassDEP records for sites where there have been known releases of oil and/or hazardous materials to environment. Given the proximity of the Project Area to industrial and commercial facilities, including the General Electric (GE) Aircraft Engines manufacturing plant and historic railroad operations, unknown sources of contamination may exist with the potential for additional sources of contamination, such as petroleum impacts and polycyclic aromatic hydrocarbons (PAHs), which are often associated with industrial/commercial and railroad activities.

3.4.3 Conclusions

The information indicates historic fill is present on the Lynn side of the Saugus River. Fill is heterogeneous and historic analysis indicates it is impacted with VOCs, SVOCs, metals and TPH. The fill also included dredged sediment and municipal wastes which may have been contaminated when placed in the 1920 and 1930s. These historic fill materials were not identified on the Revere side of the Project area.

In addition to historic fill, review identified potential soil and groundwater contamination from non-fill related sources, including several releases of petroleum on both the Lynn and Revere side of Saugus River and a release of chlorinated VOCs to groundwater in Lynn. Limited delineation for some of these reported releases indicates there is a potential for contamination in the Project area to impact future utility construction depending on design and location.

3.5 Stakeholders and Abutters

3.5.1 City of Lynn

The northern limit of the Section 56 crossing of the Saugus River is in the City of Lynn. The City of Lynn owns local streets in the project area, including Hanson Street, a local street connecting the Lynnway to the Lynn Harbor shoreline northeast of the General Edwards Bridge.

The City of Lynn considers the area east of the General Edwards Bridge (through the roundabout to Nahant) to be part of a strategic Lynn Municipal Harbor area in which they wish to promote bettered land use for the community. The interests of the City in in the area are summarized as follows (from September 2010 Municipal Harbor Plan by Sasaki):

- *"enhance the physical and visual connection of the larger City with its waterfront*
- *create a unified series of public spaces along a waterfront promenade*

- *create a landmark open space within the waterfront for the staging community events and celebrations*
- *create a mixed-use neighborhood designed to maximizes the benefits to be derived from its unique waterfront location (e.g., views and water/land interface)*
- *ensure that the future development of the waterfront functions as an extension of, rather than a departure from, the City's existing urban fabric*
- *configure and align development blocks so as to promote energy conservation though the siting of buildings*
- *expand the range of transportation options available to residents through the introduction of a water-based option*
- *coordinate the goals of the City to promote the beneficial development of its waterfront with the goals and policies of the Commonwealth of Massachusetts to protect the interests of all Commonwealth citizens with regard to the use of public trust lands (i.e., tidelands)"*

Figure 34 - Lynn Harbor Planning Area from MHP

The vision for land use was reconciled into a Lynn Municipal Harbor Plan ("MHP") which was approved by the Commonwealth's Executive Office of Energy and Environmental Affairs in 2010. The limits of the MHP area is shown in Figure 34. The MHP provided an opportunity for local and state agencies to reconcile vision and streamline approvals and permitting required for desired land development, as summarized below (from September 2010 Municipal Harbor Plan by Sasaki):

- *"Enhance the responsiveness of Commonwealth agency actions to the city's land use goals and objectives, harbor conditions, and circumstances;*
- *Ensure that tidelands licensing actions pursuant to the provisions of M.G.L.c. 91 on individual properties and projects are taken in the context of the city's objectives and goals for the development of the larger waterfront area; and*
- *Establish development and design standards specifically tailored to respond to the conditions of Lynn Harbor and the city's objectives and goals as substitutes for the general, state-wide standards specified at 310 CMR 9.00."*

The area to the east of the General Edwards Bridge is referred to as the "Gateway Zone", as described below and conceptually rendered in Figure 35. Water main replacement in the General Edwards Bridge area should proceed understanding the City of Lynn's interest for future development in the area high aesthetic quality and incorporating recreational spaces near the waterfront.

> *"The Gateway Zone extends from the General Edwards Bridge at the southwest end of the Harbor Planning Area northeast to the Carolyn Road/Lynnway intersection. As the gateway to the City from points to the south, it is vital to the future of the City that the development of this area be of high aesthetic quality. To ensure that private interests will be able to derive sufficient financial returns to establish and maintain the desired quality, land uses must be of high inherent value and developed at relatively high densities. Accordingly, the Gateway Zone is envisioned to be a mixed-use neighborhood containing a variety of housing types, block configurations, and price ranges, with supporting retail, restaurants, and some office space. The majority of the office space would be located along the Lynnway, with residential buildings making up the rest of the district. Ground floor retail would be encouraged along the Lynnway, the waterfront, and other primary streets within this zone. Restaurants would be oriented towards the water to capitalize on views of the ocean, Nahant, and the Boston skyline. A typical block within this zone would have lower-rise residential building massing along the waterfront, transitioning to high-rise massing in the middle of the zone, so as to maximize waterfront views for each development. Structured parking would be internal to the block and could be created with a green roof or encouraged to support activities to lessen the heat island effect and create a more pleasing view for the residents.*
>
> *The "water-dependent use zone", as defined in the Massachusetts Waterways Regulations at 310 CMR 9.51(3)(c), within the Gateway Zone is to be reserved for such water-dependent uses as recreational marinas and a public pedestrian promenade. The marina envisioned for the mouth of the Saugus River is to incorporate the Massachusetts Department of Conservation and Recreation's existing public fishing pier, taking it out of isolation and enhancing its value to the public. The marina along the shore of the inner harbor will be created by excavating and removing part of the municipal landfill and re-establishing a watersheet in this area of filled tidelands. The pedestrian promenade along the harbor edge in the Gateway Zone is envisioned to be part of an expanded park space extending at least 200 feet inland from the water's edge."*

Figure 35 - Conceptual Rendering Gateway Zone from MHP

The MWRA and Weston & Sampson met with the Economic Development & Industrial Corporation of Lynn ("EDIC") in September 2016 and the Lynn Water & Sewer Commission ("LWSC") in October 2016 to discuss the Project and interests in the work area. Meeting minutes from each conference are attached in Appendix G. The EDIC shared their understanding of development history and status in the work area, and the LWSC shared the nature of existing and proposed utility systems in the area.

The City of Lynn shared that a combined sewer overflow ("CSO") outfall may be planned in the area to support ongoing combined sewer separation. The team identified that the nearest location of a proposed outfall was north of Hanson Street, and should not impact the project. The City of Lynn does maintain water main in Hanson Street nearest to the Lynnway (dead ends), in the Lynnway, and in an easement in DCR property east of the Lynnway.

3.5.2 City of Revere

The southern limit of the Section 56 crossing of the Saugus River is in the City of Revere. The City of Revere owns and maintains local streets in the project area, including Rice Avenue, Whitin Avenue, Fowler Avenue, Bateman Avenue, Witherbee Avenue, Wadsworth Avenue, and others, in the Point of Pines area. The City maintains water, sewer, and stormwater collection infrastructure in the work area, as depicted in the three figures on this page.

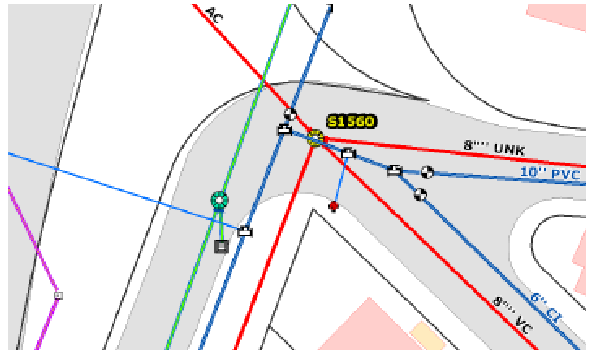

Figure 36 – City of Revere GIS, Rice Avenue at the Lynnway

The MWRA and Weston & Sampson met with the City Engineer for the City of Revere in September 2016 to discuss the Project and interests in the work area. Meeting minutes from each conference are attached in Appendix G. The City Engineer shared existing utility information including GIS exports and design plans for an existing City of Revere Stormwater Pump Station. The Pump Station exists adjacent to the Point of Pines Yacht Club. The team discussed the public park with playing fields, Gibson Park, which is located to the west of the General Edwards Bridge, as shown in the "Route Alternatives of Existing Conditions Plan", attached in Appendix D.

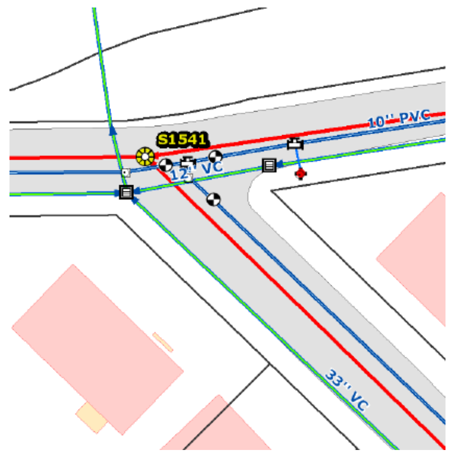

Figure 37 – City of Revere GIS, Rice Avenue at Bateman Avenue

3.5.3 Massachusetts Department of Conservation and Recreation

The DCR maintains the Lynnway in Lynn and Revere, the Lynn Fishing Pier, and various parcels abutting the Lynnway to the East. The DCR owns easements to the Lynn Fishing Pier from the Lynnway. DCR owns a 54" drain in the parcels east of the Lynnway which conveys stormwater from the Lynnway to the Saugus River immediately east of the General Edwards Bridge. The Lynn Fishing Pier, DCR parcels, and drains are shown in the "Route Alternatives of Existing Conditions Plan", attached in Appendix D.

3.5.4 Massachusetts Department of Transportation

MassDOT operates and maintains the General Edwards Bridge and North Shore Drive in Revere. South of the Bridge, MassDOT owns ramps connecting North Shore Road (State Route 1A) to the Lynnway in Revere. The General Edwards Bridge is described in Section 2 and Section 3.1.1.

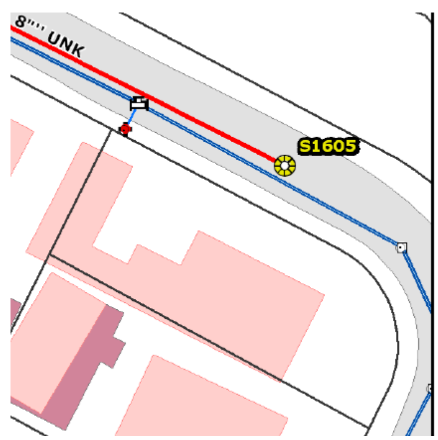

Figure 38 – City of Revere GIS, Rice Avenue at End of Point of Pines

3.5.5 Proposed Development West of the General Edwards Bridge

A private developer, Lynnway Associates LLC proposes to redevelop the former General Electric (“GE”) Gearworks site in Lynn. The project is described in a November 16, 2015 draft Environmental Notification Form (“ENF”) as follows:

Figure 39 - Lynn Gearworks Redevelopment Conceptual Rendering October 2016

> *“The project is located on a ±77 acre parcel along the westerly side of the Lynnway (Route 1A) just north of the Saugus River. A 65.5 acre portion of the parcel was purchased by the Proponent for the development of a transit-oriented, residential development project with mixed-use accessory services. The remaining 11.5 acre portion of the parcel will be retained by GE and currently houses an outlying utility building and jet fuel storage tanks, utilized by the adjacent Riverworks plant. The site was previously part of property owned by GE, along with the adjacent Riverworks plant to the west, and at its peak in 1942 contained a 500,000 SF Navy gear plant with over 15,000 employees working in multiple shifts. Due to a decline in gear orders, GE sold its non-nuclear gear product line in 2009 and the Gearworks plant was closed and demolished in 2011.*
>
> *The proposed project is a transit-oriented residential development (TOD), which includes the construction of 1,250 residential units and a mix of ancillary retail, restaurant, and other supporting uses. In addition to the seven residential buildings, the project will include several supporting amenity buildings for use by the residents, including a 10,550 SF clubhouse, a 28,800 SF sports club, a 10,200 SF leasing / management office, and approximately 16,000 SF of complementary retail space to offer on-site service to the TOD residents, without requiring off-site trip making. Access to the site is currently provided via a signalized, full-access/egress driveway along the Lynnway (Route 1A) at the northerly end of the site, known as 19th Street. As part of the project, a secondary full-access/egress driveway is proposed at the southerly end of the site, connecting to the Lynnway (Route 1A) opposite the existing Jughandle, which will provide public access to the waterfront along Rumney Marsh and the Saugus River.”*

The final EIR was submitted in March 2017. Per discussion with Lynn EDIC, the project was to begin near the end of 2017. The Project is expected to be built in five phases. The final phase is scheduled for completion in 2022.

3.5.6 Proposed Development East of General Edwards Bridge

In a September 2016 meeting, Lynn EDIC shared that a development is proposed on parcel 34-760-7 which includes approximately 250 units. This parcel abuts the Lynnway east of the General Edwards Bridge between the waterfront parcel and the Lynnway Mart. The proposed building layout will be on top of an existing foundation associated with a historic building on-site, “Club Morgan”. EDIC estimated construction might start in the second half of 2016 and conclude in approximately 24-months. EDIC recalled that subsequent phases of development has been discussed, perhaps extending to waterfront parcel 34-752-77, but that planning has not been initiated. Each of these parcels are shown in the "Route Alternatives of Existing Conditions Plan", attached in Appendix D. EDIC recalls that the property owner's name is Joseph O'Donnell and his development partner may be Priderock Capital Partners LLC.

3.5.7 Point of Pines Area Revere

The Point of Pines area in the City of Revere exists to the southeast of the General Edwards Bridge. This dense residential neighborhood is generally comprised of single family homes occupied year-round. The neighborhood is accessed from the Lynnway to the west. Rice Avenue provides bi-directional access to the shoreline. Local streets between Rice Avenue and the Lynnway are generally one-way and provide for on-street parking.

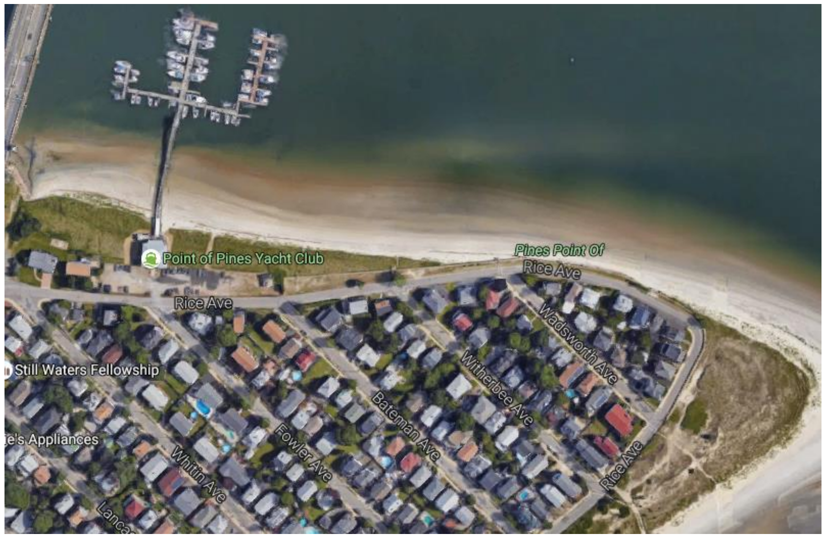

Figure 40 – Orthophoto Point of Pines Area

An organization called the Point of Pines Beach Association owns lands between Rice Avenue and the Mean Low Water Line. Residents of the Point of Pines neighborhood comprise the membership of the Point of Pines Beach Association. Per the Constitution and Bylaws of the Point of Pines Beach Association:

> *"The purposes of this corporation shall be to hold certain property known as the Point of Pines Beach as described in a certain deed recorded with the Suffolk County Registry of Deeds, Book Number 6505, Page Number 356; to establish and maintain a place for holding meetings; to encourage friendly feeling among it's members; to promote the civic and social well being of those owning and interested in real estate in the Point of Pines section of Revere; to promote and encourage civic activities, especially in respect to the control and maintenance of the community beach, and in connection therewith to acquire, hold, use, encumber, and dispose of any real and personal property and any rights and privileges which the corporation may think necessary and convenient for it's purposes; and to do any and all things permissible under Chapter 180 of the General Laws."*

A Point of Pines Yacht Club (the "Yacht Club") exists to the east of the General Edwards Bridge and houses the seasonal moorings referenced previously. The Yacht Club has a parking lot abutting the shore that has access to Rice Avenue. The Yacht Club owns land to mean low water behind their property.

3.5.8 Commercial Abutters

Various commercial premises exist in Lynn abutting the Lynnway to the west. The Lynnway Mart and Walmart exist between the Lynn Harbor shoreline and the Lynnway. In Revere, various commercial premises exist between the State Route 1A exit ramp and the Saugus River.

Figure 41 - Orthophoto Commercial Abutters Southwest of Bridge

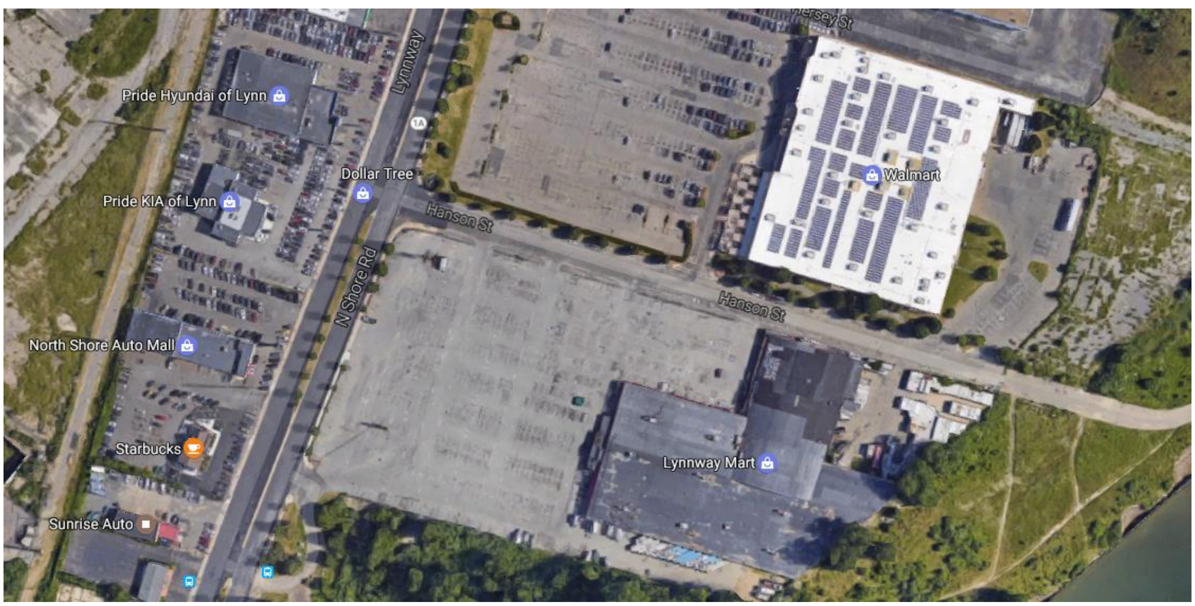

Figure 42 - Orthophoto Commercial Abutters North of the Bridge

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4.0 RIVER CROSSING METHODS

Open trench, mircotunneling and horizontal directional drilling (HDD) pipe installation methods were reviewed alongside removal and replacement on bridge.

4.1 Open Trench

Marine pipeline installation across a navigable waterway via open trench dredging and pipe installation is typically conducted from barges. In typical installations, a trench is dredged to a depth sufficient for pipe installation and backfilling. The pipeline is lowered into place and the trench is typically backfilled with excavated soil. In some cases, a protective barrier such as a segmental concrete anchoring mat is placed over the backfilled pipe to reduce the risk of damage to the pipe by navigation operations.

The depth and method of trench excavation is generally selected based on factors such as project size, characteristics of river bottom sediments and soils, range of water depth, and current. Softer or looser materials (generally associated with mild currents) tend to require greater excavation depths than stiffer or denser materials. The generalized soil profile of the Saugus River channel consists of several feet of organic (or marine) silty sand overlying up to 95 ft. of medium stiff to very soft blue clay. Glacial till and bedrock are present below the clay. The consistency of the clay is generally medium stiff near the top and becomes softer with depth. The materials to be dredged will depend on the final alignment and US Army Corps of Engineers depth of cover requirements. Hydraulic dredging and mechanical dredging/excavation are likely the most appropriate methods for this project. Use of a cofferdam is not viewed as practical at this site due to crossing-length, depth of channel, the navigable waterway, and tidal influence.

Figure 43 - Clamshell Bucket on Excavator

Figure 43 shows an environmental clamshell bucket attached to an excavator supported on a platform barge in the foreground and a crane supported on a barge in the background. The excavator is suitable for relatively shallow excavation. A clamshell suspended from a crane can be used where water depth and required excavation depth exceed the reach of a mechanical excavator. To ensure quality control during trenching, divers are typically employed with hydrographic scanners or sonar to verify trench depth and width. Trench spoil material can be stored on the river bottom adjacent to the trench if currents will allow this without undue sediment transport. Alternatively, trench spoils can be stored on the barge or transported to shore.

Mechanical dredging can result in significant quantities of suspended sediments, which is particularly undesirable if there is a risk of environmental contamination along the pipeline alignment.

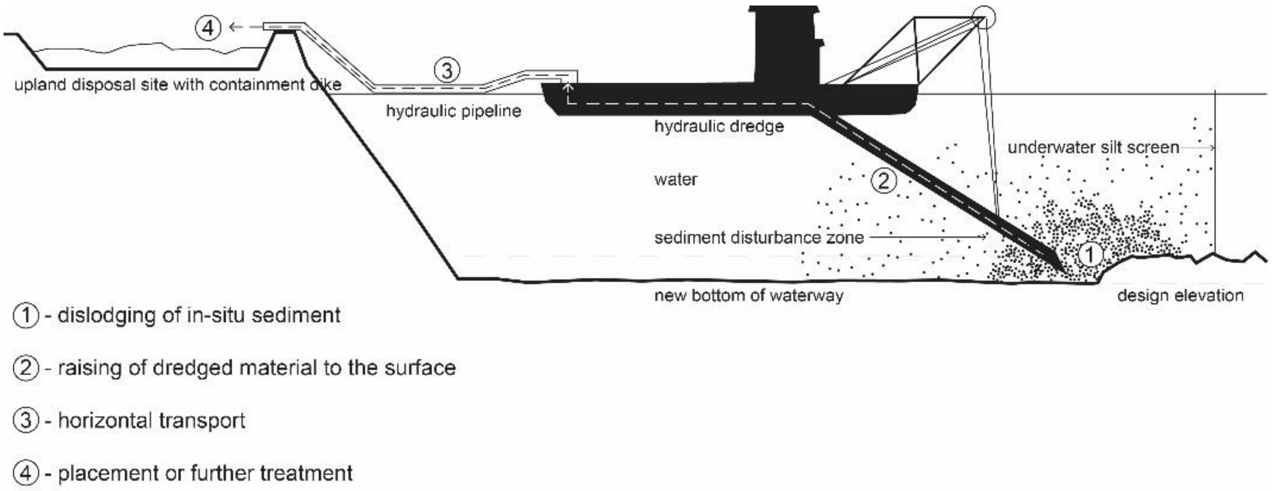

Figure 44 - Hydraulic Dredge

For softer bottom soil conditions and where sediment transport is a concern, methods such as hydraulic dredging can be used to limit sediment suspension and loss. The adjacent image illustrates a hydraulic dredging operation. Material to be dredged is essentially vacuumed from the channel bottom. There can be a tool or cutterhead at the intake end of the suction line to loosen the material to be dredged. The suction line then vacuums and transports the loosened material up to the barge for storage or upland disposal.

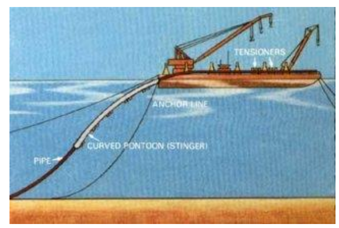

Figure 45 - Barge

Figure 46 - Floats

Once the trench is excavated to the required depth, the pipeline is assembled and lowered into place from an installation barge as illustrated in the adjacent image. Pipe installed by this method can be High Density Polyethylene (HDPE), Polyvinyl Chloride (PVC), Steel, Fiberglass Reinforced (FR), or Ductile Iron (DI) with flexible joints such as the Flex-Loc manufactured by American Cast Iron Pipe Company.

Anchor collars can be added to the pipe to aid in installation and help control flotation and movement in the trench. Once the pipe is tested and placed in the trench, the trench is backfilled with the excavated material and/or imported gravel fill. Protective segmental concrete mats can be placed over all or part of the pipe for additional protection.

Figure 47 - Concrete Mats

4.2 Microtunnel

Microtunneling is a pipe jacking process that employs a remotely controlled, closed face tunneling shield, also commonly referred to as a Microtunnel Boring Machine (MTBM). Closed face earth pressure balanced or slurry pressure balanced shields are capable of exerting a positive pressure against the excavation face to maintain face stability and prevent ground and groundwater inflow into the pipe during construction. Routine personnel entry of the pipe being jacked is not required for microtunneling. The pipe diameter range for microtunneling is generally from 10 to 136 inches, however the most common pipe diameter range for microtunneling is between 24 to 48 inches.

The primary advantages of microtunneling are that the product pipe can be directly installed in a smaller ground opening and the depth of the tunnel can be adapted to the subsurface conditions. Direct installation of the product pipe by microtunneling tends to reduce the risk of loss of ground and surface settlement compared to horizontal directional drilling methods for similar sized pipe. If necessary, the vertical grade of the pipe can be lowered (deeper jacking and receiving shafts required) to avoid poor ground conditions identified along the alignment.

Figure 48 - Typical Microtunnel Operation

Considerations for microtunneling pipe selection and cutter head design include soil type, strength, consistency, potential for encountering obstructions and groundwater levels. Subsurface explorations along the microtunnel alignment and material laboratory testing are required to identify the design parameters. Portions of the river crossing alignments are expected to encounter soft clay soils, which can cause difficulty maintaining line and grade. The risks associated with controlling line and grade can be minimized by utilizing microtunneling equipment and pipe adaptable to the anticipated ground conditions.

Utility installation using microtunneling can be executed as a one-pipe or two-pipe system. In a one-pipe system, the pipe installed via microtunneling is the final “product”, or “carrier”, pipe. In a two-pipe system, a “casing” pipe is installed via microtunnel, then a “carrier” or “product” pipe is sliplined into the casing pipe. Spacers are typically used to slipline the carrier pipe followed by backfilling the annulus space. A two-pipe system will likely to be required at this crossing.

Staging Areas

Staging areas are required at each end of the microtunnel reach: a jacking shaft at one end and a receiving shaft at the other end. The jacking shaft is of more substantial design consequence as this is where most of the work takes place. The adjacent image is a schematic illustration of a jacking shaft staging area. The staging area needs to be large enough to accommodate pipe delivery, storage and handling, a control cabin for guiding the MTBM, muck handling, temporary storage and disposal, shaft ventilation systems and other support equipment. The staging area configuration can be modified to accommodate available space and existing surface features and land use. The receiving shaft is generally smaller and sized to allow the tunneling shield to be lifted out by crane after tunneling is complete.

A typical jacking shaft staging area might require a space 18 to 24 ft. wide by 75 to 100 ft. long including space for a 10 to 15 ft. wide by 15 to 25 ft. long jacking shaft. Shaft depth is determined by a variety of factors including anticipated soil and groundwater conditions, installation length, depth of cover and other factors. The lateral limits of the jacking shaft are selected to accommodate a reaction wall for the retractable hydraulic jacks, the excavation support system for the sidewalls and floor of the shaft, and the equipment and personnel needed in the shaft during tunneling.

Intermediate Jacking Stations

Dependent on ground conditions, pipe diameter, type of equipment used and crew experience, microtunneling drive lengths up to about 1,500 feet are feasible without the need for intermediate jacking stations (IJS). An IJS is a fabricated steel cylinder fitted with hydraulic jacks, which is incorporated into a pipeline between two specially fabricated pipe segments (see adjacent image for a typical assembly). Its function is to provide additional thrust in order to overcome skin friction and distribute the jacking forces over the pipe. IJSs are utilized when jacking forces exceed the capacity of the main jacks, the maximum allowable stress on the pipe or thrust block reaction load in the jacking shaft. Upon completion of the microtunneling drive, the operational components of the IJS are removed by personnel entry thereby allowing pipe string closure. Microtunneling standards recommend a minimum casing ID size of 39 inches if an IJS is used for construction. Of note is that OSHA confined space entry requirements will need to be adhered to. The use of an IJS is assumed as risk mitigation measure in this feasibility study given the microtunnel installation length and the limited ground conditions information.

Figure 49 - Intermediate Jacking Station

4.3 Horizontal Directional Drill

HDD is a pipe installation method that involves drilling a guided borehole, referred to as the pilot hole, through the ground along a predetermined path from an entry point to an exit point. For larger pipes, a small diameter pilot hole is drilled, and then enlarged by one or more passes of a reamer to a diameter typically about 1.5 times the finished pipe diameter. Throughout the pilot hole, drilling, and reaming process soil cuttings are removed from the borehole and borehole stability is maintained by a continually circulated drilling fluid (typically bentonite slurry). A variety of pipe materials can be installed using HDD methods, including steel, HDPE and PVC pipe. The pipe is assembled by fusing/welding pipe sections to form a continuous pipe of a length sufficient to span the distance from the entry point to the exit point. The pipe integrity is tested and the pipe is pulled back through the borehole in one continuous operation, if practical, to limit the risk of the pipe becoming stuck during pullback. The pipe can be assembled in segments and welded/fused in the field during pull back, but at an elevated risk of the pipe becoming stuck in the borehole and/or increased pull time and damage to the pipe. The Figure 50 illustrates the sequence of HDD.

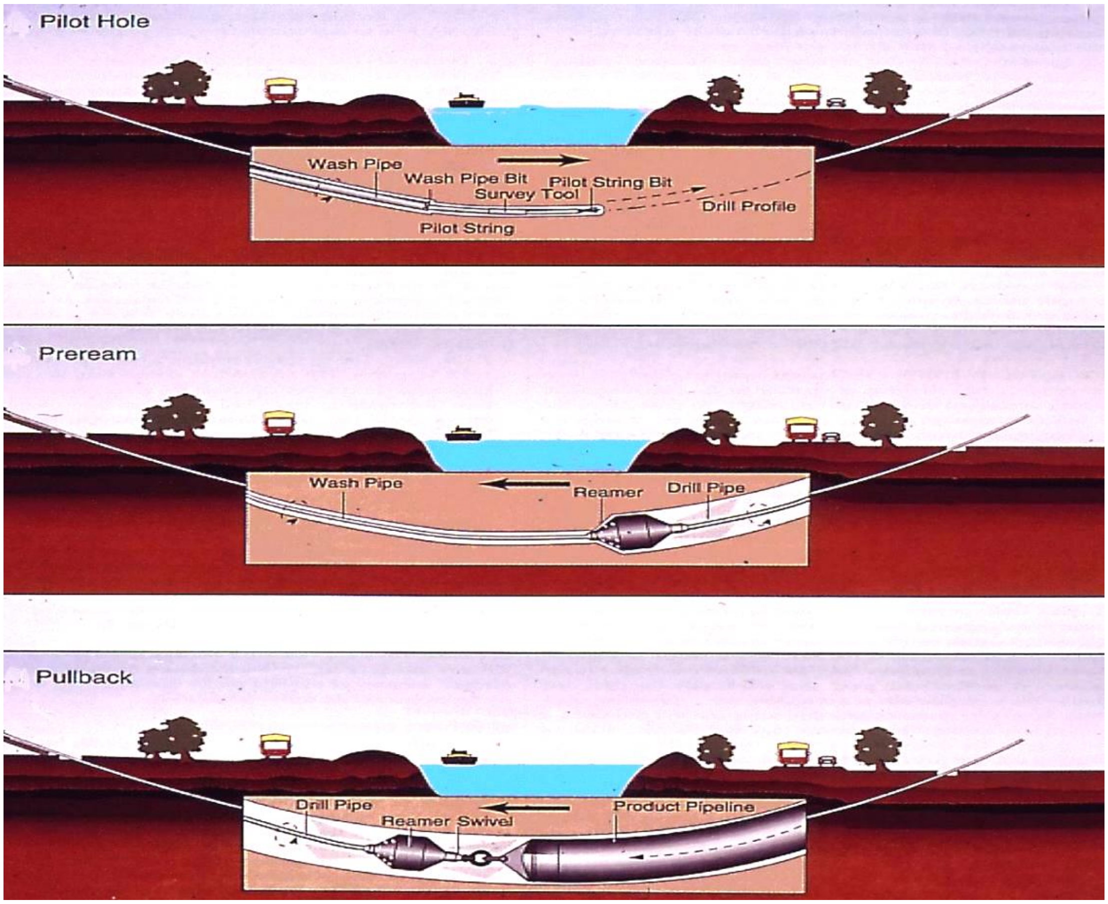

Figure 50 - Typical HDD Operation

An advantage of HDD is its steering capability. Gradual changes in horizontal and vertical alignment can be accommodated. The maximum radius of curvature is dependent on the diameter and material of the pipe. For steel pipe, the typical allowable maximum radius of curvature in feet is 100 times the diameter of pipe in inches. Multiple changes in alignment and shorter-radius changes increase the risk of the pipe becoming stuck during pullback and/or damage to the pipe during installation. However, if an obstruction is encountered during pilot hole construction, the drill head can be pulled back and guided around the obstacle during pilot hole drilling, provided the change in alignment will not adversely impact pipeline pullback. Portions of the river crossing alignments are expected to encounter soft clay soils, which could cause steering difficulties. The risk associated with steering can be mitigated during design, and by utilizing appropriate steering heads during construction.

HDD systems are typically launched from the ground surface so no jacking or receiving shafts are required. Therefore, the setup time is shorter compared to that of a microtunneling operation. Excavated materials, or “cuttings”, are suspended in the circulated drilling slurry. Slurry laden with excavated soil is passed through centrifuge desanding units to separate soil from the slurry before re-circulation. In general, there is less excavated material to manage with HDD compared to other trenchless methods.

Bore entry and exit distance from the river will be a function of available space and site constraints (seawall, piles). “Starter casings” are optional driven casings which can be installed at the HDD entry and exit locations to limit risk of hydrofracture, if cover or fluid loss are a concern, and provide advantage by isolating soils near the surface, if contamination is a concern.

HDD pipe installation may include a single carrier/product pipe, or a two-pipe carrier/product pipe and casing pipe system. Either option can include addition of a starter casing. In a single pipe installation the carrier pipe is designed to provide strength sufficient to withstand pulling forces and abrasion incurred during installation. A two pipe system will include carrier pipe, casing pipe, spacers, and backfill material in the annular space. A two pipe system is substantially more expensive. Expense is a result of adding a second pipe, spacers, fill, and labor, but also as it upsizes all aspects of the HDD operations. A larger reamed hole requires larger equipment, greater volume drilling fluids, greater volume spoils for disposal, and greater risk of release of drilling fluids due to pressure required to maintain a larger bore diameter.

Staging Areas

Staging areas are required on both ends of the HDD reach. Space requirements for each staging area depend on the phase of the work being conducted and the size of the drill rig. During drilling of the pilot hole most activity occurs at the location of the drill rig. The rig size required for HDD drilling is based on the following criteria:

Size of HDD rig	Pipe Size Range	Depth of Pipe Range	Bore Length Range
Mini-HDD	2 in. to 25 in.	Less than 30 ft.	Less than 600 ft.
Midi-HDD	12 in. to 25 in.	30 ft. to 75 ft.	600 ft. to 900 ft.
Maxi-HDD	26 in. to 60 in.	75 ft. to 200 ft.	Up to 10,000 ft.

Table 2 – Rig Size Based on HDD Characteristics

Anticipated bore lengths for the potential HDD alignments discussed below range from about 1,600 ft. to over 3,000 ft. Based on anticipated bore lengths and associated depth of pipe cover, it appears likely that maxi-HDD rig is most appropriate for the project. The staging area at the bore entry would likely be approximately 150 ft. by 250 ft. while a much smaller staging would be required at the pilot hole exit location. During reaming operations, an approximately 25 ft. by 50 ft. staging area might be required at the exit location to allow tools to be changed and for access by a vac-truck used to recover drilling fluid that may discharge from the bore exit. The following images illustrate typical entry and exit staging areas for HDD operations.

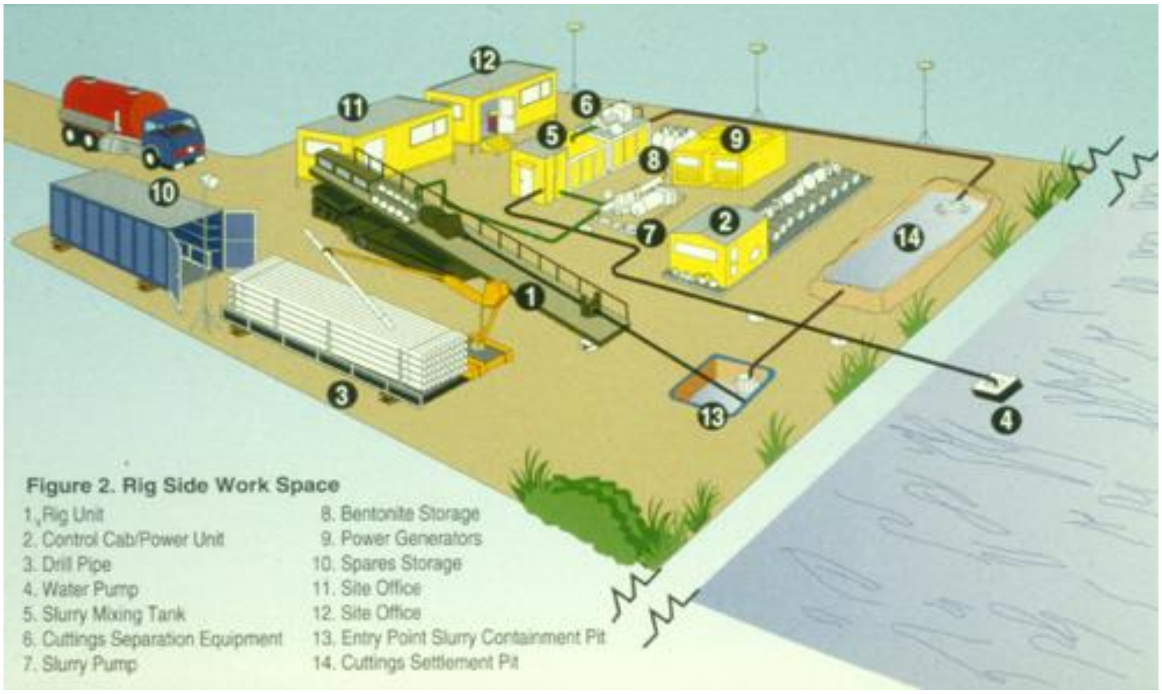

Figure 51 - Typical Bore Entry Staging

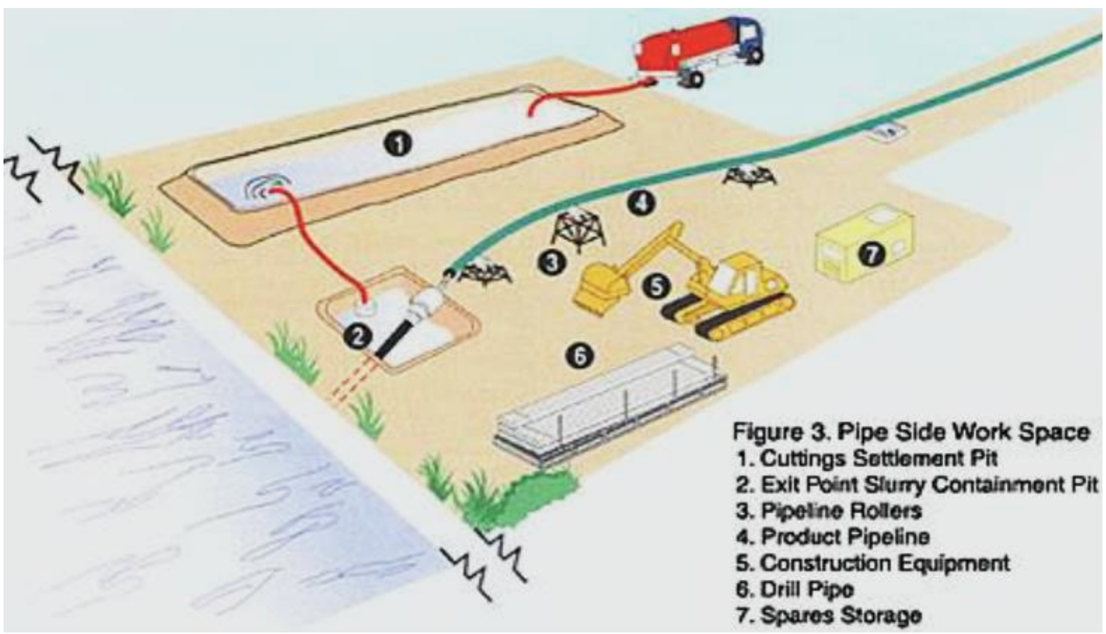

Figure 52 - Typical Pipe Side Staging

The required staging area during HDD pull-back operations is a long linear right-of-way large enough to allow make-up of the entire length of pipe to be pulled into the bore. The pull-back staging area is usually at the bore exit, but can be at either end of the alignment depending on space limitations. If pull-back is performed on the bore entry side of the drill operation, the drill rig will need to be relocated from the bore entry side to the bore exit side prior to pipe pullback. The staging area should be in the range of the total pipe length plus approximately 100 feet with an approximately 25 foot wide right-of-way. It appears that there is ample room on the Lynn side of project for pull-back staging. There are also opportunities for pull-back staging on the Revere side of the alignments.

There are certain geometric constraints that impact selection of entry and exit point locations and associated staging areas. Considerations for minimum and maximum bore entry and exit angles, minimum radius of curvature for the bore and minimum depth of cover must be considered when selecting the minimum distance between pilot hole entry and exit points and, in turn, minimum distance between staging areas. Typically the entry and exit angles should be in the range of 8 to 12 degrees such that the pipe does not require lifting above approximately 12 feet for entry into the bore. Typical allowable maximum radius of curvature (in feet) for steel pipe is 100 times the nominal pipe diameter (in inches).

Inadvertent Return of Drilling Fluids to the Environment

Inadvertent return of drilling fluids to the environment is a risk of trenchless installation methods which use drilling fluids. Inadvertent return of drilling fluid to the environment may be characterized as a “frac out” or a “hydrofracture”. “Frac out” refers to an event where drilling fluid is released during drilling through a preferential seepage path along piers, piles, loose gravel, rocks or improperly backfilled test borings. “Hydrofracture” refers to an event where drilling fluid pressure overcomes the overburden pressure to release into the environment.

Risk of release can be mitigated through appropriate subsurface exploration, design requirements, and construction methods. Subsurface investigations should be performed to identify a detailed soil bottom profile and characterize the physical properties of soils above and near the drill path. The design cover depth specified should be appropriate for anticipated drilling fluid pressure and subsurface conditions. An example depth of cover for this crossing might be around 30-feet. Requiring a starter casing at entry and exit locations can reduce risks of release in the shallowest portion of the HDD pipe installation. Drilling fluids will be designed based on the soil characteristics indicated in subsurface explorations. The contractor should have a contingency plan and be prepared to mitigate risk in the event of a release. Mitigating risk would include monitoring drilling fluids and adjusting chemical makeup and drill advancement rate. Monitoring can assist in identifying and remedying events where soil cuttings are not being conveyed sufficiently and fluid pressure is building-up. The contractor’s contingency plan should include adequate response training for staff and maintaining materials, equipment, and resources required to respond to a release event.

4.4 Replace On Bridge

The General Edwards Bridge was designed and built in 1934. The water main suspended from the bridge is a 20” diameter steel pipe with a 1/2” wall thickness. Water main changes to 30” diameter steel in the bridge support towers and the tunnel shafts (navigation channel crossing). The water main was installed as part of the original bridge construction. The pipe is supported by the bridge structure in the approach spans, travels through the west side towers at piers 5 and 6, then crosses the fender system to the pipe tunnel shaft entrances. The water main/pipe is directly supported by a radius cut beam section which sits on top of the original bridge pipe support beams. There are no pipe rollers installed on the structure, so the pipe slides along the radially cut beam section. The pipe was originally designed to expand and contract at the designated pipe expansion joints each with associated stabilizer anchor frames fixed to the pipe and to the girder webs.

In December 2015, Green International Affiliates performed a visual inspection of the exposed length of the existing pipe, supports and end connections throughout the bridge approach spans, tower transition areas, and pipe tunnel entrance shafts. This inspection results were summarized in a memorandum "Task 2.1.2, Water Main Condition Findings," prepared by Green International Affiliates and dated February 25, 2016. The conclusion of field reconnaissance was that the water main in the bridge approach spans is in poor to serious condition with pitted surfaces and evidence of three historic pipe ruptures. Laboratory analysis on pipe and bridge support coatings and insulation revealed heavy metals and asbestos, as detailed in the memorandum "Hazardous Building Materials Investigation Services" dated June 29, 2016. The tunnel shaft exposed pipe areas were identified in poor condition. Pipe supports and support beams through the approach spans were found to be in poor condition. During inspection cracks at the welded connection of the expansion joint stabilizer supports and girder webs were identified in spans 5, 9, and 11. These deficiencies were reported to MassDOT. Since it seemed the Section 56 water main stabilizer supports were compromising the integrity of the bridge girders, MassDOT requested the MWRA to perform an analysis of the pipe support system in order to cut the fixed stabilizer supports and pipe to eliminate longitudinal forces on the bridge girders, while ensuring a stable pipe support system would remain in place. The subsequent inspection included the in-depth hands-on inspection of the previously identified welds of the longitudinal frames to the girder webs, as well as the identification of any other welds associated with the support or stabilization of the MWRA 's water main. Review of scope required to satisfy MassDOT's concern over longitudinal forces apparently imparted by the water main system on the bridge girders is not included in this study.

Removal and replacement of pipe on the bridge would include cutting and removing the existing water main above river level and replacement with a new steel or ductile iron water main essentially in the same location. Water main in tunnels and tunnel shafts have not been inspected. Per discussion with the MWRA, similar tunnel shafts have been observed in poor condition. The tunnel and tunnel shafts could be rehabilitated with a structural liner or replaced. For a comprehensive long-lasting solution, Weston & Sampson presents replacing the existing tunnel shaft with a new 180-foot tunnel shaft installed via microtunneling. On the bridge, pipe support beams would need to be removed and replaced where conditions require (34 deteriorated supports identified out of 117 total supports). A substitute for the fixed stabilizer frames (7 identified - attached adjacent to the pipe expansion joints) would need to be configured to secure the main but allow for expansion and contraction. It is possible the owner of the bridge, MassDOT, would require complete bridge structural analysis to determine the impact of the proposed water main replacement on the existing bridge. If the MWRA wished to upsize the water main then structural analysis would almost certainly be required.

Removal and replacement of pipe on the bridge will require handling and disposal of existing pipe insulation which contains asbestos, and handling and disposal of existing pipe coatings which contain asbestos and heavy metals. Asbestos abatement must be performed in accordance with EPA and Massachusetts regulations. A Massachusetts licensed asbestos abatement contractor will be required to remove asbestos containing materials scheduled for removal. As the new pipe will likely be required to occupy a similar corridor as the existing pipe, asbestos containing materials need to be removed before new pipe installation proceeds. The handling and disposal of materials containing heavy metals must be performed in accordance with the health and safety measures outlined in OSHA regulations.

The possibility of future replacement of the General Edwards Bridge should be weighed in the decision over whether to mount a replacement pipe on the bridge. The Federal Highway Administration National Bridge Inventory database indicates that the last inspection of the General Edwards Bridge was performed in June 2014 (presumably secured by the Owner, MassDOT) and deck, superstructure, and substructure condition ratings were “5”, “5”, and “4” respectively. A structurally deficient bridge is one for which the deck, superstructure, or substructure is rated 4 or less, on a scale of 1-9 (9 being “excellent” and zero being “imminent failure”). In addition to condition deficiencies, another driver of bridge replacement might be local interest for aesthetic betterments. The General Edwards Bridge area is considered the gateway to the Lynn Municipal Harbor area, where an expansive plan for high-end residential, commercial, and marina development is underway. If the bridge was replaced, a replacement bridge might be constructed in the space immediately east of the bridge, where a bridge existed prior to the 1934 construction of the General Edwards Bridge. Bridge replacement would require replacement of the water main again, at least within the limits of the bridge superstructure.

4.5 Typical Profile for River Crossing Methods

Depth of utility installation for each river crossing method would be determined in design. For a general comparison between methods, a typical profile rendering has been prepared and is attached in Appendix H. The figure shares a conceptual depth of utility installation for each method overlaid on boring data from the General Edwards Bridge record drawings.

4.6 Pipe Installation Method Summary

Table 3 summarizes general advantages, disadvantages, and risks associated with the pipe installation methods discussed herein.

Alternative	Advantages	Disadvantages
Open Cut Trench	• Relatively small on-shore staging area required. • Segmental pipe assembly feasible.	• Suspended sediments from dredging • Surplus spoils generation and disposal (MCP).
Remove and Replace on Bridge	• Known alignment and convention exists for pipe support.	• Limited to lifespan of existing bridge. • Deficiencies in existing systems may require comprehensive structural review. • Navigation channel crossing could be problematic.
Microtunneling	• Product pipe can be directly installed. • Reduced risk of loss of ground/surface settlement compared to HDD.	• Limited to approximately 1,500 ft. without intermediate jacking stations. • Sensitive to obstructions. • Spoils generated for disposal (MCP).
HDD	• Steering capability and ability to maneuver around obstructions. • Shorter set up time (no jacking and receiving shafts). • Typically less excavated material to manage. • Limited spoils generated for disposal (MCP).	• Possible complications maintaining bore alignment in soft soils. • Possible hydrofracture into river channel during construction. • Although for a relatively short duration, a large pipe staging area is required to assemble the pipe for pullback.

Table 3 – General Advantages & Disadvantages of Pipe Installation Methods

4.7 General Pipe Material Alternatives

Pipe material options reviewed include Ductile Iron (DI), Steel, Polyvinyl Chloride (PVC), High Density Polyethylene (HDPE), and Fusible Polyvinyl Chloride (FPVC). Table 4 identifies pipe material options for each installation method.

Method	DI	Steel	PVC	HDPE	FPVC
HDD	X	X		X	X
Microtunnel (w/ Steel Casing)	X	X	X	X	X
Open Trench	X	X		X	
Replace On-Bridge	X	X			

Table 4 - Material Alternatives for Installation Methods

Each material was evaluated based on (1) Material Availability, (2) Fittings, (3) Deflection/Flexibility, (4) Material Cost, (5) Corrosion Resistance/Corrosion Control Required, (6) Maintenance Requirements, (7) Life Expectancy, and (8) Installation Suitability. Materials were scored for comparative advantage and disadvantage, with a score of 3 applied for a strong advantage and a score of -3 applied for a strong disadvantage. A narrative describing on pipe material performance versus established criteria is included in Appendix H. A summary of pipe material alternatives comparison is presented in Table 5.

Criteria	Ductile Iron		Steel		PVC		HDPE		FPVC	
	Adv.	*Dis.*	*Adv.*	*Dis.*	*Adv.*	*Dis.*	*Adv.*	*Dis.*	*Adv.*	*Dis.*
Material Availability	0	0	0	0	0	0	0	0	0	0
Standard Fittings	2	0	2	0	2	0	1	0	2	0
Custom Fittings	0	0	1	0	0	0	0	0	0	0
Deflection/ Flexibility	1	0	0	0	1	0	3	0	2	0
Cost	0	-1	0	-2	2	0	0	0	0	0
Corrosion Resistance	1	0	0	0	3	0	3	0	3	0
Corrosion Control Required	0	-1	0	-1	0	0	0	0	0	0
Corrosion Control Options	1	0	1	0	0	0	0	0	0	0
Maintenance	0	0	0	0	0	0	1	0	1	0
Life Expectancy	2	0	1	0	1	0	1	0	1	0
Installation Suitability	2	0	2	0	0	0	2	0	2	0
Total	9	-2	7	-3	9	0	11	0	11	0
Net Advantage	7		4		9		11		11	

Table 5 – Comparison of Advantages and Disadvantages of Pipe Material Alternatives

Notes: Advantage: 0 is neutral, 3 is strong advantage; Disadvantage: 0 is neutral, -3 is strong disadvantage.

The net advantage for Ductile Iron was +7, the net advantage of Steel was +4, the net advantage for Polyvinyl Chloride was +9, the net advantage of Fusible Polyvinyl Chloride was +11, and the net advantage of High Density Polyethylene was +11. Pipe material advantageousness for the recommended installation method/route alternative is described in Section 7.8 of this report.

5.0 ROUTE ALTERNATIVES

Routes for river crossing were reviewed from the Saugus River confluence with the Pines River to the west, through the mouth of the Saugus River at Lynn Harbor to the east. Installation methods including open trench river crossing, horizontal directional drilling, microtunneling, and removal and replacement on the bridge were considered. Section 6 generally describes each pipe installation route alternative identified.

5.1 Overview

Eight (8) route alternatives were identified and characterized. Full sized plans showing all-routes over an existing conditions plan, and all-routes over an orthophoto, are attached in Appendix D. A reduced depiction of all-routes over orthophoto is shown in Figure 53 on the following page. River crossing routes alternatives can be grouped in one of four geographic areas relative to the General Edwards Bridge:

- East of the Bridge (Route 1, Route 2, Route 3, Route 7): This area provided accessible paths for open trench and microtunneling pipe installation at a modest distance from the bridge. Space constraints between the shore and a proposed development required HDD to be shifted farther east to find adequate space for staging areas and pipe string construction. River crossings to the far east required longer river crossing and on-land pipe installation.

- Abutting the Bridge (Route 4, Route 5): Included routes immediately adjacent to the existing bridge corridor. This area provided for more direct route alignments, but passed through the layout of existing and historic structures in the area.

- West of Bridge (Route 6): This area required long trenchless pipe installation lengths and substantial over land pipe installation. Pipe installation via horizontal direction drill most appropriate for this area due to long river crossing lengths.

- On Bridge (Route 8): Installed under the bridge and in a tunnel, in an alignment approximately congruous that of the existing water main.

Land acquisition and easement requirements were estimated for each alternative. In this section, estimated easements are identified for each route by Parcel ID, Owner, Location, and Easement Type. “Temporary” easements are those required for the construction duration only. “Permanent” easements are those required for long-term pipeline occupation of a space. The MWRA may choose to purchase land instead of securing permanent easements. Appendix K has a detailed tabulation of land acquisition and easements with more details including assessed values for buildings, features, and land. Property value and perceived depreciation value were relevant factors in Weston & Sampson’s estimation of probable cost of land acquisition.

Permits required for each alternative are described herein. A detailed tabulation of permits for all alternatives is presented in the Permit Matrix attached in Appendix J. The matrix indicates general comment on the context for determination of applicability.

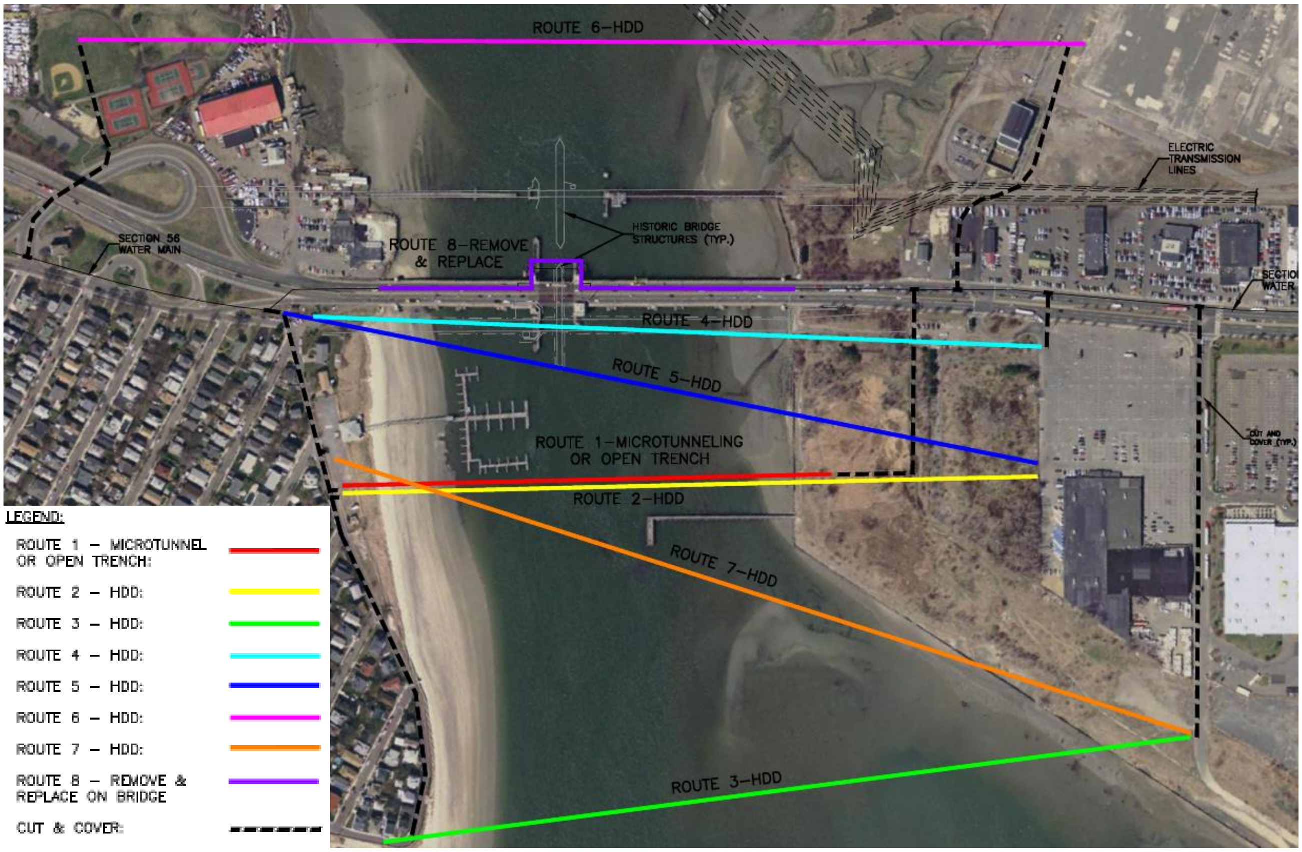

Figure 53 – Routes over Orthophoto

5.2 Route 1A –Open Trench

A prospective route for open trench pipe installation is shown in Appendix I Figure 3A. The prospective route for open trench pipe installation is the same as that proposed for microtunneling (shown on Appendix I Figure 3B). The trench alignment does not necessarily need to be a straight line. The horizontal alignment can be adjusted to avoid existing features. The degree of adjustment is dependent on the flexibility of the pipe. The open trench pipe installation route shown on Figure 3A is approximately 1,250-feet long and extends from shore adjacent to Rice Avenue, in Revere, to parcels east of the Lynnway in Lynn. Over-land cut & cover pipe installation would be required in Lynn (private parcels) and Revere (Rice Avenue) to connect the river crossing pipe to the existing MWRA Section 56 water main in the Lynnway.

Uncertainties include dredged sediment contamination and related impacts to costs and environmental permitting, as well as tidal currents across the proposed alignment. The alignment could be moved further east if currents become an issue. The length of the crossing would be greater but risks of sediment disturbance may be less.

Dredging activities and pipe assembly and placement are typically completed from barges on the river. There will need to be an on-shore staging area to store pipe and anchorage materials, equipment used on the barges, and possibly for dredged material storage and handling. The proposed route passes through parcels owned by the Point of Pines Yacht Club and WMI Lynn LLC (Joseph O'Donnell). Rice Avenue in Revere is a publicly accepted way. The barges are fitted with anchor piles that can be lowered into the river bottom to maintain a stable work position. Barges are maneuvered by tug boats. The pipe installation barge is usually equipped with a ramp or slide that guides the pipe and prevents excessive deflection of joints or bending during installation. As the barge is advanced, the pipe slides down the ramp and into the trench in a controlled manner. Pipe assembly either by welding steel, fusing HDPE or making up the Ductile Iron joints is accomplished on the pipe barge ahead of the ramp. The pipe barge(s) are generally long enough to allow for several joints to be made during deployment of assembled sections so the operation is more-or-less continuous. If there is room available on-shore, the full length of pipe can be assembled on one bank and pulled into position in the trench using a combination of tugboat, barge, divers, and winching from the opposite shore. Weighted collars can be added to the pipe as installation progresses.

Permits

Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - Individual Permit Application
- U.S. Army Corps of Engineers - Fill Permit (Consolidated with above permit)
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- U.S. Environmental Protection Agency - NPDES Remediation General Permit
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Water Quality Certificate, Permit Application
- MA Department of Environmental Protection - Chapter 91 Waterways License, Permit Application
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - NPDES Individual Permit, Surface Water Discharge Permit
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA EOEA MEPA Unit - Environmental Notification Form
- MA EOEA MEPA Unit - Environmental Impact Report
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements
Land acquisition and easements estimated required of this alternative are as follows:

- 017-760-002: MDC Right of Way Division (DCR), Lynnway - Permanent & Temporary Easement
- 034-752-077: WMI Lynn LLC (Joseph O'Donnell), Riley Way - Permanent & Temporary Easement
- Unknown Parcel: City of Revere Pump Station, Rice Ave - Permanent & Temporary Easement
- 14-192O-14A: Point of Pines Yacht Club, 28 Rice Ave - Temporary Easement

5.3 Route 1B - Microtunnel

A prospective route for microtunneling pipe installation is shown in Appendix I Figure 3B. The prospective route for microtunneling pipe installation is essentially the same as that proposed above for open trench installation. This route, excluding connecting cut-and-cover over-land construction, is approximately 1,400-feet long and extends from Rice Avenue, in Revere, to parcels east of the Lynnway in Lynn. Over-land cut & cover pipe installation would be required in Lynn and Revere to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. For planning purposes, a prospective jacking shaft location is identified on currently undeveloped space on parcels behind the Lynn seawall, owned by WMI Lynn LLC (Joseph O'Donnell), and a prospective receiving shaft in the Point of Pines Yacht Club parking lot, as indicated on Appendix I Figure 3B. Temporary easements will be required for both locations. The Point of Pines parcel would likely only be available off-season.

Permits
Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Chapter 91 Waterways License, Permit Application
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements
Land acquisition and easements estimated required of this alternative are as follows:

- 017-760-002: MDC Right of Way Division (DCR), Lynnway - Permanent & Temporary Easement
- 034-752-077: WMI Lynn LLC (Joseph O'Donnell), Riley Way - Permanent & Temporary Easement
- Unknown Parcel: City of Revere Pump Station, Rice Ave - Permanent & Temporary Easement
  14-192O-14A: Point of Pines Yacht Club, 28 Rice Ave - Temporary Easement

5.4 Route 2 - HDD

This route, excluding connecting cut-and-cover over-land construction, is approximately 2,050-feet long and extends from the Lynnway Mart in Lynn to Rice Avenue, near Bateman Avenue in Revere. Over-land cut & cover pipe installation would be required in Lynn and Revere to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. The drill entry point would be on the north side of the bridge at the edge of the Lynnway Mart Parking Lot. The drill exit would be in the parking lot of the Point of Pines Yacht Club and abutting City of Revere storm water pump station (which may be accessible off-season for use). The drill exit staging area would likely require use of one or both lanes in Rice Avenue, in addition to the parking lot area. This location in Rice Avenue does not house any resident driveway openings. The pipe string construction laydown area would be in parking lots and roads near the Lynnway Mart, Walmart, and other commercial establishments. This route is depicted in Appendix I Figure 3C.

Permits

Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Chapter 91 Waterways License, Permit Application
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements

Land acquisition and easements estimated required of this alternative are as follows:

- 017-760-002: MDC Right of Way Division (DCR), Lynnway - Permanent & Temporary Easement
- 034-752-077: WMI Lynn LLC (Joseph O'Donnell), Riley Way - Permanent & Temporary Easement
- 034-760-005: South Harbor Associates LLC (Lynnway Mart), 810 Lynnway - Temporary Easement
- 034-759-003: Capri Lynn Properties Ltd (Walmart), 780 Lynnway - Temporary Easement
- 034-758-007: Car Realty LLC, 730 Lynnway - Temporary Easement
- 034-758-005: Car Realty LLC, 732 Lynnway - Temporary Easement
- 034-758-006: Car Realty LLC, 720 Lynnway - Temporary Easement
- 034-760-007: Bayside Mortgage (Joseph O'Donnell), 830 Lynnway - Temporary Easement
- Unknown Parcel: City of Revere Pump Station, Rice Ave - Permanent & Temporary Easement

- 14-192O-14A: Point of Pines Yacht Club, 28 Rice Ave - Temporary Easement

5.5 Route 3 - HDD

This route, excluding connecting cut-and-cover over-land construction, is approximately 2,500-feet long and extends from Hanson Street in Lynn to Rice Avenue near Wadsworth Avenue in Revere. Over-land cut & cover pipe installation would be required in Hanson Street and Rice Avenue to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. Hanson Street is a publicly accepted way, similar to Rice Avenue. Abutting Hanson Street to the north and south are sites owned by WMI Lynn LLC (Joseph O'Donnell) and Massachusetts Electric Co (National Grid). The National Grid site contains a capped landfill which is not understood to be receiving waste at this time. Each site appears prospect for temporary and permanent easements required of proposed construction. To allow for pipe string construction in underutilized National Grid parcels in Lynn, the drill rig can be relocated from Lynn to Revere after reaming to allow for pipe-pull from Revere and pipe string construction in Lynn where more space exists. This route is shown in Appendix I Figure 3D.

Permits

Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- National Marine Fisheries and/or US Fish and Wildlife Service - Endangered Species Review
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Chapter 91 Waterways License, Permit Application
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- MA Division of Fisheries and Wildlife - Natural Heritage and Endangered Species, Project Review Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements

Land acquisition and easements estimated required of this alternative are as follows:

- 034-752-077: WMI Lynn LLC (Joseph O'Donnell), Riley Way - Permanent & Temporary Easement
- 034-752-075: Massachusetts Electric Co (National Grid), Riley Way - Temporary Easement
- 050-752-055: Massachusetts Electric Co (National Grid), Riley Way - Temporary Easement
- 033-752-065: City of Lynn, Marine Blvd - Permanent Easement
- 034-759-003: Capri Lynn Properties Ltd (Walmart), 780 Lynnway - Temporary Easement

- 14-192O-23: Point of Pines Beach Assoc Inc, Rice Ave - Permanent Easement

5.6 Route 4 - HDD

This route, excluding connecting cut-and-cover over-land construction, is approximately 2,150-feet long and extends from DCR and Lynn parcels to the east of the Lynnway in Lynn to the south bridge abutment access ramp east of the bridge near Whitin Avenue in Revere. Over-land cut & cover pipe installation would be required in the Lynnway to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. The drill entry point would be on the north side of the bridge at the corner of the Lynnway Mart parking lot. The exit point and pipe string construction laydown area would be on the south side of the bridge in the Lynnway from Whitin Avenue to Carey Circle. This route is shown in Appendix I Figure 3E.

Permits

Permits estimated required of this alternative are as follows:

- A summary of permits estimated required of this alternative is as follows:
- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- MA Division of Fisheries and Wildlife - Natural Heritage and Endangered Species, Project Review Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements

Land acquisition and easements estimated required of this alternative are as follows:

- 017-760-001: MDC Right of Way Division (DCR), 782 Lynnway - Permanent Easement
- 017-760-002: MDC Right of Way Division (DCR), Lynnway - Permanent & Temporary Easement
- 034-760-003: City of Lynn (Front of #810), Lynnway - Permanent Easement
- 034-760-005: South Harbor Associates LLC (Lynnway Mart), 810 Lynnway - Temporary Easement
- Unknown Parcel: MDC Right of Way Division (DCR), Lynnway - Temporary Easement

5.7 Route 5 - HDD

This route, excluding connecting cut-and-cover over-land construction, is approximately 2,350-feet long and extends from the Lynnway Mart in Lynn to the south bridge abutment access ramp east of the bridge near Whitin Avenue in Revere. Over-land cut & cover pipe installation would be required in the Lynnway to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. The entry point area would be on the north side of the bridge in private parcels east of the bridge. The exit point and pipe string construction laydown area would be on the south side of the bridge on the Lynnway from Whitin Avenue to just past Carey Circle. This route is shown in Appendix I Figure 3F.

Permits

Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements

Land acquisition and easements estimated required of this alternative are as follows:

- 017-760-002: MDC Right of Way Division (DCR), Lynnway - Permanent & Temporary Easement
- 034-752-077: WMI Lynn LLC (Joseph O'Donnell), Riley Way - Permanent & Temporary Easement
- 034-760-005: South Harbor Associates LLC (Lynnway Mart), 810 Lynnway - Temporary Easement
- 034-760-007: Bayside Mortgage (Joseph O'Donnell), 830 Lynnway - Temporary Easement
- Unknown Parcel: MDC Right of Way Division (DCR), Lynnway - Temporary Easement

5.8 Route 6 - HDD

This route, excluding connecting cut-and-cover over-land construction, is approximately 3,000-feet long and extends from playing fields west of State Route 1A in Revere to private parcels west of the Lynnway in Lynn, owned by Lynnway Associates LLC. The Lynnway Associates property is currently planned for mixed use development. Large work areas appear to be available on both sides of the alignment which may facilitate setting up two drill rigs and performing mid-path intersect. Over-land cut & cover pipe installation would be required in the private parcels west of the Lynnway to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. The entry point would likely be on playing fields west of State Route 1A in Revere. The exit point and pipe string construction laydown area would be on the north side of the bridge on private parcels. This route is shown in Appendix I Figure 3G.

Permits

Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA EOEA MEPA Unit - Environmental Notification Form
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements

Land acquisition and easements estimated required of this alternative are as follows:

- 017-796-008: Lynnway Acquisitions LLC, 843 Lynnway - Permanent & Temporary Easement
- 035-796-082: Lynnway Associates LLC, R Lynnway - Permanent & Temporary Easement
- 035-796-039: MBTA (vacant, access), R Lynnway - Temporary Easement
- 13-192T12-1: City of Revere (Gibson Park), North Shore Rd - Permanent & Temporary Easement
- 14-192S-1: Lombard Barbara A DBA Realty, 22 Whitin Ave Ext - Permanent Easement

5.9 Route 7 - HDD

This route, excluding connecting cut-and-cover over-land construction, is approximately 2,700-feet long and extends from Hanson Street in Lynn to the City of Revere Pump Station/Point of Pines Yacht Club parking lot in Revere. Over-land cut & cover pipe installation would be required in Hanson Street and Rice Avenue to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. Similar land use concerns exist as described for Route 3. This route requires a longer path across the WMI Lynn LLC parcel, where possible obstruction by historic power utility pole foundations and seawall piles will require attention. The drill entry point would be on the north side of the river and drill exit would be on the south side of the river. To allow for pipe string construction in undeveloped National Grid parcels in Lynn, the drill rig can be relocated from Lynn to Revere after reaming to allow for pipe-pull from Revere, and pipe string construction in Lynn where more space exists. This route is shown in Appendix I Figure 3H.

Permits

Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- Advisory Council on Historic Preservation - Historic Review, In Conj. w/ACOE
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Chapter 91 Waterways License, Permit Application
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Traffic Management Plan
- MA Department of Conservation & Recreation - Access Permit
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Conservation Commission, Notice of Intent
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements

Land acquisition and easements estimated required of this alternative are as follows:

- 034-752-077: WMI Lynn LLC (Joseph O'Donnell), Riley Way - Permanent & Temporary Easement
- 034-752-075: Massachusetts Electric Co (National Grid), Riley Way - Temporary Easement
- 050-752-055: Massachusetts Electric Co (National Grid), Riley Way - Temporary Easement
- 033-752-065: City of Lynn, Marine Blvd - Permanent Easement
- 034-759-003: Capri Lynn Properties Ltd (Walmart), 780 Lynnway - Temporary Easement
- Unknown Parcel: City of Revere Pump Station, Rice Ave - Permanent & Temporary Easement
- 14-192O-14A: Point of Pines Yacht Club, 28 Rice Ave - Temporary Easement

5.10 Route 8 – Remove and Replace On Bridge

This route retains the alignment of the existing pipe on the bridge, and includes construction of a new tunnel shaft via a mid-river microtunnel operation. Access to the pipeline under the bridge would be possible from the bridge and or from a barge below the bridge. Potential staging areas would be on the north side of the bridge in the DCR parking lot or in the parking lot of the Lynnway Mart. This route is shown in Appendix I Figure 3I.

Permits

Permits estimated required of this alternative are as follows:

- U.S. Army Corps of Engineers - General Permit, Pre Construction Notification
- US Coast Guard - Bridge Permit
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection - Distribution Modifications for Systems, 100% Construction Documents

- MA Department of Environmental Protection - Remedial Waste Notice
- MA Department of Environmental Protection - Hazardous Waste, As Applicable Depending on Waste Identified
- MA Department of Environmental Protection - Utility Related Abatement Measure, Notice
- MA Department of Environmental Protection Asbestos Abatement Notification, ANF-001
- MA Highway Department - Permit to Access State Highway
- MA Highway Department - Bridge Crossings, Plans
- MA Highway Department - Traffic Management Plan
- MA Historical Commission - Historic/Archaeologic Preservation Review, Project Notification Form
- MA Division of Fisheries and Wildlife - Natural Heritage and Endangered Species, Project Review Form
- Massachusetts Water Resources Authority - 8(m) Permit
- City of Lynn - Conservation Commission, Notice of Intent
- City of Lynn - Highway/Engineering Department, Street Opening Permit
- City of Revere - Highway/Engineering Department, Street Opening Permit

Land Acquisition and Easements

Land acquisition and easements estimated required of this alternative are as follows:

- 017-760-002: MDC Right of Way Division (DCR), Lynnway - Temporary Easement
- 034-760-005: South Harbor Associates LLC (Lynnway Mart), 810 Lynnway - Temporary Easement

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6.0 SCREENING AND RANKING

Route Alternatives were screened and ranked to provide a basis of comparative evaluation. Finished pipeline performance and risk criteria were evaluated to yield a composite rating score for each alternative. A summary of ratings earned by each route alternative, as well as a detailed tabulation of observations and facts contributing to the rating, is presented in Appendix L. Conceptual cost and schedule were estimated for each alternative, as presented in Appendix M and Appendix N. The ranking score, conceptual cost, and conceptual schedule together provide a basis for comparative evaluation of route alternatives.

6.1 Composite Ranking

Each route alternative was evaluated with respect to finished pipeline (as-built) performance and various implementation-related risk factors. The screening criteria were established to capture the relative advantage or risk of each route-alternative. Each criterion was assigned a score one to five, with scores applied as follows:

1 - Very Low Risk / Strong Advantage
2 - Low Risk / Advantage
3 - Medium Risk / Neither an advantage or a disadvantage
4 - High Risk / Disadvantage
5 - Very High Risk / Strong Disadvantage

The sum of ratings applied to Pipeline Performance and Program Risks criteria established the composite, or total, rating. Criteria did not always include alternatives rated with a score of one or five. This was the case where the difference in advantageousness or risk was more appropriately weighted with a narrower rating spread. The lowest composite rating was ranked the highest from a technical advantageousness perspective. Appendix L includes a summary of ratings applied for performance and risk criteria and a tabular detail of the observations and facts contributing to the rating score applied. The narratives that follow describe the evaluation criteria and the factors that contributed to high and low rankings applied.

6.1.1 Pipeline Performance

Pipeline performance criteria included Access for Maintenance, Protection Against Damage, and Hydraulics. These criteria captured the relative advantage or disadvantage of the finished solution after the system was successfully installed and in-operation. Useful service life was not evaluated as each installation option can provide for a pipeline useful life significantly greater than 50 years, with failure more likely a function of material specification and factors outside of MWRA control than route alternative and installation method.

<u>Access For Maintenance</u>

"Access For Maintenance" captured the advantage in accessibility of the finished pipeline for operations and maintenance activities. The lowest rating (1-strongest advantage) was applied where installed pipe was generally accessible through paved public ways by the MWRA with equipment and labor maintained in-house. The highest rating (5-strong disadvantage) was applied where the river crossing pipe and on-land pipe posed accessibility issues.

Protection Against Damage
"Protection Against Damage" captured the risk of damage from outside forces due to pipe location or configuration. The lowest rating (2-low risk) was applied where the pipe was confidently protected from known risks that might be incurred by aging infrastructure, environmental factors, and human influences. The highest rating (5-very high risk) was applied where pipe was most exposed to risk by aging infrastructure, environmental factors, and human influences.

Hydraulics
"Hydraulics" captured the advantage in finished pipeline hydraulics. The lowest rating (3-neither an advantage or disadvantage) was applied where the alternative provided for pipe sizing at the discretion of the MWRA and a variety of advantageous pipe materials. The highest rating (5-strong disadvantage) was applied where the alterative would likely limit pipe size and/or material due to requirements of the method or location.

6.1.2 Program Risks

Program Risks included Permitting Approval Difficulty, Technical Complexity, Construction Risk, Environmental Risk, Impact on Abutters & Motorists, Easements & Land Acquisition, and MassDOT/DCR Support. These criteria captured the relative risk associated with implementing a route alternative.

Permitting Approval Difficulty
"Permitting Approval Difficulty" captured the relative rigor associated with permitting other alternatives. The lowest rating (2-advantage) was applied where typical permits required of construction in this low elevation coastal project area were required. The highest rating (5-strong disadvantage) was applied where the most rigorous and risky permitting obligations were required of an alternative, especially where the permits would include risk of denial or overly burdensome requirements due to disadvantageous environmental risk compared to alternatives or other factors (ie MEPA EIR). Permits estimated to be required for each route are listed in Appendix J, Permit Matrix.

Technical Complexity
"Technical Complexity" captured the relative planning and engineering rigor required to responsibly engineer and execute the proposed scope. "Scope Complexity" considered factors related to scale of scope, facets of scope, scope alignment with geologic and site conditions, and coordination of work (among others). "Potential Conflicts" considered existing and historic structures that would require accommodation and drive complexity in engineering design and construction coordination. The lowest rating (3-neither an advantage or a disadvantage) was applied where the team observed moderate technical complexity compared to other alternatives. The highest rating (5-strong disadvantage) was applied where the team observed most rigorous technical complexity compared to other alternatives.

Construction Risk
"Construction Risk" captured the estimated risk that will remain in the construction phase with typical risk mitigation applied in design and construction. Construction risk can result from factors relevant to other criteria, such as Technical Complexity, Environmental Risk, and Impact on Abutters & Stakeholders. The lowest rating (3-medium risk) was applied where the team

observed moderate construction risk. The highest rating (5-very high risk) was applied where the team observed very high construction risk.

Environmental Risk
"Environmental Risk" captured the estimated risk to the environment by a proposed alternative. Receptors considered included habitats, water quality, and species of concern. Risk associated with remediation of hazardous/contaminated materials encountered also considered. The lowest rating (2-low risk) was applied where the team observed relatively low environmental risk. The highest rating (5-very high risk) was applied where the team observed very high environmental risk.

Impact on Abutters and Motorists
"Impact on Abutters and Motorists" captured the scope and scale of impact due to construction operations on abutters and motorists. Noise, aesthetics, reduction in service in roadways, and detours were considered. These impacts were considered with respect to duration, breadth of impact, and sensitivity of impacted interests. The lowest rating (2-advantage) was applied where the team observed modest impact to abutters and motorists compared to other alternatives. The highest rating (5-strong disadvantage) was applied where the team observed significant impact to abutters and motorists compared to other alternatives.

Easements & Land Acquisition
"Easements & Land Acquisition" captured the rigor associated with land acquisition and easements compared to alternatives. The lowest rating (1-strong advantage) was applied where minimal expense, complexity, and risk is estimated associated with new land acquisition and easements. The highest rating (5-strong disadvantage) was applied where significant expense, complexity, and risk is estimated associated with new land acquisition and easements.

MassDOT/DCR Support
"MassDOT/DCR Support" captured how well an alternative aligned with the apparent interests of MassDOT and DCR. Interests of each organization included maintenance of service within roadways of their jurisdiction, and limiting risk incurred by the Project on their future operation, maintenance and/or replacement. The lowest rating (2-advantage) was applied where an alternative was estimated to be viewed favorably by MassDOT and DCR. The highest rating (4-disadvantage) was applied where an alternative was estimated to be viewed unfavorably by MassDOT and DCR.

6.2 Probable Cost

Screening-level cost estimates were prepared to allow for comparison of probable cost among route alternatives. The team sought consistency in approach and accuracy appropriate for the application. The approach included itemizing work in a manner that was readily estimated by the project team, measuring quantities, and applying engineering judgement, by qualified team members, to estimate unit and lump sum prices. Conceptual cost estimates for each alternative were prepared and submitted in June 2016, then subsequently revised. Screening-level cost estimates and assumptions are presented in Appendix M.

Expense categories included in screening cost estimates included Engineering, Land Acquisition and Easements, Construction, and Contingency:

- *Engineering* expense included contract professional services furnished for engineering design, bidding, permitting, land acquisition, construction administration, and resident representation. Engineering design, bidding, construction administration, and resident representation services were estimated by identifying a typical labor rate and monthly labor utilization, then extending monthly resources expenditure to task duration, as indicated in Section 6.3. This approach was then then checked versus typical expense ratios for engineering services compared to construction cost. Permitting and Land Acquisition/Easement expense was separately estimated based on detailed study by-route, described in Section 5 and the Appendices. The average ratio engineering to construction expense was 27%.
- *Land Acquisition and Easements* value was estimated as described in Section 5.1, and as detailed in Appendix K. Land acquisition and easements was estimated on a case-by-case basis, and was not assigned as a percent of construction cost.
- *Construction* scope was itemized into substantive work scopes, measured, and estimated by qualified members of the project team based on professional judgement and project experience. Detailed backup for unit prices was not prepared for screening-level cost estimates. Work itemization included river crossing scopes (fixed and per foot), over land pipe installation (per foot), appurtenances, surface restoration, hauling and disposal of surplus excavated material, mobilization and incidentals, and uniformed officers for traffic control. Estimates accounted for markup and overhead associated with a general contractor managing specialty scopes performed by a subcontractor. At the time of screening-level cost estimation, costs were modeled assuming 24-inch diameter water main would be installed in the project area.
- *Contingency* was included in the sum of twenty five percent (25%) of estimated construction, engineering, and land acquisition expense, per the MWRA's recommendations for feasibility study cost estimation.

The Engineering News Record ("ENR") 20 Cities Construction Cost Index ("CCI") value for June 2016 is 10,337. The ENR Boston CCI for June 2016 is 13,159. Conceptual costs were escalated to an ENR 20 Cities CCI index value approximately 11,000.

6.3 Schedule

Screening-level schedule estimates were prepared to allow for comparison of probable schedule duration among route alternatives. The team sought consistency in approach and accuracy appropriate for the application. Conceptual schedule estimates for each alternative were prepared in June 2016, then subsequently revised. Complete itemized schedules for each route alternative are attached in Appendix N.

Schedule tasks included Procurement of a Consultant, Preliminary Design, Final Design, Permitting, Bid Ready Documents, Land Acquisition and Easements, Bidding and Award, and Construction.

- *Procurement of a Consultant* will result in securing contract engineering services from a consultant. The task is estimated to require about 6-months for all alternatives. MWRA notes that an additional 3-months may be required, for a total of 9-months. The extended period is represented in detailed review of schedule for the recommended alternatives in Section 7 of this report.

- *Preliminary Design* was typically estimated about 8-months, and will include survey, subsurface exploration, base map development, and a preliminary design report. Duration for MWRA review and comment was included. Preliminary design is the first phase of contract engineering services.
- *Final Design* includes iterative submittal of advancing drawings and contract documents and MWRA review. 8-months was typically estimated for final design. Final design follows preliminary design.
- *Permitting* duration was estimated for each alternative based on permits identified for each route alternative in Section 5 of this report. The Permitting period was estimated to begin midway through Final Design as initial contract documents provided sufficient information to begin some permitting obligations. The net duration of Permitting was typically driven by long duration permits which require Final Design provisions incorporated.
- *Bid Ready Documents* follows Final Design and will incorporate revisions per permit, land acquisition, and stakeholder requirements. Bid Ready Documents concluded after conclusion of Permitting and Land Acquisition and Easements tasks.
- *Land Acquisition and Easements* involves negotiation of easements with project area land owners. Abutters should also be canvassed during this period. Land Acquisition and Easements should begin as soon as practical, and are modeled to start concurrent with Preliminary Design.
- *Bidding and Award* is estimated to require 6 months. This task will follow completion of Bid Ready Documents, and result in a secured construction contractor.
- *Construction* involves implementation of water main installation and is the final phase of the project. Task duration was estimated as the sum of associated activities, including mobilization, river crossing pipe installation, over land pipe installation, connections to the existing system, water main testing and disinfection, surface restoration, and demobilization. The duration of active construction operations varied from 9 to 11 months depending on alternative. Mobilization was typically allowed an additional 3-months.

6.4 Results

Table 6 summarizes composite rating, probable costs, and construction duration for the route alternatives reviewed, sorted by composite ranking with highest rated first. Cost and schedule information presented is per screening-level estimates, and have not been superseded with detailed estimates performed for the recommended alternatives. A detailed tabulation of observations and facts contributing to the rating score is presented in Appendix L. Conceptual cost and schedule estimates are detailed in Appendix M and Appendix N.

Route & Method	Comp Rating	Cost (mil $)	Construction (mo)	Figure
Route 3 - HDD	28	$9.5	9	Figure 3D
Route 1b - Microtunnel	28	$12.7	11	Figure 3B
Route 7 - HDD	29	$9.0	9	Figure 3H
Route 4 - HDD	34	$8.4	9	Figure 3E
Route 2 - HDD	34	$8.6	9	Figure 3C
Route 5 - HDD	35	$8.0	9	Figure 3F
Route 6 - HDD	36	$10.5	10	Figure 3G
Route 1a - Open Trench	38	$8.9	10	Figure 3A
Route 8 - Remove & Replace	38	$9.7	10	Figure 3I

Table 6 – Summary of Route Alternatives Composite Rating, Cost, and Duration

The microtunneling alternative was rated favorably from a performance and risk perspective, but had the highest cost and a longer schedule duration. The open trench river crossing alternative was comparable in cost to HDD options, but included greater environmental risk, greater permitting difficulty, and a longer schedule duration. The alternative for pipe replacement on the bridge scored less favorably due to reduced protection against damage, hydraulic limitations, greater technical complexity, and greater construction risk. Relocation of Section 56 to a dedicated corridor will provide protection from weather exposure above grade and eliminate reliance on aging MassDOT bridge infrastructure.

Based on composite ranking, cost, and schedule, HDD Route 3 and Route 7 are the top ranked alternatives. Each route shares drill entry at Hanson Street in Lynn. The routes have different drill exit locations, with Route 3 exiting near the end of the Point of Pines on Rice Avenue, and Route 7 exiting near the Point of Pines Yacht Club off Rice Avenue. An overview of differentiating factors among routes Route 3 and Route 7 is as follows:

- Route 3 –Requires greater over-land pipe installation to connect to the existing main (2,900 feet) and is a relatively longer river-crossing route (2,500 feet). These factors contribute to it being the higher cost option. The location of crossing is at the broadest point in the river mouth which will reduce opportunity for scour of overlying earth by tidal and river flows over time. Risk of unknown historic piles along Route 3 is viewed as lower than along Route 7 since it is less likely that historic pile supported structures are present along Route 3 compared to Route 7. However, additional permitting may be required for Route 3 to due to habitat for a threatened bird species. This route may impact residential abutters in the Point of Pines area more significantly due to longer overland pipe installation and bore exit pit located squarely in Rice Avenue. Easements will be required with Point of Pines Beach Association, The City of Revere, WMI Lynn LLC, and Massachusetts Electric Company. Pipe string construction will require agreement with

Massachusetts Electric Company (NGrid) to occupy the entire length of their parcel during pipe string construction.

- Route 7 – Requires less over-land pipe installation to connect to the existing main (1,700 feet) but a slightly longer river-crossing route (2,700 feet). The combined impact results in Route 7 being considered slightly less costly than Route 3. However, Route 7 is perceived to have higher technical complexity and greater construction and post-construction risk because the alignment is subparallel to and therefore crosses a greater length of the Lynn seawall. This means there is greater risk of conflict between the HDD bore and the piles supporting the wall and wall anchorage system as compared to Route 3. There is also a risk of conflicts between the pipe bore and former electrical transmission tower foundations. Final design studies may determine that this risk is less than currently perceived depending on what information can be determined regarding the tip elevations of the existing piles. There is also a greater possibility of future risk to the pipeline if the seawall is repaired or replace, or if pile-supported marine structures are built extending out from the seawall in the future (i.e. new piles would be driven in proximity to the installed pipe). Route 7 has slightly less risk from a permitting perspective as it avoids construction near Revere's barrier beach listed as a habitat for a threatened bird species. Easements will be required from the Point of Pines Yacht Club, The City of Revere, WMI Lynn LLC, and Massachusetts Electric Company. Pipe string construction will require agreement with Massachusetts Electric Company (NGrid) to occupy the entire length of their parcel during pipe string construction.

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7.0 RECOMMENDED PIPE REPLACEMENT ALTERNATIVES

Based on composite ranking, cost, and schedule, HDD Route 3 and Route 7 are the top ranked alternatives. Each route shares drill entry at Hanson Street in Lynn. The routes have different drill exit locations, with Route 3 exiting near the end of the Point of Pines on Rice Avenue, and Route 7 exiting near the Point of Pines Yacht Club off Rice Avenue. Weston & Sampson recommends that both Route 3 and Route 7 be carried forward into preliminary design for further evaluation.

7.1 Routes and Staging

HDD is the advised method for replacing the deteriorated portion of the Section 56 water main crossing the Saugus River. Based on composite ranking, cost, and schedule, HDD Route 3 and Route 7 are the top ranked alternatives. Route 3 river crossing is approximately 2,500-feet long, with 2,900-feet of over-land pipe installation. Route 7 river crossing is approximately 2,700-feet long, with 1,700-feet of over-land pipe installation. Both routes connect to the Section 56 water main in the City of Revere on the Lynnway near the ramp onto State Route 1A North, and in the City of Lynn on the Lynnway opposite Hanson Street. Conceptual plans for both routes, and expanded detail related to work limits at staging areas, are attached as Appendix O. Conceptual profiles for both routes are attached as Appendix P.

The Lynn Harbor area has abundant space for horizontal directional drill staging and pipe sting construction. Staging area in Revere is much more limited. Therefore, each Route 3 and Route 7 propose drill entry staging from a location near the end of Hanson Street in Lynn. At the time of this report, it is understood that these parcels are not scheduled for development, and appear good candidates to secure temporary easements and permanent easements. Therefore, it is proposed that the two operations requiring the largest land area, pipe string construction and drill entry staging, each be performed from Lynn. As the pipe string is always pulled from the end of the hole back to the rig, staging each pipe string construction and drill entry in Lynn will require either 1) that the drill rig be relocated from Lynn to Revere to pull the pipe string after reaming, or 2) that the HDD contractor set-up a second rig at the drill exit to pull pipe. Operations in the drill entry staging area will require a minimum 3- to 4-months construction activity. Pipe sting construction in Lynn will require construction of a substantial pipe sting on a National Grid property north of Hanson Street. Operations on the site will ideally be performed from on, or immediately abutting, the Riley Way access road, to limit impact to the capped landfill inland. Cranes may be required to suspend and orient the pipe sting during the 1-day operation when the pipe is pulled into the bore hole. HDD operations can be performed from the Lynn staging area without blocking Hanson Street or the private access road, Riley Way. Typical HDD staging equipment and configuration are depicted in Figures 51 and 52 of Section 4.3.

Route 3 and Route 7 differ in locations of drill exit in the City of Revere and in the angle that the alignments cross the Lynn seawall. Route 3 drill exit is near the end of Point of Pines peninsula on Rice Avenue. Route 7 drill exit is in the general vicinity of the Point of Pines Yacht Club Parking lot, Rice Avenue, and Fowler Street. The Route 3 drill exit will be within Rice Avenue, which is a two-lane local street with concrete sidewalk and a concrete retaining wall abutting. Drill exit staging area operations are more limited in area and duration than those at the drill entry staging area. Activities will include driving of a starter casing, management and monitoring of fluids, and pipe pullback. Duration of activity in the drill exit staging area is estimated to be 1-month, as detailed in the project schedule attached in Appendix S. The first 2-weeks of operations at the drill exit staging area will require typical work week construction hours. The second two weeks of operations at the drill exit staging area will require continuous activity at the site. Construction operations in the Route 3 drill exit staging area will require detour of traffic around the work zone. Open trench pipe installation in Rice Avenue and Hanson Street will require typical construction work zone management for water main installation in a local street, including detour of the work zone to through-traffic during typical construction hours.

All staging areas, apart from the short-duration pipe sting construction area, shall be partitioned from public access by temporary construction fences and traffic control devices. Excavations will be protected from access, plated, or backfilled each day. In the City of Lynn staging area, clearing and grubbing of trees and brush may be required. Surfaces in easements should be restored with plantings similar to existing at the conclusion of work. Surfaces in public streets should be restored curb-to-curb within the work zone. Pavement restoration should include temporary trench patch, settlement for 90-days, and curb-to-curb pavement milling and overlay. Surface restoration will result in an aesthetically pleasing new roadway surface for abutters after conclusion of work.

The finished pipeline will include fused or welded water main across the river, bell and spigot water main in local streets, and connections between dissimilar systems. Anchor blocks should be installed at the connection of the fused or welded river crossing pipe to the bell and spigot pipe. Anchor blocks will restrain against separation due to thermal expansion from seasonal variations in water supply temperature. The anchoring system will be buried without evidence from the surface. Aspects of the new water main system visible from the surface at project conclusion will include cabinets for cathodic protection and manhole covers associated with valve vaults. The valve vaults will house valves for system control and air release valves to discharge air trapped in the pipeline. They will be required at each end of the river crossing, at project the extents, and at intermediate locations as required. Vehicles should be allowed to drive-over vaults, as they will be structurally rated to carry vehicle loading, but location might be coordinated to limit incidence of vehicles consistently blocking access to the vault cover. One new cabinet for cathodic protection is assumed to be required on each end of the project. The cabinet will typically be located near the property line, accessible from the roadway, and placed to avoid conflict/obstruction. The cathodic protection cabinets have an aesthetic similar to a typical traffic signal cabinets or electrical lighting cabinets.

7.2 Land Acquisition and Easements

Land acquisition and easement requirements were estimated for the recommended routes. “Temporary” easements are those required for the construction duration only. “Permanent” easements are those required for long-term pipeline occupation of a space. The limit of permanent easement, and the nature of use restrictions, should be consistent with that typically required of MWRA for its pipelines. Terms of permanent easement may include prohibiting permanent construction within a distance from the pipeline, prohibiting significant change in finished grade, maintaining accessibility, and compliance with the 8M Permit program. The MWRA may choose to purchase land instead of securing permanent easements. Appendix K includes a detailed tabulation of land acquisition and easements with more details including assessed values for buildings, features, and land. Property value and perceived depreciation value were relevant factors in Weston & Sampson’s estimation of probable cost of land acquisition.

Occupation of Local Streets & Tidal Flat (Route 3 and Route 7)

The MWRA may need to negotiate grants of location for new permanent occupation of public lands. Over-land cut & cover pipe installation is required in Hanson Street and Rice Avenue to connect the river crossing pipe to the existing Section 56 water main in State Route 1A. Hanson Street and Rice Avenue are publicly accepted ways with local jurisdiction. Also, the new pipeline passes through a City of Lynn owned tidal flat (Parcel 033-752-065).

Occupation of Drill Entry & Pipe String Construction Staging Area in Lynn (Route 3 and Route 7)
Temporary easement for use of WMI Lynn LLC (Parcel 034-752-077), Massachusetts Electric Co (National Grid; Parcel 034-752-075), and Capri Properties (Walmart; 034-759-003) will be required for construction staging and pipe sting construction operations. Permanent easement at WMI Lynn LLC (Parcel 034-752-077) will be required for permanent pipe occupation.

- The National Grid site, as described in Section 3.5.6, has an existing closed municipal landfill site which was capped in 1986 and is not receiving waste at this time. There does not appear to be significant activity at the site since operations are closed and transmission lines are removed. Pipe sting construction could be performed adjacent to the access road in the site without putting the existing landfill systems at-risk.
- The WMI Lynn LLC site is owned by the same party developing the site described in Section 3.1.10, but there are no active plans for development at this time. The proposed pipe would be located near the property line and partially within the waterfront zoning offset (200-feet per), so it is estimated that the new pipeline will incur only modest future use limitation. As the land is currently utilized, it appears a good space to secure temporary easement for HDD drill entry and general pipeline project staging.
- Beyond a finished parking lot in the rear used for loading, Walmart appears to own a section of unused land which might provide some working space at the rear of the drill entry staging area.

Occupation of Drill Exit Staging Area in Revere (Route 3)
Permanent easement with the Point of Pines Beach Association (Parcel 14-192O-23) will be required for permanent pipe occupation of the space between Rice Avenue and the low tide line.

Occupation of Drill Exit Staging Area in Revere (Route 7)
Temporary easement for use of the City of Revere Pump Station parking lot (Parcel Unknown) and the Point of Pines Yacht Club parking lot (Parcel 14-192O-14A) will be required for bore exit staging. Permanent easement at the City of Revere Pump Station parking lot (Parcel Unknown) will be required for permanent pipe occupation.

- The parking lot off Rice Avenue proposed for Route 7 drill exit is partially owned by the City of Revere and partially owned by the Yacht Club. The proposed Route alternative proposes permanent pipe occupation in lands owned by the City of Revere.
- Temporary easement with the City of Revere and the Point of Pines Yacht Club will be required to occupy space during the horizontal directional drill. Operations will likely require occupying substantial portions of the parking lot, and into Rice Avenue during reaming and pipe-pull. Some permanent use limitations may be required at the edge of the property to comply with MWRA buffer requirements.

7.3 Permits

The permit matrix attached in Appendix J indicates permits required of the recommended route alternatives. Comment and context for determination is included in the table. This list is subject to change in Preliminary Design as the engineer confirms limits of applicable resource areas, further defines the scope and sequence, and agencies of jurisdiction confirm applicability. Permits required for the Preliminary Design Scope, Subsurface Exploration, are listed in Section 7.7.4.

Permits or approvals that should be secured during design, and prior to bid of the construction contract, for each Route 3 and Route 7 include:

- U.S. Army Corps of Engineers - General Permit, Preconstruction Notification
- U.S. Environmental Protection Agency - NPDES Construction General Permit, Notice of Intent
- Advisory Council on Historic Preservation - Section 106 National Historic Preserv. Act
- MA Office of Coastal Zone Management - Consistency Determination
- MA Department of Environmental Protection – Chapter 91 Waterways License
- MA Department of Environmental Protection – Distribution Modifications for Systems
- MA Highway Department – Permit to Access State Highway with Traffic Management Plan
- MA Department of Conservation and Recreation – Access Permit
- MA Historical Commission – Historical/Archeological Preservation Review, Project Notification Form
- Massachusetts Water Resources Authority – 8(m) Permit
- City of Lynn Conservation Commission – Notice of Intent
- City of Revere Conservation Commission – Notice of Intent

Additionally, for Route 3, the following permits should be secured during design due to work near a habitat for a threatened bird species:

- National Marine Fisheries and/or US Fish and Wildlife Service – Section 7 of the Endangered Species Act, Endangered Species Review
- MA Division of Fisheries and Wildlife - Natural Heritage and Endangered Species, Project Review Form

A Utility Related Abatement Measure (URAM) should be filed with the MA Department of Environmental Protection prior to the start of construction if soil precharacterization identifies contaminated materials in exceedance of the applicable regulatory thresholds. The MWRA should require the construction contractor to secure local Street Opening Permits with the City of Lynn and the City of Revere, and to contact Dig Safe prior to performing any excavation.

7.4 Risks and Risk Management

Risks need to be considered at each stage of the Project, including planning, design, and implementation. The purpose of risk management is to assure that the project incorporates appropriate, efficient, and cost-effective measures to mitigate project related risk.

Risks may be described and characterized with respect to “consequence of occurrence” and “likelihood of occurrence”. Tables 7 and 8 outline a basis for characterizing likelihood of occurrence and consequence of occurrence.

Value	Criteria
Low	Less than 35% chance of occurring
Medium	36 – 70% chance of occurring
High	Greater than 71% chance of occurring

Table 7: Risk Likelihood of Occurrence Scale

Value	Criteria
Negligible	Minimal consequence to the program Some potential for increase in costs Slight potential for schedule change
Marginal	Small reduction in program performance Cost estimate marginally exceed budget Minor slip in schedule with milestone impacted
Moderate	Moderate reduction in program performance Cost estimate moderately exceed budget Moderate slip in schedule that effects program
Critical	Goals of the program cannot be achieved Cost Estimates seriously exceed budget Unacceptable schedule slip
Crisis	Program can not be completed Cost estimates unacceptable exceed budget Catastrophic threat to program, operation of system or people

Table 8: Consequence of Occurrence Scale

Design phase (DES) and construction phase (CON) risks were evaluated for Route 3 and Route 7. A list of identified risks is included below. A detailed description of the risk, consequence, and mitigation strategy is provided in Appendix Q, along with characterization of risk likelihood of occurrence and consequence of occurrence. Risks identified and detailed were as follows:

- DES-001 Commercial Abutter Concerns
- DES-002 Residential Abutter Concerns
- DES-003 Emergency Services Concerns
- DES-004 Local and State Leadership Concerns
- DES-005 Permanent Easement Acquisition
- DES-006 Temporary Easement Acquisition
- DES-007 Permit Acquisition
- DES-008 Identification of Unsuitable Subsurface Conditions
- DES-009 Identify Obstructions in Bore Path
- DES-010 Contaminated Materials Identification
- DES-011 Coordination with Other Activities
- CON-001 Conflict with Obstruction
- CON-002 Inadvertent Return of Drilling Fluids to the Environment
- CON-003 Drilling Fluid Circulation Loss
- CON-004 Stuck Pipeline During Pullback
- CON-005 Alignment Control

- CON-006 Borehole Collapse
- CON-007 Damage to Product Pipe
- CON-008 Surface Heave
- CON-009 Settlement
- CON-010 Weather Conditions
- CON-011 Encounter Unknown Contaminated Materials
- CON-012 Equipment Reliability & Maintenance
- CON-013 Abutter Concerns
- CON-014 Construction Delays
- CON-015 Vandalism

Effective risk management will require frequent monitoring and timely mitigation. Design risk management activities should proceed as soon as practical to provide the greatest benefit. Construction risk management activities should be performed continuously during construction, and be supported by strong contract requirements and clear work/mitigation plan submittals. Key risks and risk mitigation approaches are described below.

- *DES-004: Local and State Leadership Concerns* – The risk includes that the proposed project operations, and/or use of land, conflicts with leadership vision for the work area. The consequence of realizing the risk may include alternative route selection. To mitigate, the MWRA may inform applicable local and state leadership of the proposed scope and it's project benefits, provide a venue for discourse over the scope of work and concerns, and incorporate measures into design that mitigate the concerns as practical.

- *DES-005: Permanent Easement Acquisition* - The risk includes delay or failure to secure permanent easements required to rightfully occupy the proposed pipeline corridor. The consequence of realizing the risk may include alternative route selection or schedule delays. To mitigate, applicable property owners should be contacted as early as possible to ensure adequate time for acquisition of property. Early engagement would avoid investing excessive effort in an alternative that has limited chance of success. Study equitable recapitulation for permanent easements, prepare for presentation to key property owners, and administer negotiations. Critical negotiations will be with Point of Pines Beach Association and WMI Lynn LLC for Route 3. Critical negotiations will be with City of Revere and WMI Lynn LLC for Route #7.

- *DES-006: Temporary Easement Acquisition* – The risk includes failure to secure temporary easements required on lands that would be occupied by construction operations. The consequence of realizing the risk is requisite alternative pipe string construction staging and/or pipeline routing. To mitigate, property owners should be contacted as early as possible to ensure adequate time for acquisition of temporary easement. Study equitable recapitulation for temporary easements, prepare for presentation to key property owners, and administer negotiations. Critical negotiations will be with Massachusetts Electric Co for Route 3, and Massachusetts Electric Co and Point of Pines Yacht Club for Route 7.

- *DES-007: Permit Acquisition* – The risk includes that permit requirements may impact cost, schedule and/or approach viability. The consequence of realizing the risk is that permitting delays result in schedule slip and require provisions that increase program cost. To mitigate, incorporate into design sufficient accommodation for protecting public use of the waterways and abutting recreational spaces, maintaining use of the navigable waterway, maintaining sufficient protection and contingency measures related to management of drilling fluids, and protection of natural resources including local beaches, species, and water resources. In the near term, the MWRA may introduce the proposed work to the applicable agencies of jurisdiction to open communications and receive preliminary feedback.

- *CON-001: Conflict with Obstruction* - If the drill bit, reamer, or product pipe cannot be advanced past an obstruction, even by backing up and trying to steer around it, the impact can be significant. Typical obstructions include cobbles, boulders, wood, construction debris, and foundations. Along the proposed HDD alignment, there is potential to encounter any of these types of obstructions. In the extreme case, the HDD borehole may need to be abandoned and a new borehole drilled. Also, frac out along the piles, fouling of drilling fluids with suspended wood fibers, and impeding of forward progress is possible. Wood fibers could affect performance of the mud pumps or otherwise damage them. If an unknown obstruction is encountered during construction, the steering head can be pulled back and guided around the obstacle during pilot hole drilling, provided the change in alignment will not adversely impact pipe pullback. Execute contingency plan for mitigating inadvertent release of drilling fluids to environment (see below). The Route #7 alignment, at it's angle to seawall, increases likelihood of conflict with the seawall piles, and reduces likelihood that course adjustment will be able to remedy a conflict. Also, the location where Route #7 enters Revere is estimated to have a higher probability to encounter unknown historic piers associated with maritime activity.

- CON-002: Inadvertent Return of Drilling Fluids to the Environment - Inadvertent return of drilling fluid to the environment may be characterized as a "fracout" or a "hydrofracture". "Frac out" refers to an event where drilling fluid is released during drilling through a preferential seepage path along piers, piles, loose gravel, rocks or improperly backfilled test borings. "Hydrofracture" refers to an event where drilling fluid pressure overcomes the overburden pressure to release into the environment. Inadvertent returns are typically encountered where the ground cover is low such as near the entry and exit pits and drilling fluid pressures are high. The consequence of realizing the risk includes release of drilling fluids to the environment, possible curtailing of drilling operations, possible cost and schedule implications of required approach adjustment and clean-up. The risk of inadvertent returns can be mitigated by providing sufficient ground cover, attentiveness to drill advance rates, proper drill fluid design and circulation, installing "starter" casings near the entry and exit pits to confine the drilling fluid. Subsurface exploration should inform design to limit risk of hydrofracture under the river due to insufficient depth.

- CON-013: Abutter Concerns - The risk includes that abutter concerns result in vocal opponents of the project during construction. The consequence of realizing the risk is that abutter concerns result in poor public opinion of the project and delays as executive issues are addressed. To mitigate, public participation conferences may be conducted in design, pre-construction, and during construction to provide venue to hear, acknowledge, and address abutter concerns. The construction contract may also include work-hour, noise, and sequence provisions to minimize impact to abutters during construction.

7.5 Cost Estimate

Detailed program cost estimates were prepared for Route 3 and Route 7. Detailed estimates were prepared for use establishing a program budget, therefore accuracy was critical. The approach to estimation included solicitation of price quotes from suppliers and contractors where appropriate, and modeling equipment and labor expense based on task durations outlined in Section 7.6 of this Report. The detailed tabulation of estimated program costs, as well as statement of assumptions and price backup, is attached as Appendix R.

The estimates included construction, engineering, land acquisition and easements, engineering, and contingency costs:

- *Engineering* expense included contract professional services furnished for engineering design, construction administration, and resident representation. Engineering design included subsurface exploration, survey and base map, design, permitting, and bidding. The scope and cost for subsurface exploration is detailed in Section 7.7 of this report, and is estimated at 5.5% of construction cost. Survey and base map includes land and marine survey activities plus development of a detailed base map, and is estimated at 2% of construction cost. Design includes preliminary and final design activities and is estimated at 3% of construction cost. Permitting includes acquisition of permits described in Section 7.3, and is estimated at 1% of construction cost. Bidding includes support from preparation of the final bid documents through recommendation to award of a construction contract, and is estimated at 0.5% of construction cost. Construction Administration is estimated at 5% of construction cost, and resident engineer expense is estimated at 10% of construction cost. The allocation for resident engineering was confirmed adequate to support one senior resident engineer and one junior resident engineer throughout the construction period. The ratio engineering to construction expense is 27%.
- *Land Acquisition and Easements* was estimated as described in Section 5.1, and as detailed in Appendix K. The value of easements was estimated based on land value and estimated reduction in beneficial use, not a percent of construction cost.
- *Construction* cost estimates were based on general contractor costs extended from task durations, estimated labor/equipment resource application by task, and applicable labor/equipment rates. Quotes were secured for supply and specialty subcontractors costs. Task durations were generally per typical production rates published for operations of this length and pipe diameter. These task durations were confirmed with a qualified HDD contractor from Houston Texas. General Contractor labor and equipment resource application, and overhead expenses, were gathered from discussions with qualified Massachusetts general contractors. General contractor labor estimates accounted-for periods requiring continuous (24-hour), and typical (8-hour), operations, as well as varying labor demands by task (full 6-person crew, or reduced 3-person crew). Labor rates were per Massachusetts Prevailing Wage. Equipment rental and operating costs were from Equipment Watch Blue Book rates. Supply costs were secured via quote from qualified supply contractors. The estimate provides for upsizing the Section 56 crossing of the Saugus River to 30" diameter, as requested by the MWRA. The estimate carries fusible PVC pipe for HDD river crossing and ductile iron pipe for open trench installation on-land. Weston & Sampson believes that the program estimate is sufficiently conservative to support selection of an alternative HDD pipe material if preferred in preliminary design, as described further in Section 7.8. Spoils disposal assumes 50% will be disposed or reused at an in-state landfill, and 50% will be disposed or reused at an out-of-state landfill. Uniformed officers for traffic control are included.

- *Contingency* is included in the sum of twenty five percent (25%) of estimated construction, engineering, and land acquisition expense, per the MWRA's recommendations for feasibility study cost estimation.

The estimate is per March 2017 construction costs. The Engineering News Record Construction Cost Index (Boston) associated with this period is 13,710.37. A summary of the program cost estimate for Route 3 is presented in Table 9. A summary of the program cost estimate for Route 7 is presented in Table 10.

Description	Value
Construction	$6,347,180
Land Acquisition & Easements	$460,000
Engineering	$1,713,738
Contingency (25%)	$2,130,229
Grand Total:	$10,651,147

Table 9 - Program Cost Estimate Route 3

Description	Value
Item 1 - Construction	$5,884,093
Item 2 - Land Acquisition & Easements	$485,000
Item 3 - Engineering	$1,588,705
Item 4 – Contingency (25%)	$1,989,449
Grand Total:	$9,947,248

Table 10 - Program Cost Estimate Route 7

All installed pipe, fittings, and appurtenance are anticipated to have a useful life of greater than 30-years. Cathodic protection systems may require replacement over the lifecycle period, however the cost for this replacement is unsubstantial compared to overall project capital costs. Therefore, this review assumes that no substantial maintenance of the system will be required for the 30-year capital analysis period.

7.6 Schedule Estimate

Detailed schedule estimates were prepared for Route 3 and Route 7. Schedule estimation included identification of program tasks, defining sequence dependencies, and estimating duration required of tasks. Task duration assumptions were based on HDD design literature and discussion with qualified service providers. Project schedules, prepared in Microsoft Project, are attached as Appendix S. Notes describing the basis for construction duration, sequence, and seasonal restrictions are also included in Appendix S.

Schedule tasks included Procurement of a Consultant, Preliminary Design, Final Design, Permitting, Bid Ready Documents, Land Acquisition and Easements, Bidding and Award, and Construction.

- *Procurement of a Consultant* will result in securing contract engineering services from a consultant. 9-months have been allowed for procurement of a consultant.
- *Preliminary Design* was typically estimated to require 10-months, and will include survey, subsurface exploration, base map development, a preliminary design report, and preliminary

design plans and specification. A period for MWRA review and comment was included. Preliminary design is the first phase of contract engineering services.

- *Final Design* includes a complete engineered set of contract drawings and contract specification. Weston & Sampson assumed that Final Design activities would begin immediately after MWRA acceptance of the Preliminary Design Report. A period for MWRA review was allowed. Final Design is estimated to require 5-months.
- *Bid Ready Documents* incorporate revisions and requirements identified through Permitting, Land Acquisition, and stakeholder engagement. Bid Ready Documents were estimated to require 5-months and conclude 2-months following completion of Permitting.
- *Permitting* was estimated to begin after Preliminary Design documents are reviewed, approved, and amended. The duration of the Permitting period was 11-months. The Mass DEP Chapter 91 permit was the driver of the permitting duration (9-months to process) and was sequenced after securing Conservation Commission Order of Conditions.
- *Land Acquisition and Easements* involves negotiation of easements with project area land owners. Abutters should also be canvassed during this period. Land Acquisition and Easements should begin as soon as practical, therefore it is modeled to begin before completion of Procurement of a Consultant. The task will conclude after completing the Geotechnical, Hazardous Materials, Environmental, and Corrosion Investigation. Land Acquisition and Easements is allowed 12-months.
- *Bidding and Award* is estimated to require 6-months. This task will follow completion of all other tasks, and result in a secured construction contractor. As constituted, the program schedule completes Bid Ready Documents too late in the 2020 season to provide for construction mobilization in 2020, therefore a 90-day period is provided between completion of Bid Ready Documents and Advertisement for Bid. Timing bid later in the season, and more proximate to the intended construction start, will result in greater interest from bidders.
- *Construction* involves implementation of river crossing and on-land water main installation. Construction is the final phase of the project. Task duration was estimated as the sum of associated construction tasks, including mobilization, HDD river crossing pipe installation, open trench pipe installation, and surface restoration. Construction mobilization was estimated to require about 3-months. HDD site preparation was estimated to require about 42-days. HDD drilling operations were estimated to require about 14-days. HDD post-drilling operations were estimated to require about 45-days. Open trench pipe installation was estimated to require about 86-days for Route 3, and 64-days for Route 7. Given probable seasonal restrictions applicable to Route 3 work at the end of Point of Pines, it is estimated that open trench pipe installation will occur in the first half of the 2021, and HDD operations will occur in the second half of 2021. As Route 7 does not have this restriction, it is estimated that HDD will occur in the first half of the 2021, and open trench pipe installation will occur in the second half of 2021.

Schedule estimates for Route 3 and Route 7 include design and permitting performed over a 24-month period from March 2018 to March 2020, and bidding and award over a 6-month period from June 2020 to December 2020. Land acquisition and easement negotiation is advised to begin as soon as practical and conclude early in design. Construction of Route 3 might be phased with pipe installation in Rice Avenue and Hanson Street in spring/summer 2021, directional drill performed in summer/fall 2021 (after a threatened bird species vacates the Point of Pines area), and surface restoration and finishing works in fall 2021. Route 3 requires construction operations from April 2021 through October 2021 to complete the scope of work (approximately 7-months). Construction of Route 7 might be phased with directional drill performed in spring 2021, pipe installation in Rice Avenue and Hanson Street in summer 2021, and surface restoration in fall 2021. Route 7 requires construction operations from April 2021 through September 2021 to complete the scope of work (approximately 6-months).

7.7 Recommended Subsurface Exploration

Design of an HDD installation requires reliable subsurface information along the installation route to depths sufficient to support project design and construction. Sufficient and reliable subsurface information is critical to limiting the risk of differing subsurface conditions claims during construction for protection of the interests of the project owner.

The available subsurface information indicates the northern and southern land areas are formed of surficial fill layers of variable thickness and composition, overlying an organic soil layer, followed by a relatively thin sand layer and then marine clay with glacial till and bedrock. The river channel generally consists of a soft organic sediment layer of variable thickness overlying marine clay with glacial till and bedrock between 80 and 120 ft. below mudline.

An investigation program is proposed to collect information to define subsurface soil conditions and identify potential for obstructions along Route 3 and Route 7 alignments. It should be noted that the recommendations presented herein are based on preliminary information. As design progresses, the recommendations should be refined appropriately.

7.7.1 Design-Phase Geotechnical Investigation Recommendations

The issues to be addressed by subsurface explorations include:

- Defining subsurface conditions at proposed entry and exit site locations for evaluating measures to limit risks of ground collapse, and drill fluid breakout,
- Improving our understanding of subsurface conditions along potential HDD drill alignments and cut-and-cover pipeline installation alignments,
- Clarifying conditions at potential HDD obstructions such as the Lynn seawall and Point-of-Pines seawall, and
- Determining river bottom bathymetry and soft sediment thickness along the HDD alignments.

The recommended geotechnical investigation program includes test borings, exploratory excavations, field soil index testing, and geotechnical laboratory testing as described below.

<u>*HDD Bore Entry Site (Lynn Waterfront)*</u>

One test boring should be drilled within the anticipated bore entry pit footprint. The entry pit footprint in this area is approximately the same for both Routes 3 and 7, so one test boring is considered sufficient.

The boring should be advanced through surficial fill and organic soils using hollow stem auger drilling methods. Continuous split-spoon soil sampling should be conducted from ground surface through fill and organic soils until at least two samples are obtained in the underlying native marine clay.

The remaining boring depth may be advanced using drive-and-wash casing methods with split-spoon sampling conducted through the marine clay at 5 ft. intervals of depth (standard sampling interval) until the boring encounters the underlying glacial till or bedrock. Completed boreholes should be fully backfilled by tremie grouting with cement-bentonite grout (5% cement mix).

A test pit excavation program should also be conducted to identify conditions at the Lynn seawall along both potential HDD routes. Available information suggests a timber bulkhead at the edge of land supported by battered piles and by horizontal tie rods connected to a deadman anchorage system approximately 30 ft. inland of the bulkhead. Lengths of piles are unknown but are likely to be between 40 and 60 ft. Depths, types and spacing of horizontal tie rods are unknown. In addition, the tie rod anchorage system type, geometry and component spacing are also unknown. The test pit excavation program should be designed and conducted to identify this type of information for inclusion on subsurface profiles so that potential interference with HDD installation can be assessed and measures designed to reduce the risk of interference during construction.

Test pit excavations will need to comply with OSHA trenching regulations and should be backfilled to comply with the landowner's requirements, which would be ascertained during final planning of the test boring and test excavation program. Assume two days in the field with a tracked excavator will be required to complete the excavation program.

HDD Bore Exit Site (Revere Waterfront)

One test boring should be conducted within the footprint of each conceptual bore exit pit location on the Revere waterfront side of the project (two test borings total).

Each boring should be advanced through surficial fill and organic soils using hollow stem auger drilling methods. Continuous split-spoon soil sampling should be conducted from ground surface through fill and organic soils until at least two samples are obtained in the underlying native marine clay.

The remaining boring depth should be advanced using drive-and-wash casing methods with split-spoon sampling conducted through the marine clay at 5 ft. intervals of depth (standard sampling interval) until the boring encounters the underlying glacial till or bedrock. Completed boreholes should be fully backfilled by tremie grouting with cement-bentonite grout (5% cement mix).

The concrete seawall along the northern shore of the Point-of-Pines neighborhood likely has either a timber pile foundation or a boulder fill foundation. It is also possible there is no foundation other than native beach sand. In any event, the foundation conditions should be explored for potential interference with HDD installation as part of final design. A shallow test pit (3 to 4 ft. depth) along the land side of the blocks is recommended to access the foundation zone below the wall. Careful hand excavation below the wall from the test pit may be necessary to expose the foundation conditions. Assume one day of test pit excavation and documentation of condition will be required for this effort.

Cut-and-Cover Alignments

Test borings should be drilled along all cut-and-cover alignments at approximately 300 ft. spacing. The borings should be drilled using hollow-stem auger drilling methods with continuous split-spoon sampling to at least 20 ft. below grade. Completed boreholes should be fully backfilled with soil cuttings sealed with cold patch.

HDD Alignments

At least three test borings should be drilled along each potential HDD alignment (six test borings total) where they cross the mouth of the river. The borings should be advanced using drive-and-wash casing drilling methods from a barge-mounted drill rig. One boring should be located at approximately the center of the channel for each alignment. Two additional borings should be spaced along the remaining water crossing portion of each alignment. Water boring locations should be offset approximately 20 ft. laterally from the anticipated HDD alignments.

Continuous split-spoon samples should be collected from each boring within the upper 10 ft. below the river channel mudline to confirm the thickness and composition of soft sediments at each location. Thin wall tube samples (30-inch length) should be collected in the marine clay beginning at 10 ft. below mudline at 15 ft. to 20 ft. depth intervals, with split-spoon samples collected immediately before and after each tube sample and at 5 ft. depth intervals between tubes until the boring encounters glacial till or bedrock. Completed boreholes should be fully backfilled by tremie grouting with cement-bentonite grout (5% cement mix) to approximately 6 ft. below the mudline.

The thin wall tube samples should be properly sealed with wax after conducting field index testing (i.e. pocket penetrometer testing, Torvane shear testing and field classification), and carefully delivered to a geotechnical laboratory for testing. Each tube sample should be opened in the laboratory, processed and tested for index properties including pocket penetrometer and Torvane testing, Atterberg limits, natural moisture content, specific gravity and unit weight determinations and grain size distribution analyses (including hydrometer analyses).

It should be noted that project design should include detailed bathymetry of the river bottom and identification of the range of thickness and composition of soft sediments along the HDD alignment for evaluating minimum depth of cover for the entire alignment. This memorandum considers bathymetric sounding, sub-bottom profiling, and side-scan sonar as part of survey scope required for the project. As such, the estimated cost for those services is not included in the subtotals of Section 7.7.3, but rather in the detailed cost estimate allowance for “Survey and Basemap”. Geophysical survey for near surface obstructions (metallic objects, concrete/granite blocks) in the fill material near the HDD entry/exit area located in Lynn is included.

7.7.2 Design-Phase Environmental Investigation Recommendations

Review of available files from the Massachusetts Department of Environmental Protection (DEP) identified several known state-listed disposal sites within or proximate to the Section 56 project area. The review also identified the presence of contaminated historical fill materials on the Lynn side of the Saugus River as well as a closed municipal landfill formerly operated by the City of Lynn north of the proposed HDD entry point on Hanson Street. Based on these findings, an environmental investigation should be conducted to evaluate soil and groundwater conditions and assess the extent of oil and hazardous materials (OHM) that may be encountered. The investigation should also be performed to obtain representative characterization data that will assist with soil and groundwater management planning and obtaining necessary approvals or permits from off-site soil disposal facilities or regulatory agencies overseeing groundwater treatment/discharge.

The environmental investigation should be conducted concurrently with design-phase geotechnical investigations and include:

- Field screening exposed soil samples for visual/olfactory evidence of contamination (i.e., staining, odors, etc.) and jar headspace using a photoionization detector (PID).
- Installation of eight (8) groundwater monitoring wells to measure groundwater levels and characterize groundwater quality on the Lynn and Revere sides of the Saugus River; and
- The collection of soil and groundwater samples for laboratory analysis.

Soil and groundwater samples should be collected to representatively characterize materials that may be encountered during construction and facilitate future off-site disposal of surplus bore and excavation spoils. Specifically, soil samples should be collected from each boring, including those advanced along the HDD alignments beneath the Saugus River, at depth intervals corresponding to the anticipated depth of construction and analyzed for disposal characterization parameters in accordance with DEP's COMM-97-001 Policy, "Reuse and Disposal of Contaminated Soil at Massachusetts Landfills". Groundwater samples should be analyzed for all the parameters listed in Attachment III of EPA's NPDES Remediation General Permit using the methods specified in RGP Attachment VI.

7.7.3 Subsurface Exploration Estimated Cost and Schedule

Preliminary planning-level estimated ranges of costs for the explorations and laboratory testing described above, as well as the estimated engineering costs (i.e. program planning, permitting, monitoring, coordination, preparation of a geotechnical baseline report and project management) for the subsurface exploration and characterization are as follows:

Description	Cost Range
Subsurface Explorations	$ 90,000 to $110,000
Geophysics Survey	$ 40,000 to $ 50,000
Geotechnical Laboratory Testing	$ 15,000 to $ 20,000
Environmental Laboratory Testing	$ 20,000 to $ 25,000
Geotechnical Engineering	$155,000 to $180,000
Total Estimated Range:	$320,000 to $385,000

From execution of contracts, the schedule for subsurface exploration is estimated as follows:

Description	Duration
Planning, Permitting, and Coordination of Work	2-months
Execution of Field Operations	1-month
Laboratory Analysis	1-month
Prepare Geotechnical Report	1-month
Total Duration:	5-months

7.7.4 Required Permits for Subsurface Exploration

Permits in the matrix related to dredging and construction in the waterway are not applicable to exploratory drilling with the purpose of sample collection (ie Army Corps 404, CZM Consistency Determination, Mass DEP Chapter 91, among others). NPDES is not applicable due to limited area impacted. As work is not being performed on the bridge, a Mass DOT Access Permit will not be required. Permits related to historic review are not applicable. The MWRA does not require their 8m Permit for exploratory borings, although they do look for notification to their permitting department. MA DEP regulation related to remedial wastes is not applicable. The work is exempt from MA Division of Fish and Wildlife NHES as it in support of utility work and work near the habitat for a threatened bird species will be contained within the roadway.

- Digsafe - Required of all excavations, secured by the team executing work.

- Notice of Intent – Submittal required to the City of Revere and the City of Lynn Conservation Commissions, secured by the team executing work
- Street Opening Permit – To each the City of Revere and the City of Lynn as notice, secured by the team executing work.
- Department of Conservation and Recreation (DCR) Construction Access Permit – Required to access the DCR Lynnway. Recommend at least one of the borings at the project extent be within the roadway to identify typical pavement thickness and subbase characteristics. Permit should be secured by the team executing work.
- National Marine Fisheries, Section 7 of the Endangered Species Act - A Section 7 Consultation with National Marine Fisheries should be performed to verify whether the nature of work will require a permit.

7.8 Pipe Material Review

Route 3 and Route 7 involve bore entry near the end of Hanson Street in Lynn. This path will require a bore entry angle sufficient to pass under timber piles associated with the Lynn seawall, and steering sufficient to level the bore path in firmer blue clays above underlying softer clay and glacial till, while retaining sufficient depth of cover under the Saugus River bottom. Space for drill entry staging, and complete construction of the pipe string, appear to be available in privately parcels in the Lynn Harbor area provided easements can be secured.

The Section 56 water main is in the MWRA's High Pressure service zone which has a hydraulic grade line (HGL) of the 280 feet, relative Boston City Base (BCB) datum. At BCB elevation zero, which is approximately equivalent to mean low water level, working pressure based on HGL is estimated at 121 psi. With the proposed HDD pipe conceptually installed up to 50 feet below mean low water, the pipeline at the lowest-elevation point is estimated to have a working pressure of approximately 143 psi.

During HDD installation pipe experiences a combination of tensile, bending, and compressive stresses. These installation forces must be accounted for individually and in combination. They are significantly impacted by the installation alignment, borehole conditions, and fluid conditions. In addition to installation forces, pre-installation forces and operating stresses need to be considered. Often in long installations the installation stresses can exceed the operating stresses and become the determining factor in pipe dimension design. Pipe dimension selection should be calculated during the design phase of the project based on the design pipe route and subsurface conditions. Any reference to specific pipe thickness classes or dimension ratios herein are provided for comparison purposes per vendor rule of thumb estimation based on conceptual route length, depth, and operating pressure, and will vary from actual requirements to be identified in design.

Typical pipe materials used in HDD include steel, ductile iron ("DI"), high density polyethylene ("HDPE"), and fusible polyvinyl chloride ("FPVC"). These materials were screened for comparative advantage and disadvantage Section 4.7 of this report. In general plastic pipes (HDPE and FPVC) were identified as more advantageous than metal pipe (steel and DI) due to corrosion resistance, advantageous hydraulics throughout pipe lifecycle, and reduced installed costs. Where metal pipes will rely on coatings, encasement, and cathodic protection to reduce internal and external corrosion, plastic pipes do not similarly corrode in typical soil conditions. The interior profile of fused plastic pipes is smooth, and does not accumulate tuberculation on the interior. Supply cost of plastic pipe is typically less than metal pipe, and installation cost is generally less due to reduced product weight and ease of handling.

Jointing of pipe is critical in a HDD application. HDPE, FPVC, and Steel in HDD application would utilize continuously fused or welded joints. DI in HDD application would utilize restrained joints. Most restrained joint systems have bells which protrude and effectively increase the outside diameter of the installed pipe system, which increases bore diameter. Restrained joint DI pipe systems are often used in HDD installations where space limitations preclude assembly of a complete pipe string. One-joint-at-a-time assembly of restrained joints is referred to as a “cartridge” installation method. Fused and welded joints, executed in a controlled environment, provide for great confidence in the viability of the joint, allow for ready testing, and eliminate reliance on ancillary materials, such as gaskets, for long term pipeline integrity.

HDPE, FPVC, and steel, are available in standard size and material characteristics required of this potable water application. FPVC pipe of the size required by this project is specified for potable water use in ANSI/AWWA C900-16 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-In Through 60-In (recently superseded ANSI/AWWA C905). HDPE pipe for of the size required by this project is specified for potable water use in ANSI/AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings. Underground Solutions is the sole manufacturer of their patented/proprietary fusible PVC pipe system. Their “Fusible C-905” fusible PVC pipe for potable water is available in pipe sizes 14” to 36” in a variety of standard Dimension Ratios (DR). HDPE potable water pipe and fusing systems are an open market with many manufacturers producing pipe of a broad range of sizes and dimension ratios. HDPE, FPVC, and steel have been used in numerous potable water HDD applications of same or larger diameter.

Weston & Sampson summarizes herein key differences between pipe material alternatives FPVC, HDPE, and Steel, as they relate to HDD:

- As summarized previously, FPVC and HDPE have greater corrosion resistance, advantageous hydraulics throughout lifecycle, and reduced installed costs compared to steel. Where steel will rely on coatings, wraps, and cathodic protection to reduce internal and external corrosion, plastic pipes do not similarly corrode in typical soil conditions. The interior profile of fused plastic pipes is smooth, and does not accumulate tuberculation on the interior. Supply cost of plastic pipe is typically less than metal pipe, and installation cost is generally less due to reduced product weight and ease of handling.
- HDPE flexibility supports ease of installation. On land, the pipe string can be easily navigated around obstructions and oriented in-line with the bore path. For a 30” HDPE pipe, the minimum published radius of curvature is approximately 60-feet. For 30” FPVC it is approximately 670-feet. For 30” steel it is around 3,000-feet. FPVC pipe will require greater care to align bore path with pipe string orientation than HDPE, and steel will require significantly greater care to align relative both plastic options. Figures 1D and 2D, in Appendix O, demonstrate the maximum allowable radius of curvature overlaid on the Pipe String Staging area for Routes 3 and 7, respectively. In the bore hole, the maximum allowed deflection angle of drill rod joints will limit the radius of curvature practical of the bore hole. This will align the actual allowable bore-radius of curvature for HDPE to align more closely with that allowed by FPVC.
- HDPE is resilient through the rigors of installation due to its wall thickness, tolerance for abrasion, and elasticity. Fusible PVC and steel will require greater care in handling.
- Steel and FPVC have substantially greater stiffness than HDPE, which contributes to better resisting of external loads, such as earth loading should the bore hole collapse. Steel has substantially greater stiffness than each FPVC and HDPE. Estimated loadings on pipe will

require detailed review during design. At this time, it appears that each alternative can each be engineered to adequately accommodate anticipated loads.

- HDPE and steel have better resistance to recurring surge pressures than FPVC for comparable pressure class pipe. AWWA C905 requires FPVC pipe to sustain an occasional surge pressure 1.6 times maximum working pressure rating, but does not provide for additional allowance for recurring surge pressures. AWWA C906 requires HDPE pipe to sustain an occasional surge pressure 2 times maximum working pressure rating, and 1.5 times maximum working pressure for recurring surge pressures. The design team should consider whether the Section 56 pipeline is likely to be subject to recurring surge pressures.
- Some studies indicate that HDPE has inferior resistance to hydrocarbon permeability and chlorine induced oxidation. These risks may be limited given the actual subsurface conditions and wall thickness that will be required of HDD pipe installation. Each risk can be assessed during pipe selection in Preliminary Design.
- FPVC has a density of 1.40, which means it will sink in most aqueous solutions, reducing friction on the top of the bore hold due to floating of the pipe. HDPE pipe has a specific gravity of 0.95 and will float in an aqueous solution. In HDD application, a floating pipe incurs friction with the top of the bore hole and increase pulling force required.
- FPVC and steel have reduced wall thickness compared to HDPE, which means a smaller bore hole is required to install the same inside-dimension pipe. A larger bore diameter means additional reaming duration, additional drilling fluids required, and additional material disposal expense. Risks and expense increase with increased bore hole diameter.
- HDPE and steel are more resilient to cold temperatures during installation. FPVC becomes brittle in cold temperatures and it is not advised that it be installed in winter weather temperatures. Pipe fusing and installation would need to be coordinated for a period with low risk of freezing temperatures.
- FPVC and steel expand and contract less than HDPE from temperature variation and pipe stresses. This will facilitate connection of FPVC and steel to existing buried pipe at the HDD extents.

Typical pipe materials used in HDD include steel, DI, HDPE, and FPVC. Final pipe material selection should be determined in the design phase of the project based on detailed evaluation of existing conditions, design stresses, and required alignment geometry. Cost estimates for Route 3 and Route 7 in Section 7.5 carry FPVC. The cost for steel and ductile iron pipe installation will be greater than FPVC. The cost for HDPE pipe installation is approximately equivalent to FPVC, and will vary depending on the dimension ratio identified required in Preliminary Design.

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8.0 CONCLUSIONS

Inspection revealed that the existing Section 56 water main supported on the General Edwards Bridge is in poor to serious condition. Typical pitting on the exterior of the water main was 0.125 to 0.25 inches deep. Three (3) locations of previous pipe blowout were observed. The tower portions of the pipe were not visible for inspection due to existing insulation. Pipe extending to tunnel shafts, as well as at the top of each tunnel shaft, was observed in poor condition. Many pipe supports were observed in poor condition. The General Edwards Bridge is over 80-years old and currently rated “structurally deficient”. The water main in its existing location is exposed to risk from weather, as evidenced by current condition, and from human activities, as indicated by extensive graffiti on the water main at the north bridge abutment.

Routes for river crossing were reviewed from the Saugus River confluence with the Pines River to the west, through the mouth of the Saugus River at Lynn Harbor to the east. Installation methods including open trench river crossing, horizontal directional drilling, microtunneling, and removal and replacement on the bridge were considered. River crossing routes alternatives can generally be grouped in one of four geographic areas relative to the existing bridge:

- On Bridge (Route 8): Installed under the bridge and in a tunnel, in an alignment approximately congruous that of the existing water main.

- Abutting the Bridge (Route 4, Route 5): Included routes immediately adjacent to the existing bridge corridor. This area provided for more direct route alignments, but incurred substantial risk of encountering piles associated with existing and historic structures in the area, including those associated with historic docks and piers, the existing railroad bridge, the demolished historic bridge, the General Edwards Bridge, and fenders associated with each historic bridge structure.

- West of Bridge (Route 6): Included routes to the west of the bridge corridor. This area required long trenchless pipe installation lengths, substantial over land pipe installation, and encountered sensitive environmental receptors, developer interests, and local interests.

- East of the Bridge (Route 1, Route 2, Route 3, Route 7): Included routes to the east of the bridge corridor. This area provided accessible paths for open trench and microtunneling pipe installation at a modest distance from the bridge. Space constraints between the shore and a proposed development required HDD to be shifted farther east to find adequate space for staging areas and pipe string construction. River crossings to the far east required longer river crossing and on-land pipe installation, but provided reduced risk of encountering historic obstructions and foundation structures of the Lynn Seawall.

Each alternative was evaluated with respect to finished “pipeline performance” and “program risks”. Pipeline performance criteria included *Access for Maintenance*, *Protection Against Damage*, and *Hydraulics*, and program risks criteria included *Permitting Approval Difficulty*, *Technical Complexity*, *Construction Risk*, *Environmental Risk*, *Impact on Abutters & Motorists*, *Easements & Land Acquisition*, and *MassDOT/DCR Support*. Route alternatives were evaluated against criteria and assigned a score of one to five. The sum of ratings applied to pipeline performance and program risks criteria became the composite, or total, rating. Program cost and program schedule were estimated for each alternative.

Horizontal directional drill pipe installation from Hanson Street, in the City of Lynn, to Rice Avenue, in the City of Revere, provided for the two most highly ranked alternatives (Route 3 and Route 7). The microtunneling alternative was rated favorably from a performance and risk perspective, but had the highest cost and a longer schedule duration. The open trench river crossing alternative was comparable in cost to HDD options, but included greater environmental risk, greater permitting difficulty, and a longer schedule duration. The alternative for pipe replacement on the bridge scored less favorably due to reduced protection against damage, hydraulic limitations, greater technical complexity, and greater construction risk.

The two highly ranked horizontal directional drill routes each propose drill entry and pipe string construction from near Hanson Street in Lynn, but differ in their location of drill exit. Drill exit for Route 3 is near the end of the Point of Pines on Rice Avenue, and for Route 7 it is near the Point of Pines Yacht Club just off Rice Avenue. A focused comparison factors differentiating Route 3 and Route 7 is presented in Table 11.

Table 11 – Comparison of Route 3 and Route 7 (Part 1)

Criteria	Route 3	Route 7
Pipe Length	Requires a longer over-land pipe installation (1,700-ft in Revere and 1,200-ft in Lynn) and a shorter river-crossing (2,500-ft).	Requires a shorter over-land pipe installation (500ft in Revere and 1,200-ft in Lynn) and a longer river-crossing (2,700-ft).
Protection Against Damage	The location of crossing is at the broadest point in the river mouth which will reduce opportunity for scour of overlying earth by tidal and river flows over time. Reduced length of crossing the Lynn seawall will reduce risk of damage as structure is maintained or replaced in the future.	A longer route crossing the existing Lynn seawall, close proximity to the Lynn Fishing Pier, close proximity to the Point of Pines Yacht Club moorings, and close proximity to the City of Revere Pump Station discharge – all result in a greater risk of damage as existing structures are maintained or replaced in the future.
Permitting Approval Difficulty	NHESP review will be required due to habitat for a threatened species located on the adjacent barrier beach in Revere.	No NHESP review required.
Technical Complexity & Construction Risk	Risk of encountering unknown historic piles at this location is reduced as historic maritime development was typically upriver, closer to the General Edwards Bridge. Complexity and risk is reduced due to crossing the Lynn seawall at an angle closer to perpendicular (compared to Route 7). This reduces probability of conflict with the seawall and increases likelihood that a conflict can be remedied through course correction.	The alignment passes closer to known existing structures, and location is believed to have greater probability of containing unknown historic structures. Complexity and risk are increased due to a crossing angle farther from perpendicular (compared to Route 3) through features such as the Lynn seawall and historic power line foundations. This increases probability of conflict and reduces likelihood that a conflict can be remedied through course correction.

Table 11 – Comparison of Route 3 and Route 7 (Part 2)

Criteria	Route 3	Route 7
Impact on Motorists	This route will impact residential abutters in the Point of Pines area more significantly due to longer overland pipe installation in Revere (1,700 feet) and a bore exit pit located within Rice Avenue.	This route will impact residential abutters in the Point of Pines area less significantly due to reduced overland pipe installation in Revere (500 feet) and a bore exit pit located outside of the roadway.
Easements & Land Acquisition	Risk exists securing permanent easement with the Point of Pines Beach Association to allow for occupation of lands between Rice Avenue and the mean low water line.	Risk exists securing temporary and permanent easements with the Point of Pines Yacht Club and City of Revere (Pump Station Site).
Cost (ENR Boston CCI 13,710.37)	Construction: $6,347,180 Easements: $460,000 Engineering: $1,713,738 Contingency (25%): $2,130,229 Grand Total: $10,651,147	Construction: $5,884,093 Easements: $485,000 Engineering: $1,588,705 Contingency (25%): $1,989,449 Grand Total: $9,947,248
Schedule	7 months of active construction operations and an estimated project completion date in October 2021	6 months of active construction operations, and has an estimated project completion date in September 2021

With the information available at this time of this feasibility study, it is Weston & Sampson's opinion that Route 7 has greater construction risk than Route 3. Weston & Sampson recommends that both Route 3 and Route 7 be carried forward into preliminary design for further evaluation. As detailed in Appendix Q, risks associated with obstruction by the seawall (DES-009, CON-001, CON-002), easement acquisition (DES-005, DES-006), and abutter concerns (DES-001, DES-002, DES-003, DES-004, CON-013) will be better understood in preliminary design after execution of the recommended subsurface exploration program, engagement of abutters, and initiation of access/easement negotiation. The additional subsurface exploration required to evaluate two alternatives includes four additional borings and one additional test pit, so overall additional resource expenditure is modest. Using the preferred Route 3 program cost and schedule for program capital planning will secure a more conservative budgetary cost and schedule estimate.

Each route will require land access/acquisition agreements and/or easements to provide for construction access and pipeline occupation. A summary of easement requirements is presented in Table 12.

Map Parcel ID	Owner	Additional Description	Location	Easement Type	
				Route 3	Route 7
034-752-077	WMI Lynn LLC	(O'Donnell)	Riley Way	Permanent & Temporary	
034-752-075	Massachusetts Electric Co	(National Grid)	Riley Way	Temporary	
050-752-055	Massachusetts Electric Co	(National Grid)	Riley Way	Temporary	
033-752-065	City of Lynn		Marine Blvd	Permanent	
034-759-003	Capri Lynn Properties Ltd	(Walmart)	780 Lynnway	Temporary	
(unknown)	City of Revere	(Pump Station)	Rice Ave	(N/A)	Permanent & Temporary
14-192O-14A	Point of Pines Yacht Club		28 Rice Ave	(N/A)	Temporary
14-192O-23	Point of Pines Beach Association Inc		Rice Ave	Permanent	(N/A)

Table 12 – Probable Land Acquisition and Easements Routes 3 and 7

Schedule estimates for Route 3 and Route 7 include design and permitting performed over a 24-month period from March 2018 to March 2020, and bidding and award over a 6-month period from June 2020 to December 2020. Land acquisition and easement negotiation is advised to begin as soon as practical and conclude early in design. Construction of Route 3 might be phased with pipe installation in Rice Avenue and Hanson Street in spring/summer 2021, directional drill performed in summer/fall 2021 (after a threatened bird species vacates the Point of Pines area), and surface restoration and finishing works in fall 2021. Route 3 requires construction operations from April 2021 through October 2021 to complete the scope of work (approximately 7-months). Construction of Route 7 might be phased with directional drill performed in spring 2021, pipe installation in Rice Avenue and Hanson Street in summer 2021, and surface restoration in fall 2021. Route 7 requires construction operations from April 2021 through September 2021 to complete the scope of work (approximately 6-months).

In conclusion, Weston & Sampson recommends abandoning the existing Section 56 crossing of the Saugus River and replacing it with a new river crossing, installed via horizontal directional drill, from Hanson Street in Lynn to Rice Avenue in Revere. Route 3 and Route 7 should be carried forward into preliminary design. Preliminary design activities should advance understanding of risks associated with obstructions, abutter concerns, and easements, and facilitate route selection. Open cut pipe installation will be required on land to connect the new river crossing to the existing Section 56 water main in the Lynnway. Route 3 has an estimated program cost of $10,651,147 (March 2017 ENR Boston CCI 13,710.37), requires 7-months of construction operations, and has an estimated project substantial completion date in October 2021. Route 7 has an estimated program cost of $9,947,248, requires 6-months of construction operations, and has an estimated project substantial completion date in September 2021.

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ATTACHMENT N

Public Notice of Environmental Review

PUBLIC NOTICE OF ENVIRONMENTAL REVIEW

PROJECT: MWRA Section 56 Water Pipeline Replacement Project

LOCATION: Lynn and Revere, at the mouth of the Saugus River

PROPONENT: Massachusetts Water Resources Authority

The undersigned is submitting an Expanded Environmental Notification Form ("EENF") to the Secretary of Energy & Environmental Affairs on or before 7/31/2023

This will initiate review of the above project pursuant to the Massachusetts Environmental Policy Act ("MEPA," M.G.L. c. 30, ss. 61-62L). Copies of the EENF may be obtained from:
Katherine Ronan, Katherine.ronan@mwra.com, 617-788-1177

Electronic copies of the EENF are also being sent to the Conservation Commission and Planning Board of Lynn and Revere

The Secretary of Energy & Environmental Affairs will publish notice of the EENF in the Environmental Monitor, receive public comments on the project, and then decide if an Environmental Impact Report is required. A site visit and/or remote consultation session on the project may also be scheduled. All persons wishing to comment on the project, or to be notified of a site visit and/or remote consultation session, should email MEPA@mass.gov or the MEPA analyst listed in the Environmental Monitor. Requests for language translation or other accommodations should be directed to the same email address. Mail correspondence should be directed to the Secretary of Energy & Environmental Affairs, 100 Cambridge St., Suite 900, Boston, Massachusetts 02114, Attention: MEPA Office, referencing the above project.

By Massachusetts Water Resources Authority

AVISO PÚBLICO DE REVISIÓN AMBIENTAL

PROYECTO: MWRA Sección 56 Proyecto de Reemplazo de Tubería de Agua

UBICACIÓN: Lynn y Revere, en la boca del Río Saugus

PROPONENTE: Massachusetts Water Resources Authority

El abajo firmante presentará un formulario de notificación ambiental ("ENF") al Secretario de Energía y Asuntos Ambientales el día
31/7/2023 o antes.

Esto iniciará la revisión del proyecto anterior en conformidad con la Ley de Política Ambiental de Massachusetts ("MEPA", Ley General de Massachusetts [M.G.L.], capítulo 30, secciones 61-62L). Se pueden obtener copias del ENF en:
Katherine Ronan
Katherine.ronan@mwra.com
617-788-1177

También se enviarán copias electrónicas del ENF a la Comisión de Conservación y la Junta de Planificación de Lynn y Revere**.**

El Secretario de Energía y Asuntos Ambientales publicará un aviso del ENF en *Environmental Monitor*, recibirá comentarios públicos sobre el proyecto y luego decidirá si se requiere un informe de impacto ambiental. También se puede programar una visita al sitio o una sesión de consulta remota sobre el proyecto. Todas las personas que deseen hacer comentarios sobre el proyecto, o ser notificados de una visita al sitio o una sesión de consulta remota, deben enviar un correo electrónico a MEPA@mass.gov o al analista de MEPA que figura en *Environmental Monitor*. Las solicitudes de traducción de idiomas u otras adaptaciones deben enviarse a la misma dirección de correo electrónico. La correspondencia por correo debe dirigirse a Secretary of Energy & Environmental Affairs, 100 Cambridge St., Suite 900, Boston, Massachusetts 02114, Attention: MEPA Office, haciendo referencia al proyecto anterior.

Por Massachusetts Water Resources Authority