SINGLE ENVIRONMENTAL IMPACT REPORT

EEA No./Project ID 16749: MWRA Section 56 Water Pipeline Replacement Project

Revere and Lynn, Massachusetts

Application of:

Massachusetts Water Resources Authority

Submitted by:

AECOM

April 2024

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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. Without this segment of the Section 56 water main, the Northern High Service Zone has been without redundancy and thus vulnerable to failure. 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.

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, Route 7 and Horizontal Directional Drilling (HDD) were selected as the preferred alternatives and are presented in this Single Environmental Impact Report (SEIR).

2. Project Description

The following sections provide a description of the project site, project goals, and major work activities that will 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 lot. 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” and Hanson Street in Lynn. The project's southerly and northerly terminus points connect to the existing Section 56 water main on North Shore Road in Revere and the Lynnway in Lynn, respectively. The proposed pipeline route can be seen in **Figure 1**. Site photos can be found in **Attachment A**. The Expanded Environmental Notification Form (EENF) was submitted to MEPA on July 31st, 2023. On September 15th, 2023, MWRA’s request to authorize a SEIR was approved.

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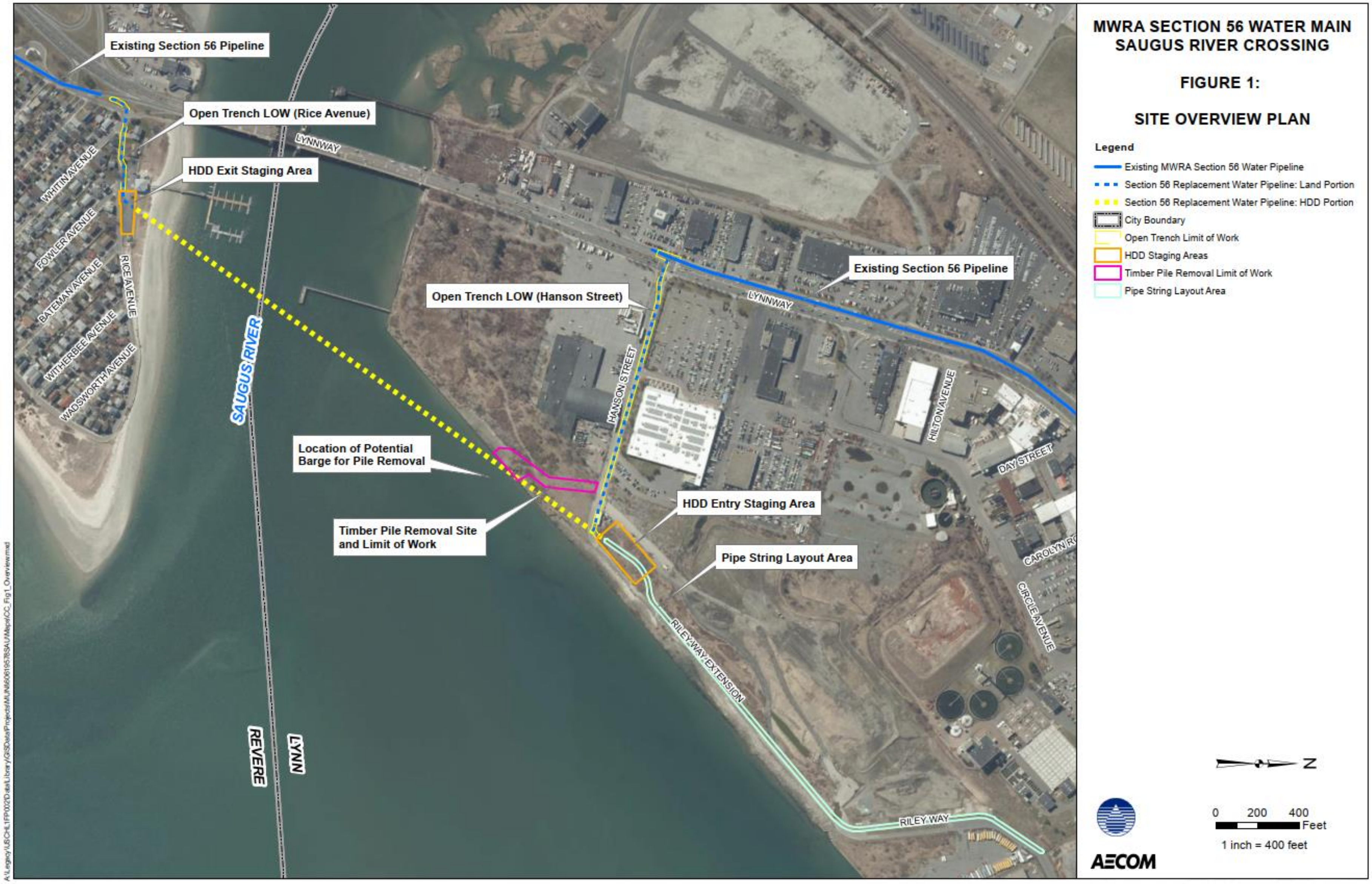


Figure 1. The proposed pipeline route, including two terrestrial portions (Lynn and Revere), and the section beneath the Saugus River. The terrestrial portions of the proposed water main will join with the existing Section 56 pipeline at the ends of Hanson Street and Rice Avenue.

2.2. Project Goal

The goal of the Project is to construct a new water pipeline that will replace the portion of Section 56 that was removed from the General Edwards Bridge in 2018 due to corrosion. Without this connection, the MWRA Northern High Service Zone is vulnerable to failure. This new pipeline will reestablish the connection of Section 56 on both sides of the river in Revere and Lynn and reestablish system redundancy previously provided by this water main, which is crucial to protecting public and environmental health.

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 will be installed via Horizontal Directional 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 various limits of work.

Table 1. Limits of Work

City	Limit of Work	Area (sq ft)	Purpose
Revere	Rice Avenue pipeline installation	3,580	Installation of terrestrial pipeline via traditional cut-and-cover methods within existing paved roadway.
	HDD Exit Staging Area (Point of Pines Yacht Club Parking Lot)	12,650	Equipment staging area for horizontal directional drilling pipe string exit point. Location is a paved parking lot.
Lynn	Hanson Street pipeline installation	8,580	Installation of terrestrial pipeline via traditional cut-and-cover methods within existing paved roadway.
	HDD Entry Staging Area	36,320	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	29,720	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	51,230	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 B**. The new water main marine section will 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

Previously (and as reflected in the Environmental Notification Form and attached documents), the terrestrial pipeline to be installed in Lynn and Revere was designed at 20 inches in diameter. Refinement to the MWRA's hydraulic model resulted in refinement to the pipe size selected. The terrestrial pipeline as designed at this time will be 24 inches in diameter and will connect to the existing 20-inch diameter pipeline.

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 will be 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 will constantly move as construction progresses. 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 be discharged to either 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 five feet of cover where possible. The project will comply with applicable regulations and requirements per the National Pollutant Discharge Elimination System (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) onshore alignments will be connected via a section of pipe in the ground beneath the riverbed of the Saugus River. The Environmental Notification Form and attached documents indicated that a 20-inch diameter pipe would be installed. However, refinement to the MWRA's hydraulic model resulted in refinement to the pipe size selected. It is proposed that this 30-inch diameter pipe be high-density polyethylene (HDPE) and installed via HDD. HDD is a method of underground utility installation that entails drilling a small-diameter pilot hole at a relatively shallow angle along the pre-determined curved alignment, enlarging the borehole with one or more passes of a reamer, and then installing the pipeline through the enlarged borehole. HDD is typically employed to avoid obstacles and minimize surface impacts. The borehole will be enlarged up to 48-inches in diameter. The length of the pipe beneath the Saugus River will be approximately.2,120 feet. Approximately 640 feet will be installed in upland areas to the entry and exit pits in Lynn and Revere respectively.

2.3.3 Appurtenances

The proposed 24-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. The only above-ground impacts resulting from the installation of this water main will be the installation of six manholes (three in Lynn and three in Revere).

2.3.4 Dredging

The 48-inch borehole to be drilled into the ground beneath the water of the Saugus River will displace a volume of material (approximately 1,300 cubic yards). Additionally, up to thirty 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 riverbed, removal thereof is considered dredging (the volume of the piles to be removed constituting approximately 100 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 H-beam 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 B** (specifically, C-110 Lynn Bulkhead Access Plan and C-111 Existing Pile Location Plan and Notes) 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 reestablish the connection of Section 56 on both sides of the river in Revere and Lynn. 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 no replacement or reconnection of the Section 56 pipeline that was removed due to corrosion. 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. Waterway Avoidance Alternative (310 CMR 9.12(2)(d))

The waterway avoidance alternative would require a Section 56 pipeline route to avoid the Saugus River. In their review comments on the EENF, MassDEP requested that further information be provided regarding this alternative, and to allow the Secretary of Environmental Affairs to make a determination regarding the water dependency of the proposed project in the SEIR MEPA Certificate. It is not possible to install the pipeline without crossing underneath the Saugus River. As described above in **Sections 1**and **2**, Section 56 includes existing pipeline on either side of the Saugus River in Revere and Lynn. The goal of the project is to reconnect these two existing segments. Therefore, the pipeline must cross the Saugus River at some point.

The only alternative that would avoid impacting the waters of the Saugus River would be to install the pipeline on the General Edwards Bridge. This alternative was evaluated, but as described below in **Section 3.3** is not feasible. The General Edwards Bridge is deemed structurally deficient by MassDOT, and the Department is in the planning phase to replace this 87-year-old structure. The construction bid date for a new General Edwards Bridge is in 2028, and the construction period is at least five years and possibly longer. Installing the Section 56 replacement section on the bridge would cause a significant and unacceptable delay to the pipeline replacement, which is needed to provide water supply system redundancy for several communities. The pipeline would also be far less protected from severe weather events and damage if placed on the bridge, similar to the original section that was removed due to corrosion.

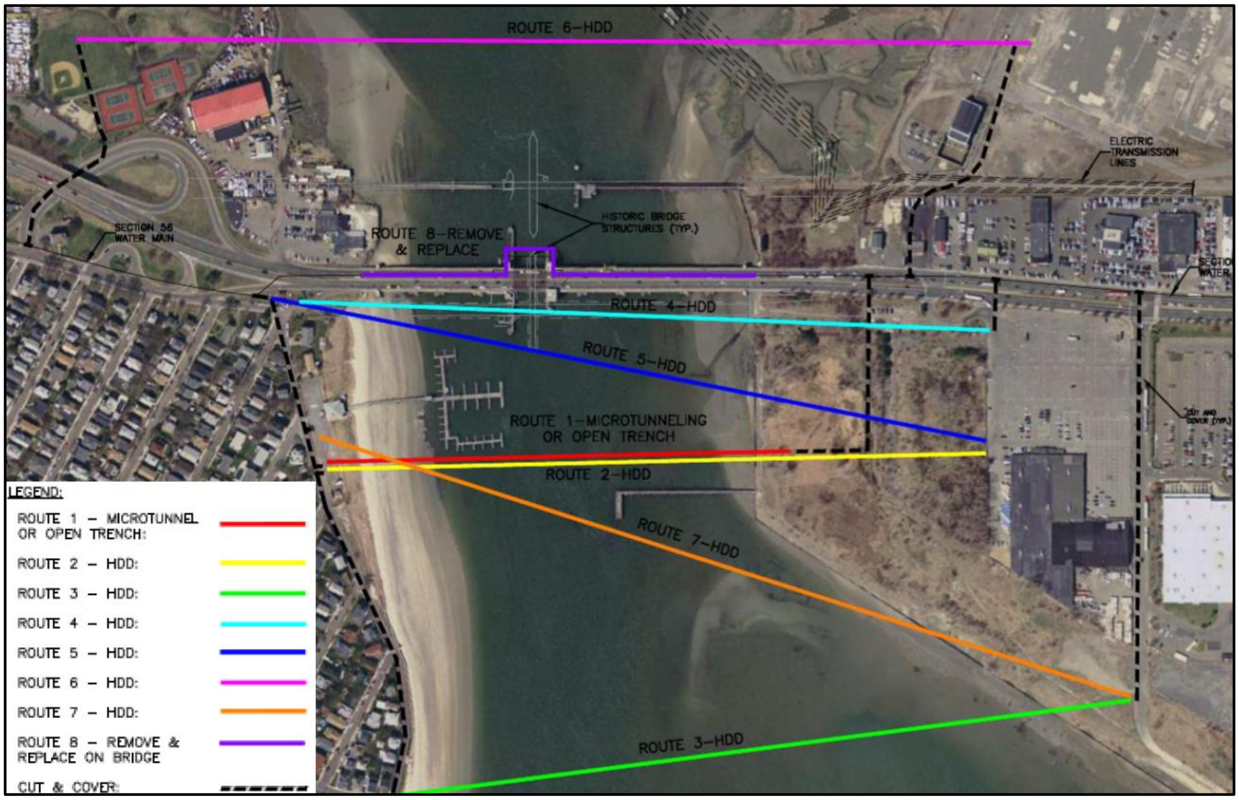
Any other alternatives to locate the Section 56 replacement further inland would have a substantially greater footprint of disturbance, including impacts to the Rumney Marsh Reservation Area of Critical Environmental Concern (ACEC), and would still require crossing the Saugus River at some location upstream. With consideration of the environmental impact and impacts to the surrounding environmental justice communities, and from an overall logistics perspective, an alternative of locating the pipeline away from tidal or inland waters is not considered viable. Thus, the project meets the definition of water-dependent in accordance with 310 CMR 9.12(2)(d).

3.3. Route and Installation Method Alternatives Analysis

In 2017, MWRA's consultant conducted an alternatives analysis that analyzed four pipe installation methods and nine routes for the new pipe placement. This analysis can be found within the Feasibility Study in **Attachment C**. Appendix L of the Feasibility Study provides the Matrix for Screening & Ranking of Alternatives Rating Summary (Alternatives Rating Matrix), which can also be found in **Attachment C**. The criteria considered within the Alternatives Rating Matrix included Access for Maintenance, Protection Against Damage, Hydraulics, Permitting Approval Difficulty, Technical Complexity, Construction Risk, Environmental Risk, Impact on Abutters and Motorists, Easement and Land Acquisition, and MassDOT/DCR Support. Overall cost and construction duration were also considered but were not assigned a rating.

Eight route alternatives were identified and characterized for the pipeline replacement and installation. **Figure 2** shows all routes over an orthophoto. This figure and additional details about route alternatives can be found in the Feasibility Study (**Attachment C**).

Figure 2. Eight Route Alternatives Considered in the Feasibility Study.



East of the General Edwards Bridge, four alternative routes were proposed which included Route 1, Route 2, Route 3, and Route 7. This area provides accessible paths for open trench and microtunneling pipe installation at a safe distance from the bridge. Space constraints between the shore and the proposed HDD pipeline installation pits required HDD sites to be shifted farther east to find adequate space for staging areas and pipe string layout. These spacing constraints required the preferred routes and on-land pipe installations to have a longer river crossing compared to other proposed alternatives.

Two HDD pipeline route alternatives were proposed abutting the General Edwards Bridge, which included Route 4 and Route 5. These routes were immediately adjacent to the bridge corridor and provided a more direct alignment for the pipeline installation. However, these routes were not feasible, as they would require space in Lynn that is currently being utilized by an ongoing construction project.

One HDD pipeline route alternative was proposed for installation just west of the bridge. This area required long trenchless pipe installation lengths and substantial overland pipe installation. Pipe installation via HDD was most appropriate for this area due to long river crossing lengths.

One pipeline replacement route alternative was proposed for installation on the General Edwards Bridge, where the previous pipeline route was located. The pipeline would be installed under the bridge and in a tunnel in an alignment approximately congruous to that of the existing water main. This route is not feasible due to the needed replacement of the General Edwards Bridge at some point in the near future. The “Environmental Risk” section of the matrix (also shown in **Table 2**) captured the estimated risk to the environment by each alternative.

Receptors considered included habitats, water quality, and species of concern. Risk associated with the remediation of hazardous/contaminated materials encountered was also considered. Each category was assigned a risk multiplier on a scale of 2 to 5, with 2 being low risk and 5 being very high risk. Microtunneling Route 1b posed the lowest environmental risk, with a score of 2. HDD Routes 2, 3, 4, 5, and 7 all scored a 3. HDD Route 6 and Remediation and Replacement Route 8 scored a 4. Open Trench Route 1a posed the greatest environmental risk to the project area, with a score of 5.

Table 2. Quantified Categories of Potential Environmental Impacts. Assessment Performed by Weston and Sampson Feasibility Study, Included in Attachment C.

Alternative	Length of Route (Linear ft)	Construction (months)	Permitting Approval Difficulty*	Environmental Risk Rating*	Impacts on Abutters and Motorists*
Route 1A - Open Trench	1,250	10	5	5	4
Route 1B - Microtunnel	1,400	11	2	2	2
Route 2- HDD	2,050	9	2	3	4
Route 3- HDD	2,500	9	3	3	3
Route 4- HDD	2,150	9	2	3	5
Route 5- HDD	2,350	9	2	3	4
Route 6- HDD	3,000	10	3	4	4
Route 7- HDD	2,700	9	2	3	2
Route 8 – Replace on General Edwards Bridge	N/A	10	4	4	4

* 1 low-5 high

The installation methods included open trench river crossing, 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. 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, greater environmental risk, and greater construction risk.

Conceptual impacts to environmental resource areas associated with each of the nine alternatives evaluated in the 2017 Feasibility Study are summarized in **Table 3**. For the purposes of alternatives comparison, the analysis summarized by this table reflects only construction impacts, since permanent impacts of all alternatives would be minimal. Additionally, impacts to Coastal Beach and Coastal Bank are not included in this conceptual overview as these two resource areas require site-specific delineations and are not listed in the MassGIS DEP Wetland Datalayer.

Table 3. Summary of the Estimated Environmental Impacts of Nine Route Alternatives.

Route/Installation Method	Total Impact Area (Sq ft)	200-foot Riverfront Area (Sq ft)	Barrier Beach System (Sq ft)	Bordering Land Subject to Flooding (Sq ft)*	ACEC (Sq ft)	NHESP Priority Habitat of Rare Species (Sq ft)	NHESP Estimated Habitat of Rare Species (Sq ft)	Article 97 Openspace (Sq ft)	Total Quantified Environmental Impact (Sq ft)**
1a – Open Trench	134,630	41,000	36,010	134,630	0	15,750	15,750	19,700	262,840
1b - Microtunnel	129,620	41,190	17,810	129,620	0	0	0	28,220	216,840
2 – HDD	97,330	27,250	17,970	97,330	0	0	0	7,660	150,210
3 – HDD	87,650	8,560	24,040	87,650	0	3,310	3,310	400	127,270
4- HDD	91,030	13,110	13,740	85,340	0	10	10	24,090	136,300
5 – HDD	94,810	13,100	13,740	89,120	0	0	0	18,910	134,870
6 – HDD	62,380	14,470	19,190	62,380	15,990	0	0	17,590	129,620
7 – HDD	96,880	16,120	17,810	96,880	0	0	0	400	131,210
8 – Replace on General Edwards Bridge	13,740	2,640	13,740	8,050	0	0	0	13,740	38,170

*No permanent loss of flood storage will occur as all areas will be restored to existing grade at project completion.

**Calculated as the cumulative sum of all resource areas/protected areas listed in this table.

As noted above, due to various screening criteria, Alternatives 1B and 8 were not preferred due to constructability and cost. Alternative 1A resulted in a substantially greater impact due to the use of open-cut versus trenchless technologies for pipeline installation. While Alternative 6 ranks fairly low on Total Quantified Environmental Impact (**Table 3**), this route would have resulted in impacts to the Rumney Marsh Area of Critical Environmental Concern (ACEC). Alternatives 2, 3, 4, 5, and 7 were identified to have similar environmental impacts. However, since the 2017 Feasibility Study, a 550-unit apartment development construction project has begun at 800-810 Lynnway, which is the area that would be needed for a Lynn HDD staging area for Alternatives 2, 4, and 5. The presence of this project in that location renders these alternatives technically infeasible within the timeline proposed by this project. As noted below, Alternatives 3 and 7 were selected for further geotechnical analysis.

3.4. Route 3 and Route 7 Weighted Route Selection

The two pipe replacement alternatives selected for further geotechnical analysis both extend from Hanson Street in the City of Lynn to Rice Avenue in the City of Revere and were designated Route 3 and Route 7. Both routes connect to the Section 56 water main in Revere on the North Shore Road/Lynnway near the ramp onto State Route 1A North and in Lynn on the Lynnway (State Route 1A) opposite Hanson Street.

In 2020, AECOM conducted geological boring investigations along Routes 3 and 7. 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. This geotechnical boring data was used to build the criteria list for HDD Constructability Items in the Weighted Route Selection Matrix. The Weighted Route Selection Matrix summarizing the scoring of Routes 3 and 7 is provided in **Attachment C**. Scores found within the HDD Constructability section of the Weighted Route Selection Matrix are based on the HDD Constructability Risk Register, also found in **Attachment C**. The Risk Register included a wider range of categories and items but was narrowed down to the most critical items for the Weighted Matrix. The scores for items within the Risk Register are relatively the same to those within the Weighted Matrix, but each item was re-scored once it was included in the Weighted Matrix. A lower score indicates that a route has a lower impact on the various items and categories within consideration.

Route 7 had a high HDD Constructability High Impact score of 145 within the Weighted Matrix but scored quite low on the Other Project Items category. Route 3 had a relatively lower score of 80 within the HDD Constructability High Impact category but scored very high in the Other Project Items category. The Other Project Items category included items such as impacts to public safety, public utilities, and impacts to residents of the Point of Pines community (Revere). Although both offer 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. Route 7 also scored lower overall on the Weighted Route Selection Matrix. Therefore, Route 7 is the route with less impact on the Barrier Beach System and the communities surrounding the project site.

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 SEIR; 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 in Revere 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.

In addition to the existing conditions records review, an exploration program consisting of bathymetric, side scan, and sub-bottom sonar surveys, surface geophysical surveys, land and marine borings, vibracore sampling, test pit excavation, and environmental, corrosion, and geoarchaeological soil sampling was performed to gather data for the design and construction of the proposed pipe. In addition, a laboratory testing program consisting of geotechnical, soil corrosion, and environmental testing was also completed.

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 from December 14 through 16, 2020. The surveys were intended to map current bathymetry (bed elevations), characterize sediment stratigraphy (overburden thickness), and identify surficial bed features that 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 3** is a bathymetric map depicting site conditions using 1.0-foot NAD83 contours.

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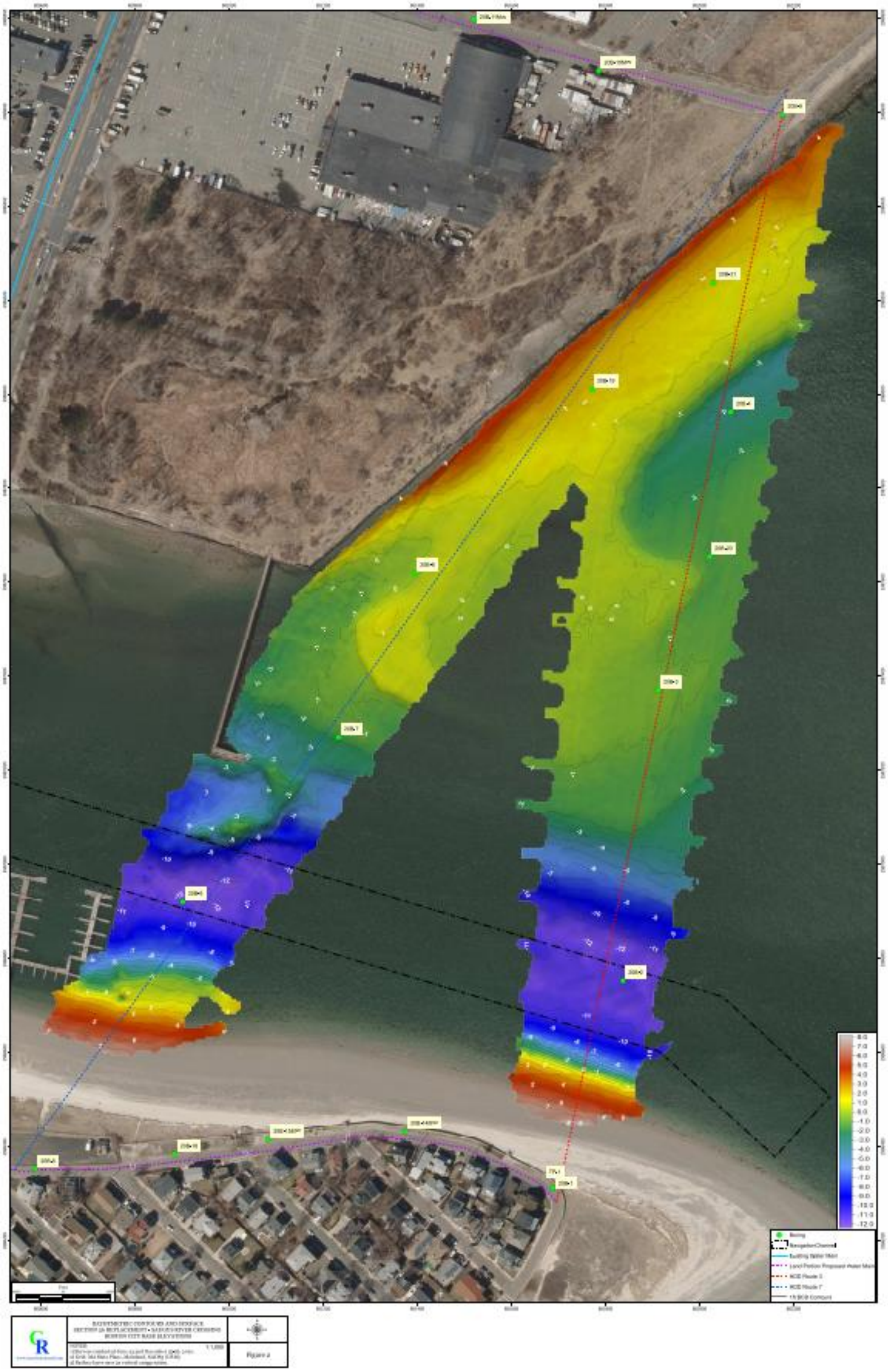

Figure 3. Bathymetric Contours and Surface (December 2020).

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.

4.1.2 Geotechnical 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 4**.

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.

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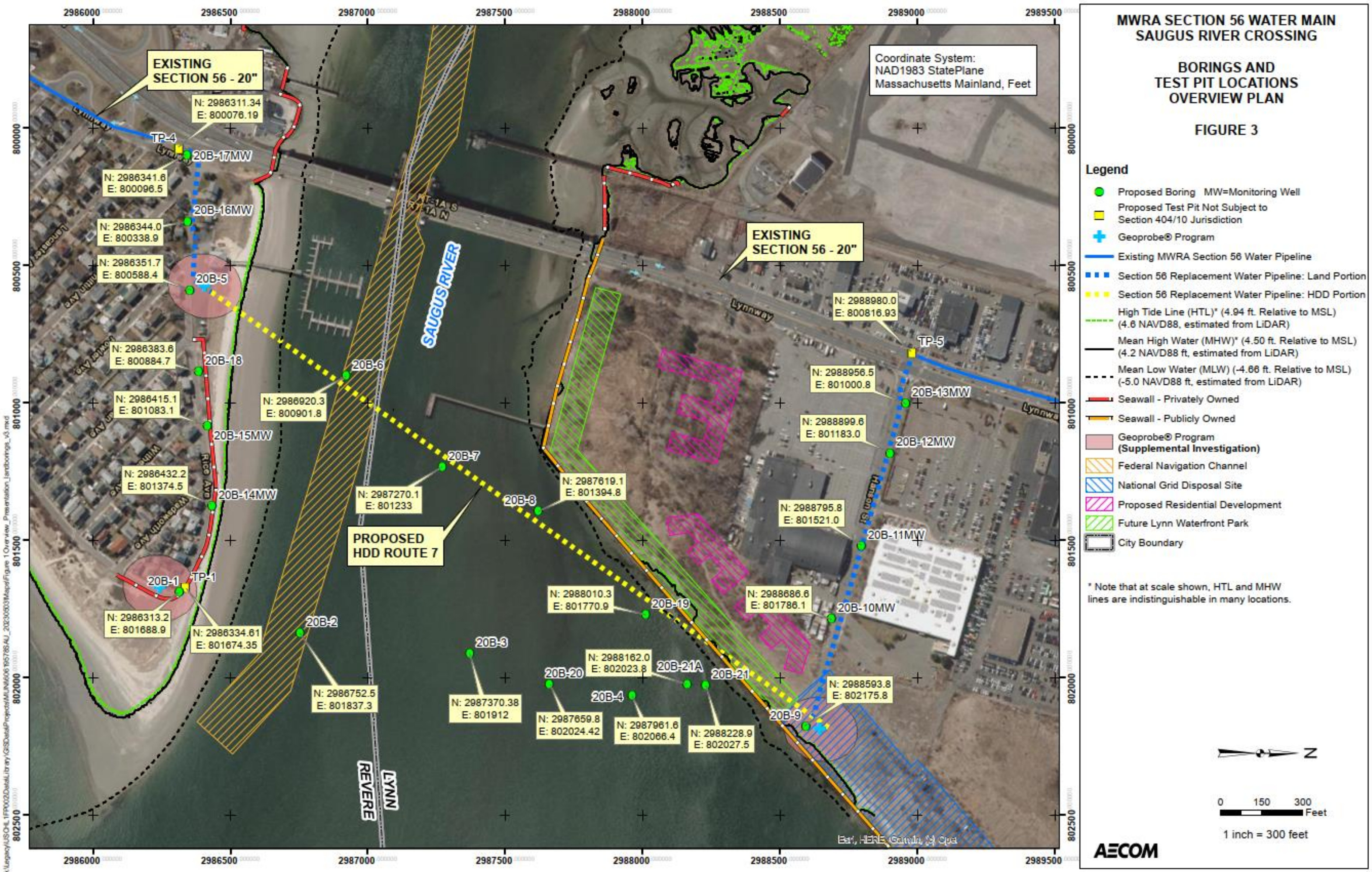


Figure 4. Geotechnical Borings and Test Pit Locations Overview Plan.

4.1.2.1 Hanson Street, Lynn Terrestrial Geotechnical Borings

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 Terrestrial Geotechnical Borings

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) Marine Geotechnical Borings

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 D** and **Attachment E** 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 an 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 will be the pipe string laydown area, which will 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 professional 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 (United States Army Corps of Engineers [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, Land Under Water, Land Under the Ocean, 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 F**.

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 5** 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.

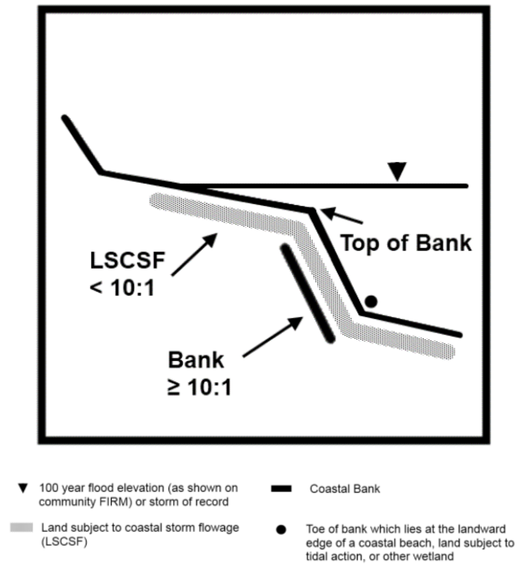


Figure 5. Scenario D from the Coastal Manual.

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 F**. 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 is adjacent to but does not overlap with Priority Habitat of the Piping Plover, (*Charadrius melodus),* which is located 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 septentrionali*s), 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 was Critical Habitat for right whales (feeding area) in the project area. 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 G**.

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 releases of drilling fluid or mud loss (frac-outs) occurring during the water main installation that would migrate up the strata or to the surface. Based on these results, no further marine archaeological investigations are recommended or required by BUAR (see communication in **Attachment G**).

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 6** (and **Figure 2A** in **Attachment F)**. 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 6. 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 4** with roadway classification and jurisdiction indicated.

Table 4. Functional Classification and Jurisdiction of Impacted Roadways

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

Source: Massachusetts geoDOT GIS application portal

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

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 this parcel is limited to mixed herb-level grasses. See **Attachment A** 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 A** 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 (EJ) 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 EJ populations either in whole or in part within the designated geographic area or DGA (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 H** have maps of the populations in a one-mile radius color coded by EJ criteria. **Table 5** provides a summary. The full list of Environmental Justice populations within five miles of the project site can be found in **Attachment H**.

Table 5. Environmental Justice Block Groups 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 (MA DPH EJ 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.

The 110% of Statewide Rate row of **Table 6** indicates the Vulnerable Health EJ Criteria thresholds above which a community has evidence of higher-than-average rates of environmentally related health outcomes. These thresholds are 110% greater than the 5-year average state rate or prevalence.

As shown in **Table 6**, Revere meets two of the criteria (Childhood Asthma ED Visits and Heart Attack Rate), and Lynn meets two of the criteria (Childhood Asthma ED Visits and Elevated Blood Lead Prevalence). Saugus does not exhibit priority community environmental justice criteria, as the related health indicators are lower than statewide rates based on a five-year rolling average, aside from Heart Attack Rates which is slightly higher than the statewide rate per 10,000.

Table 6. Priority Community Environmental Justice Criteria: Community Level

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

Although there are 31 block groups located within the DGA, the MA DPH EJ Tool only provides information on areas within the DGA down to the census tract level. There are eighteen census tracts in the DGA, two of which have been excluded from **Table 7** as they encompass bodies of water and are not representative of any population within the DGA. The MA DPH EJ Tool utilizes data retrieved from the Massachusetts Center for Health Information and Analysis (MCHIA), the Massachusetts Registry of Vital Records and Statistics (MRVRS), and the MA DPH Lead Poisoning Prevention Program. Although these sources have provided data for the four categories of vulnerable health indicators, the MCHIA does not currently have data for geographies below the city or town level (Massachusetts Department of Publix Health Environmental Justice Tool). As the MCHIA is the source of the Heart Attack Rate and Childhood Asthma data, census tract level data for these criteria are not available. The two remaining Vulnerable Health EJ Criteria (Elevated Blood Lead Prevalence per 1,000 and Low Birth Weight per 1,000) are available for most census tracts in the DGA. **Table 7** lists the data available via the MA DPH EJ Tool.

Table 7. Priority Community Environmental Justice Criteria: Census Tract Level

Census Tract ID	Elevated Blood Lead Prevalence per 1,000 (2016-2020)	Low Birth Weight per 1,000 (2011-2015)
Statewide Rate per 10,000	14.985	216.8
110% of Statewide Rate	16.484	238.5
25009201100	20.8	NS
25009205500	42.7	174.6
25009205700	Unknown	250
25009205800	26.5	669.3
25009206000	14.4	150.2
25009206100	44.6	456.9
25009206200	25.7	155.4
25009206700	29.1	Unknown
25009206800	29.9	274.9
25009206900	20.1	329.7
25009207000	33.6	362.3
25009207100	33.8	313.5
25009207200	19.9	NS
25009208101	14.8	322.6
25009208102	Unknown	Unknown
25025170502	Unknown	Unknown

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 7** and in **Table 8**.

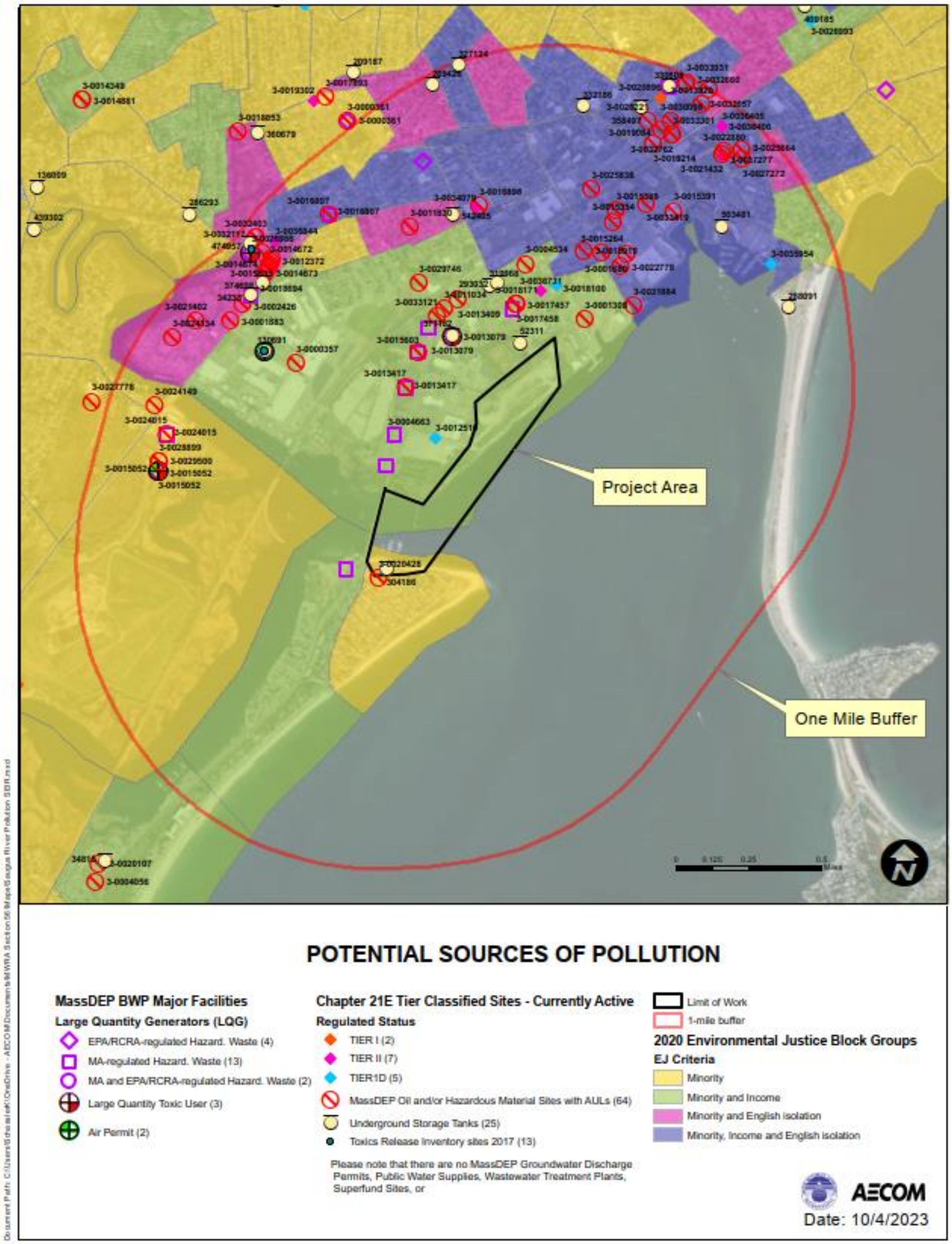


Figure 7. Potential Sources of Pollution within One Mile of the Project Area.

Table 8. Potential Sources of Pollution within One Mile of the Project Area.

ID Number	Block Group	Facility	Info
MassDEP BWP Major Facilities: Large Quantity Generators (LQG)			
	Block Group 1, Census Tract 2071, Essex County, Massachusetts	CVS 0075	
3-0016807	Block Group 1, Census Tract 2071, Essex County, Massachusetts	VALVOLINE INSTANT OIL CHANGE	
	Block Group 1, Census Tract 2072, Essex County, Massachusetts	SULLIVAN TIRE	
3-0004663	Block Group 1, Census Tract 2072, Essex County, Massachusetts	PRIDE HYUNDAI OF LYNN	
	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GENERAL ELECTRIC COMPANY	
3-0013079	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GARELICK FARMS LLC	
3-0013417	Block Group 1, Census Tract 2072, Essex County, Massachusetts	PRIDE CHEVROLET PONTIAC INC	
	Block Group 1, Census Tract 2072, Essex County, Massachusetts	AUTOZONE 5122	
	Block Group 1, Census Tract 2072, Essex County, Massachusetts	ATLANTIC TOYOTA GROUP INC	
	Block Group 1, Census Tract 2072, Essex County, Massachusetts	LYNN DPW	
	Block Group 1, Census Tract 2072, Essex County, Massachusetts	AUTO FITNESS II INC DBA EASY LUBE	
3-0024015	Block Group 1, Census Tract 2081.02, Essex County, Massachusetts	PATTYS AUTO PARTS INC	
3-0015052	Block Group 1, Census Tract 2081.02, Essex County, Massachusetts	WHEELABRATOR SAUGUS INC	
	Block Group 2, Census Tract 2068, Essex County, Massachusetts	US POSTAL SERVICE- LYNN VMF	
	Block Group 3, Census Tract 1705.02, Suffolk County, Massachusetts	G J COMPANIES	
3-0018694	Block Group 3, Census Tract 2058, Essex County, Massachusetts	MBTA LYNN BUS GARAGE	
	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS	
MassDEP BWP Major Facilities Large Quantity Toxic User			
MAD001017110	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GARELICK FARMS LLC	
MAC300002706	Block Group 1, Census Tract 2081.02, Essex County, Massachusetts	WHEELABRATOR SAUGUS INC	
MAD001008093	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS	
MassDEP BWP Major Facilities Air Permit			
MAD001408517	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GENERAL ELECTRIC COMPANY	
MAC300002706	Block Group 1, Census Tract 2081.02, Essex County, Massachusetts	WHEELABRATOR SAUGUS INC	
Chapter 21E Tier Classified Sites - Currently Active			
3-0036405	Block Group 1, Census Tract 2069, Essex County, Massachusetts	38 EXCHANGE STREET	TIERII
3-0036406	Block Group 1, Census Tract 2069, Essex County, Massachusetts	38 EXCHANGE STREET	TIERII
3-0037277	Block Group 1, Census Tract 2069, Essex County, Massachusetts	PARKING LOT	TIERII
3-0018100	Block Group 1, Census Tract 2072, Essex County, Massachusetts	NO LOCATION AID	TIER1D
3-0012510	Block Group 1, Census Tract 2072, Essex County, Massachusetts	LOT 75 OF BLOCK 752, ASSESSORS MAP 85	TIER1D
3-0036731	Block Group 1, Census Tract 2072, Essex County, Massachusetts	HARBOR AUTO PARTS	TIERII
3-0036844	Block Group 2, Census Tract 2058, Essex County, Massachusetts	SUMMER HILL LANDING	TIERII
3-0020896	Block Group 2, Census Tract 2068, Essex County, Massachusetts	NO LOCATION AID	TIERI
3-0034079	Block Group 2, Census Tract 2072, Essex County, Massachusetts	MCMANUS PARK	TIERII
3-0035954	Block Group 3, Census Tract 2069, Essex County, Massachusetts	RIP-RAP ROCK SHORE BEND OCEAN SHORE APTS	TIER1D
MassDEP Oil and/or Hazardous Material Sites with AULs			
3-0036405	Block Group 1, Census Tract 2069, Essex County, Massachusetts	38 EXCHANGE STREET	
3-0036406	Block Group 1, Census Tract 2069, Essex County, Massachusetts	38 EXCHANGE STREET	
3-0037277	Block Group 1, Census Tract 2069, Essex County, Massachusetts	PARKING LOT	
3-0018100	Block Group 1, Census Tract 2072, Essex County, Massachusetts	NO LOCATION AID	
3-0012510	Block Group 1, Census Tract 2072, Essex County, Massachusetts	LOT 75 OF BLOCK 752, ASSESSORS MAP 85	
3-0036731	Block Group 1, Census Tract 2072, Essex County, Massachusetts	HARBOR AUTO PARTS	
3-0036844	Block Group 2, Census Tract 2058, Essex County, Massachusetts	SUMMER HILL LANDING	
3-0020896	Block Group 2, Census Tract 2068, Essex County, Massachusetts	NO LOCATION AID	
3-0034079	Block Group 2, Census Tract 2072, Essex County, Massachusetts	MCMANUS PARK	
3-0035954	Block Group 3, Census Tract 2069, Essex County, Massachusetts	RIP-RAP ROCK SHORE BEND OCEAN SHORE APTS	
Underground Storage Tanks			
288091	N/A	DCR NAHANT LABOR YARD	
304186	Block Group 1, Census Tract 1705.02, Suffolk County, Massachusetts	POINT OF PINES YACHT CLUB INC	

327124	Block Group 1, Census Tract 2060, Essex County, Massachusetts	CHOWDHURY INC DBA CONVENIENCE STATION	
332186	Block Group 1, Census Tract 2061, Essex County, Massachusetts	VERIZON MASSACHUSETTS 552509	
371182	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GARELICK FARMS LLC	
319968	Block Group 1, Census Tract 2072, Essex County, Massachusetts	MOTIVA ENTERPRISES LLC	
293032	Block Group 1, Census Tract 2072, Essex County, Massachusetts	P&E SERVICE STATION INC	
130691	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GENERAL ELECTRIC COMPANY	
52311	Block Group 1, Census Tract 2072, Essex County, Massachusetts	LYNN REGIONAL WWTP	
269426	Block Group 2, Census Tract 2060, Essex County, Massachusetts	S&E INC CORP DBA STOP QUICK MART	
330808	Block Group 2, Census Tract 2068, Essex County, Massachusetts	US POSTAL SERVICE- LYNN VMF	
358497	Block Group 2, Census Tract 2068, Essex County, Massachusetts	AMERADA HESS CORP	
542405	Block Group 2, Census Tract 2071, Essex County, Massachusetts	HIBERNIA ATLANTIC	
374698	Block Group 3, Census Tract 2058, Essex County, Massachusetts	AL PRIME ENERGY CONSULTANTS INC	
34233	Block Group 3, Census Tract 2058, Essex County, Massachusetts	MBTA LYNN BUS GARAGE	
474957	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS	
503481	Block Group 3, Census Tract 2069, Essex County, Massachusetts	CITY OF LYNN SEAPORT MARINA	
Toxics Release Inventory sites 2017			
01910GNRLL1000W	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GE AVIATION	Nickel
01910GNRLL1000W	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GE AVIATION	Cobalt
01910GNRLL1000W	Block Group 1, Census Tract 2072, Essex County, Massachusetts	GE AVIATION	Chromium
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Hydrazine
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Cyclohexane
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	n-Hexane
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Toluene
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Diisocyanates
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Triethylamine
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	N-Methyl-2-pyrrolidone
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Methanol
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Toluene diisocyanate (mixed isomers)
01905CLHTH638SU	Block Group 3, Census Tract 2058, Essex County, Massachusetts	CL HAUTHAWAY & SONS CORP	Xylene (mixed isomers)

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 13 environmental indicators. The state percentile indicates what percent of the Massachusetts population has an equal or lower value, meaning equal or lower 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 in Revere and Block Group 1, Census Tract 2072 in Lynn. **Table 9** summarizes the rankings for these two block groups. The data indicate one or both of these two block groups have higher values than the state average for several indicators. For example, both block groups have higher potential exposure to inhalable particles that are 2.5 micrometers or smaller (reported as average concentration in air of 7.12 and 7 micrograms per cubic meter for the Revere and Lynn block groups, respectively) than the statewide average (6.79 micrograms per cubic meter). 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 Risk Management Plan (RMP) Facility Proximity.

Table 9. 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)	6.62	7.04	68	6.82	56
Ozone (ppb)	58.3	59.8	78	60.9	87
2017 Diesel Particulate Matter* (µg/m3)	0.253	0.378	82	0.303	71
2017 Air Toxics Cancer Risk* (lifetime risk per million)	21	20	3	21	3
2017 Air Toxics Respiratory Hazard Index*	0.26	0.3	49	0.3	49
Toxic Release to Air (RSEI modeled toxicity-weighted concentrations in air of TRI listed chemicals)	2800	3600	69	4900	91
Traffic Proximity (daily traffic count/distance to road)	630	1200	86	1100	83
Lead Paint (% Pre-1960 Housing)	0.51	0.51	47	0.65	64
Superfund Proximity (site count/km distance)	0.18	0.074	28	0.11	56
RMP Facility Proximity (facility count/km distance)	0.36	0.32	72	1.7	96
Hazardous Waste Proximity (facility count/km distance)	6.7	7	77	6.3	74
Underground Storage Tanks (count/km2)	3.4	3.6	67	5.5	80
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.2	0.15	95	0.0016	58

*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 November 30, 2023.

Attachment I 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.

MWRA continues to take proactive steps to engage and inform stakeholders and the community of the upcoming Section 56 water pipeline replacement project. These efforts include the development of a project webpage, which is supported by Google Translate. Additionally, contained on the project’s webpage is a summary of the project’s goals and specific activities that will take place once construction begins, and several documents, such as Public Notices, EJ Screening Forms, MEPA Documents, and the Notice of Remote Consultation Session. All documents have been translated and posted based on languages spoken by at least 5 percent of census tract population (English, Khmer, Russian, Spanish, and Urdu). Currently, the agency is also in the process of finalizing a Question & Answer document, which aims to directly provide information that is likely to be commonly sought by members of the communities about the project and its associated impacts. This document, as well as any future documents, will continue to be translated and posted on the project’s webpage. The Authority has also created a notification request form within the Everbridge system to enable the Authority to begin collecting contact information from those seeking to receive updates as the project progresses.

Furthermore, MWRA staff have met and/or discussed with municipal officials and stakeholders, including the Revere Conservation Commission, city employees, and the Point of Pines Yacht Club in an effort to better coordinate the upcoming project. Additional meetings will be coordinated with state legislative officials and the Point of Pines Neighborhood Association once plans have been further developed. Lastly, information regarding the project has similarly been shared with several within the communities, for example, the Advance Notification Environmental Justice Screening Forms were shared with the City of Lynn and the City of Revere, the Point of Pines Yacht Club, the Point of Pines Neighborhood Association, and other stakeholders. **Attachment J** contains MWRA’s Environmental Justice Outreach Plan.

5. Impacts of Proposed Project

5.1. Topography, Soils, and Sediment

In Lynn, a portion of the shoreline will 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 will 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 B**. The HDD Staging Area and Entry site will also need to be cleared and grubbed, which will 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.

Approximately 1,300 cubic yards (CY) of sediment will be dredged by the HDD drill bit in order to accommodate the pipeline. 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 timber piles is also considered dredging. The volume of material being removed (i.e., the volume of the piles under the mudline) is approximately 100 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 will 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, Land Under Water, Land Under the Ocean, and the 100-foot Buffer Zone. **Table 10** 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 10** 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 and Hanson Street (both of which are areas that are already paved).

Table 10. Summary of Impacts Associated with the Section 56 Saugus River Crossing.[1, 2.]

Municipality	Resource Area	Temporary Disruption During Construction	Permanent Impacts
Revere	Coastal Dune/Barrier Beach System	16,230 sqft: Rice Avenue pipeline installation via trench and HDD Staging and Exit Area.	None.
	200-foot Riverfront Area	14,560 sqft: Rice Avenue pipeline installation via trench and HDD Staging and Exit Area.	None.
	Land Under Water [3.]	None	2,430 sqft: HDD pipe installation below the Saugus River.
Lynn	Coastal Bank	1,430 sqft: clearing and regrading required to access the timber pile removal site.	None.
	Coastal Beach/ Tidal Flats	3,640 sqft: timber pile removal site and access route.	95 sqft: Timber pile removal and subsequent fill with low-density grout.
	100-foot Buffer Zone	68,010 sqft: timber pile access route, HDD Staging Area and Entry, and pipe string layout area.	None.
	Land Under Water [3.]	None	1,270 sqft: HDD pipe installation below the Saugus River.
	Land Under the Ocean[3.]	None	4,780 sqft: HDD pipe installation below the Saugus River.
Both Lynn and Revere	Bordering Land Subject to Flooding	142,080 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.

[1.] All areas are approximate; sqft = square feet.
[2.] Please note that an earlier version of this table in the EENF included impacts attributed to the Point of Pines Yacht Club float storage on the Coastal Beach. As the floats will now be stored outside of the Coastal Beach, this impact has since been subtracted. Additionally, design considerations resulted in an increase of the maximum number of timber piles to be removed, which increases the square footage of impact to Coastal Bank (temporary only) and Coastal Beach (both temporary and permanent) in Lynn. Other values in this table have been adjusted slightly according to the most recent project design.
[3.] The pipeline will be installed 30 to 50 feet below the bed of the Saugus River with no surface disturbance.

5.2.1 Coastal Dune/Barrier Beach System

Impacts on the Barrier Beach System are limited to 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 LOW within the 200-foot 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 1,430-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 will 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 up to thirty 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 3,640 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 95 square feet and necessitate 100 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 will 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 will 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 H-piles (also known as 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.

Comments received from the Massachusetts Division of Marine Fisheries (DMF) on the EENF recommended that all pile removal be accomplished from machinery operating on the upslope side of the existing Lynn timber bulkhead at low tide and that all excavation and backfill work be completed before the high tide returns; i.e., during one tidal cycle. If a barge is deemed to be necessary for pile removal, DMF recommends that work be sequenced during high tide to avoid barge grounding. The removal scenarios described above are consistent with these recommendations.

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 common reed (*Phragmites australis*) 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.

5.2.6 Land Under Water

Work within Land Under Water is limited to the Saugus River area of the proposed project area due to necessary HDD pipe installation. All impacts will be 30-50 feet below the surface of the Saugus River, with impacts totaling approximately 1,270 square feet in Lynn and approximately 2,430 square feet in Revere. The diameter of the borehole for drilling is up to 48 inches, with the pipeline being 318 linear feet in Lynn and 607 linear feet in Revere.

5.2.7 Land Under the Ocean

Work within Land Under the Ocean includes HDD pipe installation in Lynn. Work areas include land extending from the mean low water line seaward to the boundary of Lynn's jurisdiction and includes land under estuaries. All impacts will be 30-50 feet below the surface of the Saugus River. Approximately 1,195 linear feet of pipe will be installed with the borehole being up to 48 inches, which totals approximately 4,780 square feet of disturbance to Land Under the Ocean in Lynn.

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 noise from pile removal and HDD activities 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. DMF comments on the EENF state that they do not recommend a TOY restriction for any of the proposed work; therefore, no TOY restrictions are planned to protect fish.

5.4. Threatened and Endangered Species

As previously stated, the project area is adjacent to Priority Habitat for the Piping Plover (*Charadrius melodus*). During the off-season, the Point of Pines (PoP) Yacht Club typically stores some of their dock floats in the parking lot, a portion of which will be unavailable due to construction activities. This project had previously proposed storing the Point of Pines Yacht Club's floats on the Coastal Beach and within NHESP Priority Habitat for the Piping Plover. Based on EENF comments received from NHESP and Mass CZM as well as recent consultation with the Revere Conservation Commission, it has been determined that floats will instead be stored at an alternative location off of the Coastal Beach. There will be no project-related impacts within Priority Habitat.

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 G**. 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 G** 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 or releases during drilling ("frac-out") has been considered in developing the pipe string route. Frac-outs occur when drilling fluid or mud is released to the ground surface or into the surrounding parent material during HDD installation. 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 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 contingency plan has been developed to best prepare for the unlikely occurrence of a frac-out during HDD activities. A draft of this frac-out contingency plan has been included in **Attachment K**.

While the pipe installation by HDD methods is not anticipated to have any impact on the hydrology or water quality at the site, removal of the timber piles along the Lynn shoreline will necessitate access to the shoreline. Due to the depth of the piles, estimated to be at least 60 feet, the timber pile bulkhead presents obstructions to the HDD route and must be removed to prevent a disturbance to the HDD operation. The 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 will 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 will 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 will occur during pipeline installation activities. Factors contributing to this noise will be construction equipment and construction vehicles at the site. To minimize noise impacts during construction, best management practices (BMPs) will 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, Lynn, and Revere regarding 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 impact 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 north 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 (6pm to 6am). Parking restrictions and detours will not be required for this area of work.

Rice Avenue (Revere): Construction on Rice Avenue 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 Avenue and Whitin Avenue (northwest of the yacht club). The proposed temporary traffic control setup at the intersection of Whitin Avenue and Rice Avenue 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 Avenue to provide a minimum of one travel lane. The section of water main installation on Rice Avenue between Whitin Avenue and Fowler Avenue 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 will 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 will return to its current aesthetics.

As identified in **Section 4.9,** the Commonwealth owns and DCR maintains the verge between the Lynnway and North Shore Road, immediately west of the intersection between Rice Avenue and the Lynnway.

The proposed Section 56 replacement pipe will require construction of 160 feet of water pipeline and installation of an at-grade manhole within the grassy triangle between Rice Avenue and the access ramp to the Lynnway in Revere, on the south side of the General

Edwards Bridge. The Lynnway in Revere, including the access ramp and the grassy triangle, is identified in MassGIS as being protected under Article 97 of an amendment to the Constitution of the Commonwealth of Massachusetts. MWRA initiated consultation with DCR to discuss impacts to this mapped Article 97 land and compliance with the Public Lands Preservation Act (PLPA). During this initial consultation, DCR indicated that the Lynnway in Lynn, on the north side of the General Edwards Bridge, may also be subject to Article 97, even though it is not mapped as such on the MassGIS Openspace Datalayer. The proposed construction on the Lynnway in Lynn consists of installing 80 feet of pipeline from the top of Hanson Street across the roadway intersection where it will connect to the existing Section 56 pipe in the Lynnway. Further consultation with DCR and EEA is needed to confirm the Article 97 protected status of the Lynnway in Lynn. MWRA is in discussions with DCR to determine whether there is a need for a property interest disposition for the project where the MWRA has existing water infrastructure and rights in the land appurtenant thereto, which it acquired from the Commonwealth pursuant to its Enabling Act.

If it is determined that a disposition of a property interest by the Commonwealth is needed for the project and that the disposition of the property interest is subject to Article 97, the MWRA will comply with the PLPA and its established requirements and process and the EEA's Article 97 Land Disposition Policy to avoid net loss of lands protected under Article 97. For example, in accordance with the requirements of the PLPA, the MWRA would notify the Secretary of the EEA and the public by submitting the proposed disposition request within the online PLPA Portal and performing appropriate additional notifications. Further, prior to submission, the MWRA would continue its coordination with DCR, as required by the PLPA. Finally, as noted in the September 15, 2023 EENF Certificate, the MWRA would be responsible for meeting the obligations of the PLPA, including public notification, an alternatives analysis, the identification and dedication of replacement land to Article 97 purposes as applicable, an appraisal, requests for the Secretary to waive or modify the replacement land requirement or make findings relative to funding in lieu of replacement land, if applicable, and Article 97 legislation.

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

There were no alternatives to avoid work in land protected under Article 97 because of the need to reconnect to existing water supply infrastructure within land mapped as Article 97. All alternatives for routing the new pipeline will require a connection to the existing main to make the pipeline operational. Three alternative approaches to the project were considered, including a No-Action alternative, a waterway avoidance alternative, and consideration of various alternative pipeline construction methods and routes.

- The "No-Action" alternative would result in no replacement being made for the Section 56 pipeline route and would ultimately leave the pipeline 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.

- The waterway avoidance alternative would result in an alternative pipeline replacement route that would completely avoid the need to cross underneath the

Saugus River. This alternative was deemed infeasible because the two connecting points of the pipeline are located on opposite sides of the Saugus River. The General Edwards Bridge was previously used to connect the Section 56 pipeline route, but has been deemed structurally deficient by MassDOT, and the Department is in the planning phase to replace this 87-year-old structure.

- The pipeline alternatives included four installation method alternatives and eight pipeline route alternatives. The installation methods included open trench river crossing, HDD, microtunneling, and removal and replacement on the General Edwards Bridge. All alternative installation methods and routes would require construction within Article 97 land. The pipeline route alternatives were screened regarding pipeline performance, program risks, cost, and schedule. Routes 3 and 7 were chosen as the most ideal, both of which would require the same connection to the existing Section 56 water main, and therefore the same work in Article 97 land. Although both offered feasible routes from a 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 in Revere.

The proposed project would not destroy or threaten a unique or significant resource. The Article 97 land to be temporarily altered is part of the Lynnway roadway and associated landscaped island with no other vegetation. This area is located immediately west of the intersection between Rice Avenue and the Lynnway and is mapped as part of the Revere Beach Reservation. As there is no vegetation apart from grass, no tree clearing will be required to execute the project. The land in its finished condition would include a new water supply main and valves, all at grade, with surface access. The Article 97 parcel involved in this project is part of a previously disturbed roadway and no unique or significant resources are present. Following construction, the parcel in question will be restored to pre-construction conditions.

The project serves a public purpose as it would be used for water supply and to enhance redundancy for the existing water supply infrastructure to portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus, and Swampscott. The reliable delivery of water is essential to protecting public health, providing sanitation, and fire protection, as well as supporting a viable economy. Revere, where the property is located, would benefit from the Program as it is a community that relies on this infrastructure for water supply.

5.11. Socioeconomic Characteristics / Environmental Justice

As discussed in **Section 4.11.3**, the project site is within two environmental justice populations, and 29 additional block groups designated as environmental justice (EJ) populations are either in whole or in part within the projects Designated Geographic Area (DGA). The EJ Screening Forms in **Attachment H** have maps that show EJ block groups within the DGA and are color-coded by EJ criteria. The complete list of EJ block groups within five miles of the project site can also be found in **Attachment H**.

The primary long-term benefit to all populations within the DGA is water supply system reliability because the construction of the Section 56 water main will provide redundancy within the regional water supply system. A reliable water supply system protects public health and environmental health. The project will also have beneficial short-term effects on the economy due to a temporary increase in employment opportunities for the construction workforce and increasing revenues of local businesses generated from construction activities and workers. However, any increase will be temporary, lasting only for the duration of the construction.

The following impacts may affect populations within the DGA, as well as the wider public, and will be mitigated to the maximum extent practicable.

- Short-term impacts to traffic on Rice Avenue would affect 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.
- The temporary closure of the Point of Pines Yacht Club due to construction staging in the parking lot will result in short-term economic impacts to the Yacht Club and the surrounding neighborhood. Increased activity at the project site may disrupt recreational activities from taking place with participants moving to alternate recreation locations, resulting in short-term economic impacts to local businesses.
- Short-term impacts to traffic on Hanson Street would affect traffic patterns in the commercial/industrial vicinity during the installation of the pipeline in the roadway.
- Traffic on Route 1A and traffic crossing over the General Edwards Bridge would be impacted during the installation of the pipeline at the connection points.
- 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 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 would affect 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. Otherwise, there will be no anticipated impacts to pedestrian or bicycle travel during construction. Pedestrian sidewalks and facilities will be maintained throughout construction and fences will be provided on the edge of walkways.
- Short-term impacts to public transit bus routes crossing over the General Edwards Bridge are anticipated when construction is taking place at pipeline connection points.

These impacts are not expected to disproportionately impact EJ populations. Construction schedules will be communicated in advance to the public and to residents who will be affected by construction activities and traffic. This will help residents to prepare and plan accordingly.

As discussed in **Section 4.11.3**, **Attachment I** 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. 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.

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 re-cap the landfill, which had been capped prior to Massachusetts enacting more stringent regulations. Coordination with this project includes siting 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 Executive Office of Energy and Environmental Affairs) 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 and intends to closely coordinate with the project proponent.
- 830 Lynnway – This project is a public-private, mixed-use development that will include up to 850 apartment units, approximately 26,000 square feet of retail and restaurant uses, and approximately 8 acres of public park. The lot is currently vacant and is south of Hanson Street and the Lynn Harbor Property LLC development. The project will entail 2,260 square feet of temporary impact to Coastal Beach, 2,164 linear feet of temporary impact to Coastal Bank, and 1,800 square feet of temporary impact to Land Containing Shellfish. These impacts are primarily due to the project's intent of restoring the Lynn bulkhead in certain locations and removing it in locations where it is no longer functional. Impervious surface will increase on the site by 7.65 acres. The project is anticipated to commence in Q2 2025. MWRA is aware of the project and intends to closely coordinate with the project proponent.

7. Construction Management Plan

7.1. Introduction

As design progresses, the MWRA will develop requirements for traffic routes and work hour restrictions based on permit conditions and community coordination. These requirements will be documented in the contract documents and address the requirements listed in a Construction Management Plan (CMP). This draft CMP details construction and contractor measures to avoid, minimize, and mitigate potential traffic disruptions, and potential air quality and noise impacts. This CMP identifies the requirements for the contractors to accept prior to the start of construction activity and follow during construction. It is not anticipated that a full CMP will be developed for this project, but various document submittals from the contractor will meet the requirements of a CMP.

7.2. Requirements

The following requirements are included herein to limit potential impacts to EJ populations as well as the wider public, and will require contractor sign-off:

- The project will minimize unnecessary construction traffic and limit lane closures to non-peak hours when possible.
- Temporary traffic control setups will be in place at the intersection of Route 1A and Hanson Street during off-peak traffic hours (overnight). This will minimize the impact to travelers on Route 1A and impact to access points for nearby businesses.
- Only a single lane will be closed at any given time in either direction to maintain traffic flow along Route 1A.
- The proposed temporary traffic control setup will involve a sequence of shoulder closures along 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 or appropriately re-routed, 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).
- The proposed temporary traffic control setup at the intersection of Whitin Avenue and Rice Avenue will involve narrowing the roadway and maintaining all existing traffic movements.
- Construction vehicles and equipment will be located off the roadway of Rice Avenue to provide a minimum of one travel lane.
- The section of water main installation on Rice Avenue between Whitin Avenue and Fowler Avenue 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 or equivalent covering at the end of each work shift so that traffic is restored during non-working hours.
- During construction, traffic signal timings may be adjusted, where necessary and as appropriate, to minimize potential intersection delay due to construction vehicles and trucks.
- Vehicles traveling to and from construction sites will take the most direct route along main roadways to/from highways to minimize traffic and emissions.
- Contractors will limit vehicle idling time in compliance with the Massachusetts idling regulation (310 CMR 7.11). Idling restriction signs will be placed on the premises to remind drivers and construction personnel of the applicable regulations. Drivers and equipment operators will be trained accordingly.

- Contractors will be required to implement measures to protect local residents, visitors, passengers, and passers-by from off-site exposure to dust and debris.

7.3. Discussion

Appropriate methods of dust control will be determined according to the surfaces concerned (roadways or disturbed areas) and will include, as applicable, application of water during ground disturbing activities; stone surfacing of construction roads; seeding of areas of exposed or stockpiled soils; wheel washing; using covered trucks; and regular sweeping of paved roadways. Recycling construction waste and demolition materials may also reduce dust emissions. Removing these materials from the construction site each day may mitigate the potential for removed materials dry out and become airborne.

Work within roadways would be coordinated with the local municipality, the MWRA, and/or MassDOT. Upon completion of the pipe installation, the disturbed areas will be restored and affected roadways would be repaved. The final re-pavement restoration details and any necessary details would be coordinated with the local municipality, the MWRA and/or MassDOT.

As described and shown in Section 4.11.3, census tracts containing EJ populations are located within the DGA for the project. These include EJ population block groups that have existing unfair or inequitable environmental burdens per two MA DPH vulnerable health criteria data; specifically, low birth weight and elevated blood lead prevalence.

Despite being located within the DGA, these impacts are not expected to disproportionately impact EJ populations. Construction schedules will be communicated in advance to the public and to residents who will be affected by construction activities and traffic. This will help residents to prepare and plan accordingly. A detailed outreach plan has been prepared and can be found in **Attachment J**. More details regarding traffic impacts to Environmental Justice populations can be found in Section 5.11 above.

The construction specifications will require contractors to submit detailed procedures to meet the requirements listed above. The draft CMP will help to develop an outline for general requirements that contractors must meet to reduce adverse impacts to EJ populations within the DGA. Although no singular document will be drafted as a CMP, each document submitted will meet or exceed the standards that were set within this draft CMP.

8. Mitigation Measures and Section 61 Draft

8.1. Project Description

As described in the EENF and **Section 1** of this SEIR, the MWRA proposes to replace a portion of the Section 56 drinking water pipe in Lynn and Revere. This section of water pipeline 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. Prior to removal, it provided redundancy for the MWRA Northern High Service Zone. This pipeline provides redundancy to portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus, and Swampscott. Without this segment of Section 56, the Northern High Service Zone is without redundancy and thus vulnerable to disruptions in water supply if the pipe providing the primary water supply to these areas were to fail. 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 the MWRA Northern High Service Zone.

The project will install approximately 4,800 feet of water pipeline, using both open-cut method for work on land (2,000 feet of water pipeline) and a trenchless underwater pipeline construction method (horizontal directional drilling (HDD) to cross the Saugus River (2,120 feet of water pipeline beneath the Saugus River and 640 feet in upland areas)). HDD is a trenchless method of installing underground utilities particularly suited for installing pipeline beneath obstructions and minimizing surface impacts. The project also proposes removal of up to thirty timber piles from a deteriorating sea wall along the Lynn shoreline to allow for the preferred pipeline alignment. The major components of the project are as follows:

- **Installation of 24-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 30-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. This distance includes installation in terrestrial areas and under the Saugus River between the entry and exit pits. Approximately 2,020 feet of this distance is in Lynn and 730 feet in Revere.
- **Installation of 24-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.
- **Removal of up to thirty timber piles** from the dilapidated seawall on the Lynn shoreline. The removal will utilize one of two strategies which include a pile removal by land or the use of a barge within the river to remove the piles.
- **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.

8.2. Alternatives

Three alternatives to the proposed resolution were considered in order to achieve compliance with town, state, and federal regulations as well as adequately fulfill project requirements. These alternatives included a No-Action alternative, a waterway avoidance alternative, and a pipeline route alternatives section. These alternatives are described in greater detail in **Section 3: Alternatives to the Project**.

The “No-Action” alternative would result in no replacement being made for the Section 56 pipeline route and would ultimately leave the pipeline 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.

The waterway avoidance alternative would result in an alternative pipeline replacement route that would completely avoid the need to cross underneath the Saugus River. While this method would avoid the need to construct near or within waterways, it would be nearly impossible to achieve as the two connecting points of the pipeline are located on opposite sides of the Saugus River. The General Edwards Bridge was previously used to connect the Section 56 pipeline route but has been deemed structurally deficient by MassDOT, and the Department is in the planning phase to replace this 87-year-old structure. Therefore, the waterway avoidance alternative was dismissed.

The route and installation method alternatives that were proposed were comprised of four installation method alternatives and eight pipeline route alternatives. The installation methods included open trench river crossing, Horizontal Directional Drilling (HDD), microtunneling, and removal and replacement on the General Edwards Bridge. The pipeline route alternatives were screened concerning pipeline performance, program risks, cost, and schedule. Two of these routes were eventually chosen as the most ideal which included 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.

8.3. Summary of Potential Impacts

Table 11 and **Table 12** summarize the potential impacts of the Section 56 Water Pipeline Replacement Project and associated mitigation measures that will be taken in order to minimize risk and/or mitigate any potential negative impacts that may arise as a result of project work. **Table 11** details potential impacts to the environment and resource systems within the project area and **Table 12** addresses potential Environmental Justice impacts on surrounding communities. The potential impacts and mitigation measures listed within these tables are described in greater detail within **Section 5: Impacts of Proposed Project**.

Table 11. Potential Environmental Impacts and Minimization & Mitigation Commitments

Potential Impact from Proposed Activity	Scope of Impact	Minimization/Mitigation Commitment	Associated Agency and Permit	Timeline for Implementation	Cost of Commitments
Increase of turbidity from timber pile removals	Temporary	A turbidity curtain shall be installed around the perimeter of the pile removal work.	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions USACE Section 404 General Permit	This curtain will be installed prior to any work that will be done involving the removal of timber piles. These will remain in place until all work on the timber piles has been completed.	Costs will be determined closer to construction
Increase of sedimentation from timber pile removals	Temporary	Erosion and sediment controls shall be employed, including installing coir wattles downslope limits of grading. These measures will be installed at each limit of work	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions USACE Section 404 General Permit MEPA Review	Control measures will be implemented prior to any work that will be done involving the removal of timber piles. These will remain in place until all work on the timber piles has been completed.	Costs will be determined closer to construction
Increase in erosion and sedimentation runoff from on	Temporary	Erosion and sediment controls shall be employed, including installing coir wattles downslope limits of	Lynn Conservation Commission Order of Conditions	Control measures will be implemented prior to any work that will be done in order to minimize the potential	Costs will be determined closer to construction

Potential Impact from Proposed Activity	Scope of Impact	Minimization/Mitigation Commitment	Associated Agency and Permit	Timeline for Implementation	Cost of Commitments
land project area		grading. These measures will be installed at each limit of work.	Revere Conservation Commission Order of Conditions USACE Section 404 General Permit MEPA Review	for any accidental runoff. These control measures will remain in place until all work within a given area is complete.	
Potential release of sediment from drilling activities	Temporary	Erosion and sediment controls shall be employed. A frac-out management plan will be prepared by the contractor in case a sediment spill results from any HDD activity.	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions USACE Section 404 General Permit MassDEP Chapter 91 Waterway License MEPA Review	Control measures will be implemented prior to any work that will be done regarding drilling activities in order to minimize the potential for any accidental sediment spills or releases. These control measures will remain in place until all drilling work is complete.	Costs will be determined closer to construction
Increased generation of waste from construction activities	Temporary	Waste materials, debris, and trash will be cleaned from the work site at the end of each day and placed in trash barrels and/or dumpsters which will be disposed of off-site.	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions MEPA Review	Waste management will continuously happen throughout the course of the project. Debris and waste will be cleaned at the end of each day.	Costs will be determined closer to construction
Increase in air pollution from construction activities	Temporary	Construction access roads and vehicles will be watered down as needed. Idling time of construction vehicles will also be minimized.	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions MEPA Review	Air pollution control measures will be set in place before construction begins and will remain in place for the duration of construction.	Costs will be determined closer to construction
Increase in debris from demolition activities roadways	Temporary	Concrete debris from demolition will be removed from the site and stockpiled in the upland staging area while awaiting proper disposal.	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions	Debris control measures will be implemented prior to and following demolition work that is to occur. Debris will be cleaned and stockpiled at the end of each day. This procedure will continue throughout the duration of the project while demolition work continues.	Costs will be determined closer to construction
Potential damage to riverbed from the timber	Temporary	In the event a barge will be used to extract timber piles along the Lynn shoreline, bottoming out	Lynn Conservation Commission Order of Conditions	This measure will be used in the instance the river-based timber pile removal strategy is	Costs will be determined closer to construction

Potential Impact from Proposed Activity	Scope of Impact	Minimization/Mitigation Commitment	Associated Agency and Permit	Timeline for Implementation	Cost of Commitments
pile removal barge bottoming out.		shall be avoided by floating the barge further from the shoreline as low tide approaches.	Revere Conservation Commission Order of Conditions MEPA Review	chosen. It will be implemented prior to the start of removal work and remain as standard procedure throughout the duration of the pile removal.	
Timber pile removal and subsequent fill with low-density grout.	Permanent	The voids left from the pile removal will be backfilled with grouting immediately. Grouting will be pumped through a tube into the hollow pipe from a pump truck. The pump truck will remain upslope of the Mean High-Water line.	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions MEPA Review	This will occur following the complete removal of all previously identified timber piles.	Costs will be determined closer to construction

Table 12. Potential Environmental Justice Impacts and Minimization & Mitigation Commitments

Potential Impact from Proposed Activity	Scope of Impact	Minimization/Mitigation Commitment	Associated Agency and Permit	Timeline for Implementation	Cost of Commitments
Increase in traffic within/near to construction activities	Temporary	A route of least impact was chosen to reduce overall traffic. A traffic management plan will be developed by the cities of Revere and Lynn in consultation with the MassDOT	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions Department of Conservation and Recreation Access Permit MEPA Review	The route of least impact and the traffic management plans for both cities will be completed prior to any construction work.	Costs will be determined closer to construction
Increase in noise pollution from construction activities	Temporary	To minimize noise impacts during construction, BMPs will include mufflers on construction equipment and vehicles.	Lynn Conservation Commission Order of Conditions Revere Conservation Commission Order of Conditions MEPA Review	BMP’s for minimizing noise will be implemented at the start of construction and will remain in place for the duration of construction work.	Costs will be determined closer to construction

8.4. Draft Section 61 Findings Statement

This section provides draft Section 61 determination language for state agencies issuing Section 61 Finings documenting mitigation commitments for the project.

8.4.1 Massachusetts Department of Conservation and Recreation

Draft Only

Findings Pursuant to

MGL Chapter 30, Section 61

Project Name: MWRA Section 56 Water Pipeline Replacement Project

Project Location: Revere and Lynn, Massachusetts

Project Proponent: The Massachusetts Water Resource Authority (MWRA)

EEA Number: 16749

Date Noticed in Monitor:

Applicable State Action/Permits

Construction Access Permit

This following Section 61 Finding for the MWRA Section 56 Water Pipeline Replacement Project (EEA 16633) has been prepared in accordance with the provisions of M.G. L. Chapter 30, Section 61 and 301 CMR 11.07(6)(k).

The potential environmental impacts of the project are characterized and quantified in the MWRA Section 56 Pipeline Water Replacement Project Expanded Environmental Notification Form (EENF) and Single Environmental Impact Report (SEIR), which are incorporated by reference into this Section 61 Findings. To the greatest extent practicable, the Authority has taken all feasible measures to avoid and/or minimize adverse environmental and human health impacts of the proposed project. Where impacts are not avoidable, the Authority has worked throughout the planning and environmental review process to develop measures to mitigate impacts of the project to the extent practicable. With the implementation of the proposed mitigation, conducted in cooperation with state agencies, the Massachusetts Department of Conservation and Recreation (DCR) finds that there are no significant unmitigated impacts.

The Authority recognizes that the identification of effective minimization and mitigation, and implementation of that mitigation throughout the life of the Section 56 Water Pipeline Replacement Project, is central to its responsibilities under MEPA. Accordingly, the Authority has prepared a Summary of Potential Impacts and Minimization & Mitigation Commitments (**Table 11**) that specifies the mitigation that the Authority would provide. In the Summary of Potential Impacts table, the Authority provides clear commitments to implement the mitigation measures; identifies the parties responsible for implementation of measures; and provides a schedule for their implementation based upon project phasing.

Specifically, the following mitigation measures are applicable to the Construction Access Permit:

Construction Traffic

- A traffic management plan will be developed in consultation with the cities of Revere and Lynn as well as MassDOT. To minimize construction-related traffic impacts to the greatest extent possible, including to vehicular traffic, public transit, bicyclists, and pedestrians.
- Notify residents and business abutting impacted roadways ahead of road closures and detours.

Construction Air Quality

- Construction access road and vehicle watering as required.
- Street sweeping of adjacent local roadways to address potential sediment accumulation.
- Construction vehicles will idle only when necessary. The contractors will comply with Massachusetts anti-idling regulations (M.G.L. C.90, § 16A; M.G.L. C. 111, § § 142A-142M, and 310 C.M.R. 7.11) with regard to the amount of time the vehicles will idle.
- All diesel-powered non-road construction equipment with engine horsepower ratings of 50 and above to be used for 30 or more days over the course of Project construction will have US EPA verified (or equivalent) emission control devices, such as oxidation catalysts or other comparable technologies (to the extent that they are commercially available) installed on the exhaust system side of the diesel combustion engine.

DCR has reviewed the MEPA filings for the project and finds that the environmental impacts resulting from construction of the project are those impacts as described in the EENF and SEIR, which would be updated as needed in permit applications submitted for compliance with federal and state environmental laws. Pursuant to Massachusetts General Laws Chapter 30, Section 61, DCR finds that with the implementation of mitigation measures as identified in the Summary of Proposed Mitigation Measures table, all practicable and feasible means and measures would have been taken to avoid or minimize potential damage to the environmental due to the construction and operation of the Section 56 Water Pipeline Replacement Project. In making this finding, DCR has considered reasonable foreseeable climate change impact and environmental justice impacts.

8.4.2 Massachusetts Department of Environmental Protection

Draft Only

Findings Pursuant to

MGL Chapter 30, Section 61

Project Name: MWRA Section 56 Water Pipeline Replacement Project

Project Location: Revere and Lynn Massachusetts

Project Proponent: Massachusetts Water Resources Authority

EEA Number: 16749

Date Noticed in Monitor:

Applicable State Action/Permit

Section 401 Water Quality Certificate

Chapter 91 License

This following Section 61 Finding for the MWRA Section 56 Water Pipeline Replacement Project (EEA 16633) has been prepared in accordance with the provisions of M.G. L. Chapter 30, Section 61 and 301 CMR 11.07(6)(k).

The potential environmental impacts of the project are characterized and quantified in the MWRA Section 56 Pipeline Water Replacement Project Expanded Environmental Notification Form (EENF) and Single Environmental Impact Report (SEIR), which are incorporated by reference into this Section 61 Findings. To the greatest extent practicable, the Authority has taken all feasible measures to avoid and/or minimize adverse environmental and human health impacts of the proposed project. Where impacts are not avoidable, the Authority has worked throughout the planning and environmental review process to develop measures to mitigate impacts of the project to the extent practicable. With the implementation of the proposed mitigation, conducted in cooperation with state agencies, the Massachusetts Department of Environmental Protection (MassDEP) finds that there are no significant unmitigated impacts.

The Authority recognizes that the identification of effective minimization and mitigation, and implementation of that mitigation throughout the life of the Section 56 Water Pipeline Replacement Project, is central to its responsibilities under MEPA. Accordingly, the Authority has prepared a Summary of Summary of Potential Impacts and Minimization & Mitigation Commitments (**Table 11**) that specifies the mitigation that the Authority would provide. In the Summary of Potential Impacts table, the Authority provides clear commitments to implement the mitigation measures; identifies the parties responsible for implementation of measures; and provides a schedule for their implementation based upon project phasing.

Specifically, the following mitigation measures are applicable to the Section 401 Water Quality Certificate and Chapter 91 License:

- A turbidity curtain shall be installed around the perimeter of the timber pile removal work.
- Impacts to wetland resource areas are avoided where possible. The only permanent impacts, associated with the project, to wetland resource areas are the installation of six manholes (three in Lynn and three in Revere) and filling the voids left from the timber pile removal.
- A frac-out management plan will be prepared by the contractor in case a sediment spill results from any HDD activity; MWRA has prepared a draft HDD Contingency and Frac-Out Management Plan that will be used as the basis of the Contractor’s final Plan.
- The project will comply with applicable regulations and requirements per the National Pollutant Discharge Elimination System (NPDES) Construction General Permits and NPDES Dewatering and Remediation General Permits
- Erosion and sedimentation controls shall be employed, including installing coir wattles downslope of limits of grading, to minimize the potential for offsite sedimentation and erosion.
- Native vegetation will be restored and replanted post-construction.
- Floating docks will be stored off of the Coastal Beach.

MassDEP has reviewed the MEPA filing for the Project and finds that the environmental impacts resulting from construction of the Project are those impacts as described in the EENF and SEIR, which would be updated as needed in permit applications submitted for compliance with federal and state environmental laws. Pursuant to M.G. L, Chapter 30, Section 61, MassDEP finds that with the implementation of mitigation measures as identified in the Summary of Proposed Mitigation Measures table, all practicable fand feasible means and measures would have been taken to avoid or minimize potential damage to the environment dye to the construction and operation of the MWRA Section 56 Water Pipeline Replacement Project. In making this finding, MassDEP has considered reasonable foreseeable climate change impacts and environmental justice impacts.

8.5. Construction Period

The timber pile removal along the Lynn shoreline shall occur either during high tide (if the piles are to be removed by barge) or at low tide (if the piles are to be removed by shore). In the former case, if the removal requires longer than one tide 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 will be floated back in place to complete the pile extraction.

For the duration of construction, the project will minimize unnecessary construction traffic and limit lane closures to non-peak hours when possible. MWRA shall coordinate with the North Shore Traffic Management Association to minimize unnecessary construction traffic and limit land closures to non-peak hours when possible. A traffic management plan shall be prepared in consultation with DCR and the two communities to mitigate temporary traffic disruption.

8.6. Environmental Impact Mitigation

Erosion and sedimentation controls shall be employed, including installing coir wattles downslope of limits of grading, to minimize the potential for offsite sedimentation and erosion. These measures shall be employed at each limit of work (Rice Avenue cut and cover, HDD exit staging area, HDD entry staging area, Hanson Street cut and cover, and the timber pile removal area). Details of typical controls are illustrated on Sheets C-1 and C-2 in **Attachment B**.

In the event a barge will be used to extract the timber piles along the Lynn shoreline, bottoming out shall be avoided by floating the barge further from the shoreline as low tide approaches. A turbidity curtain shall be installed around the perimeter of the pile removal work. Temporary devices and structures to control erosion and sedimentation in and around the site shall 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 shall be surrounded by erosion controls. Any sediment collected by these devices shall 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 shall be prepared by the contractor and submitted to the local Conservation Commissions before construction activities commence. A draft frac-out plan is included as **Attachment K**.

Following construction, the limits of work shall be restored to pre-construction conditions. In the case of the HDD entry area in Lynn and the timber pile removal area (which will be cleared to accommodate the project activities), vegetation shall be replaced with native species. Currently, the vast majority of shrubs and trees in those two areas are non-native species.

8.7. Coastal Storm Preparedness

As discussed in **Section 4.2**, the project is located almost entirely in the FEMA 100-Year Floodplain or the Velocity Zone (Zone VE). The project will not result in any permanent changes to site topography or floodwater flow paths to warrant concern about the long-term impacts of the project as it relates to floodplain functions. During construction, however, equipment and work areas are vulnerable to coastal storm events. In the event of an impending storm, work equipment that can be transported off site and stored inland prior to the commencement of the storm will be. Temporary structures or equipment unable to be removed from the site will be secured where feasible. Sandbags or other mitigation will be used to prevent excessive flooding.

8.8. Construction Site Maintenance

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

General construction safety procedures will be followed to prevent accidents that could result in spills, releases, or other environmental damage. Activities such as fueling operations and hot work will be monitored and conducted away from sensitive resource areas when possible. Mitigation for dust will include watering down the construction access road and vehicles, as needed, especially during especially windy and dry days. To minimize noise impacts during construction, BMPs will include mufflers on construction equipment and vehicles. Reducing idling time will reduce pollution, GHG emissions, and noise.

8.9. Mitigation Measures Relative to EJ Populations

The impacts of this project are not expected to disproportionately impact EJ populations. Although the project site is located within two block groups designated as EJ populations, the mitigation measures described above are expected to appropriately mitigate impacts to the EJ population similar to the greater population. Therefore, no specific mitigation measures relative to EJ populations are proposed. Avoidance, minimization, and mitigation measures described herein that will benefit both EJ populations and the wider public.

Short-term impacts to traffic on Rice Avenue will 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, will temporarily disrupt local traffic. The project design process considered impacts to residents during the alternatives screening process, and the preferred route was deemed to have the least amount of impact. The impacts on traffic in Revere will be mitigated via a traffic management plan developed in consultation with MassDOT and the City of Revere. Similarly, short-term impacts to traffic on Hanson Street in Lynn will impact traffic patterns in the commercial/industrial vicinity during the installation of pipeline in the roadway. A traffic management plan developed in consultation with the City of Lynn and MassDOT will mitigate these impacts. A Traffic Assessment and Control Memo has been developed and is included in **Attachment L**.

BMPs to control construction emissions shall be implemented to minimize dust and emissions. Mitigation for dust will 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.

9. Opportunities for Public Involvement

The Massachusetts Water Resources Authority (MWRA) continues to take proactive steps to engage and inform stakeholders and the community of the upcoming Section 56 water pipeline replacement project. These efforts include the development of a project webpage, which is supported by Google Translate. Additionally, contained on the project's webpage is a summary of the project's goals and specific activities that will take place once construction begins, and several documents, such as Public Notices, EJ Screening Forms, MEPA Documents, and the Notice of Remote Consultation Session. All documents have been translated and posted based on languages spoken by at least 5 percent of census tract population (English, Khmer, Russian, Español, and Urdu). Currently, the agency is also in the process of finalizing a Question & Answer document, which aims to directly provide information that is likely to be commonly sought by members of the communities about the project and its associated impacts. This document, as well as any future documents, will continue to be translated and posted on the project's webpage. The Authority has also created a notification request form within the Everbridge system to enable the Authority to begin collecting contact information from those seeking to receive updates as the project progresses.

Furthermore, MWRA staff have met and/or discussed with municipal officials, including the Revere Conservation Commission, city employees, and the Point of Pines Yacht Club in an effort to better coordinate the upcoming project. Additional meetings will be coordinated with state legislative officials and the Point of Pines Neighborhood Association once plans have been further developed. Lastly, information regarding the project has similarly been shared with several within the communities, for example, the Advance Notification Environmental Justice Screening Forms were shared with the City of Lynn and the City of Revere, the Point of Pines Yacht Club, the Point of Pines Neighborhood Association, and other stakeholders.

The Community-Based Organizations (CBOs) and MEPA Distribution List is included as **Attachment M**.

The Public Notice of Environmental Review as published in both English and Spanish is included as **Attachment N**.

10. 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

- MassDEP 401 Water Quality Certification
- Consistency Determination from the Massachusetts Office of Coastal Zone Management
- MassDEP Chapter 91 Waterways License
- 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

11. Response to Comments

Comments were received from the Executive Office of Energy and Environmental Affairs, state agencies and the City of Revere regarding the Expanded Environmental Notification Form. The MEPA Certificate was issued on September 15th, 2023. The MEPA Office granted the request for a Single Environmental Impact Report. The letter and comments received by the Executive Office of Energy and Environmental Affairs and others are provided in **Attachment O**, along with a table summarizing the comments, responses, and sections of the document where the comments received were addressed.

12. References

AECOM Technical Services Inc. 2021. *Cultural Resources Field Investigations and Report: Section 56 Water Main Replacement Saugus River Crossing Lynn and Revere, MA*

AECOM Technical Services Inc. 2020. *Preliminary Design Report Saugus River Crossing Section 56 Replacement MWRA Contract No. 7454*.

City of Lynn. 2019*. Lynn Revised Waterfront Master Plan*. Sep 2019.

City of Revere, Metropolitan Area Planning Council. 2020*. Next Stop Revere (Draft Master Plan)*. Jan 2020.

CR Environmental, Inc. 2020. *Hydrographic Survey Report Saugus River Crossing*. Prepared for AECOM Technical Services, Inc. Oct 2020.

Environmental Laboratory. 1987*. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1*. US Army Engineer Waterways Experiment Station. Vicksburg, MS.

Fishbrain.com accessed June 15th, 2023. *Fishing spots, fishing reports and regulations in Saugus River*. https://fishbrain.com/fishing-waters/a51Wkqz8/saugus-river

Hager GeoScience, Inc. 2021. *Geophysical Survey MWRA Section 56 Water Main Saugus River Crossing HDD Routes 3 and 7 Lynn and Revere, Massachusetts*. Prepared for AECOM Technical Services, Inc. August 2021.

Massachusetts Department of Environmental Protection. 2017a. *Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40) Wetland Protections Act Regulations (310 CMR 10.00)*. Effective October 24, 2014.

Massachusetts Department of Environmental Protection. 2017b. *Applying the Massachusetts Coastal Wetlands Regulations: A Practical Manual for Conservation Commissions to Protect the Storm Damage Prevention and Flood Control Functions of Coastal Resource Areas*. Office of Coastal Zone Management.

Massachusetts Department of Environmental Protection. 2022a. *Massachusetts 2021 Air Quality Report.*

Massachusetts Department of Environmental Protection. 2022b*. Integrated Lists of Waters & Related Reports*. https://www.mass.gov/lists/integrated-lists-of-waters-related-reports#final-2018/2020-integrated-list-of-waters-

Massachusetts Department of Public Health. 2023. *MA DPH Environmental Justice Tool. https://matracking.ehs.state.ma.us/Environmental-Data/ej-vulnerable-health/environmental-justice.html*

Massachusetts Division of Fisheries and Wildlife. 2021. *Regulatory Maps: Priority & Estimated Habitats*. Natural Heritage & Endangered Species Program. https://www.mass.gov/service-details/regulatory-maps-priority-estimated-habitats

Massachusetts Environmental Policy Act Office. 2023. *Massachusetts Environmental Protection Act (MGL c. 30, §§61 through 62L). MEPA Regulations Review Thresholds (301 CMR 11.03).*

Massachusetts Executive Office of Energy & Environmental Affairs. 2018. *Waste Site & Reportable Releases Information – Riley Way Extension RTN 3-0032437*. https://eeaonline.eea.state.ma.us/portal#!/wastesite/3-0032437

MassGIS. 2023. *MassGIS Data: Protected and Recreational OpenSpace*. https://www.mass.gov/info-details/massgis-data-protected-and-recreational-openspace. Accessed April 3rd, 2023.

Metropolitan Area Planning Council. 2008. *MetroFuture: Making a Greater Boston Region's 30-Year Plan*. May 2008.

Saugus River Watershed Council. 2020. https://www.saugusriver.org/

US Army Corps of Engineers. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*. Version 2.0. January.

ATTACHMENT A

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.

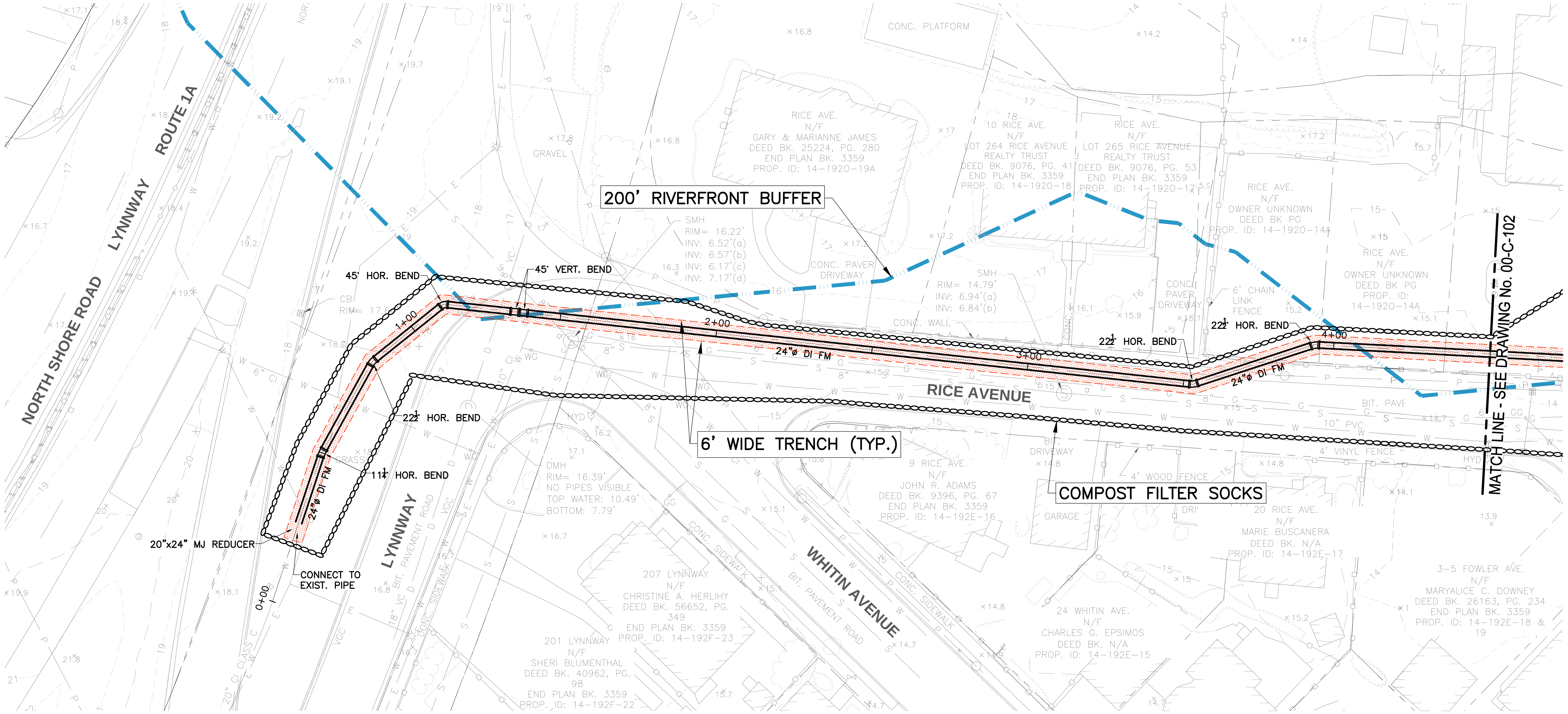
Description: This photograph was taken facing south. The timber pile bulkhead can be seen in the background. The path shown in the above photo continues south as shown here on the right side of the image. Vegetation includes autumn olive (*Elaeagnus umbellata*), European buckthorn (*Rhamnus cathartica*),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

Project Plans



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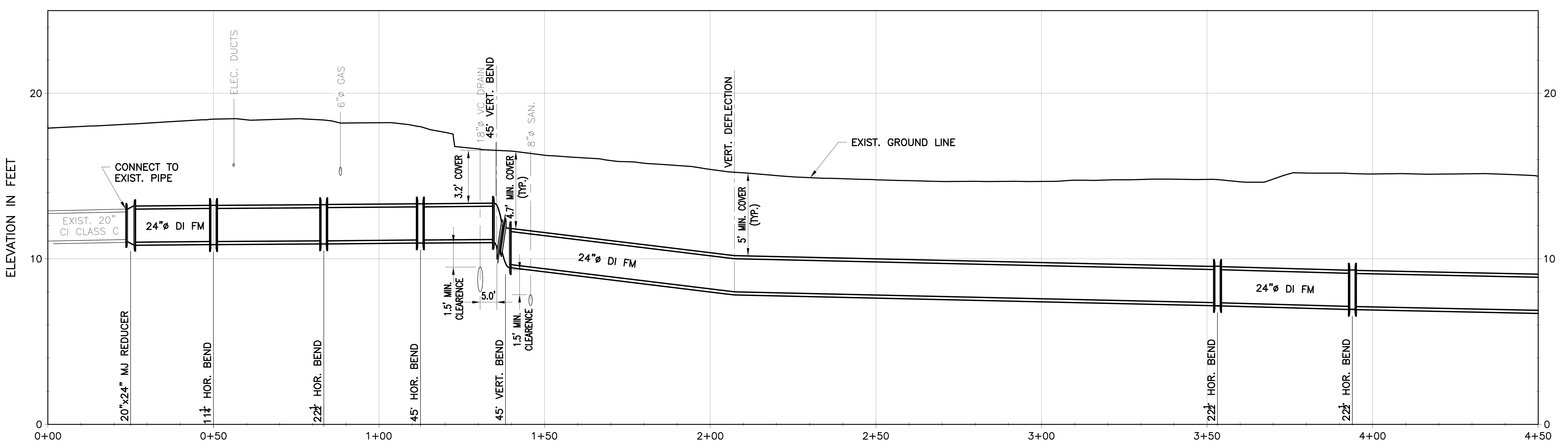

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1" = 4' VER.

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

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. ENTIRE AREA IS WITHIN DEP MAPPED BARRIER BEACH/COASTAL DUNE AND LAND SUBJECT TO COASTAL STORM FLOWAGE.

60% SUBMITTAL

NO.	DATE	BY	CHK'D	REVISION

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CAD FILE NO.: 00 C-101.DWG
ACCESSION NO.:
SECTION NO.:
DATE: MARCH 2024
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM
SCALE: 1"=20' HOR. & 1"=4' VER.

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY:
AECOM
AECOM TECHNICAL SERVICES, INC.
250 APOLLO DRIVE
CHELMSFORD, MA 01824
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www.aecom.com

SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

RICE AVENUE PLAN AND PROFILE
STA. 0+00 TO STA. 4+50

DRAWING NO.
00 C-101
4 OF 35

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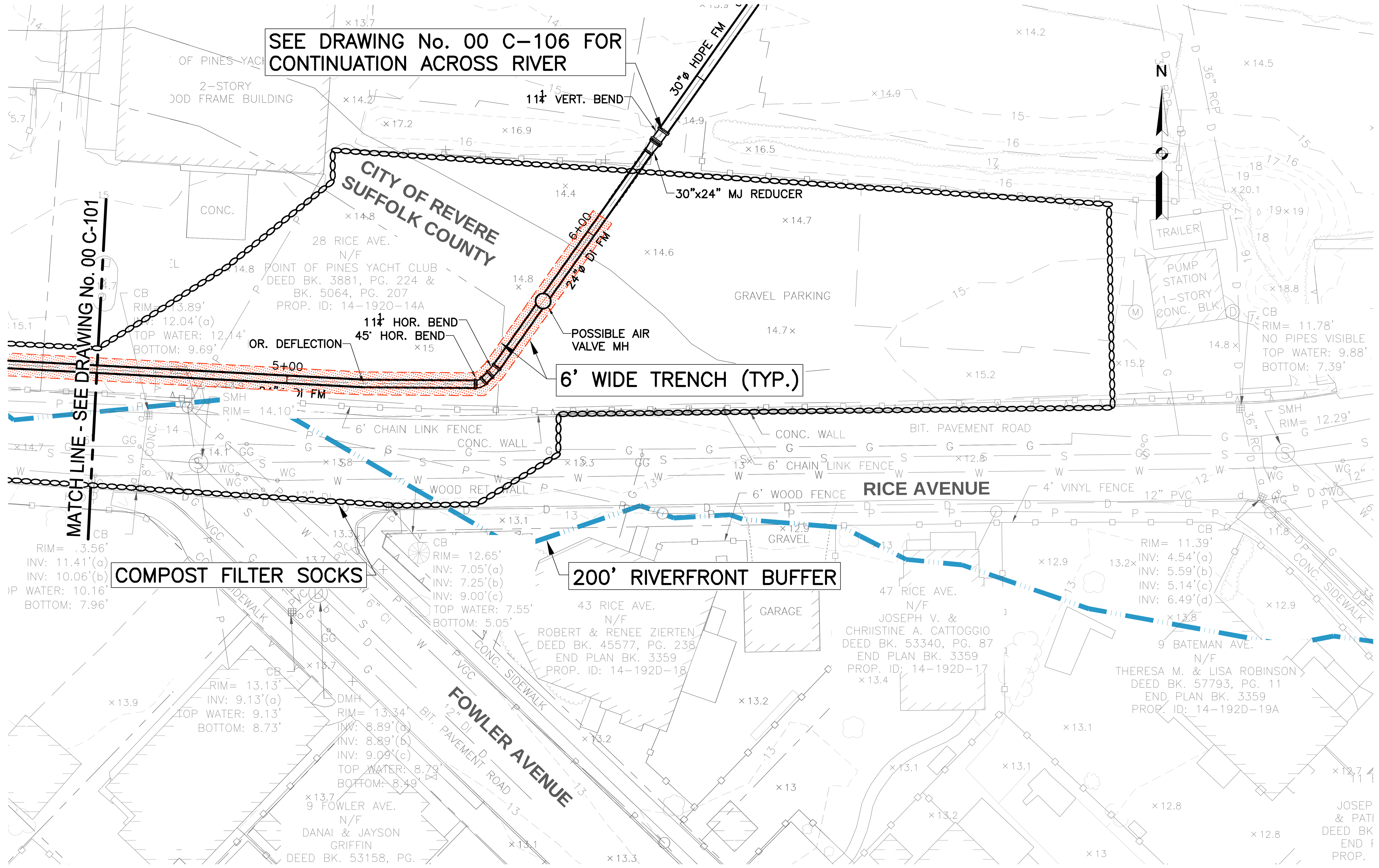

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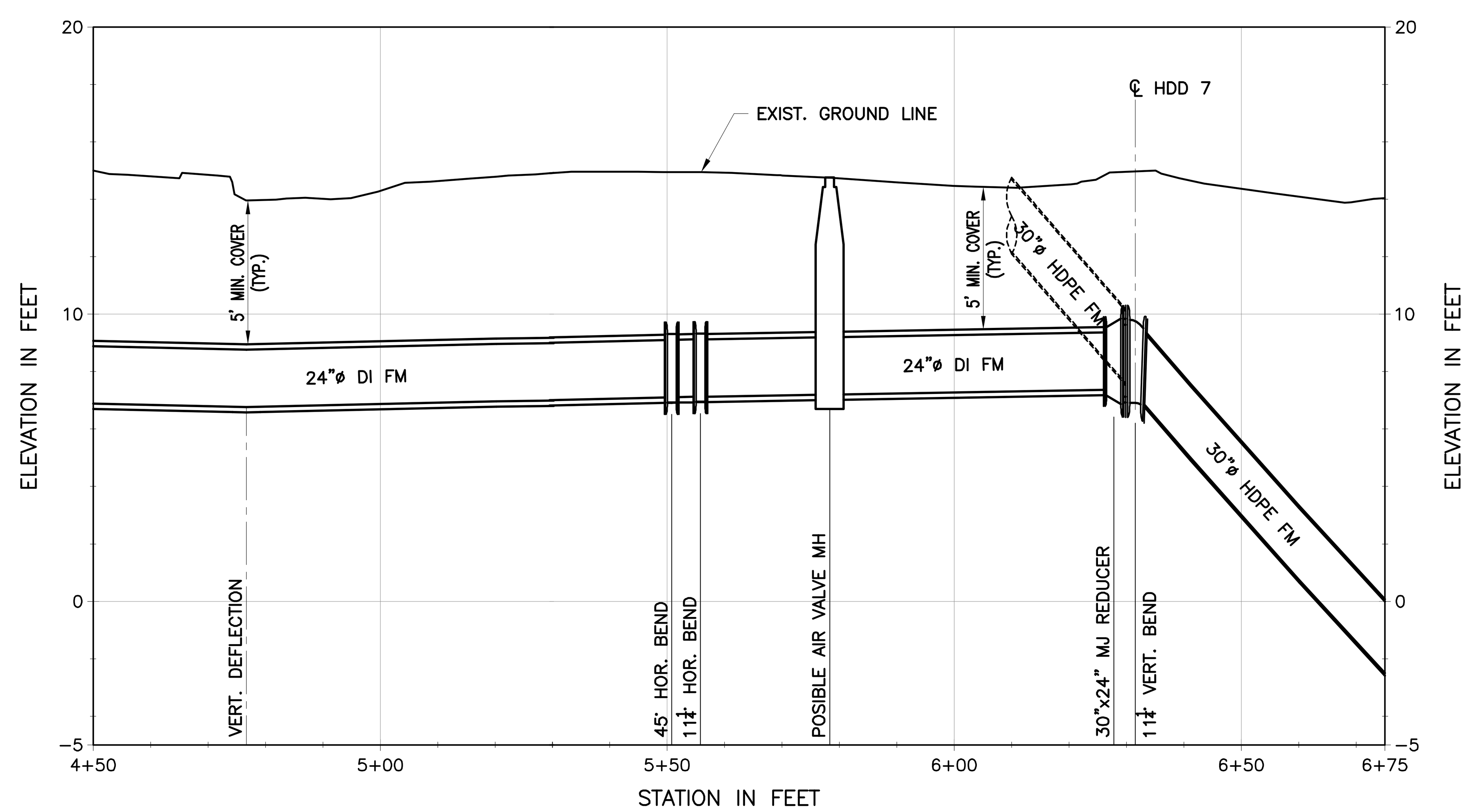

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1" = 4' VER.

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
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

60% SUBMITTAL

NO.	DATE	BY	CHK'D	REVISION

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DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM
SCALE: 1"=20' HOR. & 1"=4' VER.

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY :

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SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

RICE AVENUE PLAN AND PROFILE
STA. 4+50 TO STA. 6+75

DRAWING NO.
00 C-102

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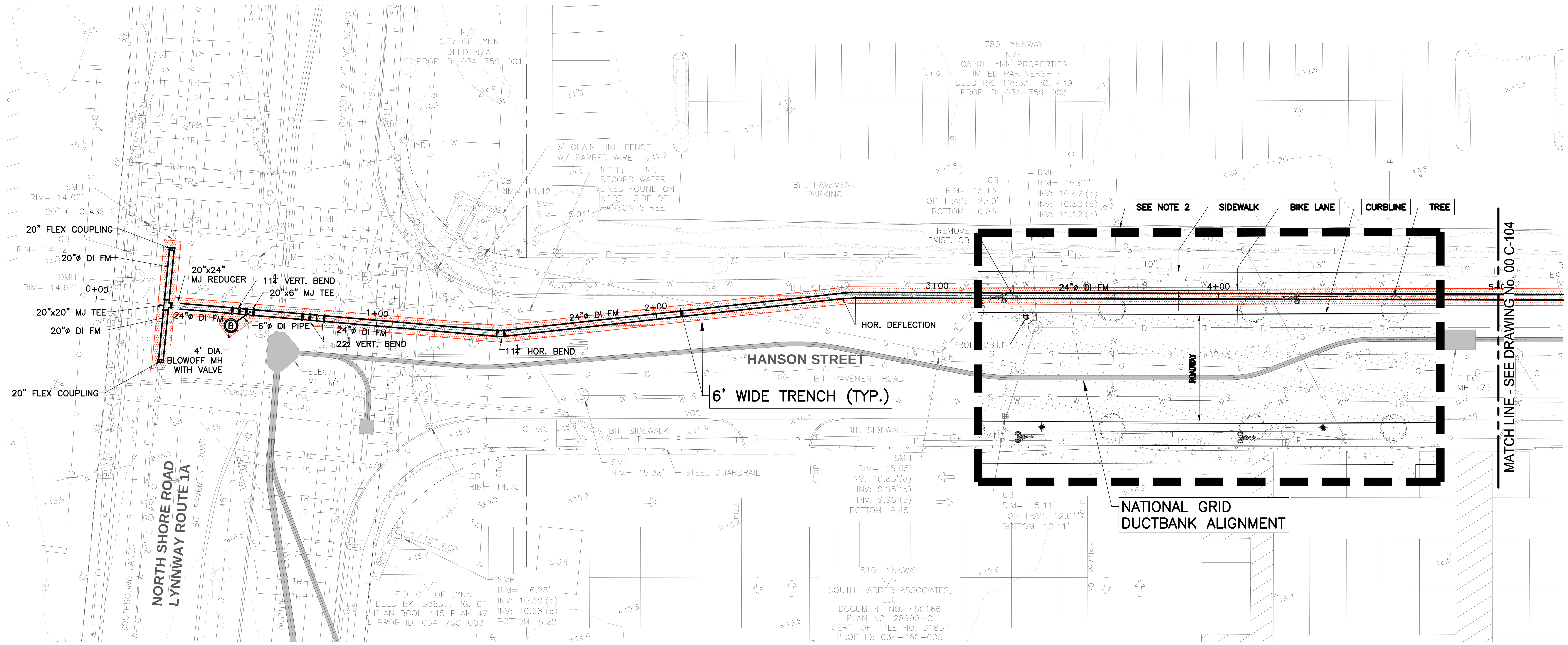

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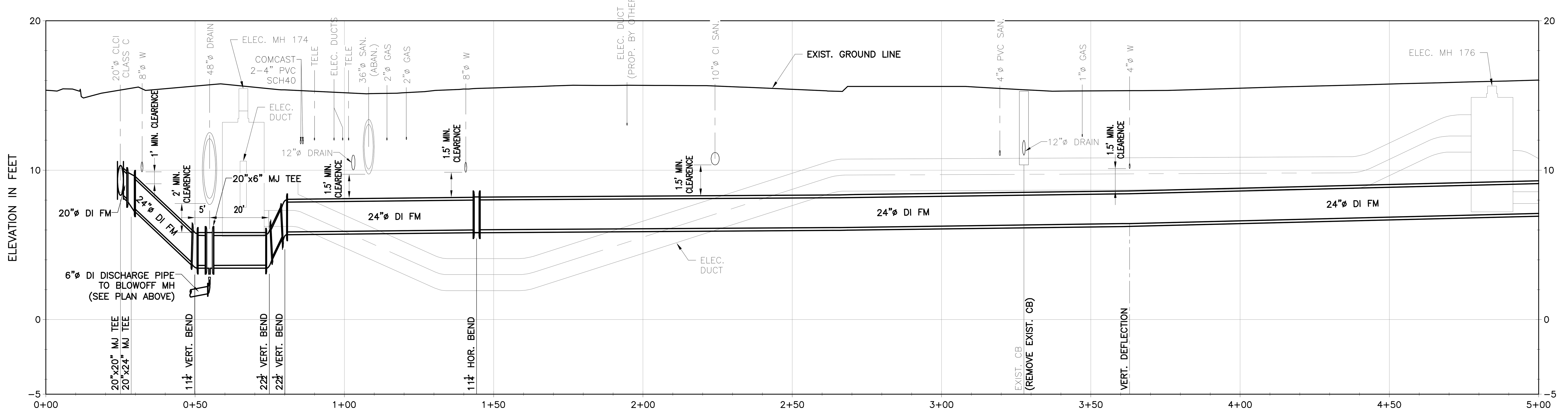

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HOR. SCALE IN FEET: 20 0 20 40

VER. SCALE IN FEET: 4 0 4 8

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. SNIPPET SHOWING FUTURE LOCATION OF SIDEWALK, BIKE LANE, TREES, AND CURBLINE UNDER A SEPARATE CONTRACT (BY OTHERS). THE 20" DI FM TO BE LOCATED WITHIN THE LIMITS OF FUTURE BIKE PATH AS SHOWN.
3. ENTIRE AREA IS WITHIN LAND SUBJECT TO COASTAL STORM FLOWAGE.

60% SUBMITTAL

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO. : 7454
ACCESSION NO. :
DATE: MARCH 2024
SCALE: 1"=20' HOR. & 1"=4' VER.

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DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY:

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SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

HANSON STREET PLAN AND PROFILE
STA. 0+00 TO STA. 5+00

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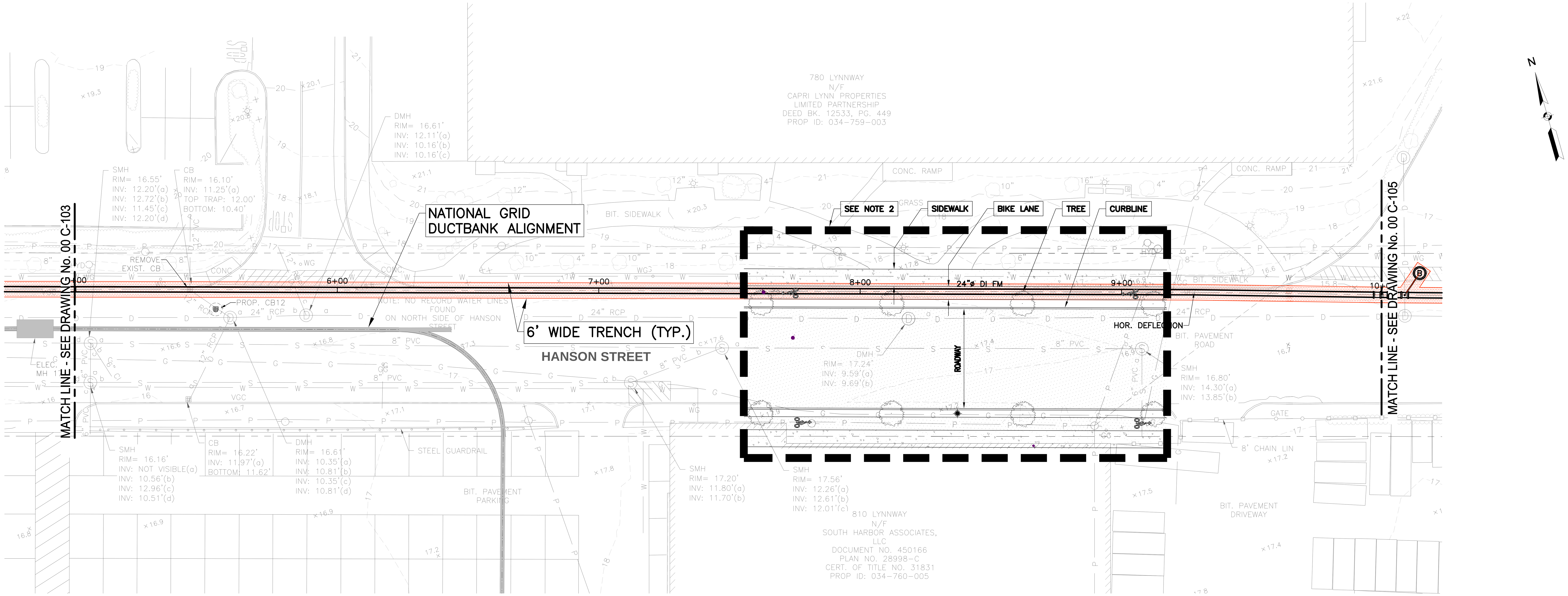

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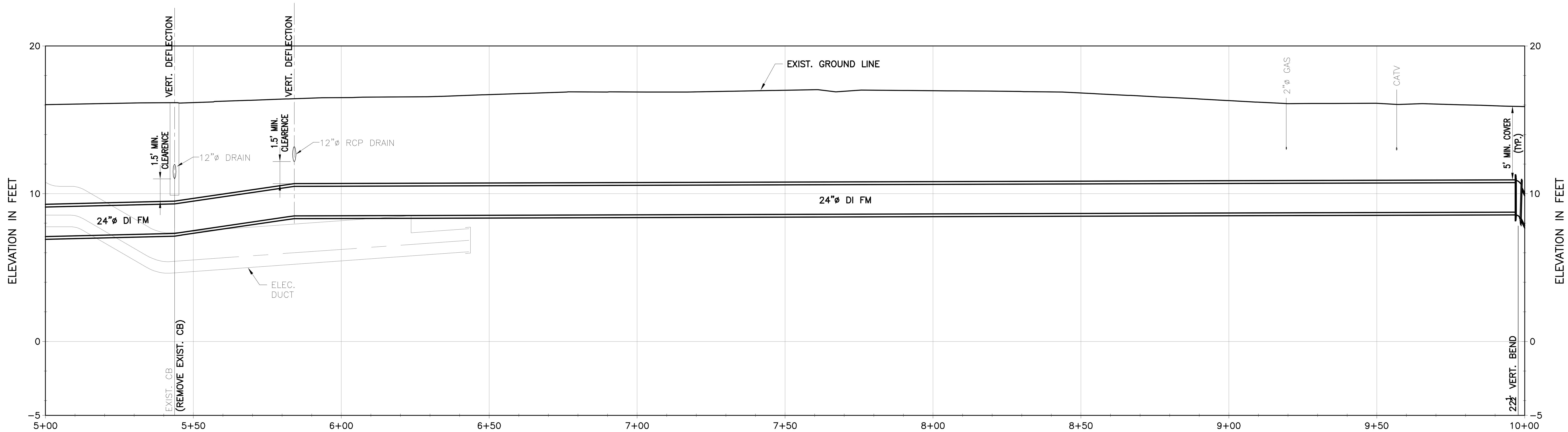

PROFILE
SCALE: 1" = 20' HOR.
1" = 4' VER.

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. SNIPPET SHOWING FUTURE LOCATION OF SIDEWALK, BIKE LANE, TREES, AND CURBLINE UNDER A SEPARATE CONTRACT (BY OTHERS). THE 20" DI FM TO BE LOCATED WITHIN THE LIMITS OF FUTURE BIKE PATH AS SHOWN.
3. ENTIRE AREA IS WITHIN LAND SUBJECT TO COASTAL STORM FLOWAGE.

60% SUBMITTAL

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.: 00 C-104.DWG
ACCESSION NO.:
SECTION NO.:
DATE: MARCH 2024
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM
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

SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

HANSON STREET PLAN AND PROFILE
STA 5+00 TO STA. 10+00

DRAWING NO.
00 C-104

PATH/FILENAME: C:\60619578 - MWRA 7454 SAUGUS RIVER CROSSING\SHEETS\C00-C-104.DWG
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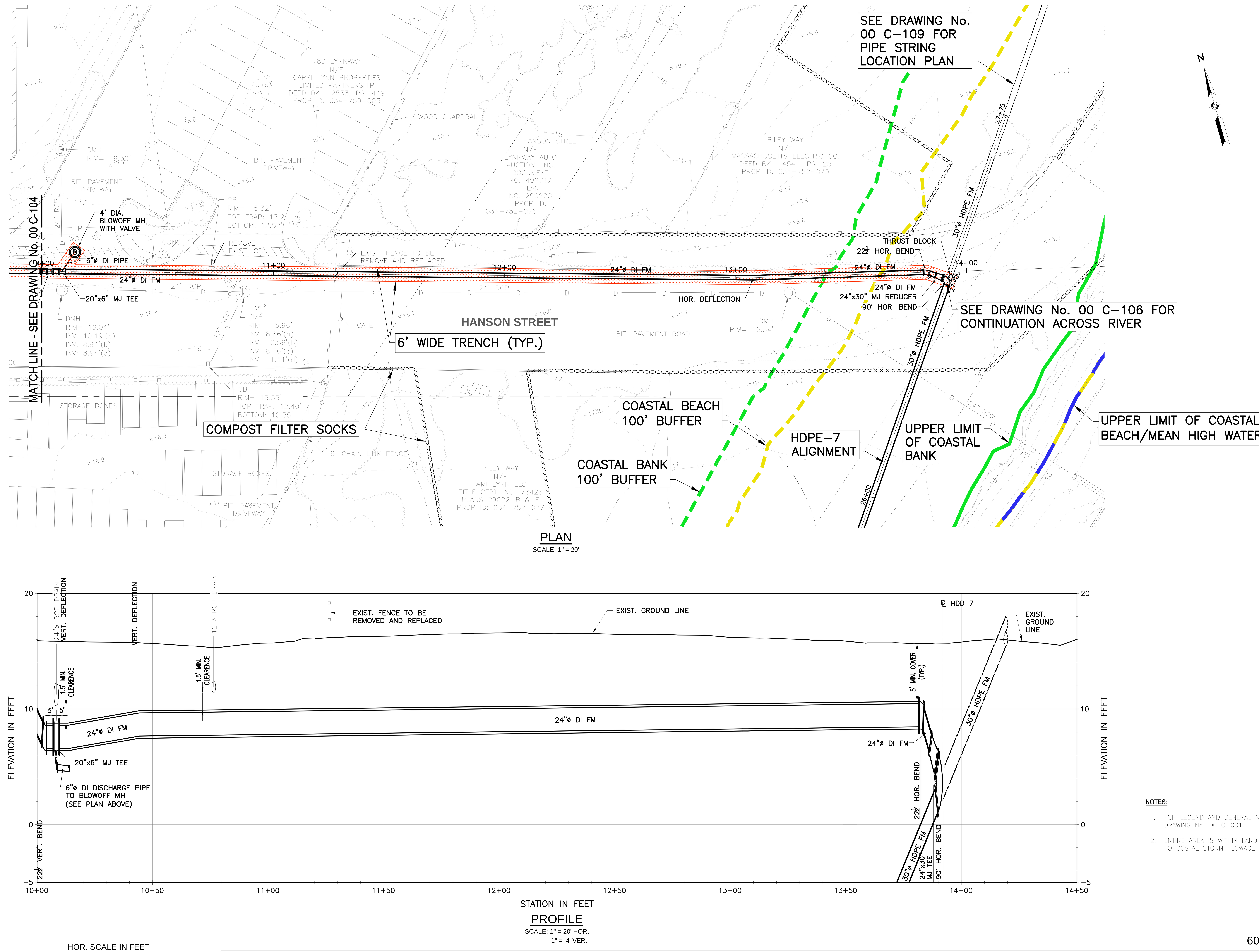
PLOT DATE: Friday, February 23, 2024 10:47:35 AM



HOR. SCALE IN FEET
VER. SCALE IN FEET

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. ENTIRE AREA IS WITHIN LAND SUBJECT TO COSTAL STORM FLOWAGE.

60% SUBMITTAL

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454
CAD FILE NO.: 00 C-105.DWG
ACCESSION NO.:
SECTION NO.:
DATE: MARCH 2024
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM
SCALE: 1"=20' HOR. & 1"=4' VER.

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SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

HANSON STREET PLAN AND PROFILE
STA. 10+00 TO STA. 14+00

DRAWING NO.
00 C-105
8 OF 35

PATH\FILENAME: C:\60619578 - MWRA 7454 SAUGUS RIVER CROSSING\SHEETS\C00 C-105.DWG
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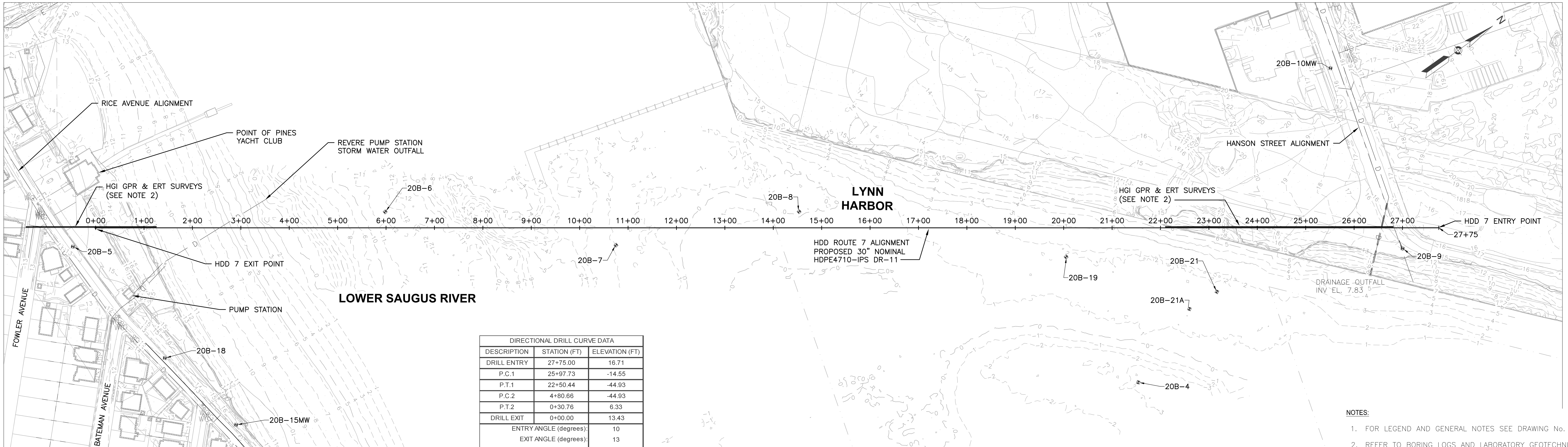
PLOT DATE: Friday, February 23, 2024 10:53:05 AM



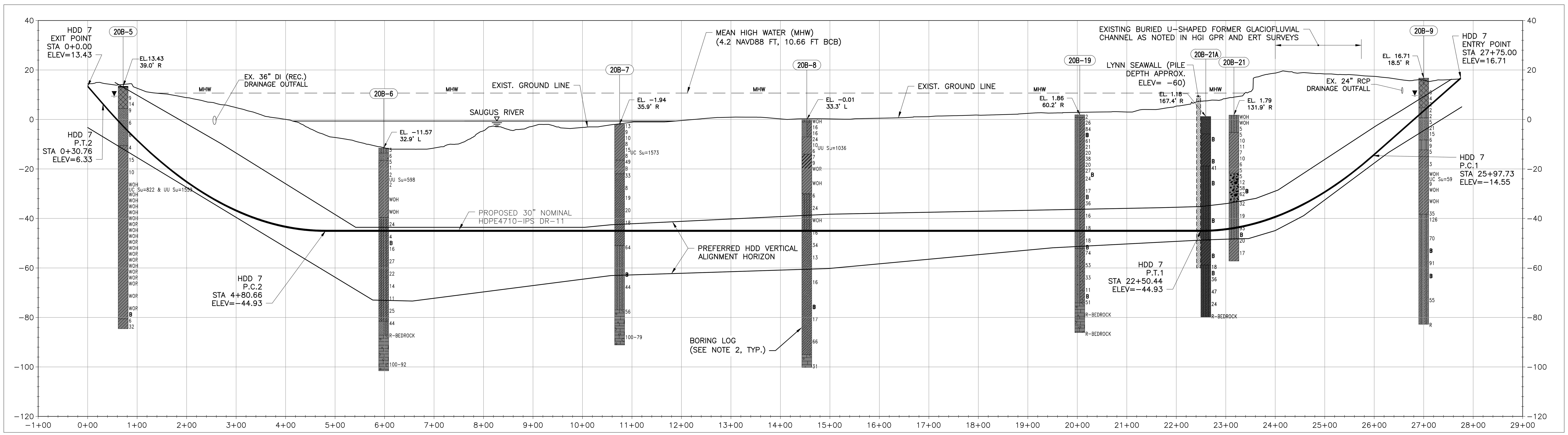
DIRECTIONAL DRILL CURVE DATA		
DESCRIPTION	STATION (FT)	ELEVATION (FT)
DRILL ENTRY	27+75.00	16.71
P.C.1	25+97.73	-14.55
P.T.1	22+50.44	-44.93
P.C.2	4+80.66	-44.93
P.T.2	0+30.76	6.33
DRILL EXIT	0+00.00	13.43
ENTRY ANGLE (degrees):		10
EXIT ANGLE (degrees):		13
HORIZONTAL DISTANCE (ft):		2775
HDD LENGTH (ft):		2784
ENTRY VERTICAL RADIUS (ft):		2000
EXIT VERTICAL RADIUS (ft):		2140

PLAN

SCALE: 1" = 100'

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. C-1.
2. REFER TO BORING LOGS AND LABORATORY GEOTECHNICAL INFORMATION INCLUDED IN THE GDR IN THE APPENDIX TO SPECIFICATIONS.



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
ACCESSION NO. :
DATE: MARCH 2024
SCALE: 1"=100' HOR. & 1"=20' VER.
CAD FILE NO. : FM-HDD.dwg
SECTION NO. :
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM

MASSACHUSETTS WATER RESOURCES AUTHORITY

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250 APOLLO DRIVE
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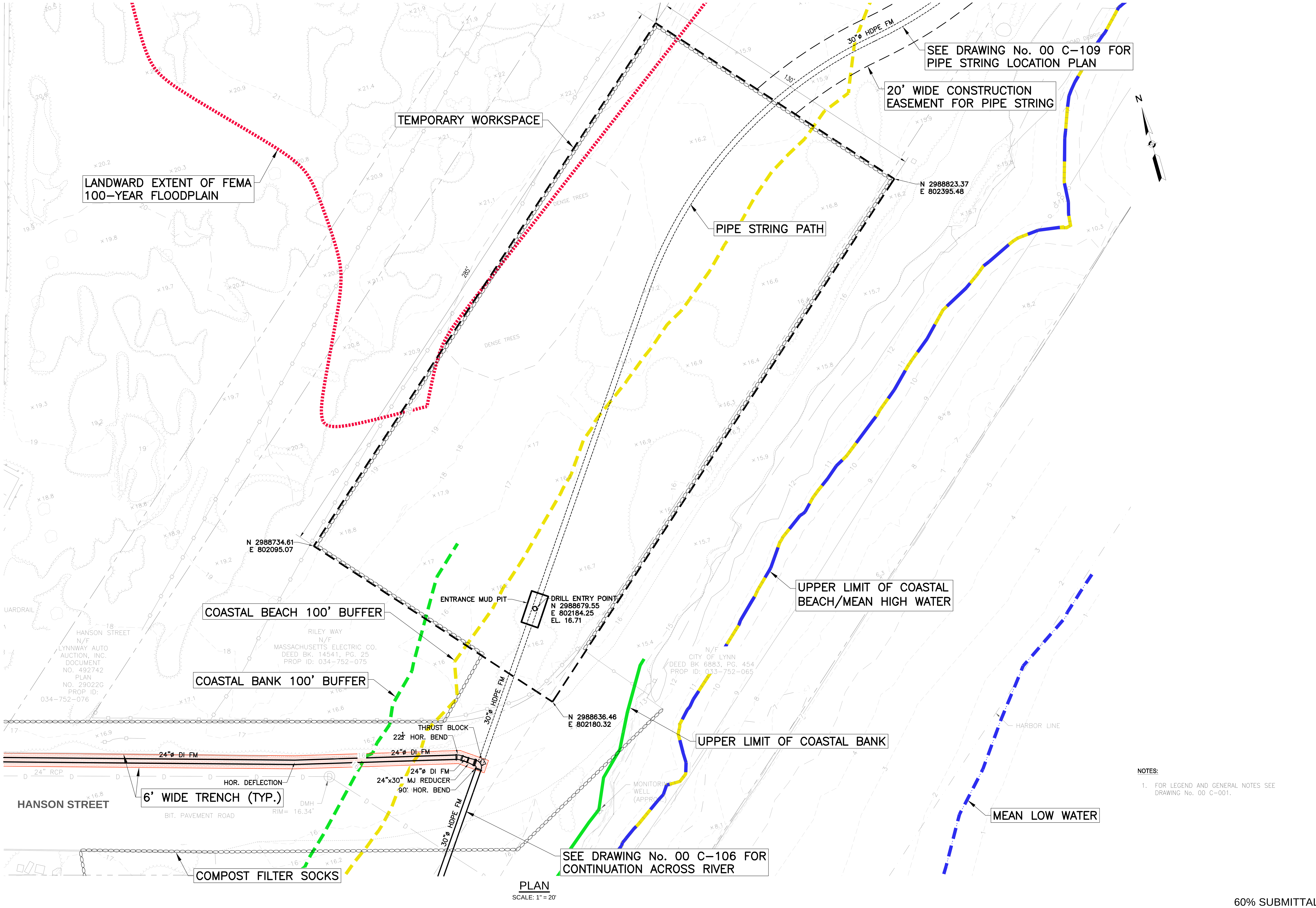
SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

HORIZONTAL DIRECTIONAL DRILLING
PLAN AND PROFILE

DRAWING NO.
C-106

9 OF 26



NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.

60% SUBMITTAL

0 20 50 100

SCALE: 1" = 20'

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454

CAD FILE NO.: 00 C-107.DWG

ACCESSION NO.:

SECTION NO.:

DATE: MARCH 2024

DESIGNED BY: ___

DRAWN BY: ZB

CHECKED BY: ___

APPROVED BY: MM

SCALE: 1"=20'

MASSACHUSETTS WATER RESOURCES AUTHORITY

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SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

HORIZONTAL DIRECTIONAL DRILLING
ENTRY POINT PLAN

DRAWING NO.

00 C-107

10 OF 35

PATH\FILENAME: C:\60619578 - MWRA 7454 SAUGUS RIVER CROSSING\SHEETS\C00 C-107.DWG
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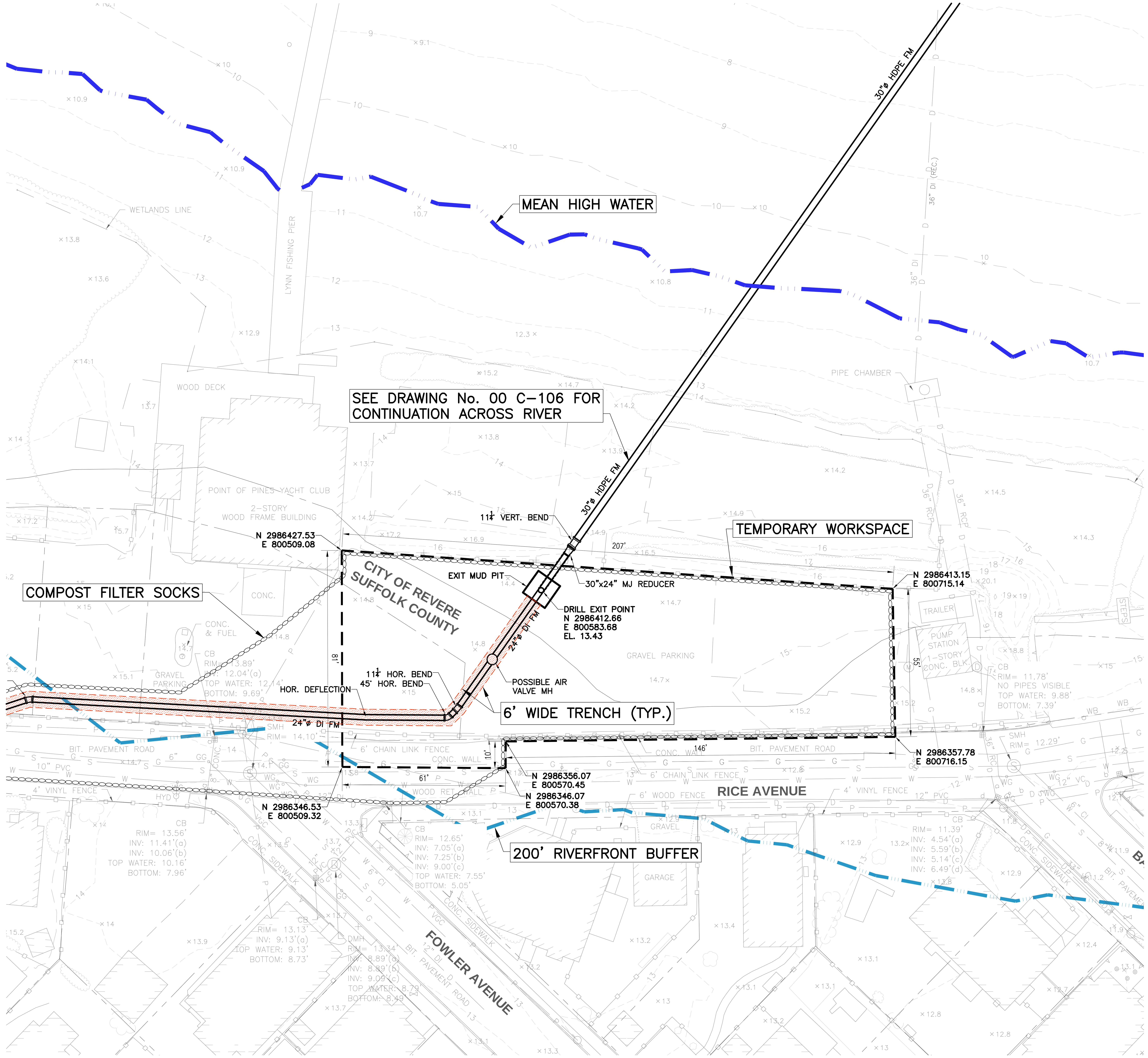

PLAN
SCALE: 1" = 20'

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. ENTIRE AREA IS WITHIN DEP MAPPED BARRIER BEACH/COASTAL DUNE AND LAND SUBJECT TO COASTAL STORM FLOWAGE.

60% SUBMITTAL

0 20 50 100
SCALE: 1" = 20'

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454
CAD FILE NO.: 00 C-108.DWG
ACCESSION NO.:
SECTION NO.:
DATE: MARCH 2024
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM
SCALE: 1"=20'

MASSACHUSETTS WATER RESOURCES AUTHORITY

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250 APOLLO DRIVE
CHELMSFORD, MA 01824
PHONE: (978) 905-2100
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SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

HORIZONTAL DIRECTIONAL DRILLING
EXIT POINT PLAN

DRAWING NO.
00 C-108
11 OF 35

PATH\FILENAME: C:\60619578 - MWRA 7454 SAUGUS RIVER CROSSING\SHEETS\C00 C-108.DWG
LAST UPDATE: Tuesday, February 20, 2024 5:52:03 PM
PLOT DATE: Thursday, February 22, 2024 5:36:45 PM

PLAN

SCALE: 1" = 100'

0 100 200 300 400

SCALE: 1" = 100'

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.

60% SUBMITTAL

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO. : 7454

CAD FILE NO. : 00 C-109.DWG

ACCESSION NO. :

SECTION NO. :

DATE: MARCH 2024

SCALE: 1" = 100'

DESIGNED BY: __

DRAWN BY: ZB

CHECKED BY: __

APPROVED BY: MM

MASSACHUSETTS WATER RESOURCES AUTHORITY

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CHELMSFORD, MA 01824
PHONE: (978) 905-2100
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SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

PIPE STRING PLAN LOCATION AND NOTES

DRAWING NO.

00 C-109

PATH/FILENAME: C:\60619578 - MWRA 7454 SAUGUS RIVER CROSSING\SHEETS\C\00 C-109.DWG
LAST UPDATE: Friday, February 23, 2024 11:14:37 AM
PLOT DATE: Friday, February 23, 2024 12:31:52 PM

PLAN
SCALE: 1" = 20'

60% SUBMITTAL

0 20 50 100
SCALE: 1" = 20'

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. ENTIRE AREA IS WITHIN LAND SUBJECT TO COASTAL STORM FLOWAGE.

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454
CAD FILE NO.: 00 C-110.DWG
ACCESSION NO.:
SECTION NO.:
DATE: MARCH 2024
DESIGNED BY: ___
DRAWN BY: ZB
CHECKED BY: ___
APPROVED BY: MM
SCALE: 1"=20'

MASSACHUSETTS WATER RESOURCES AUTHORITY

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CHELMSFORD, MA 01824
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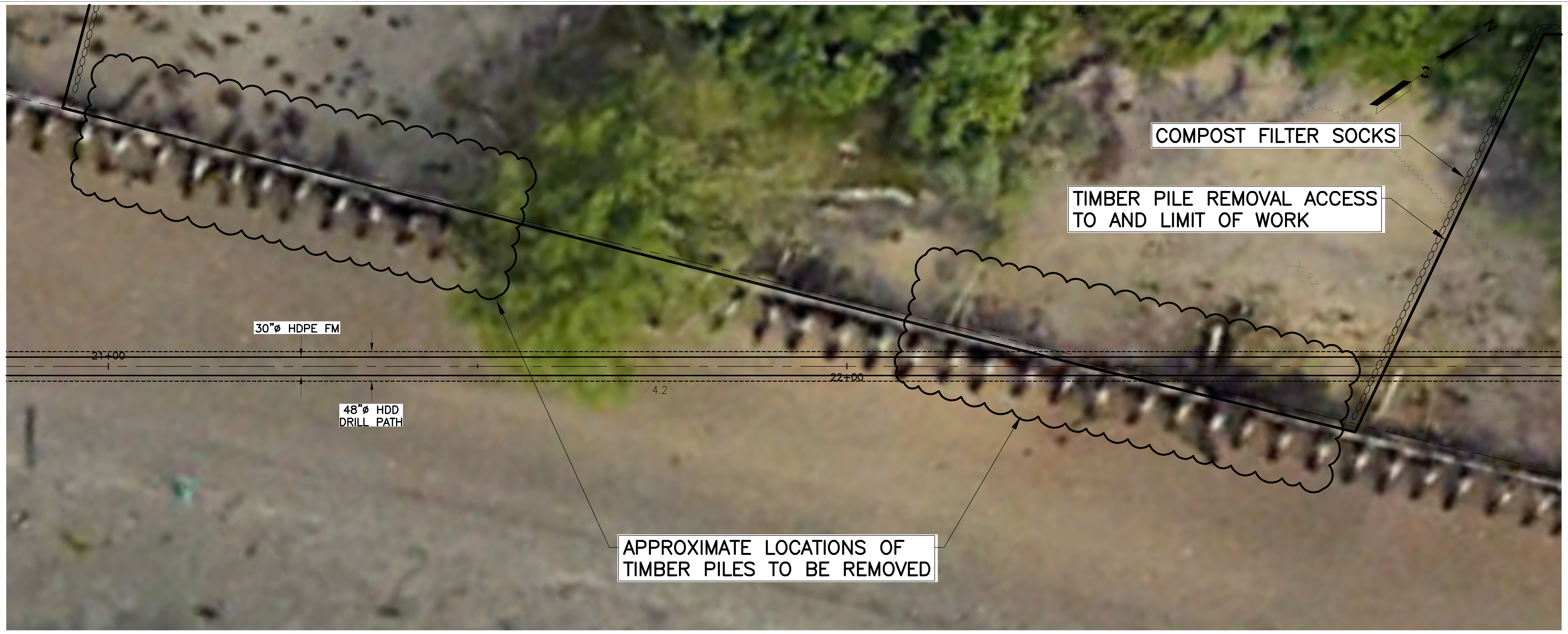
SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

LYNN BULKHEAD
ACCESS PLAN

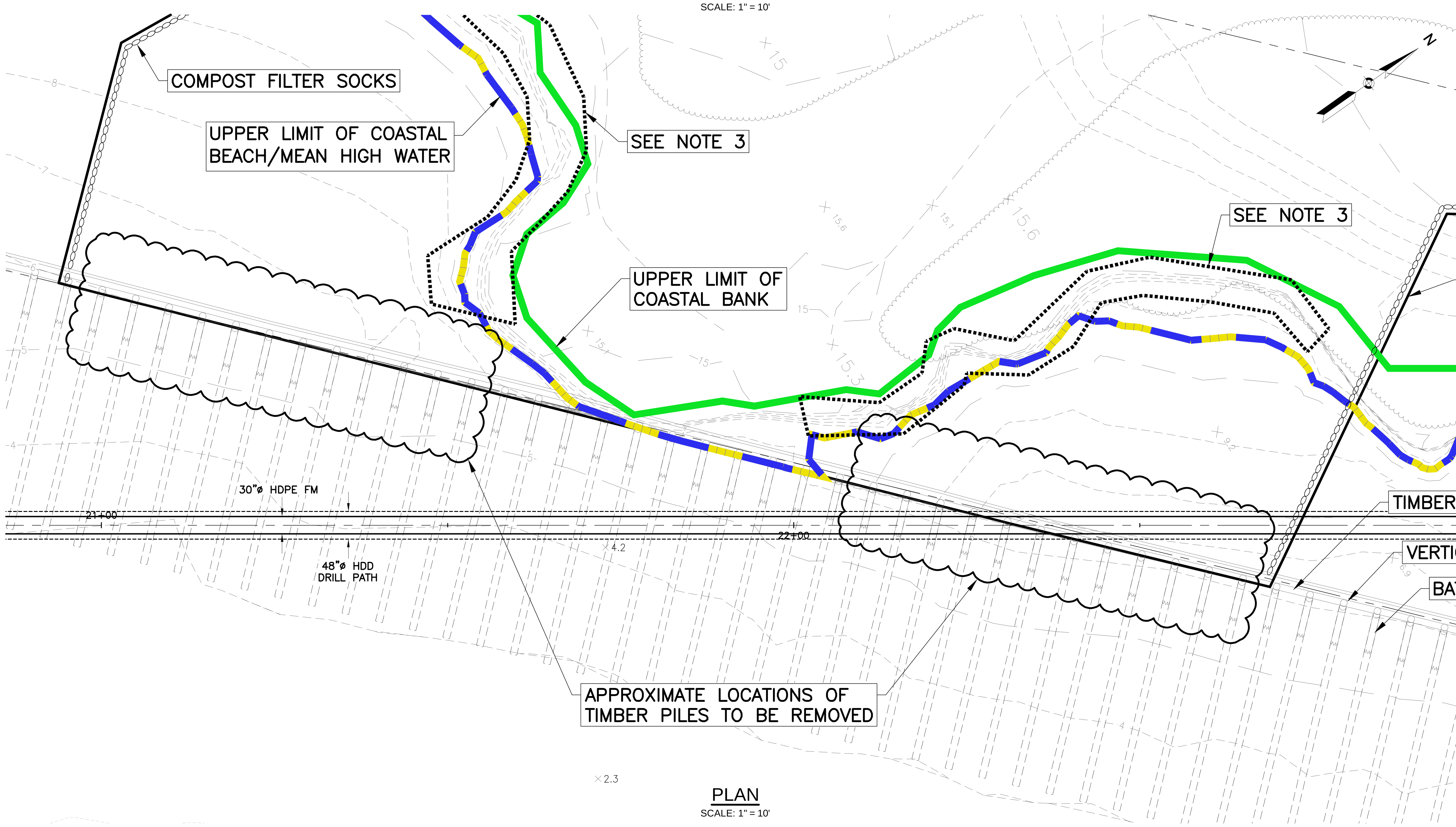
DRAWING NO.
00 C-110
13 OF 27

LAST UPDATE: Thursday, February 22, 2024 6:08:41 PM
PLOT DATE: Friday, February 23, 2024 11:22:41 AM



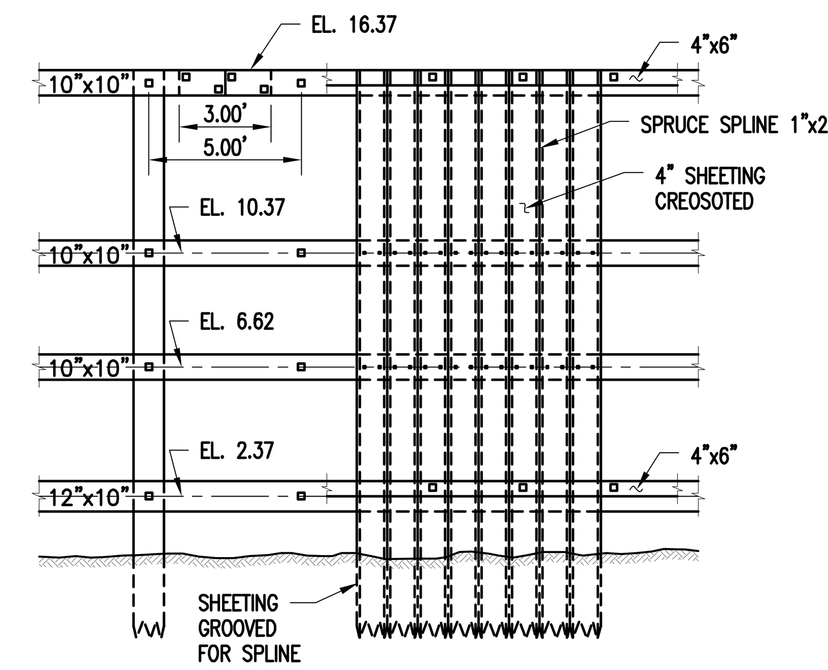
PLAN

SCALE: 1" = 10'



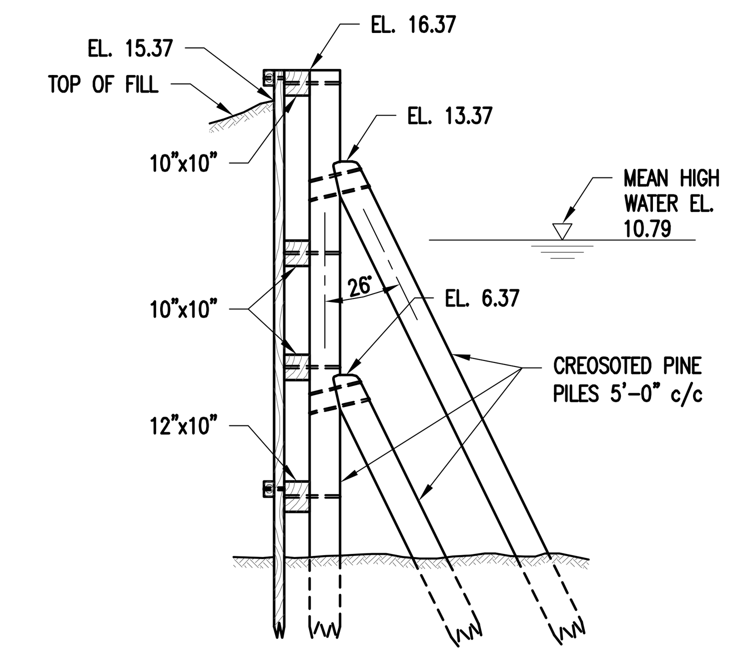
PLAN

SCALE: 1" = 10'



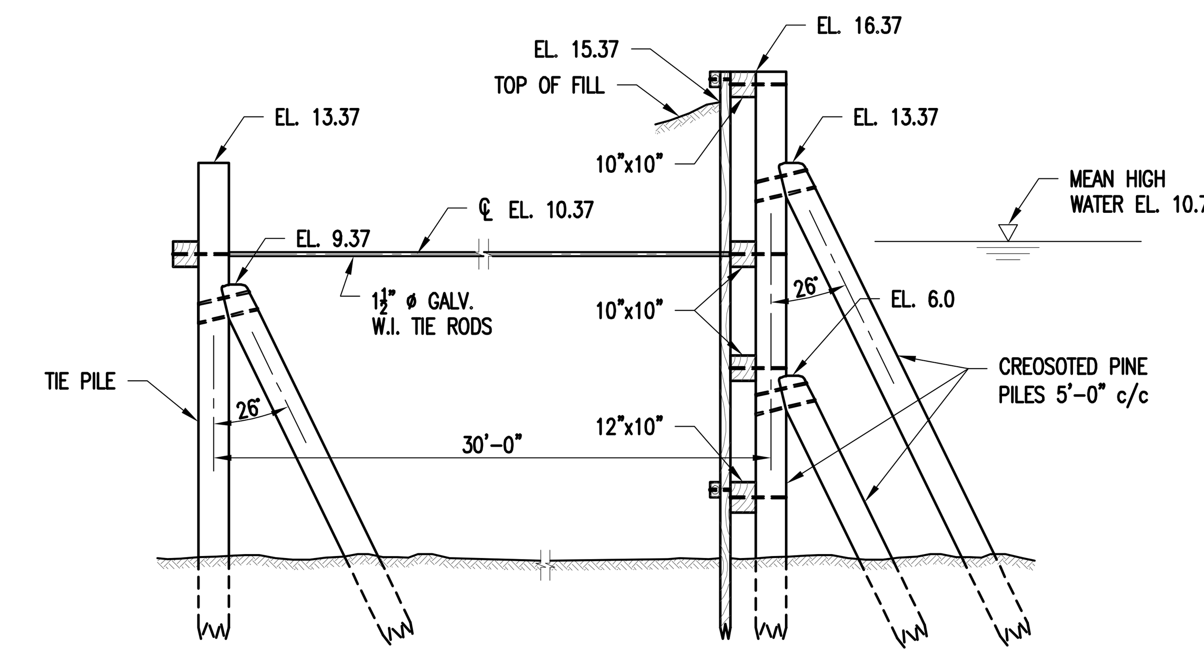
REAR ELEVATION

SCALE: 1" = 5'



TYPICAL SECTION - CLASS A

SCALE: 1" = 5'



TYPICAL SECTION - CLASS B

SCALE: 1" = 5'

NOTE:

RECORD DRAWING ARE NOT AVAILABLE FOR THE LYNN BULKHEAD /SEAWALL. THE ABOVE INFORMATION'S SOURCE IS FROM A 1927 REGULATORY LICENSE. ELEVATIONS FROM THE RECORD DRAWINGS WERE CONVERTED FROM CITY OF LYNN TO BOSTON CITY BASE. ELEVATIONS IN BOSTON CITY BASE ARE SHOWN IN SECTIONS ABOVE. MEAN HIGH WATER ELEVATION HAS BEEN UPDATED TO 2023 MHWL.

SEQUENCE OF CONSTRUCTION:

1. LAYOUT PIPE HORIZONTAL ALIGNMENT CROSSING ON THE BULKHEAD SYSTEM.
2. PROVIDE ACCESS TO AND WORKING PLATFORM AROUND CROSSING. TREES IN THE DESIGNATED LIMIT OF WORK CAN BE CLEARED BUT STUMPS SHALL BE LEFT IN PLACE.
3. STABILIZE SLOPE WITH GEOTEXTILE REINFORCEMENT AND RIPRAP (TO BE REMOVED FOLLOWING CONSTRUCTION) WHERE INDICATED ON THE PLAN.
4. MARK ALL EXISTING VERTICAL, BATTERED, AND DEADMEN PILES WHICH WILL INTERFERE WITH THE HDD PROCESS.
5. DISMANTLE BULKHEAD SUPERSTRUCTURE TO GAIN ACCESS TO INTERFERING PILES.
6. VERIFY THAT NO BURIED DEADMEN PILES INTERFERE WITH HDD PROCESS.
7. PERFORM PILE INTEGRITY TESTING ON ALL REPRESENTATIVE CREOSOTED TIMBER PILES TO DETERMINE THEIR DEPTH AND WHETHER THEY WILL OBSTRUCT HDD PROCESS.
8. EXTRACT ALL PILES OBSTRUCTING HDD PROCESS WHILE SIMULTANEOUSLY GROUTING THE VOIDS LEFT BEHIND TO MINIMIZE POTENTIAL FOR INADVERTENT HDD RETURNS.

60% SUBMITTAL

0 5 10 15 20

SCALE: 1" = 5'

0 10 20 30 40

SCALE: 1" = 10'

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. ENTIRE AREA IS WITHIN LAND SUBJECT TO COASTAL STORM FLOWAGE.

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO. : 7454
CAD FILE NO. : 00 C-111.DWG
ACCESSION NO. :
SECTION NO. :
DATE: MARCH 2024
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY: MM
SCALE: 1"=10' & 1"=5'

MASSACHUSETTS WATER RESOURCES AUTHORITY

PREPARED BY :

AECOM

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

SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

LYNN BULKHEAD
EXISTING PILE LOCATION PLAN AND NOTES

DRAWING NO.

00 C-111

14 OF 27

PATH/FILENAME: C:\60619578 - MWRA 7454 SAUGUS RIVER CROSSING\SHEETS\00 C-111.DWG
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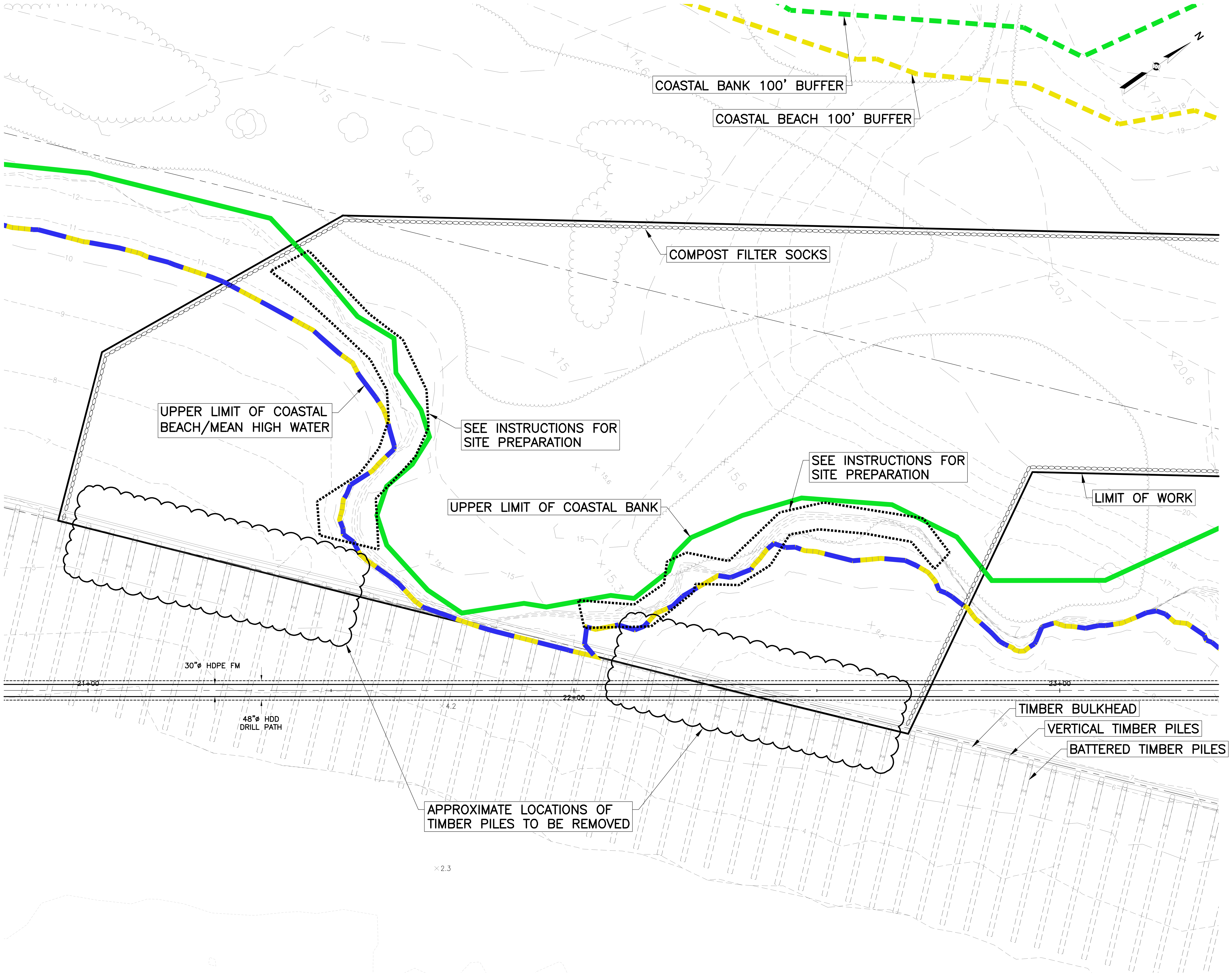

PLAN

SCALE: 1" = 10'

INSTRUCTIONS FOR SITE PREPARATION:

1. CLEAR VEGETATION AS REQUIRED FOR THE WORK WITHIN THE SHOWN LIMIT OF WORK, LEAVING STUMPS IN PLACE.
2. APPLY GEOTEXTILE REINFORCEMENT TO STABILIZE SLOPES WHERE INDICATED.
3. APPLY RIPRAP WHERE INDICATED TO ARTIFICIALLY REGRADE BANK AND FACILITATE ACCESS TO TIMBER PILE REMOVAL AREAS.
4. FOLLOWING ALL ACTIVITY IN THE AREA, RIPRAP AND GEOTEXTILE REINFORCEMENT SHALL BE REMOVED BY HAND TO ENSURE STABILITY OF EXISTING BANK. SLOPE AND CONDITION OF EXISTING BANK SHALL BE PRESERVED.

60% SUBMITTAL

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWING No. 00 C-001.
2. ENTIRE AREA IS WITHIN LAND SUBJECT TO COASTAL STORM FLOWAGE.

0 10 20 30 40

SCALE: 1" = 10'

NO.	DATE	BY	CHK'D	REVISION

CONTRACT NO.: 7454
CAD FILE NO.: 00 C-112.DWG
ACCESSION NO.:
SECTION NO.:
DATE: MARCH 2024
DESIGNED BY:
DRAWN BY:
CHECKED BY:
SCALE: 1"=10'
APPROVED BY: MM

MASSACHUSETTS WATER RESOURCES AUTHORITY

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SAUGUS RIVER CROSSING
SECTION 56 REPLACEMENT

TIMBER PILE REMOVAL SITE PREPARATION

DRAWING NO.
00 C-112

15 OF 27

PATH/FILENAME: C:\60619578 - MWRA 7454 SAUGUS RIVER CROSSING\SHEETS\C00 C-112.DWG
LAST UPDATE: Thursday, February 22, 2024 6:16:12 PM
PLOT DATE: Friday, February 23, 2024 11:31:26 AM

ATTACHMENT C

Feasibility Study, Alternatives Screening and Rating Results, Route Selection Matrix, and Supplemental Alternatives Analysis of Quantitative Environmental Impacts

EXHIBIT 3

Feasibility Study

Weston & Sampson

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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LIST OF APPENDICES

O:\MWRA\2150821-Bridge Crossing FS\C7500 File\13 Subtasks\3.3 Final Feasibility Study\Feasibility Study Final Report.docx

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.

O:\MWRA\2150821-Bridge Crossing FS\C7500 File\13 Subtasks\3.3 Final Feasibility Study\Feasibility Study Final Report.docx

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.

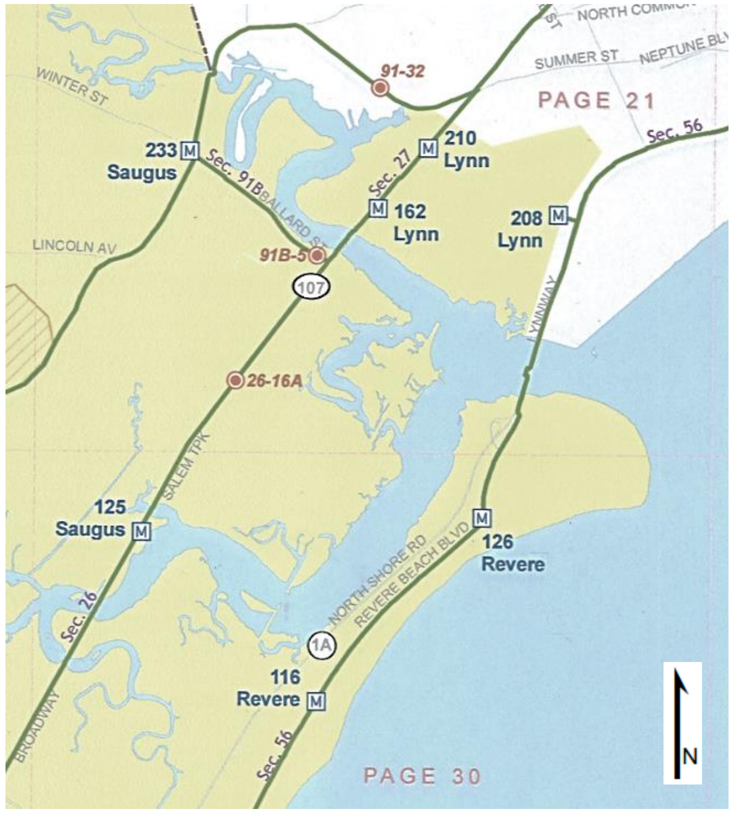

Figure 1 – Overview of Section 56

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

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.

Figure 2- General Edwards Bridge North Elevation

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
- o Introduces the problem, the purpose of contract, the project team, and schedule

Section 2 - Existing Bridge and Pipeline
- o Describes the existing bridge, pipeline inspection efforts, and insulation/coating analysis

Section 3 - Study Area
- o Characterizes existing conditions within the study area

Section 4 - River Crossing Methods
- o Describes methods for river crossing pipe installation

Section 5 - Route Alternatives
- o Identifies route alternatives and describes advantages/disadvantages

Section 6 - Screening & Ranking
- o Describes approach for alternatives screening, screening results, and ranking

Section 7 - Recommended Pipe Replacement Alternatives
- o Includes a detailed review of cost, schedule, subsurface exploration, risks and risk mitigation for the recommended alternatives

Section 8 - Conclusions
- o 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.

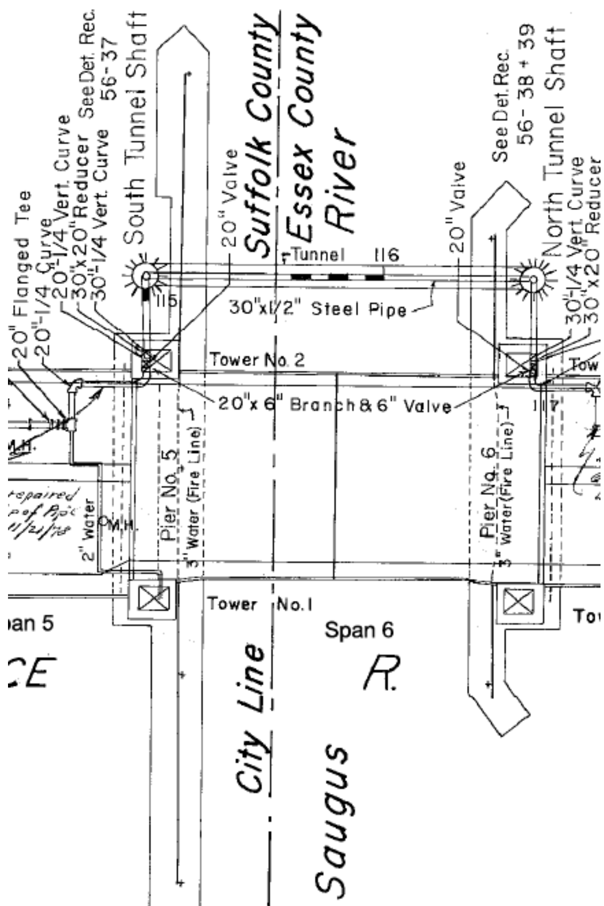

Figure 5 - Tunnel Plan 1934

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.

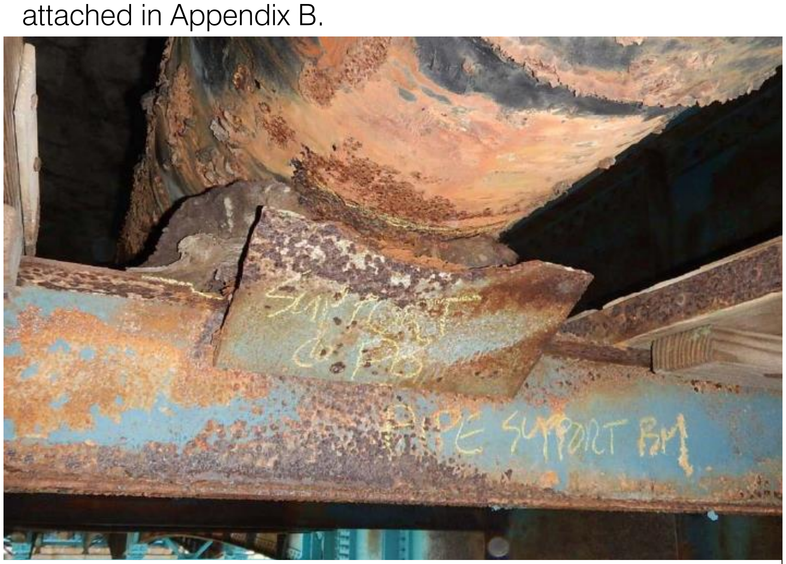

Figure 6 – Typical Deteriorated Pipe Support and Support Beams

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.

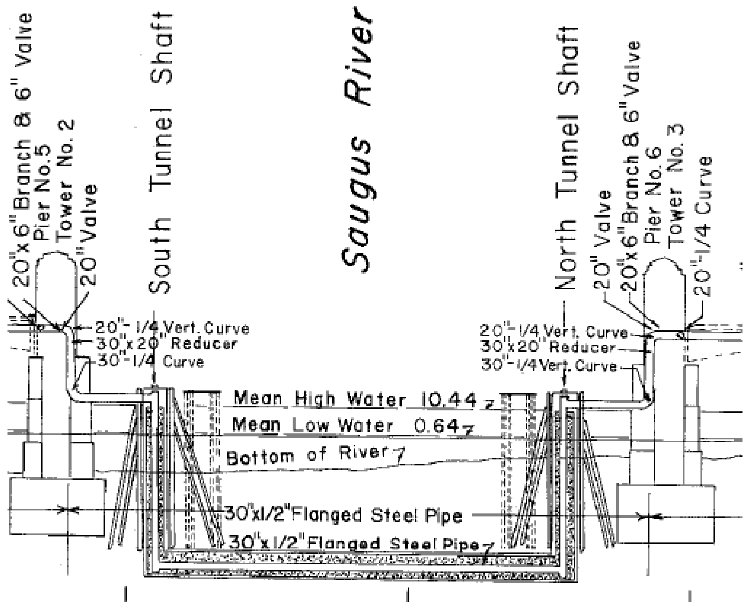

Figure 13 - Tunnel Shaft Profile 1934

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.


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.

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.

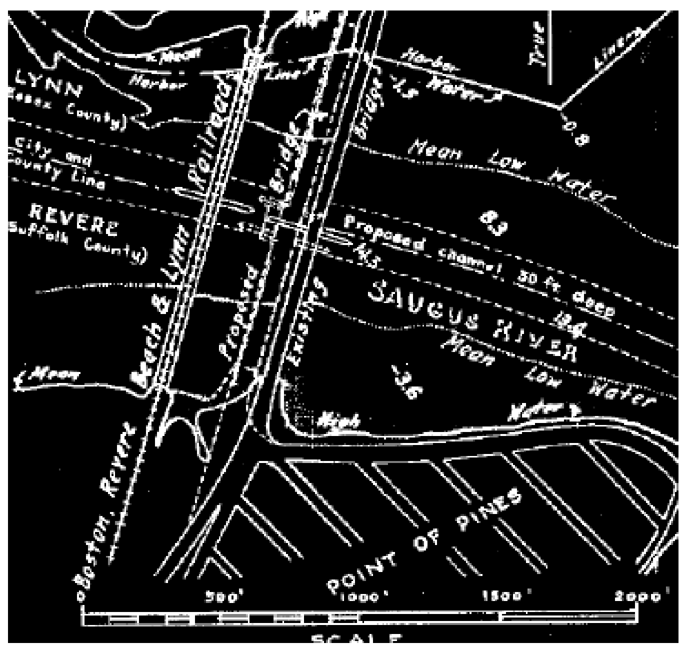

Figure 17 - Historic Bridge Alignment

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.

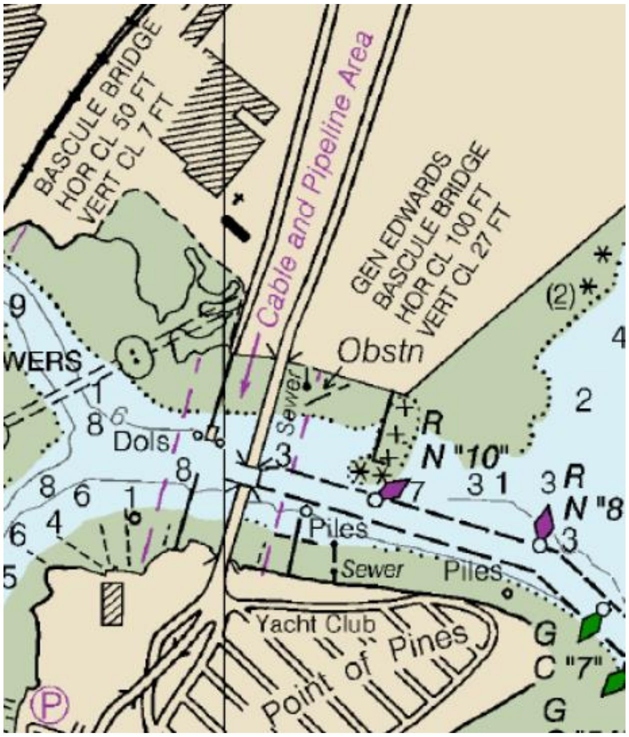

Figure 26 - Excerpt NOAA Salem & Lynn Harbors Map 13275

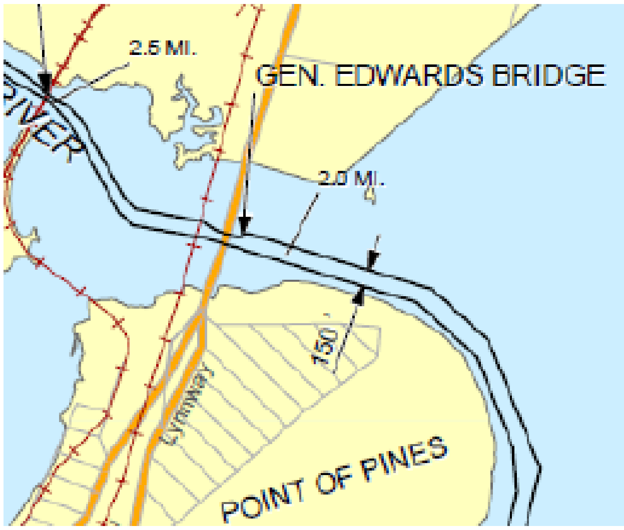

Figure 27 – Excerpt ACOE Map of Saugus River FNP

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.

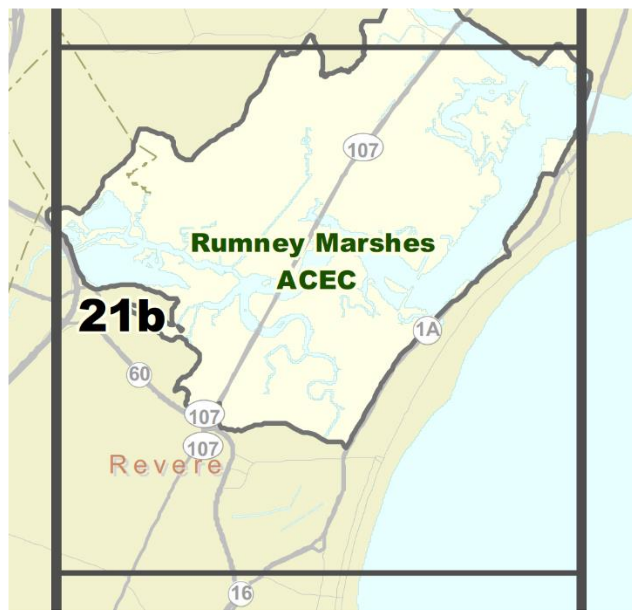

Figure 29 – Rumney Marshes ACEC Index Map

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

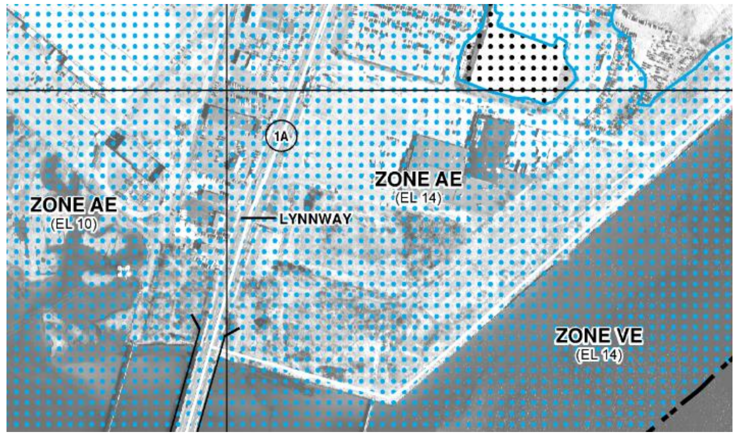

Figure 30 - FEMA FIRM Lynn

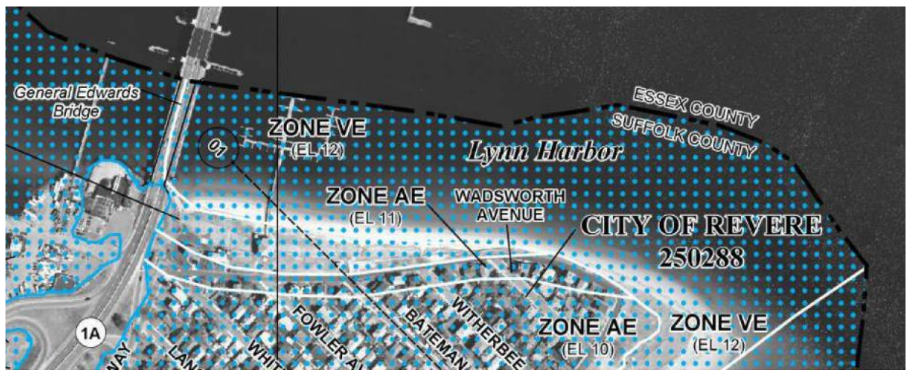

Figure 31 - FEMA FIRM Revere

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

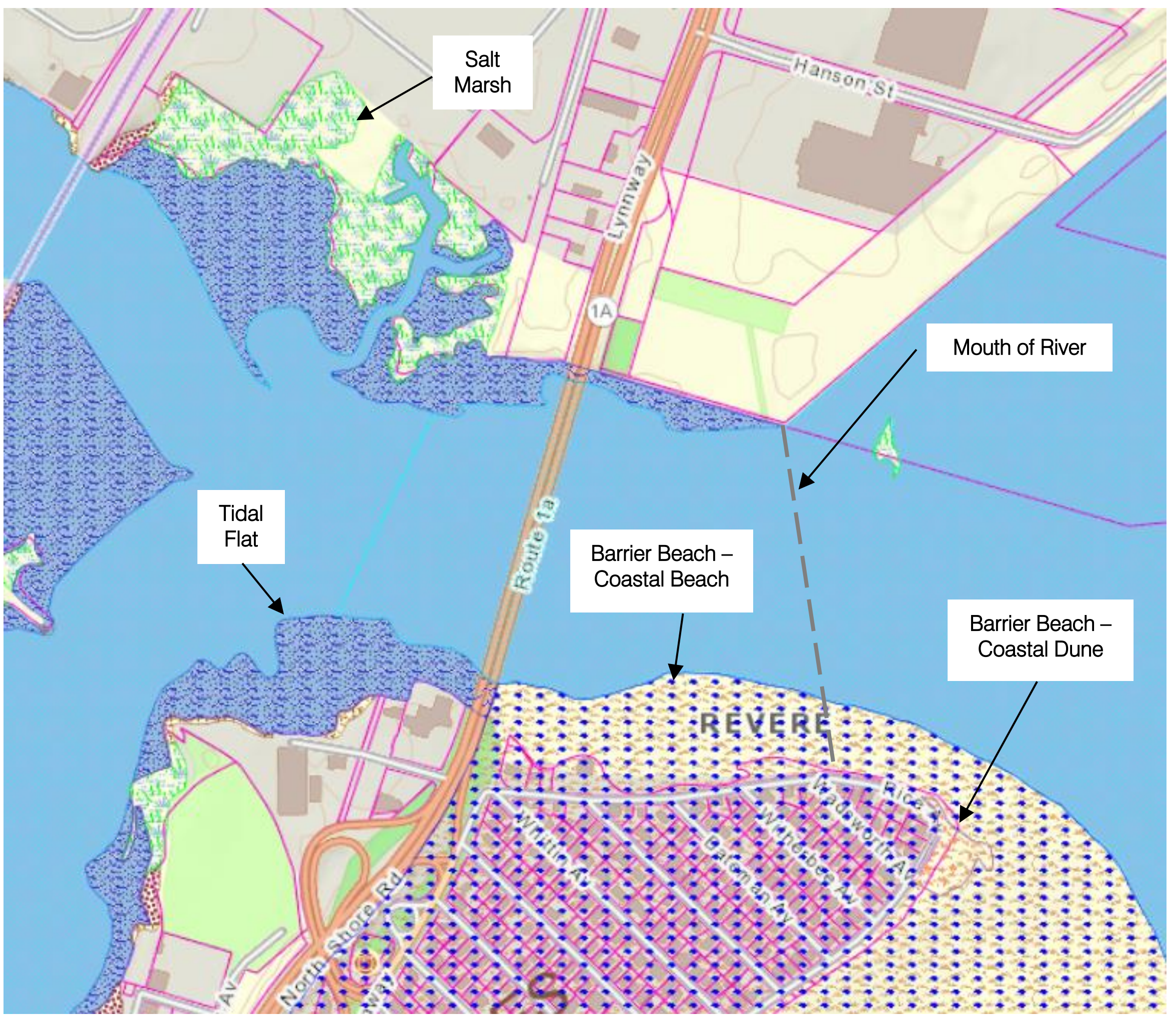

Figure 33 – DEP Wetlands MassGIS

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.

1934 Borings (River Channel Area)
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.

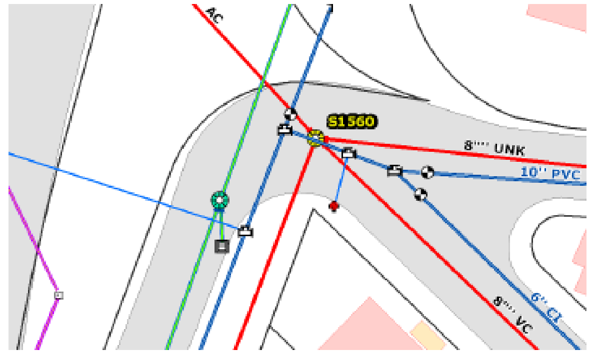

Figure 36 – City of Revere GIS, Rice Avenue at the Lynnway

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.

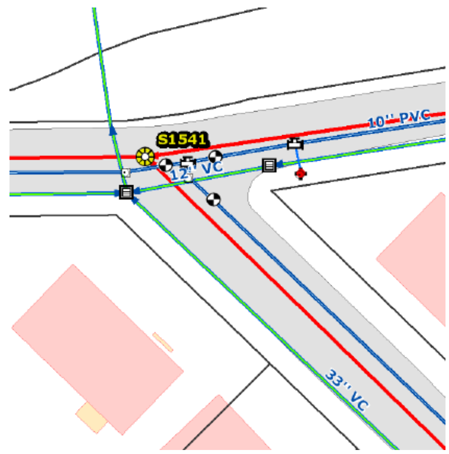

Figure 37 – City of Revere GIS, Rice Avenue at Bateman Avenue

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.

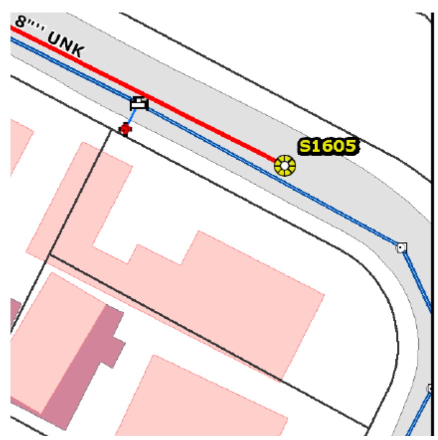

Figure 38 – City of Revere GIS, Rice Avenue at End of Point of Pines

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.

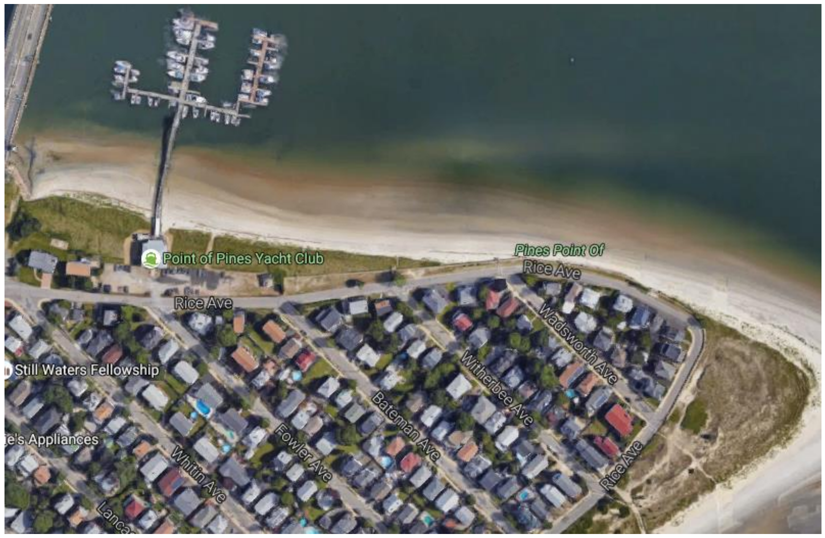

Figure 40 – Orthophoto Point of Pines Area

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

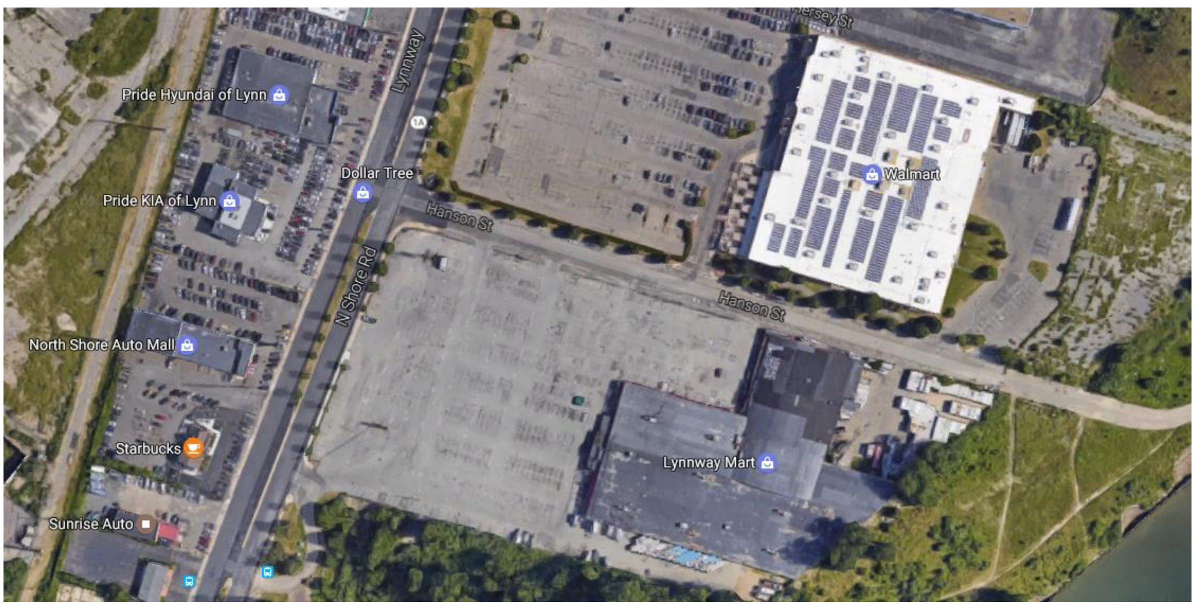

Figure 42 - Orthophoto Commercial Abutters North of the Bridge

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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.

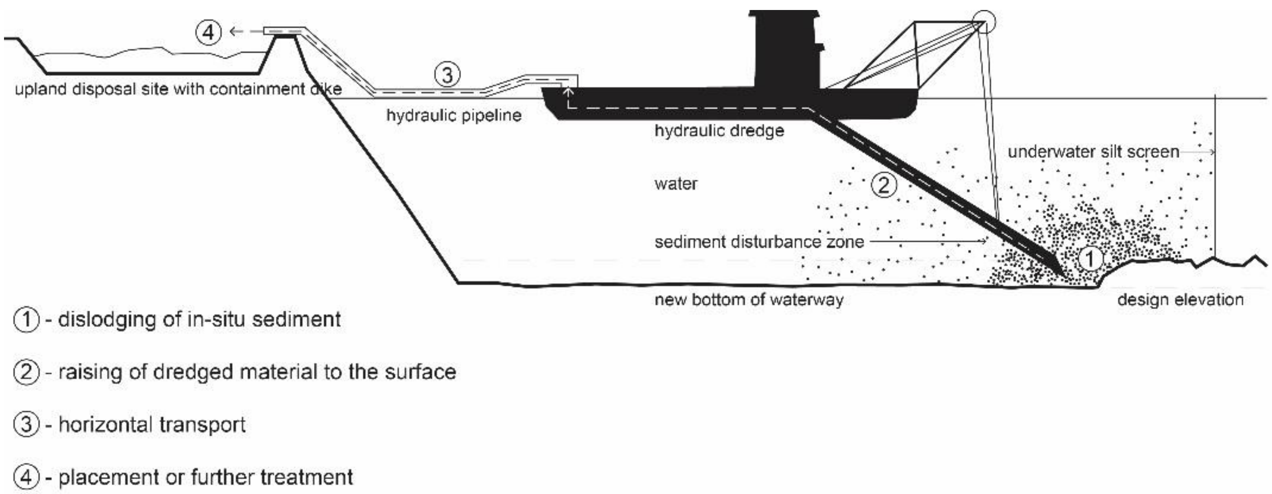

Figure 44 - Hydraulic Dredge

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.

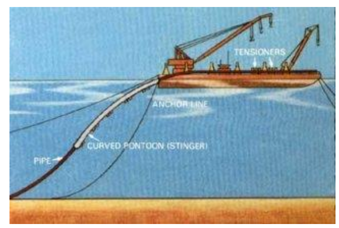

Figure 45 - Barge

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.

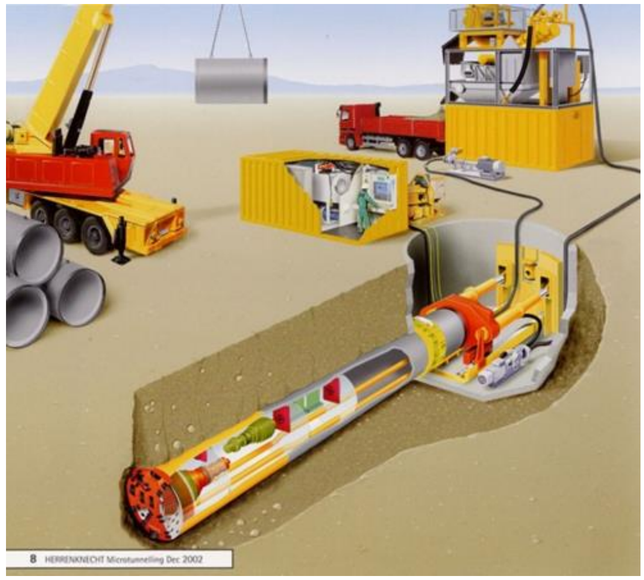

Figure 48 - Typical Microtunnel Operation

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.

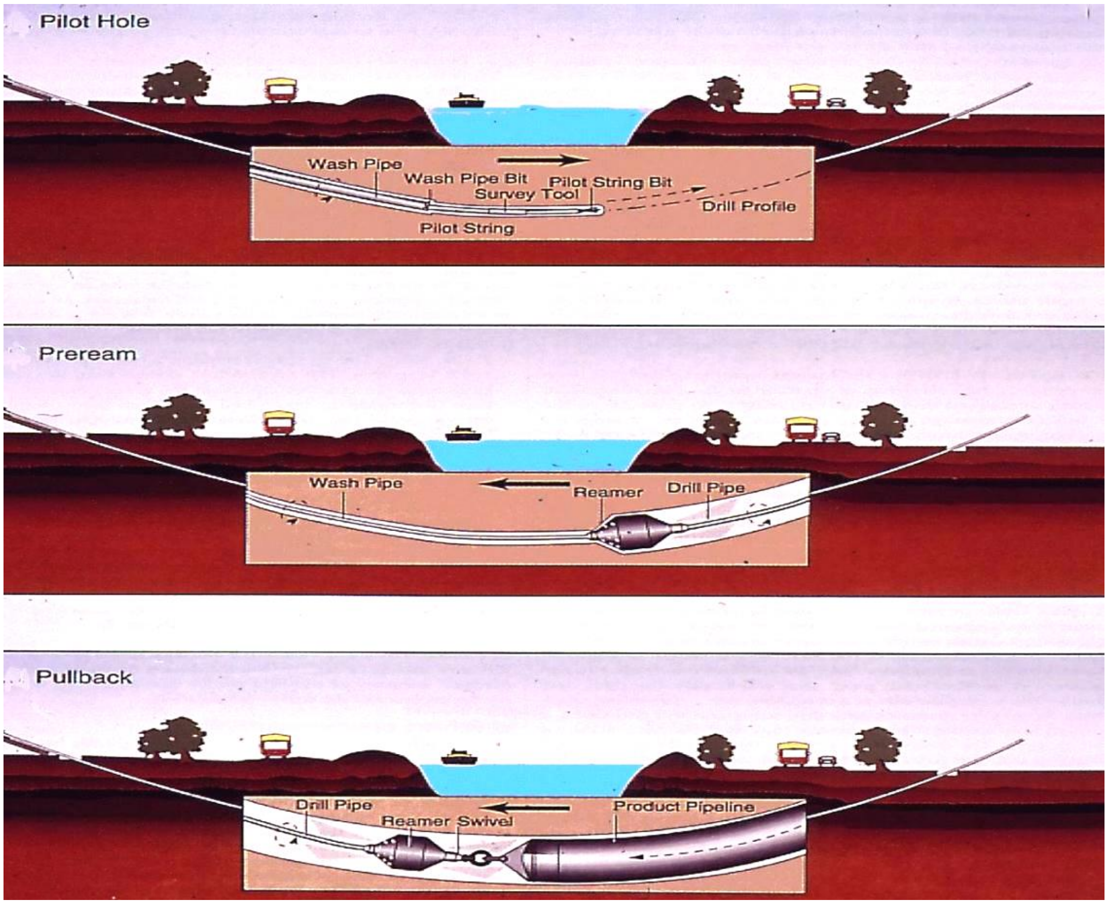

Figure 50 - Typical HDD Operation

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.

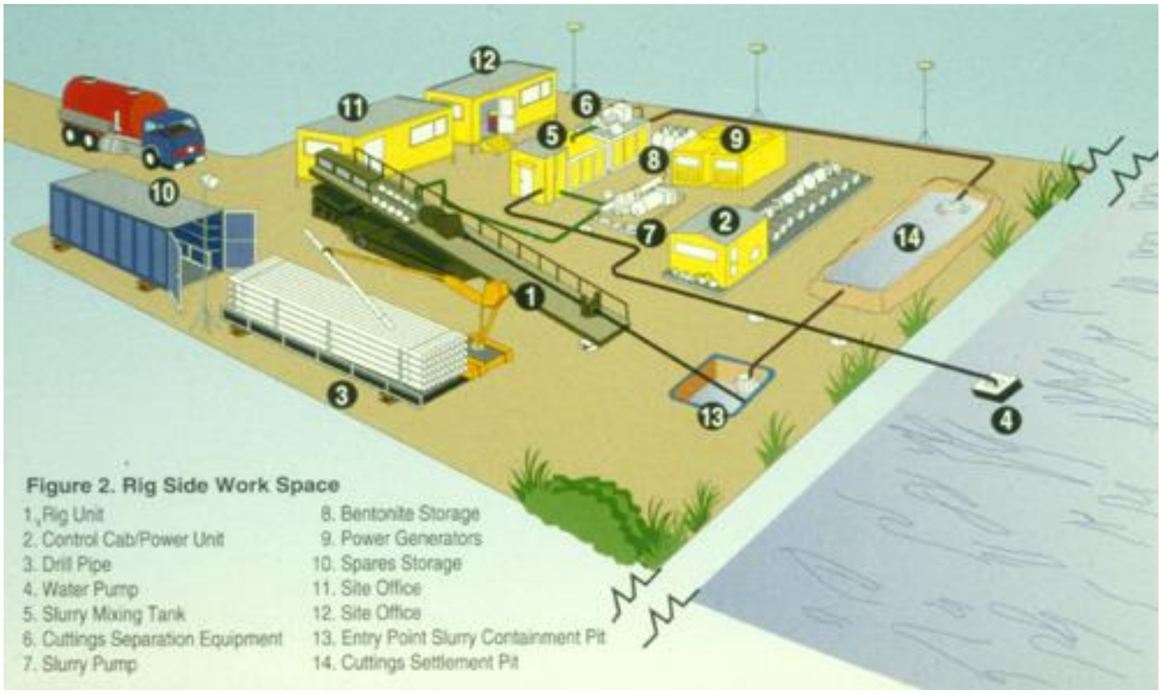

Figure 51 - Typical Bore Entry Staging

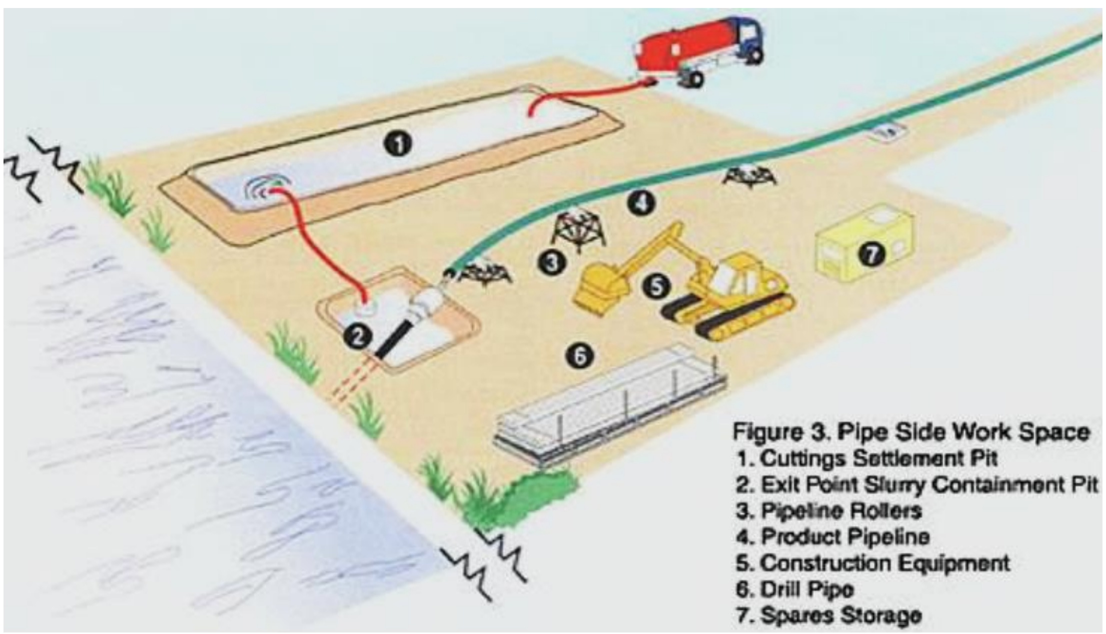

Figure 52 - Typical Pipe Side Staging

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.

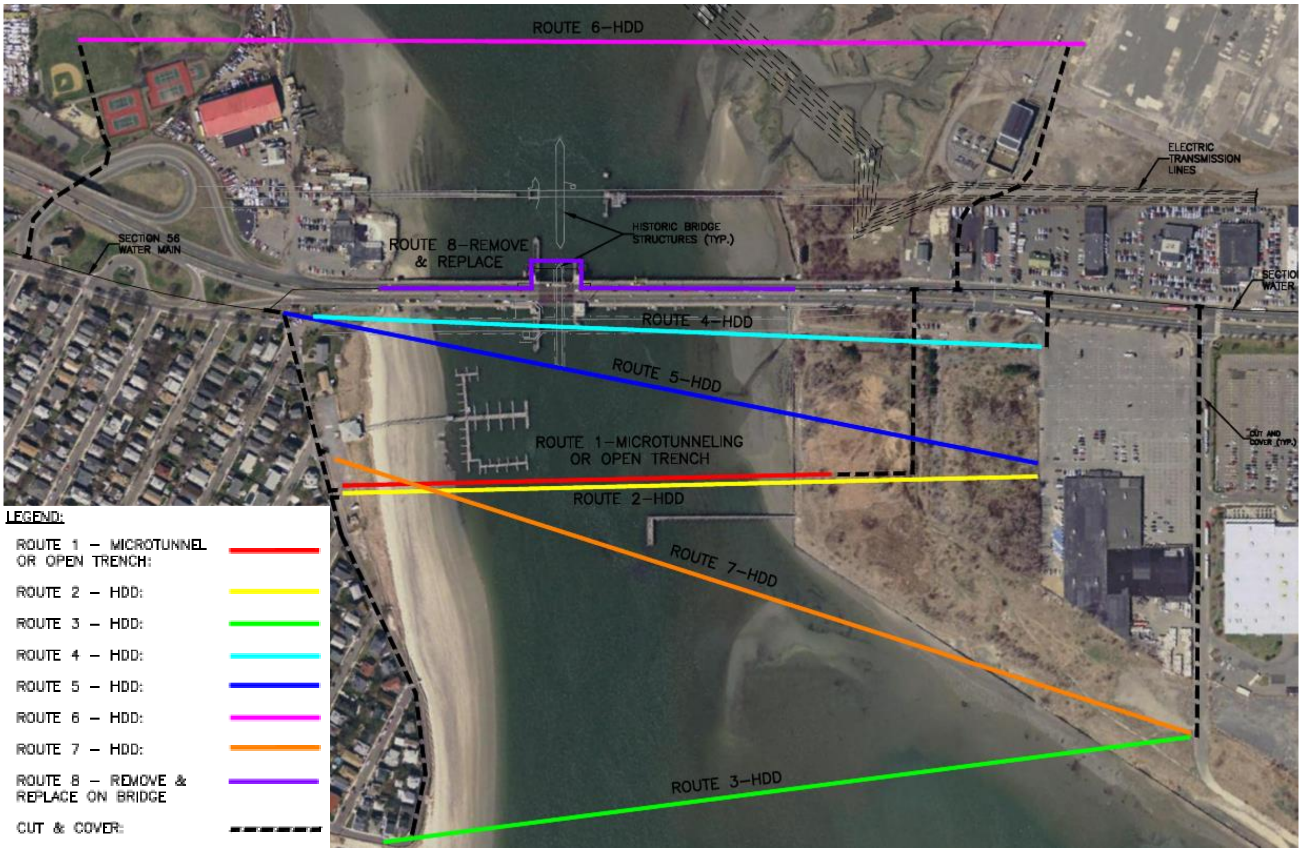

Figure 53 – Routes over Orthophoto

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.

Access For Maintenance

"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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APPENDIX L

Alternatives Screening & Rating Results

Massachusetts Water Resources Authority

Matrix for Screening & Ranking of Alternatives - Rating Summary

Contract No. 7500

May 2017

Description:	Route 1a - Open Trench	Route 1b - Microtunnel	Route 2 - HDD	Route 3 - HDD	Route 4 - HDD	Route 5 - HDD	Route 6 - HDD	Route 7 - HDD	Route 8 - Rem. & Repl.
Crossing Length (ft):	*1250*	*1400*	*2050*	*2500*	*2150*	*2350*	*3000*	*2700*	*1250*
Over Land Length (ft):	*1550*	*1400*	*1250*	*2900*	*250*	*500*	*1700*	*1700*	*0*
AS-BUILT PERFORMANCE									
Access for Maintenance	4	4	4	3	3	4	5	3	1
Protection Against Damage	4	3	3	2	3	3	3	3	5
Hydraulics	3	3	3	3	3	3	3	3	5
PROGRAM RISKS									
Permitting Approval Difficulty	5	2	2	3	2	2	3	2	4
Technical Complexity	3	3	4	3	4	4	4	4	5
Construction Risk	4	3	4	3	5	4	4	4	5
Environmental Risk	5	2	3	3	3	3	4	3	4
Impact on Abutters & Motorists	4	2	4	3	5	4	4	2	4
Easements & Land Acquisition	4	4	5	3	2	5	4	3	1
MassDOT/DCR Support	2	2	2	2	4	3	2	2	4
Rating Total:	38	28	34	28	34	35	36	29	38
COST									
Probable Cost (millions)	$8.9	$12.7	$8.6	$9.5	$8.4	$8.0	$10.5	$9.0	$9.7
SCHEDULE									
Construction Duration (months on-site)	10	11	9	9	9	9	10	9	10

Notes:

1) The lowest rating is most advantageous.

2) Cost and schedule are presented separate from the rating scale.

3) Ratings for criteria are assigned as follows:

1 - Lowest Risk / Strongest Advantage

2 - Low Risk / Advantage

3 - Medium Risk / Neither an advantage or a disadvantage

4 - High Risk / Disadvantage

5 - Very High Risk / Strong Disadvantage

4) Budgetary estimates were prepared in June 2016 ENR CCI (20 Cities) index value is 10,337. Budget incorporates cost escalation over program schedule consistent with ENR CCI index value approximately 11,000

Description:	Route 1a - Open Trench	Route 1b - Microtunnel	Route 2 - HDD	Route 3 - HDD	Route 4 - HDD	Route 5 - HDD	Route 6 - HDD	Route 7 - HDD	Route 8 - Rem. & Repl.
Crossing Length (ft):	*1250*	*1400*	*2050*	*2500*	*2150*	*2350*	*3000*	*2700*	*1250*
Crossing Length (ft):	*1550*	*1400*	*1250*	*2900*	*250*	*500*	*1700*	*1700*	*0*
AS-BUILT PERFORMANCE									
Access for Maintenance	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Portions of water main will require access through easements outside of a paved public ROW.	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Portions of water main will require access through easements outside of a paved public ROW.	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Portions of water main will require access through easements outside of a paved public ROW.	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Accessible on each end from public spaces.	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Accessible on each end from public spaces.	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Portions of water main will require access through easements outside of a paved public ROW.	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Portions of water main will require access through easements outside of a paved public ROW. Water main in Revere will exist in easements through a tow/junk yard, recreational space in an ACEC, and athletic playing fields. Water main in Lynn will exist in easements in parcels scheduled for mixed use development in near future. Schedule for construction of new access road by developer is not clear at this time.	1. Significant portions of the water main will be inaccessible via conventional excavation. 2. Accessible on each end from public spaces.	1. Majority of water main will be accessible via snooper truck or via reconstructed catwalk.
Protection Against Damage	1. Water main will be shallower than HDD or Microtunnel alternatives.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	1. 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. 2. Reduced length of crossing the Lynn seawall will reduce risk of damage as structure is maintained or replaced in the future.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	1. Longer route crossing the existing Lynn seawall (compared to Route 3), 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 result in a greater risk of damage as existing structures are maintained or replaced in the future.	Neither an advantage or a disadvantage.	1. Pipe and pipe supports will be subject to corrosion by weather. 2. Pipe is exposed for accidental or intentional damage by others. 3. Pipe longevity is tied to bridge longevity and bridge maintenance could impose risk of damage to a new pipe.
Hydraulics	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	Neither an advantage or a disadvantage.	1. Limitations on increase in pipe size or mass may incur due to bridge loading limitations. 2. Pipe route includes more bends than trenchless alternatives.
PROGRAM RISKS									
Permitting Approval Difficulty	1. Open trench results in the greatest impact to at-grade resource areas and interests. 2. MEPA Environmental Impact Report is a substantial permitting effort with risks associated. 3. See permit matrix.	1. See permit matrix.	1. See permit matrix.	1. NHESP review will be required due to a threatened species habitat located on the adjacent barrier beach in Revere. 2. See permit matrix.	1. Work passes through zone of Species of Special Concern, Common Tern. 2. See permit matrix.	1. See permit matrix.	1. Work in ACEC Rumney Marsh. 2. See permit matrix.	1. No NHESP review required. 2. See permit matrix.	1. MassDOT will have concerns over structural implications of work, coordination, impact to motorists, all vetted through their Access Permit application process. 2. Bridge is a habitat for Species of Special Concern, Common Tern. 3. Tunnel Shaft construction mid-river will incur various permits, see permit matrix.
Technical Complexity									

Massachusetts Water Resources Authority **Contract No. 7500**

Matrix for Screening & Ranking of Alternatives - Detail Tabulation **May 2017**

Description:	**Route 1a - Open Trench**	**Route 1b - Microtunnel**	**Route 2 - HDD**	**Route 3 - HDD**	**Route 4 - HDD**	**Route 5 - HDD**	**Route 6 - HDD**	**Route 7 - HDD**	**Route 8 - Rem. & Repl.**
Crossing Length (ft):	*1250*	*1400*	*2050*	*2500*	*2150*	*2350*	*3000*	*2700*	*1250*
Crossing Length (ft):	*1550*	*1400*	*1250*	*2900*	*250*	*500*	*1700*	*1700*	*0*
Scope Complexity	1. Will impact public and private use of river. 2. Required trench depth and cover requirements could render this option impracticable. 3.Contaminated soil/sediment disturbance and disposal required. 4. Weather impacts could slow dredging progress. 5. Open trench land tie-ins at both ends.	1. Distance may require intermediate jacking stations with pipe a minimum 39-inch ID to accommodate them. 2. Soft Boston Blue Clay presents difficult soil conditions to maintain line-and-grade. 3. Ensuring path without conflicts will be demanding due to size of casing and limited ability to steer around conflicts as encountered. 4. Open trench land tie-ins at both ends.	1. Require design for steering difficulty if soft Blue Clay is encountered. 2. Open trench land tie-ins at both ends. 3. For drill path to pass under lynn seawall and river channel with sufficient depth, drill entry is required within the Bayside Mortgage LLC parcel where a development is planned over a historic foundation. This conflict will requiring careful technical and schedule coordination and might preclude use of this route.	1. Require design for steering difficulty if soft Blue Clay is encountered. 2. Open trench land tie-ins at both ends. 3. Relatively longer route requires larger equipment, larger operational footprint, and greater risks requiring mitigation.	1. Require design for steering difficulty if soft Blue Clay is encountered. 2. May require a steeper drill entry angle due to possible pile obstruction close to entry point. 3. Work under existing bridge fender and in historic bridge alignment will require extensive design and construction measures to mitigate risk.	1. Require design for steering difficulty if soft Blue Clay is encountered. 2. May require a steeper drill entry angle due to possible pile obstruction close to entry point. 3. For drill path to pass under lynn seawall and river channel with sufficient depth, drill entry is required within the Bayside Mortgage LLC parcel where a development is planned over a historic foundation. This conflict will requiring careful technical and schedule coordination and might preclude use of this route.	1. Require design for steering difficulty if soft Blue Clay is encountered. 2. Open trench land tie-ins at both ends. 3. Relatively longer route requires larger equipment, larger operational footprint, and greater risks requiring mitigation. May require two drill rigs and performing mid-path intersect. 4. Work scope and schedule will require alignment with Gear Works development work plan.	1. Require design for steering difficulty if soft Blue Clay is encountered. 2. Open trench land tie-ins at both ends. 3. Relatively longer route requires larger equipment, larger operational footprint, and greater risks requiring mitigation.	1. Removal and disposal of hazardous building materials (Asbestos in insulation and pipe coatings, heavy metals in structural steel coatings) each under-bridge and inside tower. 2. Structural review of bridge to ensure adequacy of proposed improvements. 3. Replacement of tunnel shafts require mid-river tunnel shaft construction & microtunnel. 4. Remedy stabilizer and expansion joint issues from original design. 5. Coatings and insulation to protect pipe and supports from weather and freezing. 6. Work on bridge over navigable waterway.
Potential Conflicts	1. Possible piles/battered piles for Point of Pines Yacht Club boat Pier. 2. Possible piles/battered piles for Lynn Fishing Pier. 3. Timber Bulkhead (Lynn seawall) with horizontal tie rods and deadman anchor wall 30-ft inland (do not know tip elevations or anchor elevations). 4. Type of Fill material used to backfill the bulkhead east of the bridge in Lynn is unknown (potential contaminated soil disposal, boulders, debris). 5. Rice Avenue seawall (constructed of modular concrete, unknown subsurface construction). 6. No known debris or obstacles in river channel.	1. Possible piles/battered piles for Point of Pines Yacht Club boat Pier. 2. Possible piles/battered piles for Lynn Fishing Pier. 3. Timber Bulkhead (Lynn Seawall) with horizontal tie rods and deadman anchor wall 30-ft inland (do not know tip elevations or anchor elevations). 4. Type of Fill material used to backfill the bulkhead east of the bridge in Lynn is unknown (potential contaminated soil disposal, boulders, debris). 5. Rice Avenue seawall. 6. No known debris or obstacles in river channel.	1. Possible piles/battered piles for Point of Pines Yacht Club boat Pier. 2. Possible piles/battered piles for Lynn Fishing Pier. 3. Timber Bulkhead (Lynn seawall) with horizontal tie rods and deadman anchor wall 30-ft inland (do not know tip elevations or anchor elevations). 4. Type of Fill material used to backfill east of the bridge in Lynn is unknown (potential contaminated soil disposal, boulders, debris). 5. Rice Avenue seawall. 6. No known debris or obstacles in river channel. 7. Historic power line foundations in WMI Lynn parcel. 8. Historic foundation in Bayside Mortgage LLC parcel.	1. Rice Avenue seawall. 2. Timber Bulkhead (Lynn Seawall) with horizontal tie rods and deadman anchor wall 30-ft inland (do not know tip elevations or anchor elevations). Alignment crosses at an acute angle to the Lynn seawall, which will impact a greater length of the seawall, increasing potential conflicts during installation and requiring redesign of the wall support in that area. 3. Type of Fill material used to backfill east of the bridge in Lynn is unknown (potential contaminated soil disposal, boulders, debris). 4. No known debris or obstacles in river channel. 5. Historic power line foundations in WMI Lynn parcel.	1. Old Bridge piles 2. Lobster pound and wooden pier on pile. 3. Piles for old Bridge Fender. 4. Piles for Existing Bridge Fender. 5. 42" Diam. VC 6. (2) 36" Diam. VC 7. 54" Diam. RCP 8. Possible Fishing Pier piles east of the bridge in Lynn. 9. Timber Bulkhead (Lynn seawall) with horizontal tie rods and deadman anchor wall 30-ft inland (do not know tip elevations or anchor elevations). 10. Type of Fill material used to backfill east of the bridge in Lynn is unknown(potential contaminated soil disposal, boulders, debris).	1. Old Bridge piles 2. Lobster pound and wooden pier on pile. 3. Piles for old Bridge Fender. 4. Possible piles/battered piles for Point of Pines Yacht Club boat Pier. 5. Possible Fishing Pier piles east of the bridge in Lynn. 6.Timber Bulkhead (Lynn seawall) with horizontal tie rods and deadman anchor wall 30-ft inland (do not know tip elevations or anchor elevations) 7. Type of Fill material used to backfill east of the bridge in Lynn is unknown (potential contaminated soil disposal, boulders, debris). 8. Historic power line foundations in WMI Lynn parcel. 9. Historic foundation in Bayside Mortgage LLC parcel.	1. Path appears to pass close to historic existing or removed piles associated with piers. 2. Multiple overhead lines. Possible conflict with deep foundations for overhead line towers. 3. Historic facilities on GE site.	1. Rice Avenue seawall. 2. Timber Bulkhead (Lynn Seawall) with horizontal tie rods and deadman anchor wall 30-ft inland (do not know tip elevations or anchor elevations). Alignment crosses at an acute angle to the Lynn seawall, which will impact a greater length of the seawall, increasing potential conflicts during installation and requiring redesign of the wall support in that area. The angle of crossing results in a longer crossing of the seawall structure and a greater potential for conflict than Route 3. 3. Type of Fill material used to backfill east of the bridge in Lynn is unknown (potential contaminated soil disposal, boulders, debris). 4. No known debris or obstacles in river channel. 5. Historic power line foundations in WMI Lynn parcel. 6. Discharge pipe from Revere Storm water Pump Station.	1. Existing bridge structure, supports, and tunnel shafts. 2. Old bridge fender in microtunnel alignment.

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Matrix for Screening & Ranking of Alternatives - Detail Tabulation **May 2017**

Description:	**Route 1a - Open Trench**	**Route 1b - Microtunnel**	**Route 2 - HDD**	**Route 3 - HDD**	**Route 4 - HDD**	**Route 5 - HDD**	**Route 6 - HDD**	**Route 7 - HDD**	**Route 8 - Rem. & Repl.**
Crossing Length (ft):	*1250*	*1400*	*2050*	*2500*	*2150*	*2350*	*3000*	*2700*	*1250*
Crossing Length (ft):	*1550*	*1400*	*1250*	*2900*	*250*	*500*	*1700*	*1700*	*0*
Construction Risk	1. Environmental concerns and potential cost impacts are unknown and could be significant for dredging (i.e. types and concentrations of sediment contamination, dredged sediment transport and disposal requirements, etc.). 2. Currents in the river channel could make dredging across this alignment impracticable. 3. Installation method sensitive to time of year and weather conditions. 4. Conflict due to of work with maritime interests impacted by work in the river way.	1. Substantial surplus soil generation exacerbates risk of expense resulting from contaminated materials, if encountered. 2. Shaft construction and tunneling approach are heavily impacted by soil conditions encountered, so risks exist if inadequate or different conditions are encountered. 3. Close to maximum recommended length for equipment less interjacks. Interjacks would require human entry to tunnel shaft. 4. Steering difficulties likely in soft clay soil. 5. Limited ability to steer and react to conflicts incur risk of extra expense and delays.	1. Available area for drilling operations limited by residential properties in Revere, anticipated development operations in Lynn, and various commercial premises in Lynn. 2. Risk of frac-out due to known and potential unknown piles. 3. Moving drill rig to Rice Ave for pullback operation will have logistical and practical challenges given limited space in roadway and close residential premise proximity. 4. Conflict due to coordination of work with Yacht Club parking lot operations and Bayside Mortgage LLC property development plans. 5. Conflict due to historic foundation on bore exit parcel.	1. Comparatively long river crossing. 2. Longer route requires larger equipment, greater volume drilling fluid, larger operational footprint, and greater risks including that of hydrofracture. 3. Complex curvature in soft clays may be required to install alignment. 4. Moving drill rig to Rice Ave for pullback operation will have logistical and practical challenges given limited space in roadway and close residential premise proximity. 5. Alignment crosses at an acute angle to the Lynn seawall, which will impact a greater length of the seawall, increasing potential conflicts during installation and requiring redesign of the wall support in that area. 6. Conflict due to coordination of work with Rice Avenue residents or Massachusetts Electric Co. landfill operations.	1. Alignment likely conflicts with remnants of former bridge supports, and existing bridge fender. Significant obstruction difficulties probable. 2. Use of Lynnway in Revere for pipe string assembly would require extensive coordination and accommodation for maintenance of traffic. Available area for fusing pipe sections is limited. 3. Risk of frac-out due to conflict with known and potentially unknown piles. 4. Operations would require careful coordination with the proposed development adjacent, DCR, and MassDOT.	1. Use of Lynnway in Revere for pipe string assembly would require extensive coordination and accommodation for maintenance of traffic. Available area for fusing pipe sections is limited. 2. Remnants of former bridge supports impact the alignment at the south east abutment. 3. Risk of frac-out due to conflict with known and potentially unknown piles. 4. Conflict due to coordination of work Bayside Mortgage LLC property development plans. 5. Conflict due to historic foundation on bore exit parcel.	1. Comparatively longest river crossing. 2. Longer route requires larger equipment, greater volume drilling fluid, larger operational footprint, and greater risks including that of hydrofracture. 3. Operations would need to be coordinated with recreation activities at Gibson Park and with construction operations at the Gear Works site which will be ongoing 2017 to 2022 (unknown when access road to Lynnway would be constructed through private parcel). Pipe string construction on this site may become challenging as construction progresses. 4. Handling of spoils at this site will be complicated by historic land use at the site. 5. If HDD crossing is below or within the railroad zone of influence, casing the borehole may be required by the railroad. 6. Risk of frac-out due to conflict with known and potentially unknown piles.	1. Comparatively long river crossing. 2. Longer route requires larger equipment, greater volume drilling fluid, larger operational footprint, and greater risks including that of hydrofracture. 3. Complex curvature in soft clays may be required to install alignment. 4. Alignment crosses at an acute angle to the Lynn seawall, which will impact a greater length of the seawall, increasing potential conflicts during installation and requiring redesign of the wall support in that area. 5. Moving drill rig to Rice Ave for pullback operation will have logistical and practical challenges given limited space in roadway and close residential premise proximity. 6. Conflict due to coordination of work with Yacht Club parking lot operations or Massachusetts Electric Co. landfill operations. 7. The alignment passes closer to known existing structures, and location is believed to have greater probability of containing unknown historic structures.	1. Work is on old bridge with structural deficiencies. 2. Access to work area is limited. 3. Hazardous building materials management. 4. Currents in the river channel could complicate tunnel shaft construction. 5. Work area highly subject to weather. 6. Time of year limitations due to roosting species of concern.
Environmental Risk	1. Hydraulic excavation in tidal zones and river risks damaging native wildlife and plants as well as habitat. 2. Risk of turbidity and water quality issues in river. 3. Risk of damage to beaches on shoreline.	1. Relatively less environmental risk associated with microtunnel.	1. Habitat and species impact due to hydrofracture. 2. Impact to beaches on Revere shore.	1. Habitat and species impact due to hydrofracture. 2. Impact to beaches on Revere shore, including habitat of threatened species.	1. Habitat and species impact due to hydrofracture.	1. Habitat and species impact due to hydrofracture.	1. Habitat and species impact due to hydrofracture. 2. Protection of Runmey Marsh Area of Critical Environmental Concern (ACEC). 3. Work within former GE plant site with potential for contamination. 4. Longer HDD route and longer open trench on land in unpaved areas.	1. Habitat and species impact due to hydrofracture. 2. Impact to beaches on Revere shore.	1. Distribution of asbestos containing insulation and/or asbestos and heavy metal containing coatings to the environment through inadequate containment or handling. 2. Suspended sediments from tunnel shaft installation. 3. Impacting priority habitat of species of Special Concern.
Impact on Abutters & Motorists	1. The construction operation would have a significant visual impact from the shores and bridge (barge, spoils management, turbidity curtains) for relatively long duration. 2. The construction operation would pass through the navigation channel, impacting passage. 3. Rice Ave would likely require partial closure restricting access to Lynnway and General Edwards Bridge, which would require for alternate traffic access. 4. Route would limit access to Fishing Pier during construction.	1. Rice Ave would likely require partial closure restricting access to Lynnway and General Edwards Bridge, which would require for alternate traffic access. 2. Route would limit access to Fishing Pier during construction. 3. Relatively smaller visual profile. 4. Limited impact on arterial roads or navigation channel.	1. Rice Ave would likely require partial closure restricting access to Lynnway and General Edwards Bridge, which would require for alternate traffic access. 2. Route would limit access to Fishing Pier during construction. 3. Pipe string construction would impact access to several commercial premises.	1. Rice Ave would require closure during construction of the bore exit pit, reaming, and pipe sting pullback. 2. 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. 3. Hanson Street would require partial closure, though traffic is limited at this location. 4. Longest open cut installation in street. 5. Pipe string construction length is substantial.	1. Lynnway would likely require closure of one lane to accommodate pipe string construction and pullback restricting access to traffic. 2. Drill rig located immediately adjacent to Lynnway will likely result in some impact to traffic and greater aesthetic/noise impact to the general public.	1. Lynnway would likely require closure of one lane to accommodate pipe string construction and pullback restricting access to traffic.	1. Pipe string construction will impact access roads adjacent to MBTA tracks and operations on the Gear Works site. 2. Gear Works development schedule may result in conflicting operations or access roads and routes not aligning. 3. Impact access to playing fields and recreational space in Revere during construction.	1. Rice Ave may require partial closure during construction of the bore exit pit, reaming, and pipe sting pullback, but the parking lot staging area will make operations less impactful to abutters and motorists. 2. Less over-land pipe installation in Rice Avenue, Revere, (500 feet) and a bore exit pit located outside of the roadway. 3. Hanson Street would require partial closure, though traffic is limited at this location. 4. Longer open cut installation in street than many options. 5. Pipe string construction length is substantial.	1. Construction on bridge will require intermittent lane closures for construction access via snooper truck.

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Matrix for Screening & Ranking of Alternatives - Detail Tabulation **May 2017**

Description:	**Route 1a - Open Trench**	**Route 1b - Microtunnel**	**Route 2 - HDD**	**Route 3 - HDD**	**Route 4 - HDD**	**Route 5 - HDD**	**Route 6 - HDD**	**Route 7 - HDD**	**Route 8 - Rem. & Repl.**
Crossing Length (ft):	*1250*	*1400*	*2050*	*2500*	*2150*	*2350*	*3000*	*2700*	*1250*
Crossing Length (ft):	*1550*	*1400*	*1250*	*2900*	*250*	*500*	*1700*	*1700*	*0*
Easements & Land Acquisition	1. 017-760-002: MDC Right of Way Division - Lynnway Shoulder maintained by DCR. 2. 034-752-077: WMI Lynn LLC - Proposed path splits a substantial waterfront parcel in Lynn's MHP area. 3. 14-192O-14A: Point of Pines Yacht Club - Owned by an association of Point of Pines neighborhood home owners. Temporary easement for staging. 4. City of Revere Pump Station (Unknown Parcel): permanent easement for pipeline.	1. 017-760-002: MDC Right of Way Division - Lynnway Shoulder maintained by DCR. 2. 034-752-077: WMI Lynn LLC - Proposed path splits a substantial waterfront parcel in Lynn's MHP area. 3. 14-192O-14A: Point of Pines Yacht Club - Owned by an association of Point of Pines neighborhood home owners. Temporary easement for staging. 4. City of Revere Pump Station (Unknown Parcel): permanent easement for pipeline.	1. 017-760-002: MDC Right of Way Division - Lynnway Shoulder maintained by DCR. 2. 034-752-077: WMI Lynn LLC - Proposed path splits a substantial waterfront parcel in Lynn's MHP area. 3. 14-192O-14A: Point of Pines Yacht Club - Owned by an association of Point of Pines neighborhood home owners. Temporary easement for staging. 4. City of Revere Pump Station (Unknown Parcel): permanent easement for pipeline. 5. 034-760-005: South Harbor Associates LLC - Use of site required for staging of drilling and pipe string construction. 6. 034-758-007/8/9: Car Realty LLC - Use of sites is required for staging of pipe string construction. 7. 034-760-007 Bayside Mortgage: Site scheduled for development. Route may conflict with proposed building.	1. 034-752-077: WMI Lynn LLC - Proposed path crosses corner of parcel incurring limited impact on future site usability. 2. 034-752-075, 050-752-055: Massachusetts Electric Co - Use of landfill site required for staging of drilling and pipe string construction. 3. 033-752-065: City of Lynn - City of Lynn owns a tidal flat parcel through which the route passes. 4. 14-192O-23: Point of Pines Beach Assoc Inc - The beach between Rice Avenue and mean low water, where this route reaches Revere, is owned by this association of Point of Pines homeowners.	1. 017-760-001: MDC Right of Way Division - Parcel immediately adjacent to the General Edwards Bridge owned by MDC and occupied by some utility structures. 2. 017-760-002: MDC Right of Way Division - Lynnway Shoulder maintained by DCR. 3. (unknown): MDC Right of Way Division - Parcel in Revere immediately adjacent to the General Edwards Bridge. 4. W&S was unable to verify if MDC/DCR own any rights to mid-river space immediately adjacent to the existing bridge. 5.034-760-005 South Harbor Associates - staging area in Lynnway Mart parking lot. 6. 034-760-003: City of Lynn - road shoulder in front of Lynnway Mart.	1. 017-760-002: MDC Right of Way Division - Lynnway Shoulder maintained by DCR. 2. 034-752-077: WMI Lynn LLC - Proposed path splits a substantial waterfront parcel in Lynn's MHP area 3. 034-760-007 Bayside Mortgage: Site scheduled for development. Route may conflict with proposed building 4. (unknown): MDC Right of Way Division - Parcel in Revere immediately adjacent to the General Edwards Bridge. 5.034-760-005 South Harbor Associates - staging area in Lynnway Mart parking lot.	1. 017-796-008: Lynnway Acquisitions LLC - Site of former auto shop recently purchased and planned for demolition for construction of an access road. 2. 035-796-082: Lynnway Associates LLC - Large parcel on former GE plant site. Currently scheduled for mixed residential and commercial development. Proposed main is aligned with a future access road. 3. 13-192T12-1: City of Revere - Parcel houses Gibson park, which includes baseball fields, tennis courts, and other recreational space. 4. 14-192S-1: Lombard Barbara A DBA Realty - Light industrial site with tow yard and vehicle storage. 5. Path requires crossing existing easements owned by New England Power Co. which hosts electric transmission lines. 6. 035-796-039: MBTA - temporary easement for staging pipe string construction.	1. 034-752-077: WMI Lynn LLC - Proposed path crosses corner of parcel incurring limited impact on future site usability. 2. 034-752-075, 050-752-055: Massachusetts Electric Co - Use of landfill site required for staging of drilling and pipe string construction. 3. 033-752-065: City of Lynn - City of Lynn owns a tidal flat parcel through which the route passes. 4. City of Revere Pump Station (Unknown Parcel): Permanent pipe occupation will be in the tidal zone of the Pump Station parcel and at the edge of the parcel abutting the Yacht Club. 5. 14-192O-23: Point of Pines Yacht Club - Staging will be performed in the Yacht Club parking lot, unless preliminary design requires the drill exit alignment shift closer to the Yacht Club, in which case permanent easement in the Yacht Club parking lot would be required.	1. No significant land acquisition required. 2. W&S was unable to verify if MDC/DCR own any rights to space adjacent to the existing bridge where replacement tunnel shafts would require construction.
MassDOT/DCR Support	1. No apparent conflict with MassDOT and DCR interests.	1. No apparent conflict with MassDOT and DCR interests.	1. No apparent conflict with MassDOT and DCR interests.	1. No apparent conflict with MassDOT and DCR interests.	1. Entire new pipeline occupies the space immediately adjacent to the bridge. This is a location where a future new bridge might be constructed. 2. Route passes under existing bridge fenders; potential for conflict with piles. 3. Route substantially occupies DCR lands adjacent to Lynnway, limiting options for future development of the space. 4. Pipe laydown in Lynnway Revere shoulder.	1. In Revere shore, route occupies access ramp immediately adjacent to the existing bridge. 2. Pipe laydown in Lynnway Revere shoulder.	1. No apparent conflict with MassDOT and DCR interests.	1. No apparent conflict with MassDOT and DCR interests.	1. Proposes significant new construction on existing structurally deficient bridge.
COST									
Probable Cost	See estimate detail.	See estimate detail.	See estimate detail.	See estimate detail.	See estimate detail.	See estimate detail.	See estimate detail.	See estimate detail.	See estimate detail.
SCHEDULE									
Probable Schedule	See schedule detail.	See schedule detail.	See schedule detail.	See schedule detail.	See schedule detail.	See schedule detail.	See schedule detail.	See schedule detail.	See schedule detail.

O:\MWRA\2150821-Bridge Crossing FS\C7500 File\13 Subtasks\2.4 Screening and Ranking Alternatives\Matrix\[C7500 Matrix for Screening Alternatives November 2016.xlsx]Detail

Weighted Route Selection Matrix							
			Route 3		**Route 7**		
No.	**Weight Factor**	**Evaluation Factor**	**Raw Score***	**Weighted Score****	**Raw Score***	**Weighted Score****	**Notes**
High Impact on Selection							
A. HDD Constructability Items							
A.1	5	Subsurface obstructions - bulkhead piles (Lynn)	4	20	5	25	
A.2	5	Difficult subsurface drilling due to mixed soil type conditions	2	10	5	25	
A.3	5	Encountering cobble(s) and boulder(s) within till, randomly within the lower clay, and within the glaciofluvial deposits	2	10	5	25	
A.4	5	Point loading induced damage to pipe during installation due to rocks and/or boulders.	3	15	5	25	
A.5	5	Drilling fluid loss in river with highest risk in 1,000-foot thalweg section	2	10	5	25	
A.6	5	Unstable borehole in clean, uniform sands in fluvial sediments and granular deposits	3	15	4	20	
B. Other Project Items							
B.1	5	Construction noise, vibration and limited access to Point of Pines residents at HDD Route 3 exit (Revere)	5	25	0	0	Increased to a high impact rating during a 12/02/2021 Teams meeting with MWRA.
B.2	5	Impacts to public safety during construction (Revere)	2	10	1	5	
B.3	5	Damage to adjacent public utilities / structures (Revere)	5	25	2	10	
B.4	5	Damage to Point of Pines residents private property at HDD Route 3 exit (Revere)	20	100	0	0	
Subtotal High Impacts Score (Lower Score is Better)			***240***		***160***		
Medium Impact on Selection							
C. HDD Constructability Items							
C.1	3	Steering dificulties in soft clay	3	9	2	6	
C.2	3	Pipe Handling, Laydown Difficulties (Revere)	2	6	1	3	
C.3	3	Borehole collapse in granular materials in short time causing stuck drill string or carrier pipe, and damage to carrier pipe or excessive ovalization.	3	9	4	12	
C.4	3	Out of tolerance bore due to deflections by cobble or gravel or high density difference materials	3	9	4	12	
C.5	3	Potential for encountering squeezing clays causing excessive loads on drill string or product pipe	2	6	1	3	
C.6	3	Inadvertent returns of drilling fluid via bulkhead piles (Lynn)	2	6	3	9	
D. Other Project Items							
D.1	3	Obtaining temporary and permanent construction easements with property owners, yacht club and Point of Pines Assoc. for Revere side connection	4	12	2	6	
D.2	3	Construction noise, vibration and limited access to yacht club members at HDD Route 7 exit (Revere)	0	0	3	9	
Subtotal Medium Impacts Score			***57***		***60***		
Low Impact on Selection							
E. HDD Constructability Issues							
E.1	1	Damage to Port of Pines Yacht Club private property (Revere)	0	0	1	1	
F. Other Project Items							
F.1							
Subtotal Low Impacts Score			***0***		***1***		
Total Benefit Score (Low Score is Better)			**297**		**221**		

* Based on relative scoring from HDD Constructability Risk Register for each route.

** Raw Score multiplied by Weighting Factor.

Route 3 HDD Risk Register

ID	Description	Risk Before Mitigation: Probability Category	Probability Value	Impact Category	Impact Value	Impact Type*	Risk Rating	Mitigation Options	Comments	Risk Entry Date
A. Project Planning and Development										
A.1	Obtaining temporary and permanent construction easements with property owners, yacht club and Point of Pines Assoc. for Revere side connection	Could happen	3	Moderate	3	CS	9	Design Phase: Early public reach-out and coordination. Limit construction to public areas. Construction Phase: Adhere to assigned work limits.	Refusal or difficult terms by owners to grant temporary construction easement delays project, resticts work to public areas only, or forces eminent domain procedure if public space is insufficient.	
A.2	Lack of available, qualified HDD contractors drives up bids	Could happen	3	Moderate	3	C	9	Design Phase: Early advertising of project to generate interest and allow firms to plan for. Prequalify HDD contractors/bidders to ensure they have experience with similar subsurface conditions.	Bidding documents to contain appropriate experience language.	
A.3	MassDOT, Mass DEP permit delays/ restrictions force redesign	Could happen	3	Minor	2	S	6	Design Phase: Early coordination with agencies.	Present project early to agencies and solicit their input.	
B. HDD Construction										
B.1	Impacts to public safety during construction (Revere)	Will probably happen	4	Severe	5	C	20	Design Phase: Design for added construction safety. Construction Phase: Install adequate construction safety measures, work planning.	Close proximity of drilling equipment to residences at HDD exit (Revere).	
B.2	Impacts to areas of environmental concern from drilling fluid spills (Revere)	Could happen	3	Severe	5	C	15	Design Phase: Proper design. Construction Phase: Experienced contractor, proper due diligence & work planning. Prepare contingency plans and equipment.	Habitat and wetlands restrictions on Revere side.	
B.3	Damage to Port of Pines (Revere) private property	Will probably happen	4	Severe	5	C	20	Design Phase: Proper design. Construction Phase: Experienced contractor, proper due diligence & work planning. Prepare contingency plans and equipment.	Close proximity of drilling equipment and construction activities to residences; risk of inadvertent returns at HDD exit in street near houses.	
B.4	Damage to adjacent public utilities / structures (Revere)	Will happen	5	Severe	5	C	25	Design Phase: Verify existing infrastructure locations and maintain offsets. Increase cover depth and adjust clearances and deviation tolerances. Alternately, design for relocation. Construction Phase: Accurately locate utilities in work areas, entry/exit points - expose and protect as needed. Maintain specified clearance and minimize deviations. Monitor/ survey ground conditions for heave/settlement. Contingency plan for repairs.	Barrier wall damage. Roadway damage. Existing water, gas, sanitary, storm pipelines damage.	
B.5	Damage to adjacent public utilities / structures (Lynn)	Unlikely to happen	2	Minimal	1	C	2	Design Phase: Verify existing infrastructure locations and maintain offsets. Increase cover depth and adjust clearances and deviation tolerances. Construction Phase: Accurately locate utilities in work areas, entry/exit points - expose and protect as needed. Maintain specified clearance and minimize deviations. Monitor/survey ground conditions for heave/ settlement. Contingency plan for repairs.	Minimal infrastructure on Lynn side.	
B.6	Subsurface obstructions - bulkhead piles (Lynn)	Will happen	5	Significant	4	CS	20	Design Phase: Selection of reasonable clearances and tolerances. Specify additional investigation utilizing Pile Integrity Testing to confirm pile depths. Specify Contractor to develop a contingency plan for removal of existing piles and grouting resulting voids within alignment corridor on Lynn side. Construction Phase: Remove any piles obstructing HDD alignment. Grout resulting voids from pile tip to river bottom to minimize fracout potential. Add contingency for rework if obstructions are encountered.	Both routes cross under old piles from timber bulkhead on Lynn side - depth unknown. Route 3 will have less piles in the alignment.	
B.7	Difficult subsurface drilling due to mixed soil type conditions	Unlikely to happen	2	Severe	5	CS	10	Design Phase: Evaluate geotechnical, geophysical investigation results to select best available alignment. Preparation of geotechnical baseline identifying potentially difficult soils along alignment. Alignment tolerances adjusted to address potential boulders/cobles requiring alignment shifts during drilling. Construction Phase: Contractor experience with similar conditions. Drilling controls including use of temporary casings, grouting, etc. Contingency for additional work time or re-work.Pre-planning and adequate equipment selection.	Conditions range from soft clays to sand, gravel and boulders. Relatively smaller range of soil matrices along Route 3. Appropriate downhole equipment, drilling mud composition and speed of drilling to be adaptyed to individual subsurface conditons.	
B.8	Encountering cobble(s) and boulder(s) within till, randomly within the lower clay, and within the glaciofluvial deposits	Unlikely to happen	2	Severe	5	CS	10	Design Phase: Evaluate geotechnical, geophysical investigation results to select best available alignment. Preparation of geotechnical baseline identifying potentially difficult soils along alignment. Alignment tolerances adjusted to address potential boulders/cobles requiring alignment shifts during drilling. Construction Phase: Contractor experience with similar conditions. Drilling controls including use of temporary casings, grouting, etc. Contingency for additional work time or re-work. Pre-planning and adequate equipment selection.	Route 3 alignment mostly in clay and closer to till zone which may have a higher risk of boulder encounter but frequency is anticipated to be low. Both routes have similar risk of encounter at lengths between 500 and 1900 feet along the bore path.	
B.9	Inadvertent returns of drilling fluid via bulkhead piles (Lynn)	Unlikely to happen	2	Moderate	3	C	6	Design Phase: Identify piles in borepath and design for removal and grouting of hole. Require contractor IR contingency plan. Construction Phase: Pile removal and proper grouting of remaining holes. Contractor written plan for prevention and mitigation of spills and IRs. Continuous monitoring during construction.	Route 7 has approx. 3-4 times the Route 3 number of piles that would reqiuire removal prior to drilling.	
B.10	Steering dificulties in soft clay	Could happen	3	Moderate	3	CS	9	Design Phase: Require drilling plan with mitigation strategies. Design bore path with larger than typical radius of curvature and require monitoring of steerage data. Construction Phase: Contingency for additional work time or rework. Contractor to include drilling and tracking specialists experienced with similar conditions. Use of appropriate equipment for soft soil conditions.	Route 3 alignment mostly in clay; difficult steering in soft clays making up approximately 50% of proposed alignment length.	
B.11	Exceeding Maximum Pull Stress, Minimum Bending Radius	Could happen	3	Minimal	1	CS	3	Design Phase: Select appropriate pipe type and wall thickness. Construction Phase: Bid contingency, Contractor at risk to replace. Full-time field monitoring by designer or independent party.		
B.12	Equipment Layout, Pipe Handling/Laydown Difficulties (Lynn)	Unlikely to happen	2	Minimal	1	C	2	Design Phase: Obtain required permits/ agreements before construction. Specify performance criteria and detailed plan. Construction Phase: Appropriate equipment and experience working in similar conditions.	Sufficient work space for HDD entry set-up and pipe assembly/layback. Rig to be relocated to Revere side for pipe pullback.	
B.13	Equipment Layout, Pipe Handling/Laydown Difficulties (Revere)	Will probably happen	4	Severe	5	C	20	Design Phase: Obtain required permits/ agreements before construction. Specify performance criteria and detailed plan including work area safety. Construction Phase: Appropriate equipment and experience working in similar conditions.	Tight work space; proximity to residences, concrete barrier walls. Rig to be relocated here for pipe pullback.	
B.14	Excessive off-site disposal cost for silt contamination of drill fluid or contaminated materials.	Could happen	3	Moderate	3	C	9	Design Phase: Consider pipe selection material best suited to subsurface conditions. Assess degree of damage risk to a pipe acceptable to Owner. Construction Phase: Contingency for using centrifuges in mud cleaning system or more frequent drilling fluid changeouts resulting in elevated risk of higher volumes of drill fluid requiring disposal.	Route 3 has greater risk of fines contaminating the drill fluid as this route passes through more clay. Both routes have similar risk of encountering contaminated ground.	
B.15	Point loading induced damage to pipe during installation due to rocks and/or boulders.	Could happen	3	Severe	5	C	15	Design Phase: Select pipe material and parameters best suited to subsurface conditions. Assess degree of pipe damage risk acceptable to Owner. Construction Phase: Contingency for slower drilling, increased borehole conditioning using additional reaming passes. Contingency for mud engineering, and rework. Contractor written plan for alignment adjustments, redrilling work when encountering boulders. Continuous monitoring during construction.	Lowere chance of encountering boulders along Route 3. Fusible PVC pipe possible damage during installation/operation from point loading causing crack and possible propagation along longer pipe length. HDPE pipe possible deformation under point or soil loadings especially when depressurized or during low pressure operation. Steel pipe possible damage to coatings exposing metal thus requiring more cathodic protection and/or active corrosion protection.	
B.16	Potential for encountering squeezing clays causing excessive loads on drill string or product pipe	Unlikely to happen	2	Moderate	3		6	Design Phase: Contingency planning for conditions. Construction Phase: Monitor during drilling. Include approprtiate equipment to handle condition.	Route 3 alignment mostly in clay, making up approximately 50% of proposed alignment length.	
B.17	Drilling fluid loss in river with highest risk in 1,000-foot navigable channel section	Unlikely to happen	2	Severe	5		10	Design Phase: Contractor to verify initial Borehole Stability analysis prior to bidding. Require contractor drilling plan with mitigation strategies. Develop construction monitoring provisions. Construction Phase: Monitoring during drilling. Drill deeper but at higher cost and risk of drilling in till and rock.	Both routes have an issue in this area, but Route 3 indicates higher allowable annular pressure (approx. 55 PSI) versus Route 7 at approx. 35 PSI before fluid loss occurs.	
B.18	Unstable borehole in clean, uniform sands in fluvial sediments and granular deposits during pilot and reaming phases	Could happen	3	Severe	5		15	Design Phase: Reduce length of alignment in fluvial material and assess <200 content of fluvial for zones with less than 18% sub 200# sieve size (considered higher risk of unstable soil). Require contractor drilling plan with mitigation strategies. Develop construction monitoring provisions. Construction Phase: Use higher density and higher viscosity drill fluid with mud cake enhancement but at risk of elevatiing risk of drill fluid loss. Contractor to verify initial Borehole Stability analysis as part of construction submittals.	Route 3 - approximately 600 feet of bore in fluvial material. Route 7 - approximately 2100 feet in fluvial material.hole diameter. Item can cause bore collapse and loss of circulation and reduce production rates by up to 50%.	
B.19	Borehole collapse in granular materials in short time causing stuck drill string or carrier pipe, and damage to carrier pipe or excessive ovalization.	Could happen	3	Moderate	3		9	Design Phase: Contingency planning for conditions. Construction Phase: Assess during drilling and if an issue install full length steel casing then install carrier pipe inside casing.	Route 3 - approximately 600 feet of bore in fluvial material. Route 7 approx. 2,100 feet in fluvial material.	
B.20	Out of tolerance bore due to deflections by cobble or gravel or high density difference materials	Could happen	3	Moderate	3		9	Design Phase: Contingency planning for conditions. Construction Phase: Install proper controls and monitor during construction.	Route 3 provides further clearance from the till contact and less of bore path is in fluvial zone.	
B.21	Construction noise, vibration and limited access for Point of Pines residents at HDD Route 3 exit (Revere)	Will happen	5	Severe	5		25	Design Phase: Contingency planning for conditions. Construction Phase: Install proper controls and monitor during construction.	Increased to a high impact rating during a 12/02/2021 Teams meeting with Peter Grasso of MWRA.	
B.22	Construction dealing with dissolved lead in groundwater and within a portion of a potential Massachusetts Contingency Plan (MCP) disposal site along Rice Avenue.	Will happen	5	Minor	2		10	Design Phase: Contingency planning for conditions. Construction Phase: Complete required MCP submittal(s), treat groundwater from any dewatering, permit treated water discharge, install proper controls and monitor during construction.	Typical condition that is often encountered during construction projects.	
B.23	Encountering impacted soil during construction work completed within the established MCP "Disposal Site Boundary" of the National Grid disposal site on Riley Way Extension (RTN 3-32437).	Could happen	3	Minor	2		6	Design Phase: Contingency planning for conditions. Construction Phase: Complete required MCP submittal(s), characterize soil, special handling during excavation and off-site disposal as needed, install proper controls and monitor during construction.	If encountered, typical condition that is often addressed during construction projects with proper characterization, handling and disposal.	
C. Operation										
C.1	Pipeline failure due to buckling from acts of nature (storms, earthquakes) and/or other construction activities putting additional loading on pipe.	Could happen	3	Moderate	3		9	Design Phase: Proper alignment design, pipe selection, marking and warning signage. Construction Phase: Quality construction and as-builts, post construction monitoring by Owner to protect against any encroachments.		

TOTAL RISK RATING SCORE		309

Route 7 HDD Risk Register										
ID	Description	Risk Before Mitigation						Mitigation Options	Comments	Risk Entry Date
		Probability		Impact			Risk Rating			
		Category	Value	Category	Value	Type*				
A. Project Planning and Development										
A.1	Obtaining temporary and permanent construction easements with property owners, yacht club and Point of Pines Assoc. for Revere side connection	Could happen	3	Minor	2		6	Design Phase: Early public reach-out and coordination. Construction Phase: Adhere to assigned work limits.	Refusal or difficult terms by owners to grant temporary construction easement delays project, resticts work to public areas only, or forces eminent domain procedure if public space is insufficient.	
A.2	Lack of available, qualified HDD contractors drives up bids	Could happen	3	Moderate	3		9	Design Phase: Early advertising of project to generate interest and allow firms to plan for. Prequalify HDD contractors/bidders to ensure they have experience with similar subsurface conditions.	Bidding documents to contain appropriate experience language.	
A.3	MassDOT, Mass DEP permit delays/ restrictions force redesign	Could happen	3	Minor	2		6	Design Phase: Early coordination with agencies.	Present project early to agencies and solicit their input.	
B. HDD Construction										
B.1	Impacts to public safety during construction (Revere)	Unlikely to happen	2	Severe	5		10	Design Phase: Design for added construction safety. Construction Phase: Install adequate construction safety measures, work planning.	Drilling equipment/operations limited to yacht club parking lot, away from residences (Revere).	
B.2	Impacts to areas of environmental concern from drilling fluid spills (Revere)	Could happen	3	Severe	5		15	Design Phase: Proper design. Construction Phase: Experienced contractor, proper due diligence & work planning. Prepare contingency plans and equipment.	Habitat and wetlands restrictions on Revere side.	
B.3	Damage to yacht club (Revere) private property	Unlikely to happen	1	Minimal	1		1	Design Phase: Proper design. Construction Phase: Experienced contractor, proper due diligence & work planning. Prepare contingency plans and equipment.	Drilling equipment and construction activities offset from club building in parking lot; risk of inadvertent returns at HDD exit. Parking lot damage requiring re-surfacing.	
B.4	Damage to adjacent public utilities / structures (Revere)	Unlikely to happen	2	Severe	5		10	Design Phase: Verify existing infrastructure locations and maintain offsets. Increase cover depth and adjust clearances and deviation tolerances. Alternately, design for relocation. Construction Phase: Accurately locate utilities in work areas, entry/exit points - expose and protect as needed. Maintain specified clearance and minimize deviations. Monitor/ survey ground conditions for heave/settlement. Contingency plan for repairs.	Minimal or no public utilities in work area.	
B.5	Damage to adjacent public utilities / structures (Lynn)	Unlikely to happen	2	Minimal	1		2	Design Phase: Verify existing infrastructure locations and maintain offsets. Increase cover depth and adjust clearances and deviation tolerances. Construction Phase: Accurately locate utilities in work areas, entry/exit points - expose and protect as needed. Maintain specified clearance and minimize deviations. Monitor/survey ground conditions for heave/ settlement. Contingency plan for repairs.	Minimal public infrastructure on Lynn side.	
B.6	Subsurface obstructions - bulkhead piles (Lynn)	Will happen	5	Severe	5		25	Design Phase: Selection of reasonable clearances and tolerances. Specify additional investigation utilizing Pile Integrity Testing to confirm pile depths. Specify Contractor to develop a contingency plan for removal of existing piles and grouting resulting voids within alignment corridor on Lynn side. Construction Phase: Remove any piles obstructing HDD alignment. Grout resulting voids from pile tip to river bottom to minimize fracout potential. Add contingency for rework if obstructions are encountered.	Both routes cross under old piles from timber bulkhead on Lynn side - depth unknown. Route 7 will have more piles in the alignment.	
B.7	Difficult subsurface drilling due to mixed soil type conditions	Will happen	5	Severe	5		25	Design Phase: Evaluate geotechnical, geophysical investigation results to select best available alignment. Preparation of geotechnical baseline identifying potentially difficult soils along alignment. Alignment tolerances adjusted to address potential boulders/cobles requiring alignment shifts during drilling. Construction Phase: Contractor experience with similar conditions. Drilling controls including use of temporary casings, grouting, etc. Contingency for additional work time or re-work.Pre-planning and adequate equipment selection.	Conditions range from soft clays to sand, gravel and boulders. Greater range of soil matrices along Route 7. Appropriate downhole equipment, drilling mud composition and speed of drilling to be adapted to individual subsurface conditons.	
B.8	Encountering cobble(s) and boulder(s) within till, randomly within the lower clay, and within the glaciofluvial deposits	Will happen	5	Severe	5		25	Design Phase: Evaluate geotechnical, geophysical investigation results to select best available alignment. Preparation of geotechnical baseline identifying potentially difficult soils along alignment. Alignment tolerances adjusted to address potential boulders/cobles requiring alignment shifts during drilling. Construction Phase: Contractor experience with similar conditions. Drilling controls including use of temporary casings, grouting, etc. Contingency for additional work time or re-work. Pre-planning and adequate equipment selection.	Route 7 alignment mostly in fluvial zone which has a higher risk of boulder encounter than the clay. Both routes have similar risk of encounter at lengths between 500 and 1900 feet along the bore path.	
B.9	Inadvertent returns of drilling fluid via bulkhead piles (Lynn)	Could happen	3	Moderate	3	C	9	Design Phase: Identify piles in borepath and design for removal and grouting of hole. Require contractor IR contingency plan. Construction Phase: Pile removal and proper grouting of remaining holes. Contractor written plan for prevention and mitigation of spills and IRs. Continuous monitoring during construction.	Route 7 has approx. 3-4 times the Route 3 number of piles that would reqiuire removal prior to drilling.	
B.10	Steering dificulties in soft clay	Could happen	3	Moderate	3		9	Design Phase: Require drilling plan with mitigation strategies. Design bore path with larger than typical radius of curvature and require monitoring of steerage data. Construction Phase: Contingency for additional work time or rework. Contractor to include drilling and tracking specialists experienced with similar conditions. Use of appropriate equipment for soft soil conditions.	Route 7 alignment is mostly in fluvial soils; less than 22% of proposed alignment length in clay.	
B.11	Exceeding Maximum Pull Stress, Minimum Bending Radius	Could happen	3	Minimal	1		3	Design Phase: Select appropriate pipe type and wall thickness. Construction Phase: Bid contingency, Contractor at risk to replace. Full-time field monitoring by designer or independent party.		
B.12	Equipment Layout, Pipe Handling/Laydown Difficulties (Lynn)	Unlikely to happen	2	Minimal	1		2	Design Phase: Obtain required permits/ agreements before construction. Specify performance criteria and detailed plan. Construction Phase: Appropriate equipment and experience working in similar conditions.	Sufficient work space for HDD entry set-up and pipe assembly/layback. Rig to be relocated to Revere side for pipe pullback.	
B.13	Equipment Layout, Pipe Handling/ Laydown Difficulties (Revere)	Could happen	3	Minimal	1		3	Design Phase: Obtain required permits/ agreements before construction. Specify performance criteria and detailed plan including work area safety. Construction Phase: Appropriate equipment and experience working in similar conditions.	Sufficient work space in parking lot. Rig to be relocated here for pipe pullback.	
B.14	Excessive off-site disposal cost for silt contamination of drill fluid or contaminated materials.	Unlikely to happen	2	Moderate	3		6	Design Phase: Consider pipe selection material best suited to subsurface conditions. Assess degree of damage risk to a pipe acceptable to Owner. Construction Phase: Contingency for using centrifuges in mud cleaning system or more frequent drilling fluid changeouts resulting in elevated risk of higher volumes of drill fluid requiring disposal.	Route 7 has lower risk of fines contaminating the drill fluid as this route passes through more fluvial material. Both routes have similar risk of encountering contaminated ground.	
B.15	Point loading induced damage to pipe during installation due to rocks and/or boulders along alignment.	Will happen	5	Severe	5		25	Design Phase: Select pipe material and parameters best suited to subsurface conditions. Assess degree of pipe damage risk acceptable to Owner. Construction Phase: Contingency for slower drilling, increased borehole conditioning using additional reaming passes. Contingency for mud engineering, and rework. Contractor written plan for alignment adjustments, redrilling work when encountering boulders. Continuous monitoring during construction.	Higher chance of encountering boulders along Route 7. Fusible PVC pipe possible damage during installation/operation from point loading causing crack and possible propagation along longer pipe length. HDPE pipe possible deformation under point or soil loadings especially when depressurized or during low pressure operation. Steel pipe possible damage to coatings exposing metal thus requiring more cathodic protection and/or active corrosion protection.	
B.16	Potential for encountering squeezing clays causing excessive loads on drill string or product pipe	Unlikely to happen	1	Moderate	3		3	Design Phase: Contingency planning for conditions. Construction Phase: Monitor during drilling. Include approprtiate equipment to handle condition.	Route 7 alignment in clay for approximately 20% of length.	
B.17	Drilling fluid loss in river with highest risk in 1,000-foot navigable channel section	Will happen	5	Severe	5		25	Design Phase: Contractor to verify initial Borehole Stability analysis prior to bidding. Require contractor drilling plan with mitigation strategies. Develop construction monitoring provisions. Construction Phase: Monitoring during drilling. Drill deeper but at higher cost and risk of drilling in till and rock.	Both routes have an issue in this area, but Route 7 indicates a lower allowable annular pressure (approx. 35 PSI) versus Route 3 at approx. 55 PSI before fluid loss occurs.	
B.18	Unstable borehole in clean, uniform sands in fluvial sediments and granular deposits during pilot and reaming phases	Will probably happen	4	Severe	5		20	Design Phase: Reduce length of alignment in fluvial material and assess <200 content of fluvial for zones with less than 18% sub 200# sieve size (considered higher risk of unstable soil). Require contractor drilling plan with mitigation strategies. Develop construction monitoring provisions. Construction Phase: Use higher density and higher viscosity drill fluid with mud cake enhancement but at risk of elevatiing risk of drill fluid loss. Contractor to verify initial Borehole Stability analysis as part of construction submittals.	Route 7 - approximately 2100 feet in fluvial material. Route 3 - approximately 600 feet of bore in fluvial material. Item can cause bore collapse and loss of circulation and reduce production rates by up to 50%.	
B.19	Borehole collapse in granular materials in short time causing stuck drill string or carrier pipe, and damage to carrier pipe or excessive ovalization	Will probably happen	4	Moderate	3		12	Design Phase: Contingency planning for conditions. Construction Phase: Assess during drilling and if an issue install full length steel casing then install carrier pipe inside casing.	Route 7 - approximately 2,100 feet in fluvial material. Route 3 - approximately 600 feet of bore in fluvial material.	
B.20	Out of tolerance bore due to deflections by cobble or gravel or high density difference materials	Will probably happen	4	Moderate	3		12	Design Phase: Contingency planning for conditions. Construction Phase: Install proper controls and monitor during construction.	Route 7 has greater length of bore path in fluvial zone.	
B.21	Construction noise, vibration and limited access for yacht club members at HDD Route 7 exit (Revere)	Could happen	3	Moderate	3		9	Design Phase: Contingency planning for conditions. Construction Phase: Install proper controls and monitor during construction.		
B.22	Encountering impacted soil during construction work completed within the established MCP "Disposal Site Boundary" of the National Grid disposal site on Riley Way Extension (RTN 3-32437).	Could happen	3	Minor	2		6	Design Phase: Contingency planning for conditions. Construction Phase: Complete required MCP submittal(s), characterize soil, special handling during excavation and off-site disposal as needed, install proper controls and monitor during construction.	If encountered, typical condition that is often addressed during construction projects with proper characterization, handling and disposal.	
C. Operation										
C.1	Pipeline failure due to buckling from acts of nature (storms, earthquakes) and/or other construction activities putting additional loading on pipe.	Could happen	3	Moderate	3		9	Design Phase: Proper alignment design, pipe selection, marking and warning signage. Construction Phase: Quality construction and as-builts, post construction monitoring by Owner to protect against any encroachments.		

TOTAL RISK RATING SCORE		
		287

ATTACHMENT D

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 / Sampling Date / Lab ID / Parameter — Sample Depth (feet)	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
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

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
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

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
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

	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
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

	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
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

	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**
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

Sample Location / Sampling Date / Lab ID	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

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
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

Parameter / Sample Location / Sampling Date / Lab ID / Sample Depth (feet)	MCP Reportable Concentrations RCS-1	MCP Reportable Concentrations RCS-2	Lynn Borings 20B-12MW (10-12) 10/22/2020 20J1248 10 - 12	Lynn Borings 20B-13MW (3-5') 10/13/2020 20J0631 3 - 5	Lynn Borings 20B-13MW (6-8) 10/22/2020 20J1248 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

	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
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

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
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 E

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

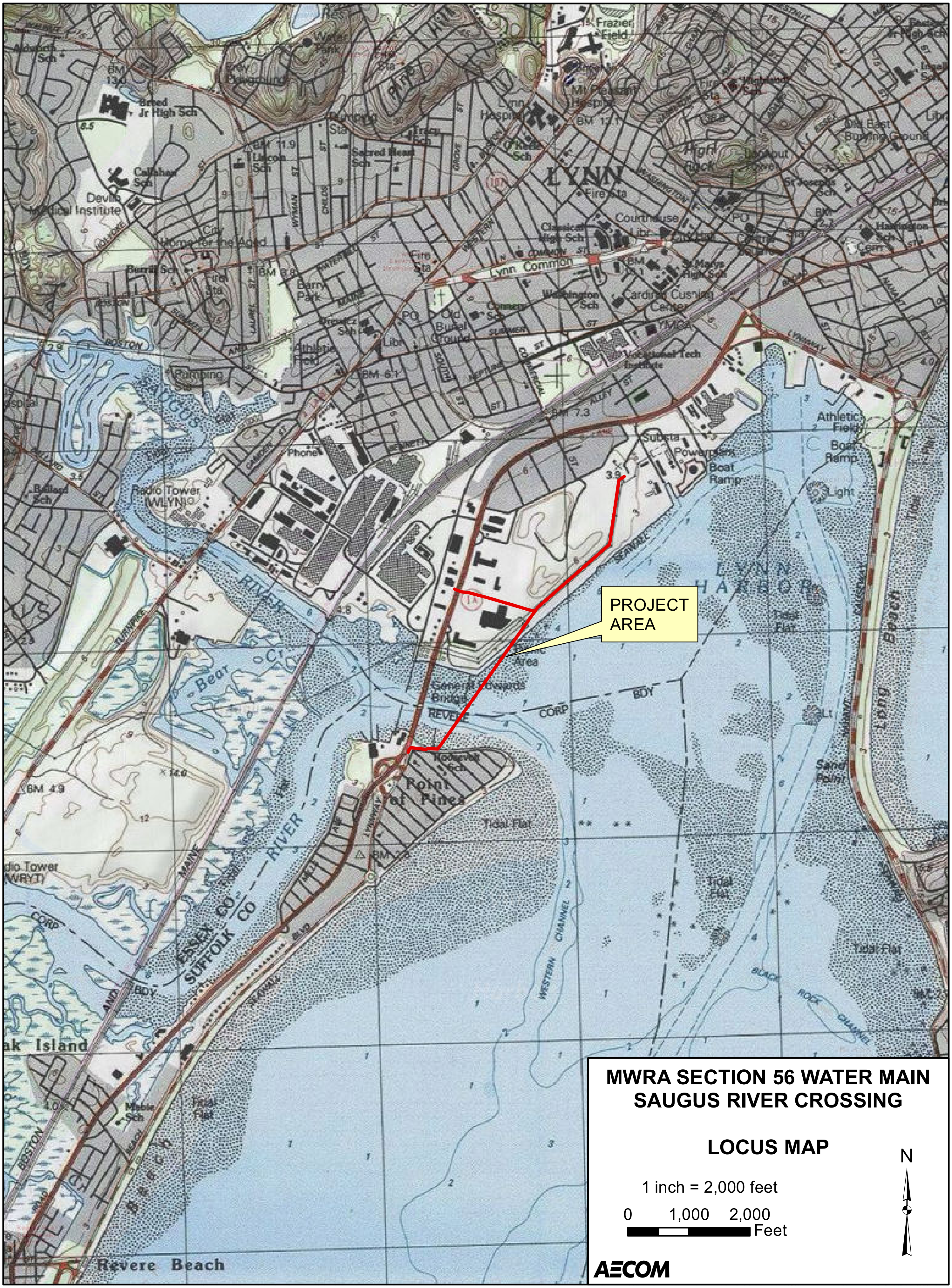
Boring No.	Depth, ft	Sample No.	Moisture Content, %	Organic Matter, %	Atterberg Limits: Plastic Limit (PL)	Atterberg Limits: Liquid Limit (LL)	Atterberg Limits: Plasticity Index (PI)	Grain Size: Gravel, %	Grain Size: Sand, %	Grain Size: Fines, %	USCS	UC/UU S_u, psf	1-D Consolidation
River Sediment													
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 F

USGS Topographic Map and Environmental Constraints Map

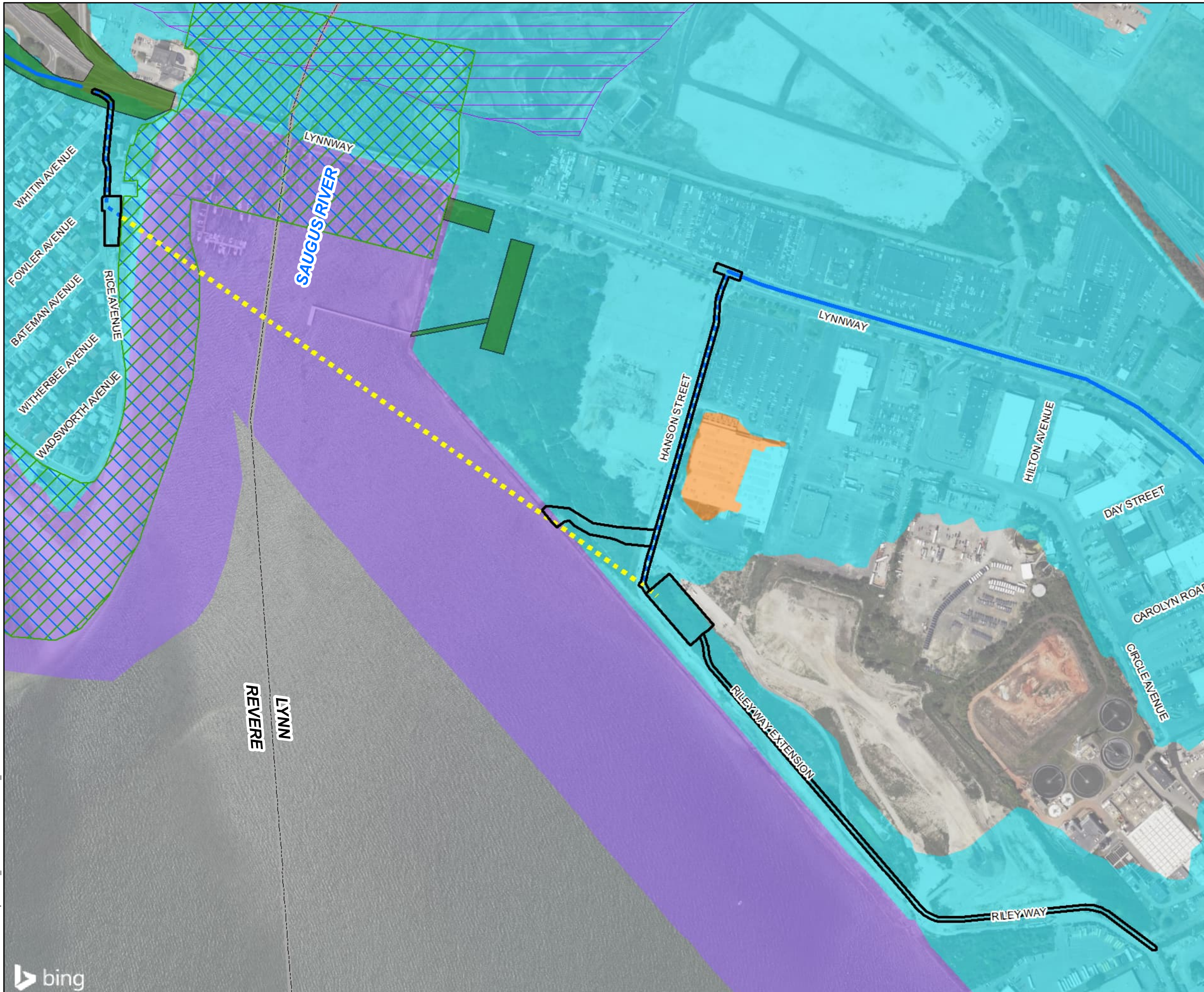


A:\Legacy\USCHL1FP002\Data\Library\GISData\Projects\MUNI\60619578SAU\Maps\LocusMap.mxd

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

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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
- 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 G

Agency 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)

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
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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)

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)

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
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

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

ATTACHMENT H

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

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

Project Name	**Section 56 Water Conveyance Replacement Saugus River Crossing**
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 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 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.**

These impacts would not result in disproportionate adverse effects on an EJ population.

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 Section 56 supplies MWRA Meters 116 and 126 in Revere and Meter 208 to the General Electric Company in Lynn. Without it, there is no redundancy in the system and the populations served by these meters are thus vulnerable to service failure. The EJ populations served by these meters**

	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:** **AECOM, Kate Schassler** **Email: kate.schassler@aecom.com** **Telephone: (978) 905-2334**	

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

Environmental Justice Screening Form

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

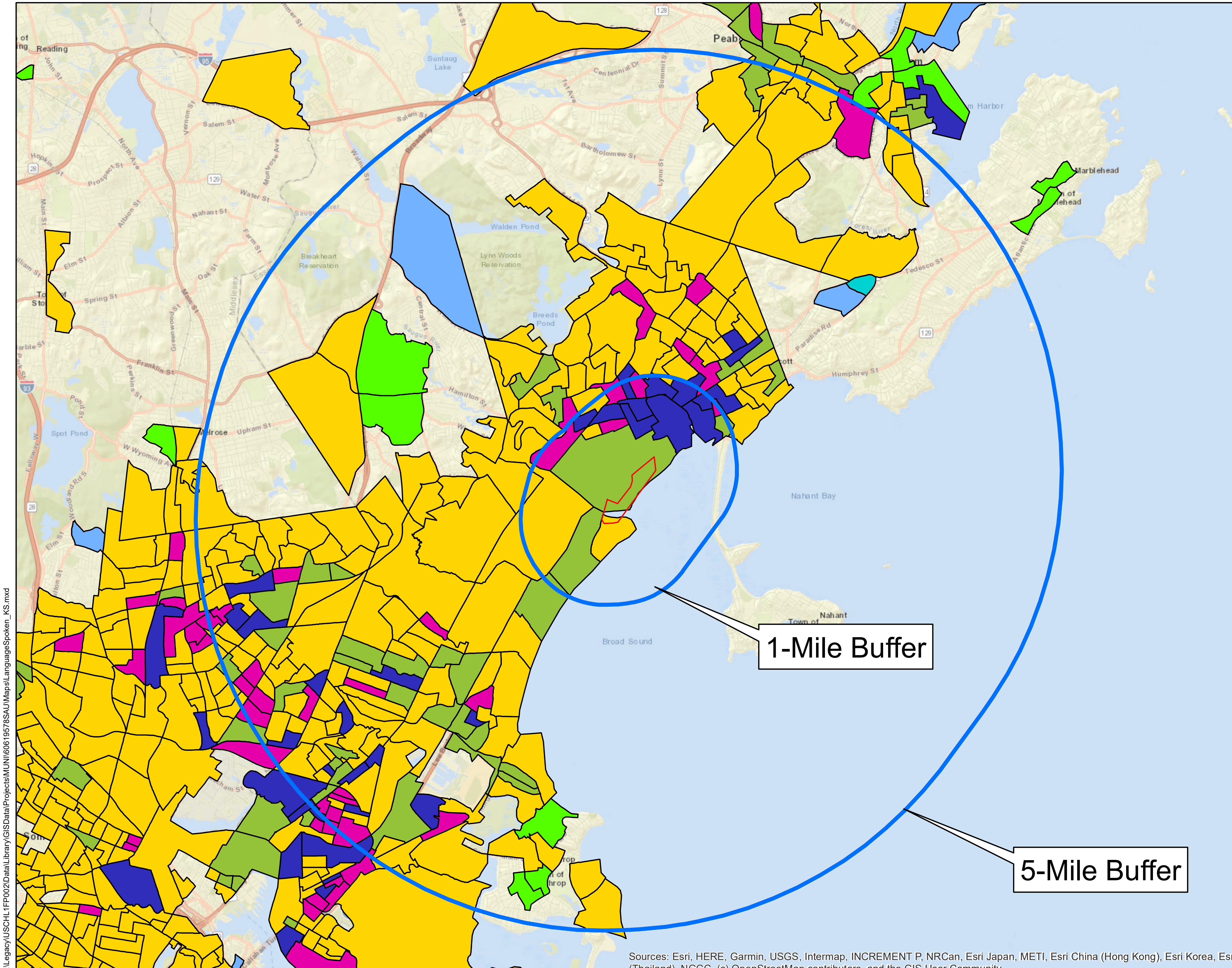
4. Identify EJ populations and characteristics (Minority, Income, English Isolation) within 5 miles of project site (can attach map identifying 5-mile radius from EJ Maps Viewer in lieu of narrative)

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

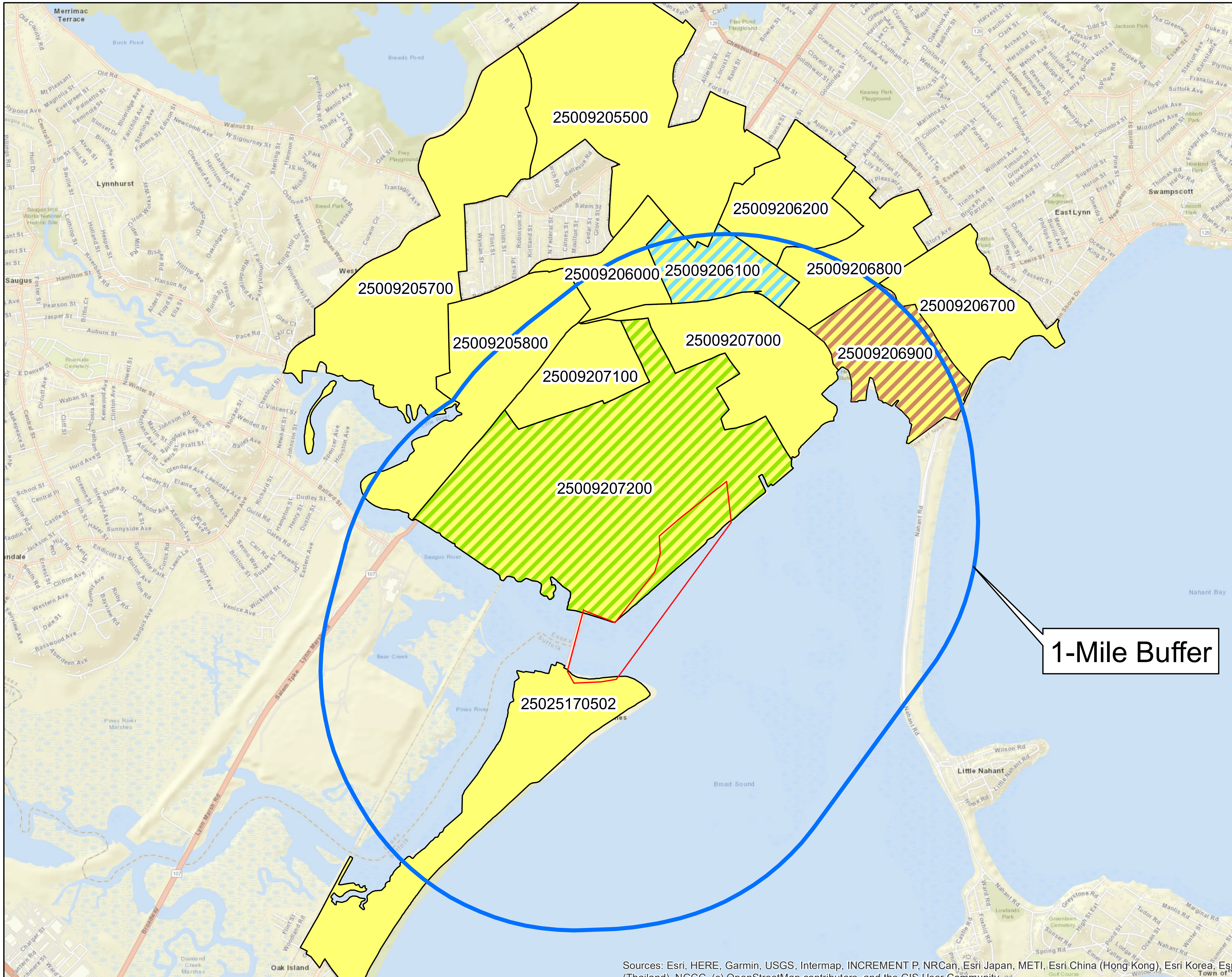
- Minority
- Income
- English isolation
- Minority and Income
- Minority and English isolation
- Income and English isolation
- Minority, Income and English isolation

0 3,000 6,000 Feet

1 inch = 6,016 feet

AECOM

Date: 3/7/2023



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

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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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.

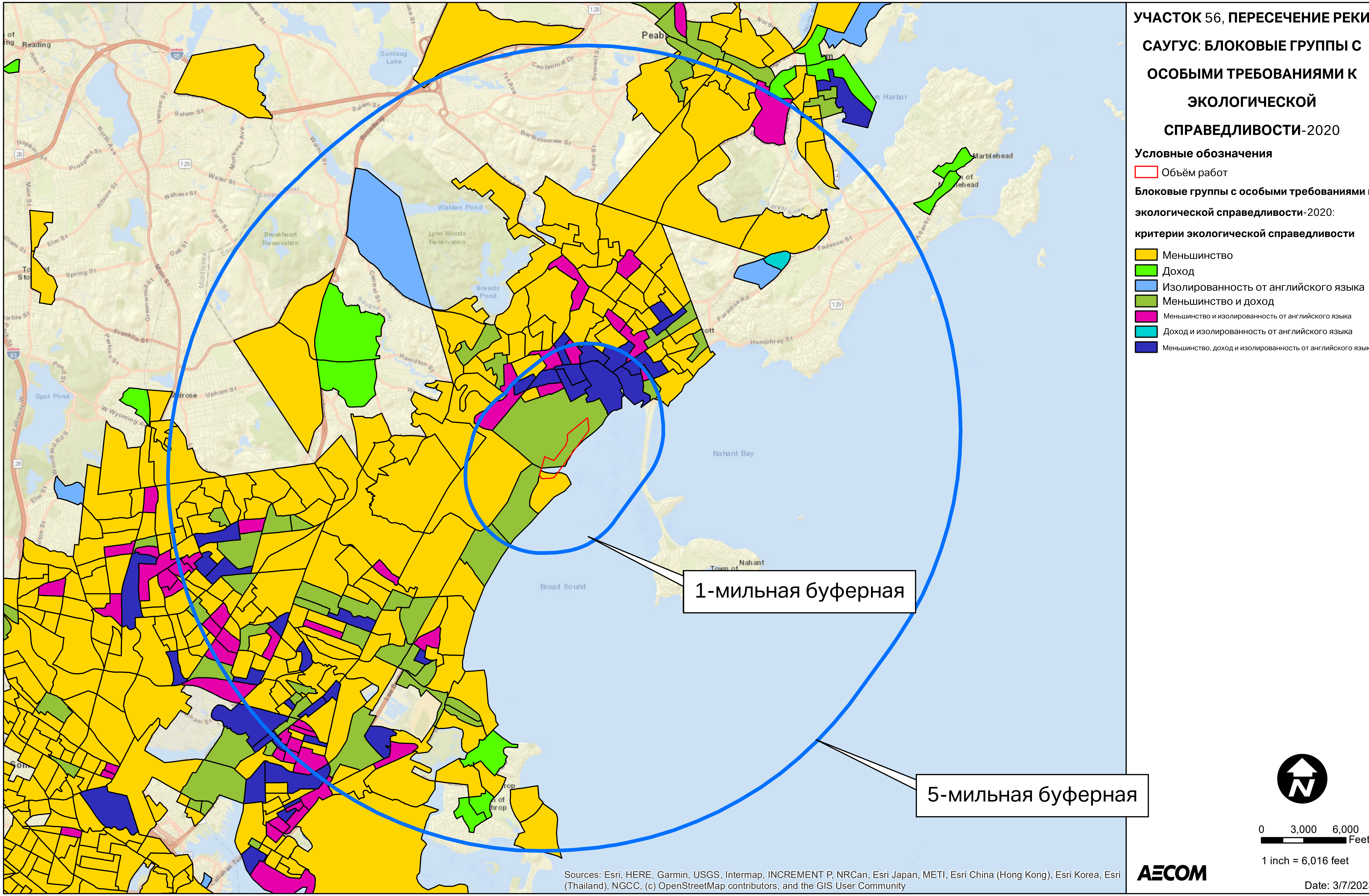
7. Определите преимущества проекта, включая «Преимущества для окружающей среды», согласно определению, приведённому в CMR, раздел 301, 11.02, которые могут улучшить экологические условия или общественное здоровье населения с особыми требованиями к экологической справедливости

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
Nahant
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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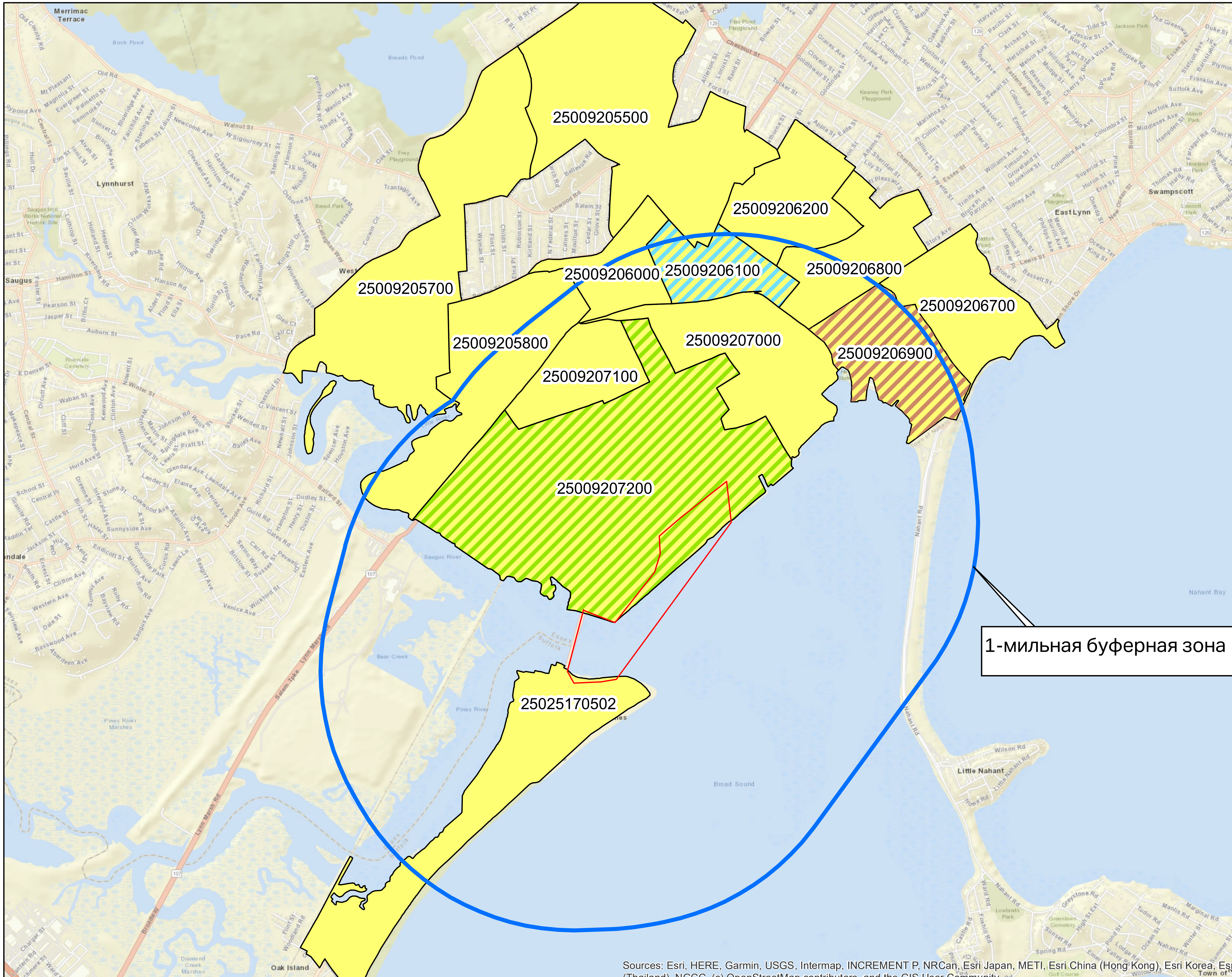

Условные обозначения

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

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	អាជ្ញាធរធនធានទឹករដ្ឋម៉ាសសាចូសេត
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។ អាជ្ញាធរធនធានទឹករដ្ឋម៉ាសសាចូសេត (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)

សេចក្ដីជូនដំណឹងអំពីសុឆន្ទៈរបស់ MAWPA (បទបញ្ញាលក្ខខណ្ឌដែលបានរំពឹងទុកពី Revere និង Lynn)

វិញ្ញាបនប័ត្រគុណភាពទឹក MassDEP 401

ការកំណត់សង្គតិភាពនៃតំបន់ឆ្នេរ Mass CZM

លិខិតអនុញ្ញាត MWRA 8M

លិខិតអនុញ្ញាតបើកផ្លូវ MassDOT, Revere

លិខិតអនុញ្ញាតបើកផ្លូវ MassDOT, Lynn

លិខិតអនុញ្ញាតសាងសង់ MassDCR

ទម្រង់ការជូនដំណឹងអំពីគម្រោងរបស់គណៈកម្មការប្រវត្តិសាស្ត្ររដ្ឋម៉ាសសាចូសេត (PNF) និងច្បាប់អភិរក្សប្រវត្តិសាស្ត្រជាតិ ផ្នែកទី 106 អនុលោមភាព

អង្គភាពវិស្វករកងទ័ពអាមេរិក ផ្នែកទី 404 និង លិខិតអនុញ្ញាតលេខ 408

ជំពូកទី 91 អាជ្ញាប័ណ្ណច្បាប់មាត់ទឹកសាធារណៈរដ្ឋម៉ាសសាចូសេត

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៖

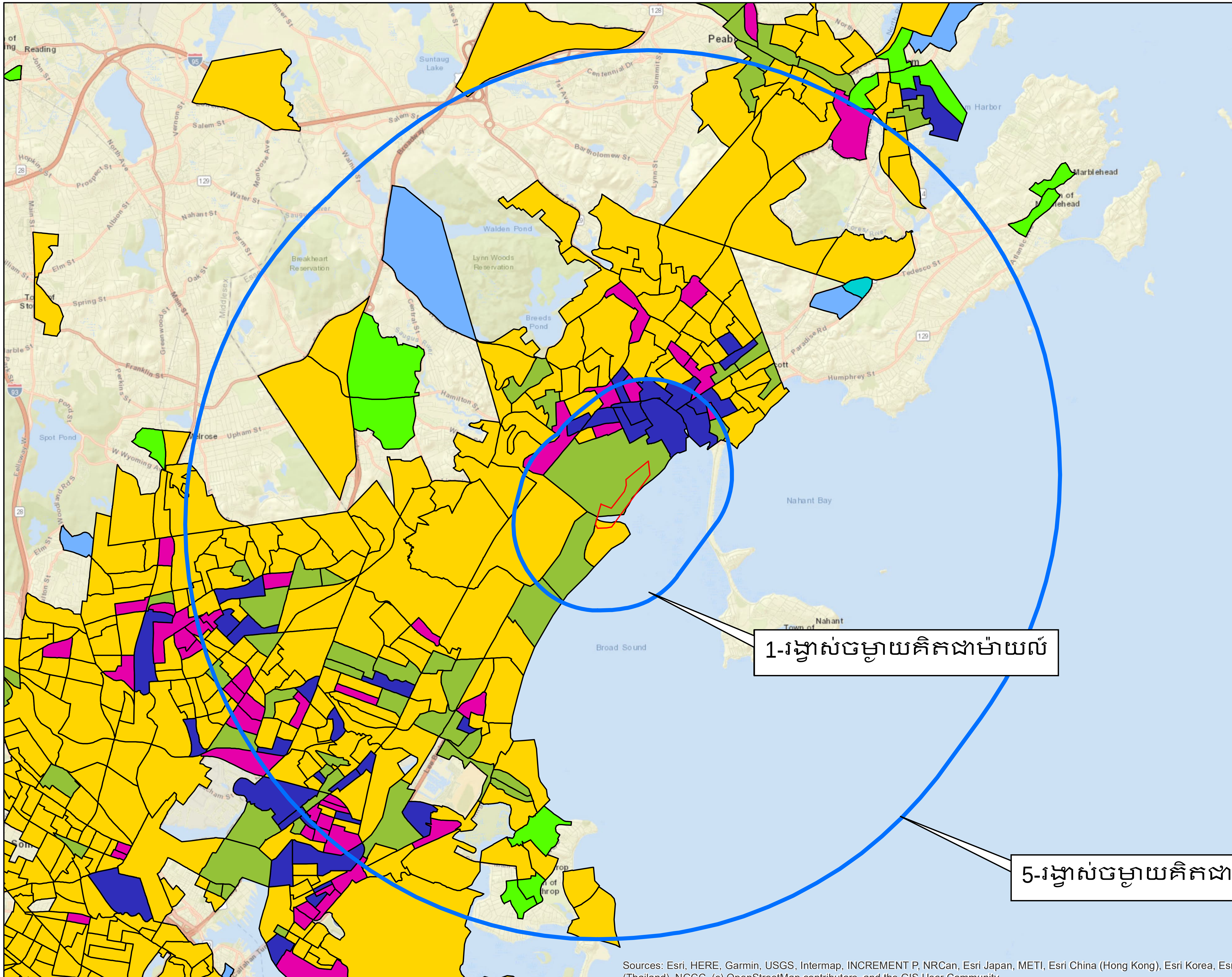
- ផលប៉ះពាល់រយៈពេលខ្លីចំពោះចរាចរណ៍នៅលើផ្លូវ Rice Avenue នឹងប៉ះពាល់ដល់អ្នករស់នៅតាមដងផ្លូវនេះ អំឡុងពេលដំឡើងបំពង់បង្ហូរនៅតាមដងផ្លូវ។ ការបង្កើនសកម្មភាពនៅតំបន់ជុំវិញទីតាំងគម្រោង រួមទាំងចំណតរថយន្ត Point of Pines នឹងរំខានដល់ចរាចរណ៍ក្នុងតំបន់ជាបណ្តោះអាសន្ន។

- ផលប៉ះពាល់រយៈពេលខ្លីចំពោះចរាចរណ៍នៅលើមហាវិថី Hanson នឹងប៉ះពាល់ដល់គំរូចរាចរណ៍នៅក្នុងតំបន់ពាណិជ្ជកម្ម/ឧស្សាហកម្ម អំឡុងពេលដំឡើងបំពង់បង្ហូរ នៅក្នុងផ្លូវ។

- ផលប៉ះពាល់រយៈពេលខ្លីចំពោះគុណភាពខ្យល់នៅក្នុងតំបន់គម្រោងអាចបណ្តាលមកពីប្រតិបត្តិការបណ្តោះអាសន្ននៃគ្រឿងម៉ាស៊ីនដែលទាក់ទងនឹងសកម្មភាពសំណង់។ 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។ ការជំនួសបំពង់នេះនឹងធានាបាននូវការផ្គត់ផ្គង់ទឹកបន្តសម្រាប់ការប្រើប្រាស់ការការពារអគ្គិភ័យ និងអនាម័យ។ ប្រជាជន EJ ដែលបម្រើដោយបំពង់នេះ ក៏ដូចជាសហគមន៍កាន់តែទូលំទូលាយ នឹងទទួលបានអត្ថប្រយោជន៍ពីសុវត្ថិភាព ដែលការជំនួសបំពង់នេះនឹងនាំទៅដល់ការផ្គត់ផ្គង់ទឹកក្នុងតំបន់។
8. ពណ៌នាអំពីរបៀបដែលសហគមន៍អាចស្នើសុំការប្រជុំដើម្បីពិភាក្សាអំពីគម្រោង និងរបៀបដែលសហគមន៍អាចស្នើសុំសេវាបកប្រែភាសាផ្ទាល់មាត់នៅឯកិច្ចប្រជុំ។ បញ្ជាក់ពីរបៀបស្នើសុំកន្លែងស្នាក់នៅផ្សេងទៀត រួមទាំងការប្រជុំបន្ទាប់ពីម៉ោងធ្វើការ និងនៅទីតាំងជិតមធ្យោបាយដឹកជញ្ជូនសាធារណៈ។ ដើម្បីស្នើសុំការស្នាក់នៅ សូមផ្ញើអ៊ីមែល ឬទូរស័ព្ទមកលេខខាងក្រោម៖ **Katie Ronan, MWRA** **(617) 788-1177** **katherine.ronan@mwra.com**



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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

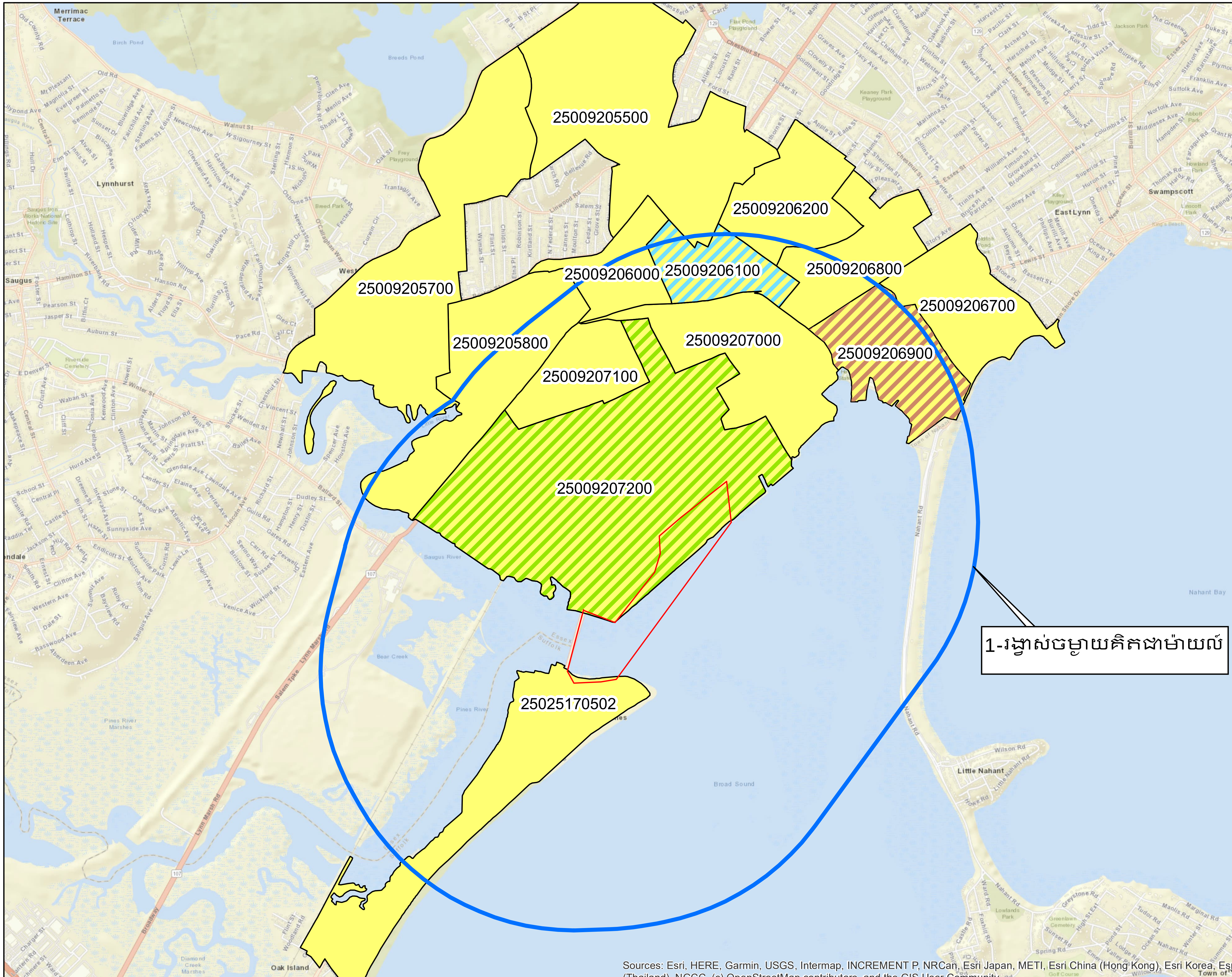
N

0 3,000 6,000 Feet

1 inch = 6,016 feet

AECOM

Date: 3/7/2023



ផ្នែកទី 56 ការឆ្លងកាត់ទន្លេ

SAUGUS៖

ភាសាដែលនិយាយដោយ>5%

នៃមនុស្សដែលនិយាយភាសាអង់គ្លេស តិចជាង "ល្អណាស់"

ចំណងជើង

- ដែនកំណត់ការងារ
- ភាសាអេស្ប៉ាញ ឬភាសាអេស្ប៉ាញ Creole
- ភាសាមនខ្មែរ ភាសារបស់កម្ពុជា
- ភាសាឥណ្ឌូអឺរ៉ុបផ្សេងទៀត
- 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 ہینسٹن 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. متوقعه MEPA جائزہ کی حدیں (11.03 CMR 301) ذکر کریں (اگر معلوم ہو)

- **CMR 11.03(3)(b)(1)(e 301), 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۔"**
- **CMR 11.03(3)(b)(1)(a 301) ، بسلسلہ "ساحلی ریت کے انبار، بیریئر بیچ یا ساحلی کنارے کی تبدیلی"۔**

3. پروجیکٹ کے لیے تمام متوقعه 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 (بیانیه 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۔ منسلکه 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۔

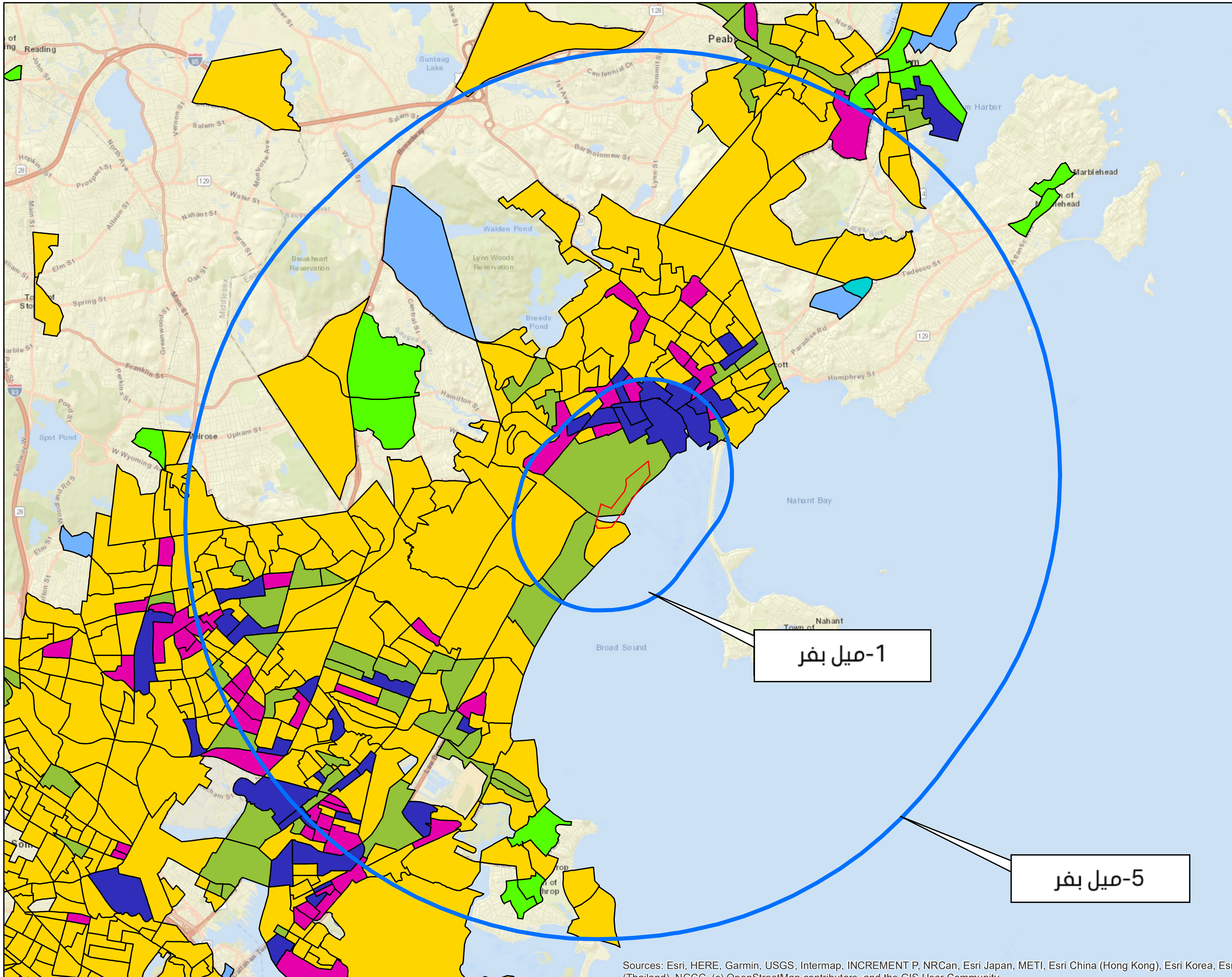
- **لین زد پذیر صحت سے متعلق EJ کے دو معیاروں کو پورا کرتا ہے: سیسے کی زہر آلودگی (BLL >= ug/dL 29 کی موجودگی فی 1,000) اور دمہ کی وجہ سے ایمرجنسی ڈیپارٹمنٹ (ED) کے دورے (130 فی 10,000)۔ ان دو معیاروں کے لیے، لین میں موجودگی کی شرح مجموعی طور پر ریاست میں موجودگی کی شرح سے 110% زیادہ ہے۔**
- **ریور بھی 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

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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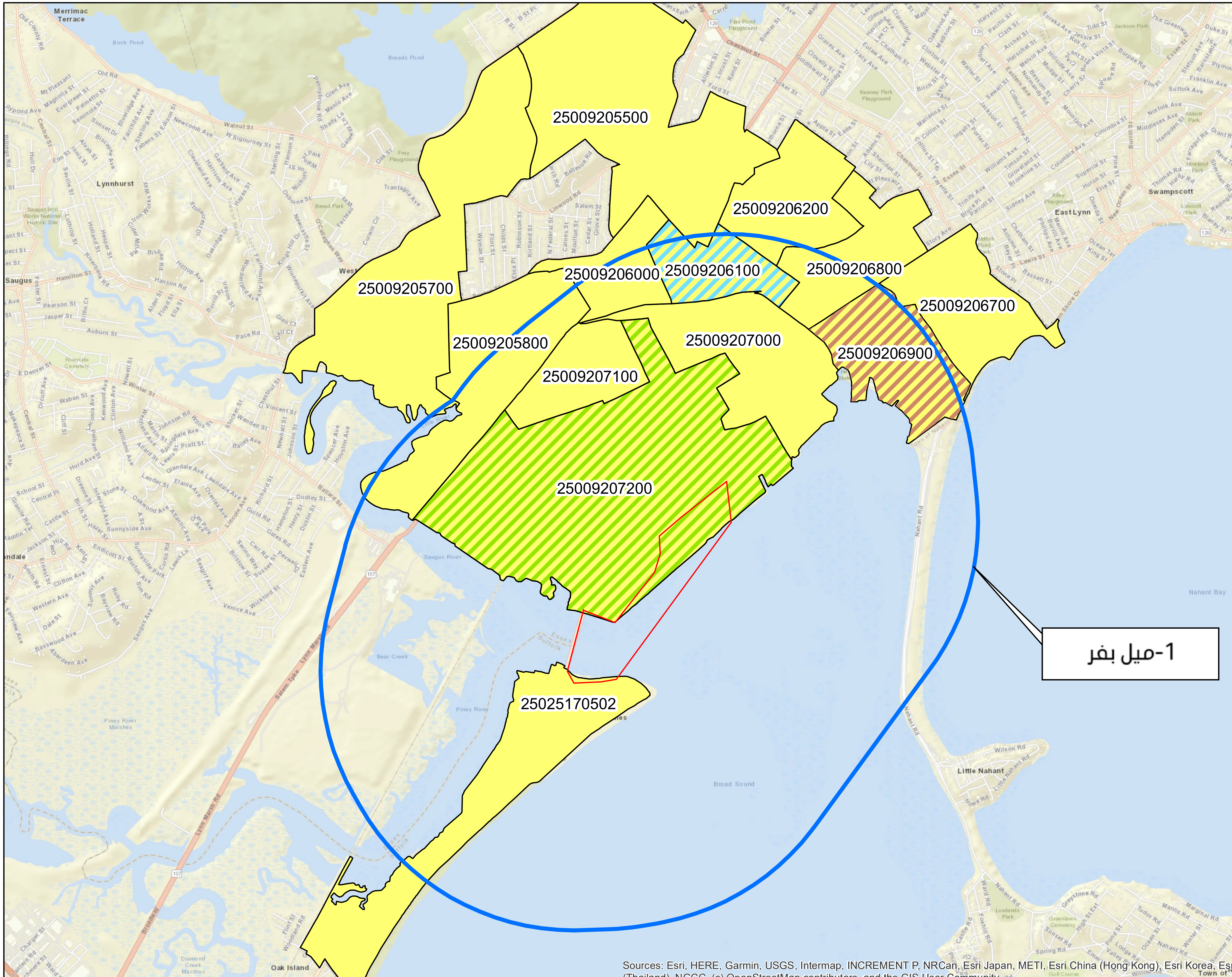

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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

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<u>**Formulario de Evaluación de Justicia Ambiental**</u>

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".**

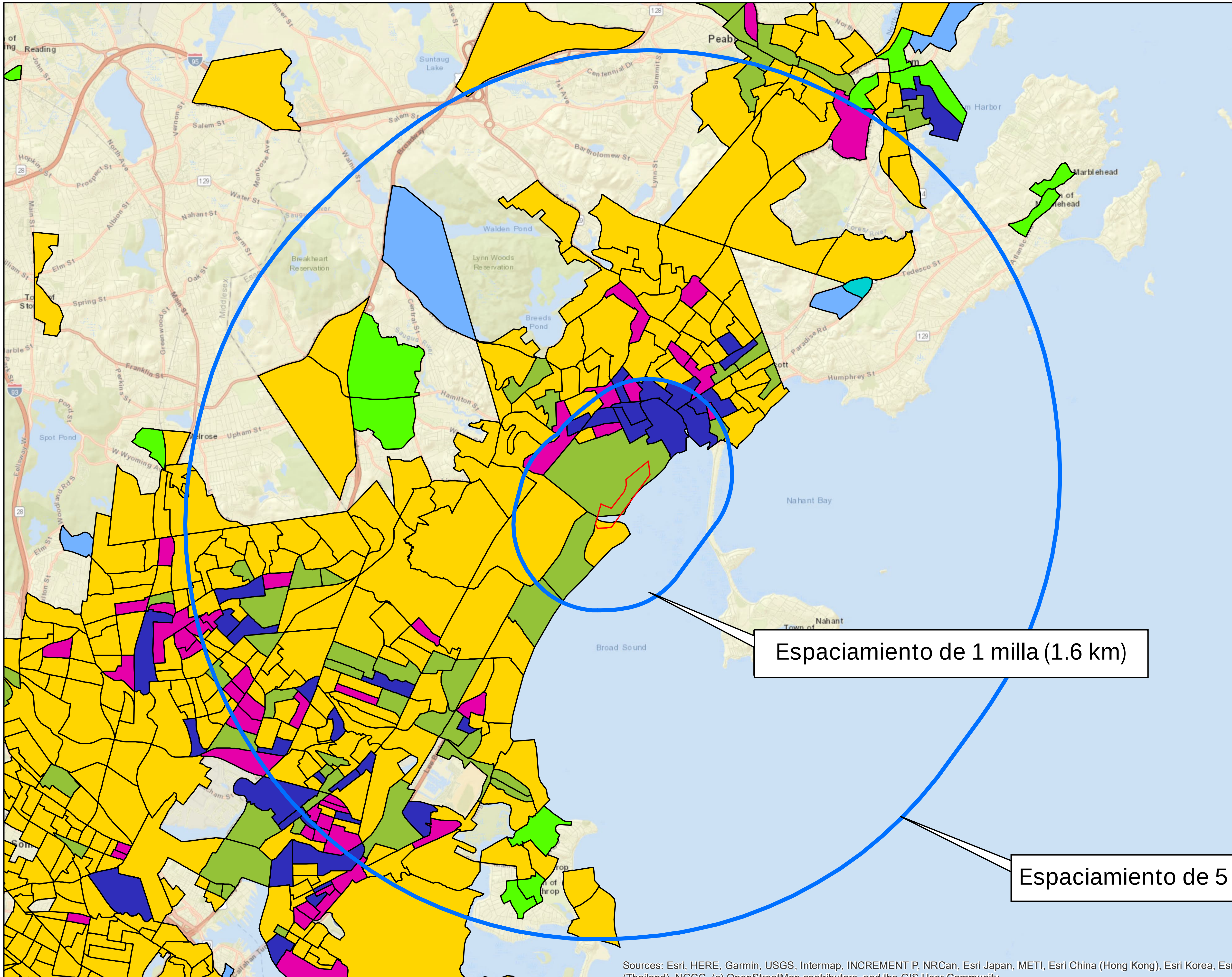
3. Enumere todos los permisos estatales, locales y federales previstos necesarios para el proyecto (si se conocen)

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

0 3,000 6,000 Feet

1 inch = 6,016 feet

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

AECOM

Date: 3/7/2023

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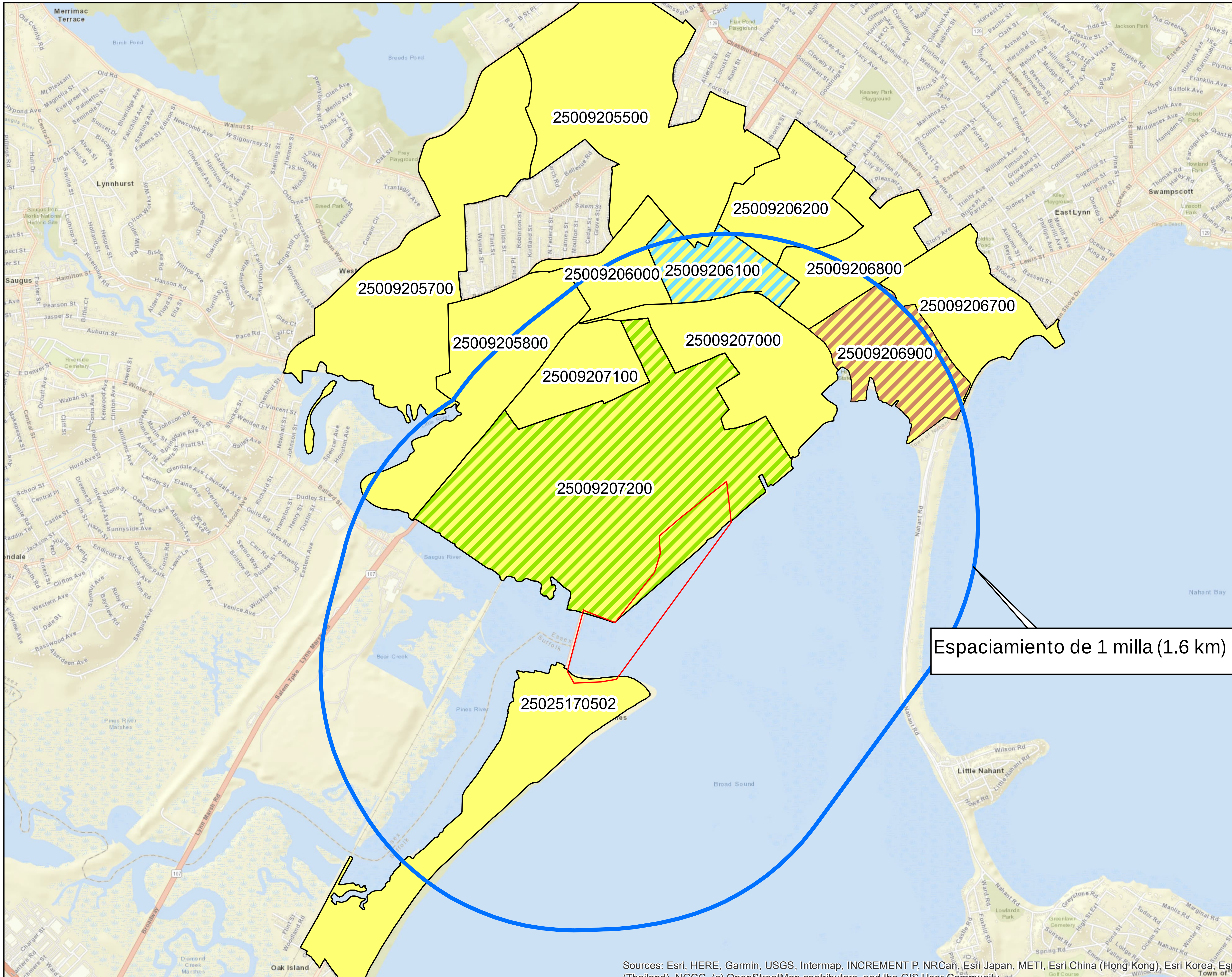


CRUCE DEL RÍO SAUGUS DE LA SECCIÓN 56: IDIOMAS HABLADOS POR >5% DE LAS PERSONAS QUE HABLAN INGLÉS MENOS QUE "MUY BIEN"

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

ATTACHMENT I

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

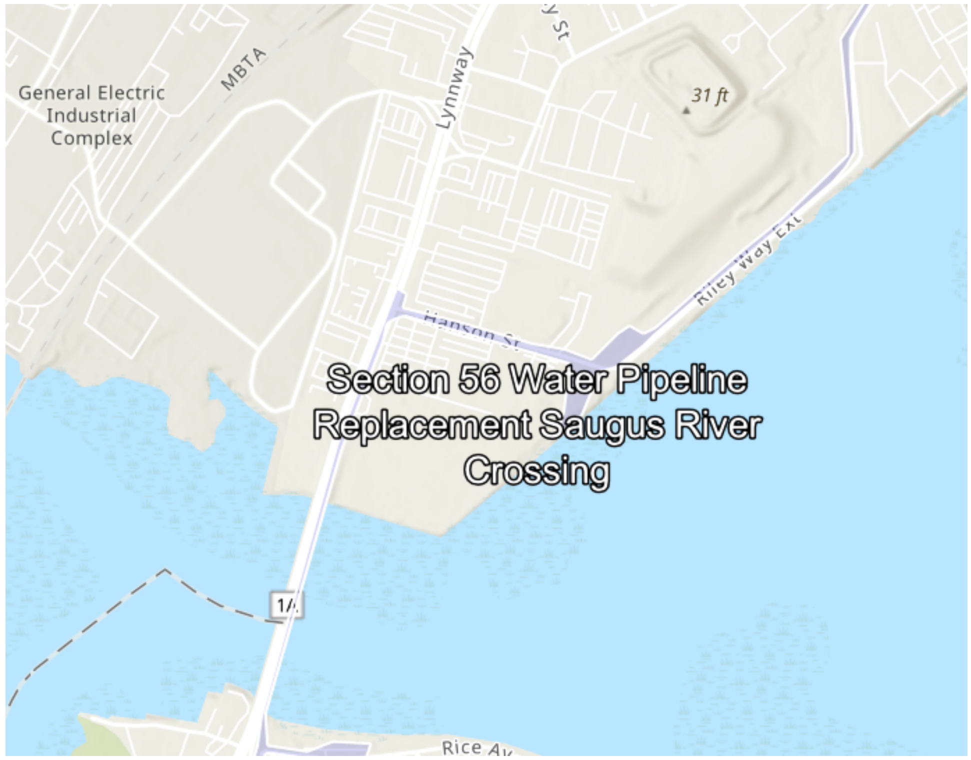
Project Contact Information: Peter Grasso (Peter.Grasso@MWRA.com)

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

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
water to for the MWRA Northern High Service Zone.	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.

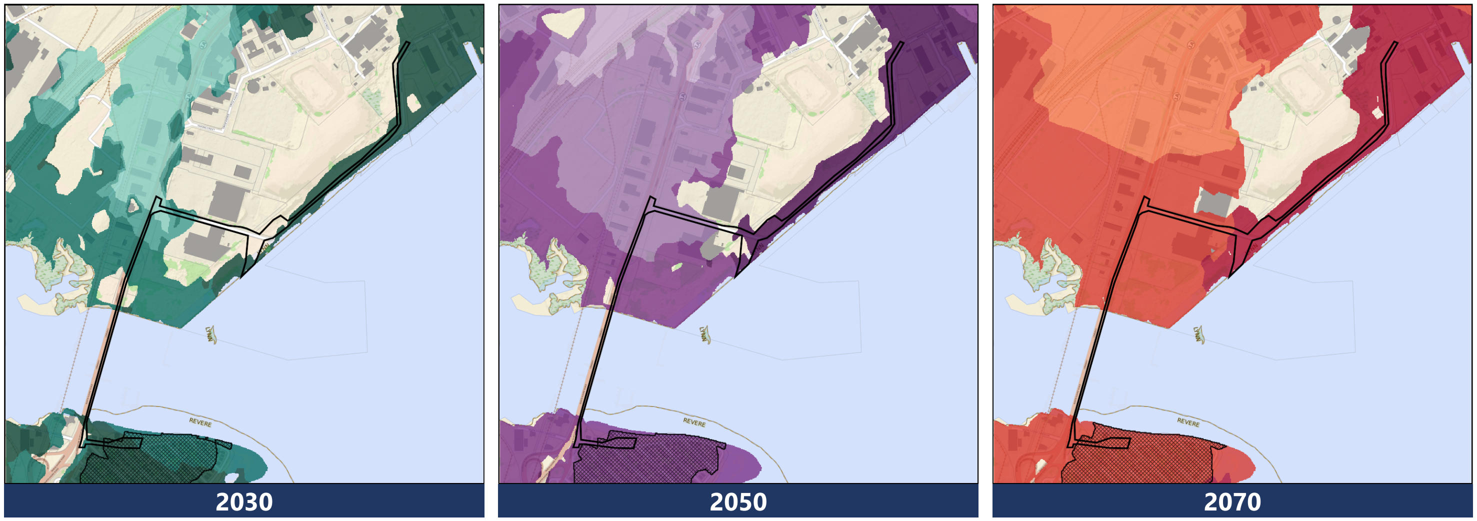
The projected values, maps, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting 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



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

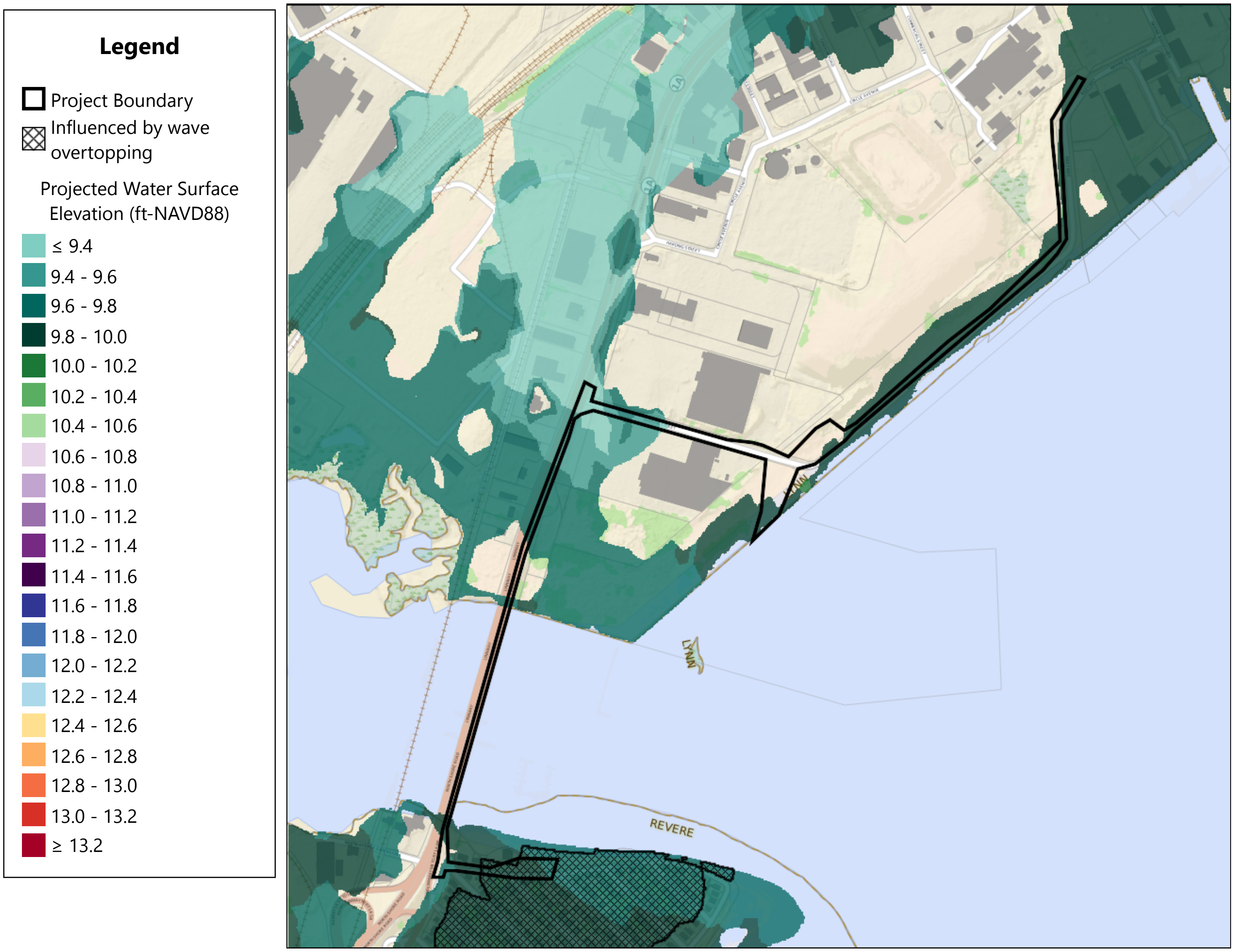
0.25 0.5 1.0 Miles

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

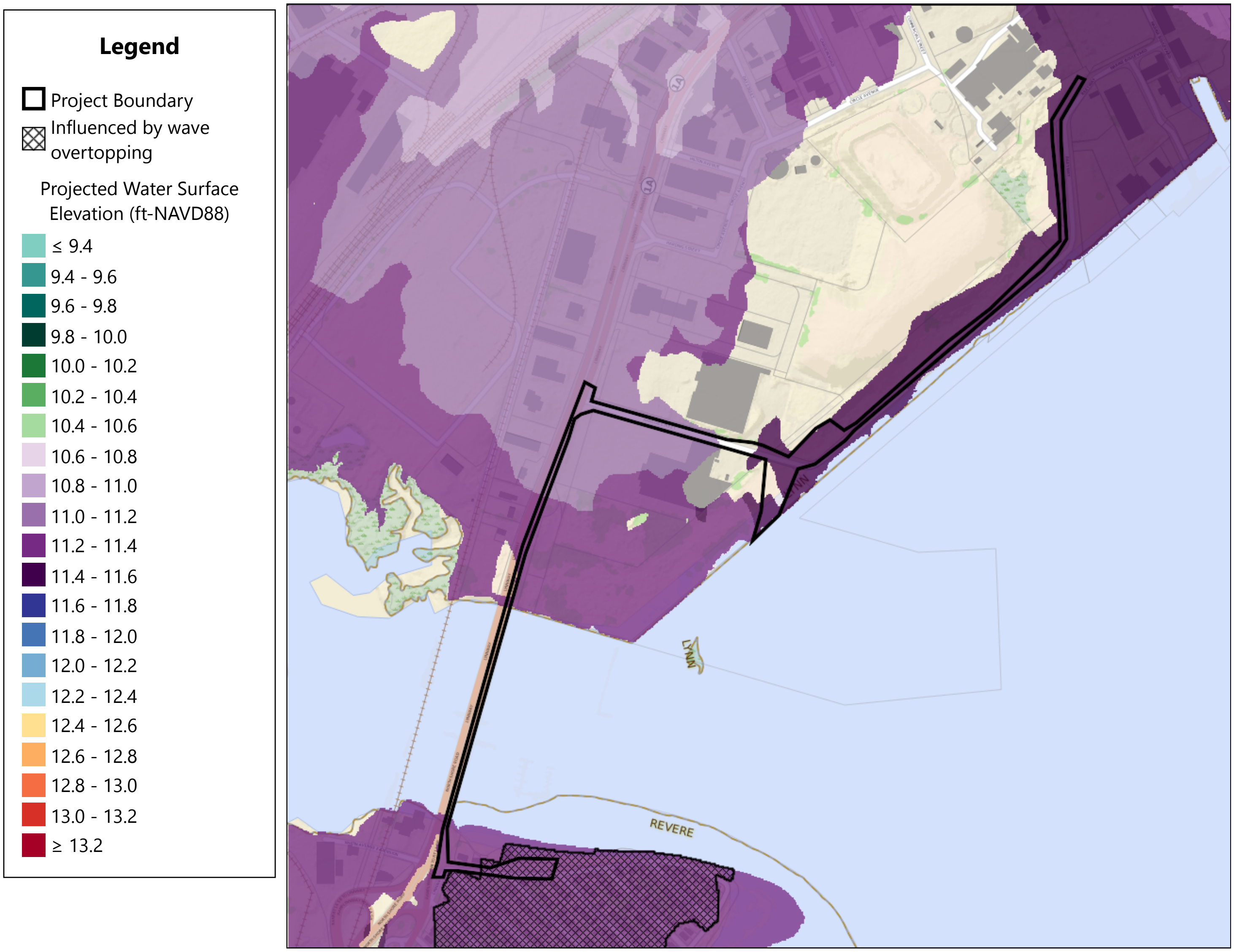
0.05 0.1 0.25 Miles

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

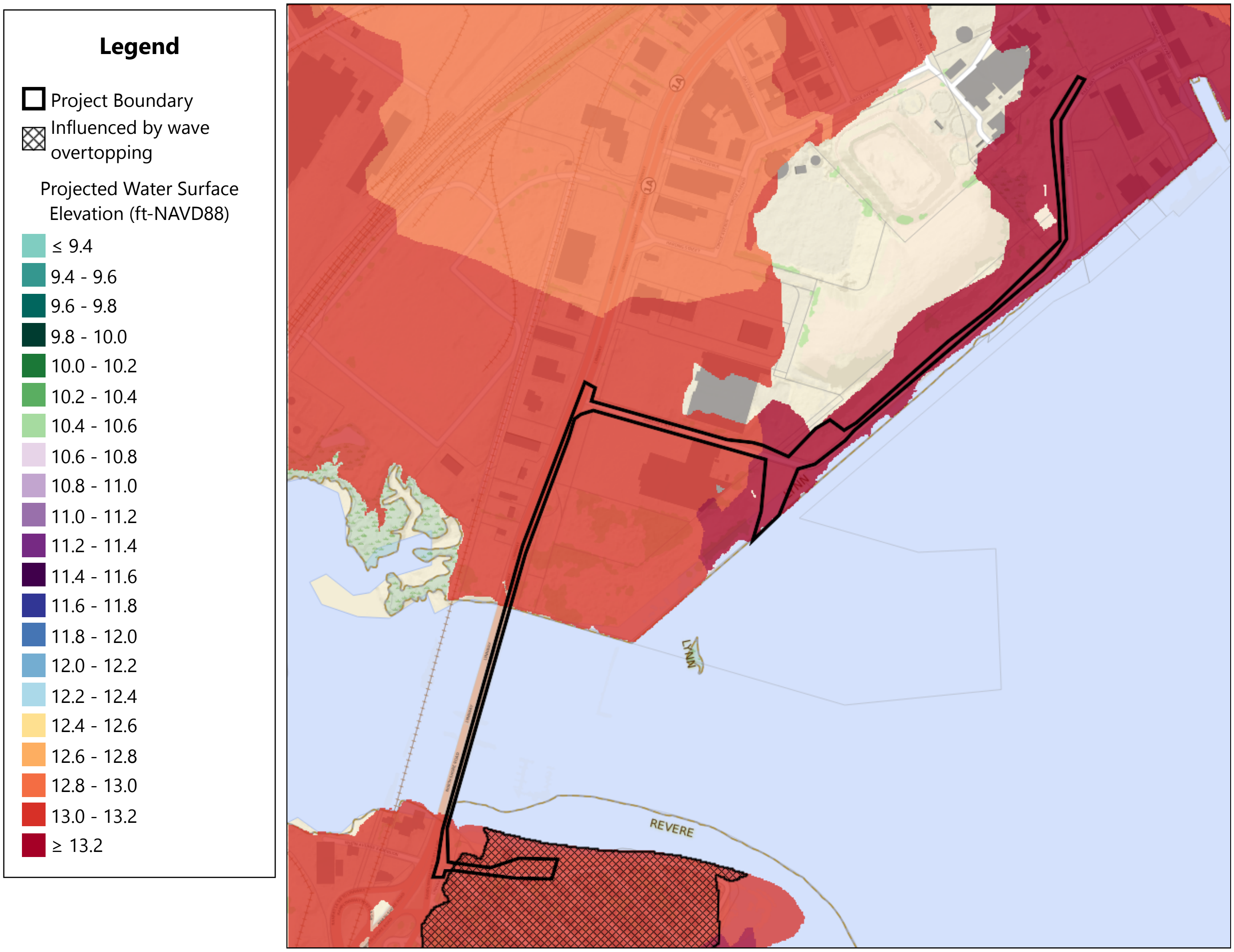
0.05 0.1 0.25 Miles

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

N

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

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 J

MWRA's Environmental Justice Outreach Plan

Environmental Justice Outreach Plan

Contained in the EENF, issued September 15, 2023, the Authority was asked to "describe a public involvement plan that the project intends to follow for EJ populations within the DGA for the remainder of the MEPA review process." Important to note, throughout the planning, design, and construction phases of the MWRA's projects, the Authority continues to enhance public outreach to better engage impacted stakeholders, including those within Environmental Justice communities. This effort incorporates a variety of methods to increase both public awareness and participation during the environmental review and development of a project.

Furthermore, the Climate Roadmap Act requires that, "[i]f a proposed project affects an environmental justice population," the Secretary of EEA shall require additional measures to improve public participation by the EJ population. To be consistent with 301 CMR 11.05(4), the MWRA voluntarily proposes to provide advance notification of the project no later than 45 days, and no earlier than 90 days, prior to filing the SEIR to community-based organizations (CBOs) and tribes based on a recommended list provided by the EEA EJ Director.

Previously, EJ analysis was conducted as part of the internal project development with a focus on EJ block groups that fall partially or fully within a one-mile radius of the impacted site. To foster robust public engagement, the MWRA is committed to several outreach methods during the environmental review process and beyond, which will include (or has been accomplished to date):

- The distribution of notifications throughout the Point of Pines neighborhood, and at community based locations, such as at the Cities of Lynn and Revere's City Hall, local immigration services organizations, and public libraries, to highlight project details and community impacts;
    - Notifications will contain QR codes to enable non-English speakers with the ability to scan and read translated information immediately.
- The creation of a project webpage hosted on the Authority's website where materials and regularly scheduled updates are translated to languages prevalent in EJ communities within the project area;
- The creation of a question and answer fact sheet and posted on the project's webpage;
- The posting of information to the Authority's X (formerly Twitter) social media account;
- The coordination of stakeholder meetings to further engage the neighborhood and community; and,
- The distribution and posting of press releases and advertisements to both local and foreign language media outlets.

Following the environmental review process, the MWRA will continue to utilize public awareness methods to ensure transparency and public awareness throughout the project's construction. This will include the distribution of additional notices to the Point of Pines neighborhood, and community organizations and other key locations, as well as updates on the project's webpage and the Authority's X account, and press releases to local and foreign language media outlets.

Furthermore, the MWRA will also host a virtual public information meeting of the project at a time of day that will ensure the greatest level of participation from the impacted communities offering interpretive services for the following languages: Spanish, Russian, Mon-Khmer, and Urdu, as well as any additional interpreters as requested. The meeting will be advertised within the local newspaper, as well as non-English and/or community-specific media outlets to publicize the project. Presentation materials will also be translated and available on the Authority's website. During and following the public information meeting, the MWRA will collect comments for two weeks regarding the project for further review.

Additionally, the Authority utilizes the subscription service Everbridge, which enables those interested to opt-in to receive project updates via email or text messaging. The Authority is committed to providing regularly scheduled updates through the Everbridge system as work progresses.

Table 1 documents a summary of the MWRA's outreach plan.

Table 1 Outreach Plan/Update

Timing	Outreach Type	Outreach Details
Since Project Initiation		
	MWRA Website	Regular updates and documents posted to a dedicated project webpage hosted on the MWRA's website with translations provided based on languages spoken by at least 5 percent of census tract population in each community.
Prior to SEIR Filing		
Winter 2024	Q&A Fact Sheet	A Q&A Fact Sheet has been posted on the Authority's project webpage. The document will be translated based on languages spoken by at least 5 percent of census tract population.
Winter 2024	Stakeholder Meetings	Stakeholder meetings have been and will continue to be organized to provide both neighborhood awareness and project coordination. These meetings will include the Cities of Lynn and Revere, the Point of Pines Yacht Club, the Point of Pines Neighborhood Association, and state and local officials.
Winter 2024	Everbridge Notification System	A notification request form has been created within the Everbridge system to enable the Authority to begin collecting contact information from those seeking to receive updates as the project progresses.
After the SEIR Filing		
Spring 2024	MWRA Website Update / Social Media	The MWRA will post the Single EIR to the Authority's project webpage. Translations of the document will be provided based on languages spoken by at least 5 percent of census tract population in each community. Additionally, a social media post and an Everbridge update will be sent to those who have signed up for the subscription service regarding the filing of the SEIR.
Spring/Summer 2024	Virtual Public Meeting	The MWRA will coordinate a virtual public meeting of the project. Interpretation services during the meeting based on languages spoken by at least 5 percent of census tract population in each community will be provided. The Authority will take meeting minutes as a record of community feedback. The meeting will also provide point of contact information at MWRA for residents and businesses for any further questions or concerns throughout the course of the project.
Spring/Summer 2024	Advertisement	Translated project and meeting information will be provided based on languages spoken by at least 5 percent of census tract population. In addition, advertise upcoming meeting through **www.MWRA.com**, organizational social media, and via the MWRA's subscription-based notification system.
Spring/Summer 2024	Notifications	Distributed to impacted neighborhood and community locations, including city halls, libraries, and immigration services organizations. Virtual meeting details to be included, as well as QR codes to enable non-English speakers with the ability to scan and read translated information on the notification form.
Spring/Summer 2024	Press Release	A full press release highlighting the project, its impacts, estimated timeline, the upcoming virtual public meeting, and the ongoing environmental review process will be distributed to both local and foreign language media outlets.
Late Fall 2024	Notifications	Distributed to impacted neighborhood and community locations, including city halls, libraries, and immigration services organizations regarding the anticipated start date of the project. QR codes will be on the notification to enable non-English speakers with the ability to scan and read translated information on the form.

Table 1 Outreach Plan/Update

Timing	Outreach Type	Outreach Details
Late Fall 2024	Press Release	A full press release highlighting the project, its impacts, and estimated timeline will be distributed to both local and foreign language media outlets.
Construction Phase		
Winter 2024/2025	Ongoing Updates of Project Status	Project updates will be provided on a regular basis to project communities through www.MWRA.com, organizational social media, via MWRA's subscription-based notification system, and on municipal websites in communities within the EJ Study Area. Translations of project updates will be provided based on languages spoken by at least 5 percent of census tract population in each community.

ATTACHMENT K

Draft Frac-Out Management Plan

Preliminary Horizontal Directional Drilling Contingency Plan and Example Frac-out Management Plan

MWRA Section 56 Pipeline Replacement Project
Revere and Lynn, Massachusetts

Prepared by:

AECOM

March 13, 2024

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Plan Scope

This contingency plan for handling inadvertent releases of drilling mud provides typical environmental protection measures to be considered for the HDD portion of the pipeline project. This plan establishes the general design, monitoring, and mitigation activities typically implemented by the selected HDD Contractor during the HDD installation of the proposed pipeline.

The procedures and requirements discussed herein will be considered for incorporation into a detailed plan that will be prepared by the Contractor and submitted to the MWRA for review prior to the start of construction activities. Submittals shall be the requirements listed in this plan, including the HDD Work Plan (including the Inadvertent Return and Surface Spill Contingency Plan) and the Contingency Plan for Remediation of Potential Problems. In addition to the MWRA requirements, applicable requirements of the regulatory agency having jurisdiction shall be included in the Contractor's detailed plans. This requirement that the Contractor shall develop a detailed contingency plan for handling inadvertent releases and environmental protection measures shall be part of the construction specifications for the project. The specifications will include requirements for monitoring, material handling and disposal, and standby equipment, including standby turbidity barriers. Specification will also include permit requirements, which the Contractor shall follow.

1.2 HDD Project Description

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" and 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**. The 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 Directional 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.

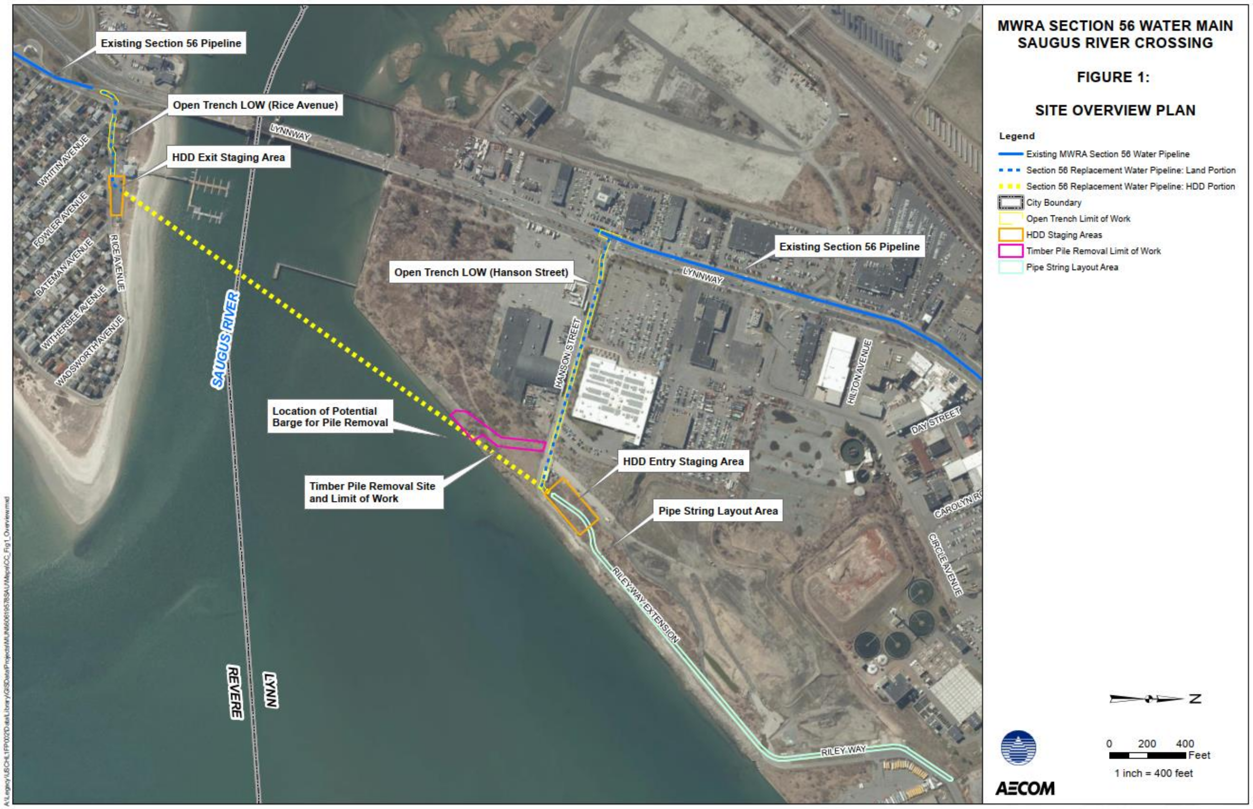


Figure 1. The proposed pipeline route, including two terrestrial portions (Lynn and Revere), and the section beneath the Saugus River. The terrestrial portions of the proposed water main will join with the existing Section 56 pipeline at the ends of Hanson Street and Rice Avenue.

1.3 HDD Process Overview (Land to Land)

The major processes comprising the HDD installation of a pipeline crossing include the installation of a pilot hole, incremental expansion of the pilot borehole by reaming and swabbing (conditioning), and product pipe pullback.

- A small diameter (generally 5-10 inches) pilot hole is drilled along a predetermined alignment, between an entry and exit point which are located specific to site topography and desired depth beneath the obstacle being crossed. Drilling fluid, pumped through the annulus of the drill stem, performs multiple functions. It aids the mud motor or jetting assembly in cutting the soil, lubricates the drill stem, suspends and carries the drilled cuttings to the surface, and forms a wall cake on the interior of the borehole to maintain the integrity of the borehole and reduce fluid loss.
- Beginning at the exit point of the crossing, a reamer is attached to the drill stem and passed through the pilot hole toward the entry point. Several passes of increasing larger diameter reamers are used to enlarge the pilot hole until the desired diameter appropriate for insertion of the pipe is reached. The borehole is then swabbed to clean out the remaining soil cuttings and prepare the borehole for the pipe pullback.
- After the reaming/swabbing processes, a pullhead is attached to the leading end of the pre-fabricated product pipe segment in preparation for the pullback process. The pullhead is connected by way of a swivel head to the drill stem at the entry side of the crossing. Using the drilling rig on the exit side, the pipe is pulled through the borehole to the exit

side. As the air-filled pipe will float in the drilling fluids, a calculated volume of water is added to the pipe sufficient to maintain neutral buoyancy during pullback.

Drilling fluids, also commonly called drilling mud, are typically a mixture of mostly fresh water and bentonite clay used in a circulating system that removes soil cuttings from the borehole while filling the void left by the cuttings. The drilling mud also lubricates and cools the drill string and seals the borehole wall to limit fluid loss and maintain borehole stability. Small proportions of chemical additives (typically less than 1%) may be mixed with the drilling fluids in order to improve drilling performance, or in response to a release. The entire drilling fluid product and additives are not hazardous and not considered to be toxic to the environment.

Figure 2 presents a schematic overview of the HDD process and the drilling mud cycle.

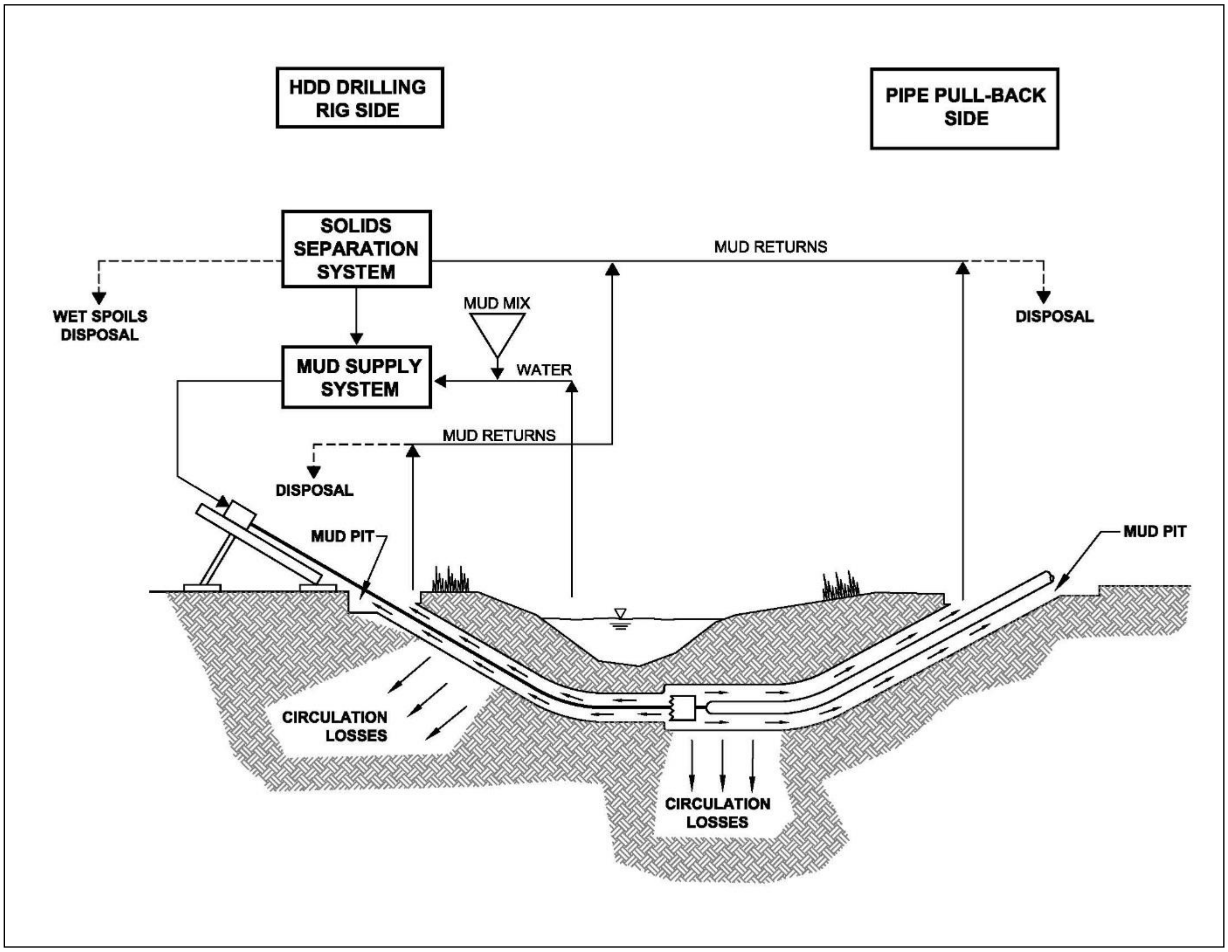


Figure 2. HDD Process Schematic and Drilling Mud Cycle.

The potential for loss of drilling fluids pumped at pressure into the borehole exists during each process described above. The drilling fluids are normally recirculated in the borehole and soil cuttings removed by specialized equipment set up near the drilling rig. For purposes of this plan, an inadvertent release is defined as the unintentional loss of drilling fluids from the HDD borehole to the ground surface or surface waters. Loss of drilling fluids to the subsurface geological formation may result in a reduction in the return of drilling fluid and cuttings but will not be considered a release.

2. PREVENTION, DISPOSAL, MONITORING, AND RESPONSE TO INADVERTENT RELEASES

This plan identifies a systematic approach to the prevention, monitoring, control, and clean-up of inadvertent releases of drilling mud at HDD crossings to be used by the HDD Contractor. The project bidding documents will stipulate that site-specific plans and all required permits be on-site and available for Contractor personnel and for project oversight.

2.1 Prevention Measures

The first step in limiting the potential environmental impacts of HDD drilling mud releases is to prevent them from occurring in the first place. This can be accomplished through the conservative design of the HDD profile, including the following key measures:

- Geotechnical Investigations - The soil strata targeted for the majority of the length of each borehole will be selected based on physical properties most conducive to producing a successful boring. These strata and their properties will be identified in pre-construction geotechnical investigations conducted along the length of the proposed HDD installation.
- Minimum Depth of Cover – If not specifically identified on the project plans, the proposed depth of cover over the HDD pipe as it crosses beneath the river will be maintained at a minimum of 20 feet at the riverbanks, and a minimum of 32 feet under any navigational channels. As the possibility of an inadvertent release may increase as the depth of soil cover decreases, the initial and terminal sections of the HDD will be located in either upland areas or at appropriate distances from the water body being crossed. Required cover depth will also be evaluated in light of the geotechnical data noted above.

Prior to the commencement of site drilling activities, the following preventive measures may be employed:

- Install erosion and sedimentation control measures between the drill site and nearby sensitive resources to prevent drilling mud releases from reaching the resource.
- Conduct regular, on-site briefings for personnel to identify and locate sensitive resources at the site.
- Maintain necessary response equipment either on-site or at a readily accessible location and in good working order.
- Clearing and grubbing HDD staging area and entry site.

The HDD Contractor will employ reasonable measures during drilling activities to prevent or minimize the occurrence of inadvertent releases, including at a minimum:

- Full-time, Qualified On-site Mud Engineer - The Mud Engineer will continuously monitor the drilling fluid circulation and returns and ensure that the fluids handling equipment is operating within expected parameters for the soil conditions observed. The Mud Engineer will continuously monitor returned cuttings for soils type and will modify the drilling fluid properties with the appropriate additives, as necessary, to account for changes in soil conditions.
- Controlled Drill Head Advance - Where possible, at the beginning of a drill, the drill head will be initially advanced with minimum drilling fluid pressure to minimize inadvertent release in the relatively shallow depths. The operator will advance the drill head at a pace that permits soil cuttings sufficient time to be flushed from the borehole by the drilling

fluids. If plugging occurs, the rate of advance will be reduced, stopped, or reversed as appropriate until the plug has been cleared.

- Minimum Pump Pressure - Drilling fluid pump pressure will be maintained at no more than the minimum necessary to maintain good circulation and to keep the borehole clear of cuttings.
- The use of a temporary steel conductor casing, which will be installed at the entry and exit sides of the drill. This will help to reduce the risks of inadvertent returns at these locations.

2.2 Disposal Measures

The HDD Contractor will ensure that sediment drilled to accommodate the pipeline will be disposed of correctly:

- Onsite Separation - Dredged sediment will typically be separated onsite by a series of sieves and cyclones into soil and sand. These materials will then be trucked offsite for disposal at an appropriate disposal site.
- Material Use – 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 the distance from surface impacts.

2.3 Monitoring Measures

The HDD Contractor will ensure that operations are monitored for the occurrence of inadvertent releases, typically using the following methods, where appropriate:

- Ground Surface Inspection - The HDD Contractor shall assign one person to visually inspect the ground surface in uplands and lowlands along the progress of the HDD for indications of escaping drilling fluids. Where possible, without trespassing outside the approved workspace, the inspection will cover a corridor at least three hundred feet wide, centered on the drill. Inspections shall be made relative to the rate of advance of the drill head, but an inspection pass shall be made at least once every hour while pumping drilling fluids. Any indications of a release shall be reported immediately to the HDD Operator and project oversight.
- Surface Water Inspection - The HDD Contractor shall assign an individual to visually inspect the water bodies under which the HDD is crossing for turbidity plumes that might indicate an inadvertent release is occurring. Inspection passes shall be made at least once every hour while pumping. Any indication of an inadvertent release shall be reported immediately to the HDD Operator. If operating parameters indicate the possibility of an inadvertent release underwater, the water inspection will become continuous (daylight only) until the location of the suspected release is found, the drill is completed, or measures to remedy the release using additives or other operations adjustments have been successful. Inspections will be made by boat or from an elevated position on land with an unobstructed view of the water body.
- Notifications - Upon first indication of an inadvertent release, the Contractor shall notify the MWRA’s oversight lead. Upon confirmation of a release, the MWRA’s oversight lead will then notify the appropriate federal and state/local regulatory agencies and the affected landowners.

2.4 Response Measures to Potential Releases

Containment and removal of drilling fluid releases to the surface from an inadvertent release of drilling fluids will be performed where practical and where there will be a net benefit in the reduction of total environmental impacts. All actions for response will be coordinated through the appropriate MWRA representative. Additional reporting requirements from regulatory bodies that include but are not limited to the Lynn and Revere Conservation Commissions shall also be followed.

2.4.1 Land-side (Terrestrial) Releases

After the initial pilot hole is drilled, drilling mud and HDD cuttings will surface from both sides of the HDD path. On both sides of the river, the HDD drill rig is a closed system wherein drill cuttings are first contained within the respective entry/exit pit. The pits hold these materials (a mix of the drilling mud and cuttings) until they are pumped into containers or container vehicles. Due to the limited staging area in Revere, materials from the exit side of the river will be containerized and will either be directly transported offsite for disposal or transported to the Lynn staging area for processing. The Lynn staging area is at least six feet upslope and over fifty feet inland of the Mean High Water elevation. Upon arrival in Lynn, the material will be conveyed into a hopper system where HDD cuttings are separated from the drilling mud. The drilling mud is typically recycled into the mixing plant. The soil cuttings are separated from the drilling mud by a processing plant with a series of sieves and cyclones, and the resulting sand and gravel are placed into large watertight steel containers. These containers are continuously removed, transported offsite, and replaced to ensure ample closed storage of these materials. At no point after being pumped out of the entry/exit pits will dredged material be stored outside of a container.

The largest volume of material to surface from the HDD drill path at once will occur during the pullback phase, wherein the assembled pipe string is pulled from Lynn to Revere. The approximately 2,800-foot pipeline will displace approximately 500 cubic yards of drilling mud in one pass over the duration of a day. The Contractor shall ensure enough containers on-site in Revere are available to contain this drilling mud and transport it to a nearby landfill to be used as day cover and to prevent any land-side releases.

The project limits of work will be lined with sedimentation and erosion control measures such as siltation fence and compost filter tubes or equivalent per standards defined in the local Order of Conditions. Contract Drawings indicate the minimum of such manners that shall be installed around the project site. The HDD Contractor will utilize, as necessary, the appropriate combination of erosion and sedimentation control measures that will most effectively contain and remove drilling fluids from upland areas in the event of a release. If a terrestrial release were to occur, the Contractor’s superintendent shall make the determination of the equipment and materials to be used, with the approval of the MWRA. The Contractor shall instruct the recovery crew to pump the contained and recovered fluids to on-site holding tanks for reuse if the Contractor’s mud engineer determines the fluids are reusable. Otherwise, the fluids will be transported off-site for disposal at an approved facility.

2.4.2 Surface Water Releases

Containment and removal of drilling fluids released to surface waters is generally impractical because of dilution in the water column and dispersion due to tides and currents. However, if the MWRA’s oversight lead considers the resulting plume excessive, or if the plume may directly and negatively impact aquatic resources or adjacent wetlands, the following containment measures may be considered, in consultation with the MWRA:

- Depending upon the depth of water and surface conditions, floating silt booms, anchored in place, may be placed over and around the location of the release. The purpose of the containment is to confine the suspended solids until some observable degree of settlement can occur. Removal of the diluted drilling fluids is not anticipated, unless dictated by unusual circumstances, and subject to MWRA approval. The containment shall remain in place until the release stops, and settlement renders the turbidity inside the containment similar to the adjacent waters based on visual inspection, or the threat to the sensitive resource has passed.
- Any containment structure placed in open water shall be clearly marked as an obstruction in accordance with federal and state agency regulations, with special consideration given to the type of marine traffic observed in the area.

2.4.3 Wetlands Releases

No freshwater bordering vegetated wetlands have been identified in the limits of work based on a review of existing data and an on-site delineation. However, there is a small area of mapped salt marsh in Lynn near the HDD alignment.

Containment and removal of released drilling fluids to wetlands shall be performed after consultation with the MWRA and generally when there is a net benefit in the reduction of impacts, as determined by the following actions:

- Prior to commencement of any HDD, the Contractor will ensure that appropriate containment equipment, such as storage tanks and vehicles, are available at each side of the crossing location to contain and recover drilling fluid flow from the inadvertent release into wetlands.
- Upon confirmation of an inadvertent release in wetlands, the HDD Contractor shall measure the area directly affected by the released drilling fluids with MWRA oversight. The area affected may be estimated from a distance if access to the affected area for measurement would result in additional unacceptable negative impacts.
- The MWRA oversight lead and/or a qualified wetlands biologist will characterize the type of impact (e.g., temporary, permanent, vegetation only, change in surface hydrology) caused by the released fluids. The MWRA lead will seek concurrence from the regulatory agency representative, as required.
- The HDD Contractor shall estimate the additional area, if any, likely to be affected if the drilling were to proceed and the drilling fluids were not contained and removed and shall coordinate with the MWRA.
- In consultation with the MWRA, the HDD Contractor will estimate and characterize the additional impacts to wetland likely to occur as a result of accessing the affected area for containment and removal of the drilling fluids.
- In consultation with the MWRA, the HDD Contractor will estimate any reduction in impacts that might be achieved if the released fluids were removed.
- The total actual impacts, plus the estimated impacts from the continuation of an uncontained release, shall be compared to the total actual impacts, plus the estimated impacts from accessing the area for containment and removal, less the estimated reduction in impacts as a result of recovery of the fluids. When making this comparison, consideration and judgment will be given to the types of impacts, and value of the resources affected if dissimilar. The action resulting in the least total impacts will generally be selected, unless there are mitigating circumstances or as otherwise instructed by the regulatory agency having jurisdiction.
- If the decision is made to forgo containment and proceed with the drill, the HDD Contractor, in consultation with the MWRA, will continue to observe the location of the

release. If impacts continue to increase, the Contractor will periodically repeat the comparison described above until such time as containment and removal are justified or the drill is complete.

- In the event of excessive and uncontrolled releases of drilling fluids, the HDD Contractor, in consultation with the MWRA, shall determine a course of action. The Contractor will attempt to stop the inadvertent release by adjustments in mud mixture or drilling techniques, and/or the released fluids shall be contained and recovered from the wetland. NOTE: No containment or recovery activities will be attempted in the wetland without prior regulatory agency approval. If these measures are not successful, the borehole will be abandoned.
- If it is determined that the released drilling fluid is to be contained and recovered, the Contractor, in consultation with the MWRA, shall direct the placement of the equipment at the applicable points of fluids release and transfer the contained fluids to a hopper barge or holding tank for subsequent reuse or disposal.
- All access to the wetlands will be done in such a manner as to cause the least impacts to the vegetation and surface hydrology, and only with prior agency approval. Because of site-specific variables such as distance from open water, surface hydrologic conditions, and vegetation cover, the selection of the most appropriate access method will be made on a case-by-case basis, subject to approval by the MWRA. The least number of personnel and equipment necessary to accomplish the task safely and in a timely manner shall be deployed.
- Following containment and removal, the Contractor will continue to monitor the crossing location for additional releases as the drilling work progresses.
- All impacts to wetlands from the inadvertent release will be measured, assessed, and recorded by the Contractor, with oversight from the MWRA, to support any mitigation or restoration measures that may be necessary.
- Upon completion of the boring, the Contractor will remove all containment and recovery equipment, tools, supplies, materials, wastes, and debris from the wetlands and adjacent buffer zones.

3. RESTORATION AND POST-CONSTRUCTION MONITORING

In the event of a drilling fluid release, a site-specific, post-remediation protocol will be submitted to the appropriate regulatory agency and will be prepared and implemented under the direction of the MWRA. This protocol will be based on the specific parameters of the release, including volume, location, and extent. The goal of the plan will be to determine what adverse effects may have occurred in the impacted area of release. Efforts will include random sampling of each habitat and comparison of impacted habitats to non-impacted habitats. Baseline data that has been obtained prior to drilling construction activities will be used for comparative purposes.

At a minimum, an inspection of the drill path will occur within 48 hours of completion of drilling activities. A letter report will be prepared to summarize any fluid deposits that are identified.

4. TYPICAL FAILURE CONDITIONS AND RESPONSE MEASURES

Typical conditions of failure associated with HDD installations, including inadvertent releases of drilling fluids and other materials used in the HDD process (fuel, lubrication oils, etc.) and their associated mitigation procedures are summarized below for easy reference.

<u>Condition 1 – Normal Directional Drilling Conditions</u>

- On-site Environmental Inspection

- Design factors to reduce drilling fluid loss potential
- On-site monitoring of fluid pressure during operation
- Maintain bentonite recovery equipment on-site

Condition 2 – Loss of Fluid Circulation

- Loss of drilling fluid circulation during drilling
- Shut down operation and addition of materials (bentonite clay) to stem fluid loss
- Observe land and water areas visually
- Stop drilling if leak detected and make appropriate adjustments
- Restart drilling if fluid circulation is regained and no release is detected

Condition 3 – Drilling Fluid Release within Terrestrial Areas

- Confirm drilling fluid release
- Shut down operation and addition of materials (bentonite clay) to stem fluid loss
- Contain fluid release
- Notify appropriate regulatory agencies and the MWRA's Resident Inspector
- Monitor to define release area
- Determine appropriate method of restoration or disposal
- Consultation between Contractor and the MWRA to determine when operation can proceed.

Condition 4 – Drilling Fluid Release within Water Bodies

- Confirm drilling fluid release
- Shut down operation and addition of materials (bentonite clay) to stem fluid loss
- Contain fluid release
- Notify appropriate regulatory agencies and the MWRA's Resident Inspector
- Monitor to define release area
- Determine appropriate method of restoration or disposal
- Consultation between Contractor and the MWRA to determine when operation can proceed.

Condition 5 – HDD Failure

- Pilot hole cannot be drilled
- Check equipment and hole for obstruction
- Try to excavate object if feasible (i.e., object within the right-of-way) or direct drill around object
- If hole cannot be completed, fill pilot with controlled density fluid and seal. Length and volume of the seal will be determined on-site, and will depend primarily on soil conditions, angle of the drill hole and land use.

Condition 1: Normal Directional Drilling Conditions

Operations

The most effective way to minimize drilling fluid loss is to maintain fluid circulation during the drill to the maximum extent practical. The HDD, once started, will continue 24 hours per day, 7 days per week of construction, if needed, unless equipment failure prevents the operation from doing so. To reduce the risk of inadvertent loss of drilling fluid during circulation, one or more of the following measures can be taken:

- Keep fluid pressure at a minimum in the borehole annulus to reduce pressure on the formation.

- Keep the borehole clean of drilled cuttings as much as possible to reduce borehole pressure from bridging.
- Move the drill pipe up and down the borehole in a smooth manner to reduce pressure surges.
- Keep the amount of drilling fluid to a minimum to reduce friction drag and pressure.
- Use the surface fluid cleaning system at maximum capacity to remove drilled solids from the system, thereby reducing the fluid weight, which, in turn, reduces pressure while pumping.

An inert, water and bentonite-based drilling fluid is typically used. In addition to bentonite, polymers may also be used. The HDD Contractor shall ensure that construction and inspection staff are made aware of the environmental scope of work, general environmental concerns, contingency plans, and regulations applicable to their construction area prior to the commencement of work. All reasonable preventative measures to avoid the release of wastes or hazardous materials or deleterious substances into the environment will be taken. The HDD Contractor will ensure that drilling fluid composition is limited to bentonite, water, polymer, and, if warranted, other inert additives. The Contractor will also ensure that all onshore fluid returns are contained within an impermeable lined sump or tank. Furthermore, the Contractor will implement and monitor additional safeguards (e.g., increase fluid density) if warranted.

Monitoring
The MWRA's Resident Inspector will be onsite to monitor the HDD operations to ensure that mitigation measures and contingency plans will be implemented accordingly. The lead will also monitor and record, with the cooperation of the HDD Contractor, the amount of fluid return to the fluid tank and the amount of drilling fluid required in the mixing tanks during drilling. Additionally, the lead will monitor the vicinity of the drill location for signs of excessive drilling fluid release. The size of the area to be monitored will be determined by the MWRA's Resident Engineer and the HDD Contractor by evaluating the geo-technical, drilling and water conditions. Monitoring will be on a continuous basis during HDD operations, and the lead will estimate and record the volume of fluid released during various stages of the HDD.

If a drilling fluid release is detected and confirmed during monitoring, Condition 3 or 4 will be implemented.

<u>Condition 2: Loss of Fluid Circulation</u>

Operations
Loss of fluid circulation generally indicates blockage of the return path, release of drilling fluid into a void space around the borehole, or a surface breakout. The following is a protocol that is typically followed should a loss of fluid circulation be detected.

- Drilling Supervisor shall notify the MWRA's Resident Inspector of the loss of fluid circulation.
- Retract drill head a short distance if deemed appropriate.
- Discontinue drilling operations to investigate the loss of fluid circulation.
- Pump drilling fluid into the borehole for approximately 15 minutes without advancement of the bore head.
- If fluid circulation is regained, restart drilling operations. The Drilling Supervisor will notify the MWRA's Resident Inspector, and Condition 2 operations will continue. If, after inspection, releases to the surface are not identified, the drilling and monitoring will return to a Condition 1.

Monitoring

- Continue visual monitoring of project area for any signs of drilling fluid release.
- If a drilling fluid release is detected, discontinue drilling and implement Condition 3 or 4.
- If no drilling fluid release is detected, reactivate drilling and monitoring under Condition 1 or 2 as applicable.

Condition 3: Land-side (Terrestrial) Spill

Operations

Releases in upland areas and riverbanks will remain in the upland areas unless they pose an imminent harm to property or the environment in the area of the release or the MWRA's Resident Engineer determines other measures should be taken. If a release in a terrestrial area occurs, the following measures shall be taken:

- Drilling fluid and other material spills will be immediately reported to the MWRA and, in accordance with regulations, to the appropriate regulatory authorities.
- A hay bale, straw wattle, and/or silt fence structure will be used to contain the material until sufficiently stabilized or until the material is removed from the site to an approved landfill, as necessary.

Monitoring

- The MWRA's Resident Engineer will immediately contact the offices of federal and/or state regulatory agency having jurisdiction.
- The MWRA's Resident Inspector will monitor the release area and attempt to determine the release boundaries.
- The origin of the release will be determined.
- Heavily contaminated soil and vegetation will be disposed of at an approved facility. Records or manifests of the disposal shall be furnished to the office of federal and/or state regulatory agency having jurisdiction upon completion of the work, or as otherwise required by regulations.
- Lightly contaminated soil areas will be fertilized and then cultivated to a depth below the depth of contamination, then repeated as required and seeded.
- Wherever reasonable to do so, wastes will be recycled, and to the extent feasible, hazardous products and waste materials will be disposed of or moved to a secure staging area on a daily basis.
- Construction will only resume in consultation with the MWRA.

Condition 4: Water Body Spill

Operations

If a release to a water body occurs, the following measures shall be taken:

- Drilling fluid and other material spills will be immediately reported to the MWRA's Resident Inspector, with subsequent notifications to the appropriate regulatory authorities.
- Containment and removal of any released drilling fluids shall be performed only after consultation with the MWRA and generally when there is a net benefit in the reduction of impacts.
- The MWRA will determine the appropriate methods to remove spills and restore impacted resources.

Monitoring

- The MWRA's Resident Engineer will immediately contact the offices of federal and/or state regulatory agency having jurisdiction.
- The MWRA's Resident Inspector will monitor the release area and attempt to determine the release boundaries.
- The origin of the release will be determined.
- Heavily contaminated soil and vegetation will be disposed of at an approved facility. Records or manifests of the disposal shall be furnished to the office of federal and/or state regulatory agency having jurisdiction upon completion of the work, or as otherwise required by regulations.
- Lightly contaminated soil areas will be fertilized and then cultivated to a depth below the depth of contamination, then repeated as required and seeded.
- Wherever reasonable to do so, wastes will be recycled, and to the extent feasible, hazardous products and waste materials will be disposed of or moved to a secure staging area on a daily basis.
- Construction will only resume in consultation with the MWRA.

<u>Condition 5: HDD Failure</u>

Operations
In the event that a pilot hole cannot be drilled, the following measures shall be taken:

- Check the equipment to verify its integrity and to determine where the problem is occurring.
- If the obstruction is on the portion of the drill outside the right-of-way, excavate and remove the obstruction, if possible.
- If the obstruction cannot be excavated or removed, direct the drill bit around the obstruction, if technically feasible. This is accomplished by backing the drill string to a point where the drill bit can be directed around the obstruction using essentially the original pilot hole.
- In the event that the hole must be abandoned and the pilot hole drilled from a different location, the abandoned hole will be filled with drilling fluid. Drilling fluid in the pit will be pumped into a holding tank for reuse or disposal, and the pit will be backfilled.
- In the event that the pull string cannot be pulled through, as much pipe as possible will be salvaged and the directional drill will be attempted from a new location. The abandoned hole shall be sealed with bentonite or controlled density fluid.
- If it is determined that the initial HDD is unsuccessful, the abandoned hole will be sealed, and either a new pilot hole will be drilled in the same general location, or the HDD Contractor may determine that an alternative to the HDD would be more appropriate.
- If an alternative method for crossing the obstacle is required, the HDD Contractor will notify the MWRA and the landowner immediately and obtain all necessary permits and approvals prior to constructing the alternative crossing.

5. ENVIRONMENTAL SERVICES CONTACT INFORMATION

Prior to the start of construction activities, the MWRA and the selected Contractor will designate the names and contact information of the Environmental Services personnel assigned to the project.

6. AGENCY NOTIFICATIONS

The MWRA's Resident Engineer will conduct the necessary calls to the regulatory agencies having jurisdiction. However, if none of these agencies can be reached, the following additional agencies will be contacted in the event of an inadvertent release, as required:

- Massachusetts Department of Environmental Protection
- The National Response Center (NRC)
- United States Fish and Wildlife (USFWS via NRC)
- Others as may be stipulated in the project permits.

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.

<u>Special consideration if HDD Route 3 is selected</u>

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.

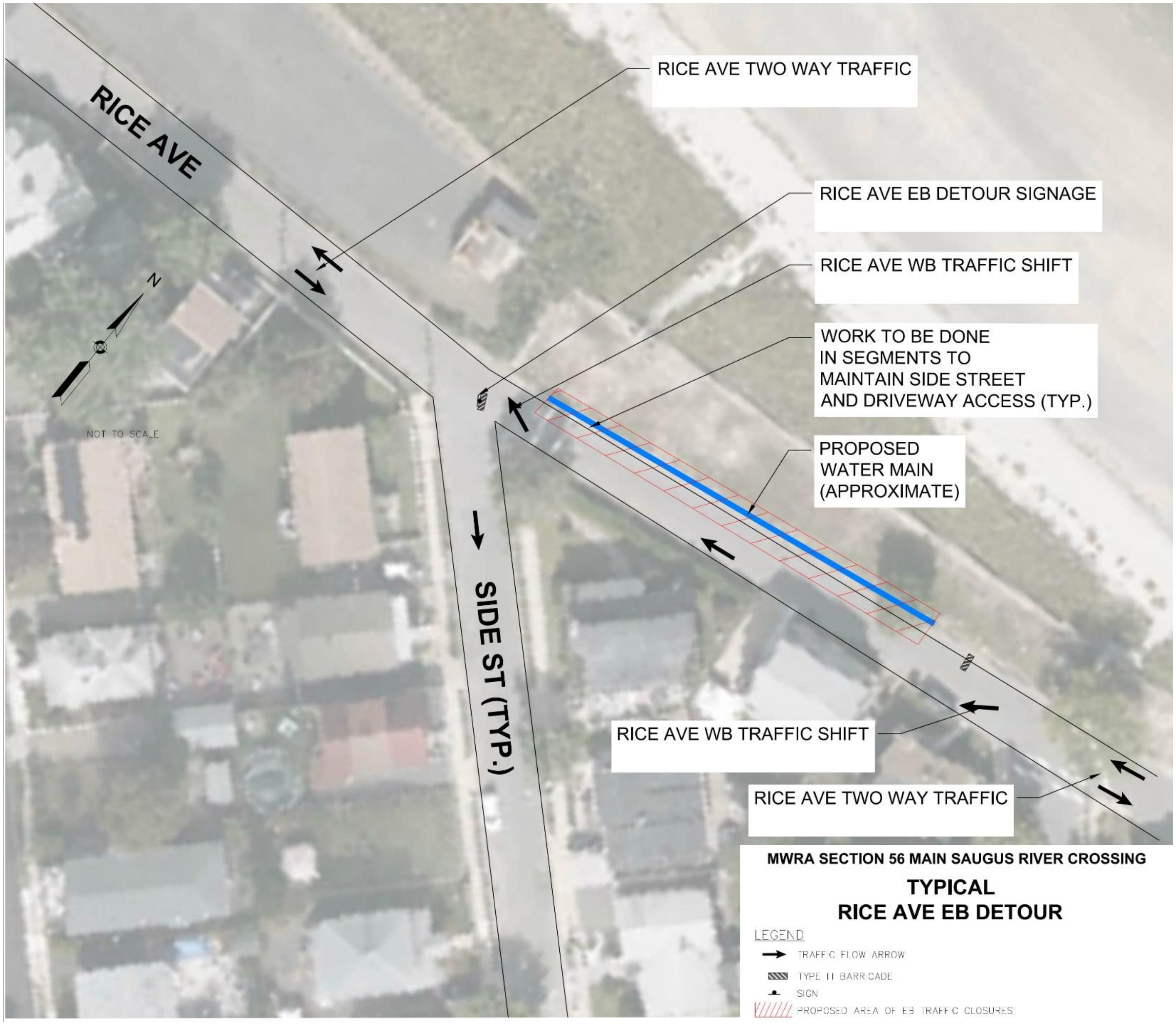


Figure 2 - Typical Rice Ave EB Detour

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

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
Elizabeth	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 Square, Lynn, MA, 01901
Lynn Planning Board/Dept	jchiappini@lynnma.gov[1]	Lynn Planning Board, 3 City Hall Square, Lynn, MA, 01901
Lynn Conservation Commission	jcerulli@lynnma.gov[1]	Lynn Conservation Commission, 3 City Hall Square, Lynn, MA, 01901
Lynn BOH/Health Dept	mdesmarais@lynnma.gov[1]	Lynn Public Health Department, 3 City Hall Square, Lynn, MA 01901
Revere City Council	**No email is available; a physical copy will be mailed.**	Revere City Council, 281 Broadway, Revere, MA, 02151
Revere Planning Board/Dept	**No email is available; a physical copy will be mailed.**	Revere Planning Board, 281 Broadway, Revere, MA, 02151
Revere Conservation Commission	concom@revere.org, jshue@revere.org[1]	249R Broadway, Conservation Commission, Revere, MA 02151
Revere BOH/Health Dept	**No email is available; a physical copy will be mailed.**	Revere Public Health Division, 25 Winthrop Ave, 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 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

ATTACHMENT O

MEPA Certificate and

Responses to EENF Comments

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Maura T. Healey
GOVERNOR

Kimberly Driscoll
LIEUTENANT GOVERNOR

Rebecca L. Tepper
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1081
http://www.mass.gov/eea

September 15, 2023

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
EXPANDED ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: MWRA Section 56 Water Pipeline Replacement Project
PROJECT MUNICIPALITY	: Lynn and Revere
PROJECT WATERSHED	: North Coastal
EEA NUMBER	: 16749
PROJECT PROPONENT	: Massachusetts Water Resources Authority (MWRA)
DATE NOTICED IN MONITOR	: August 9, 2023

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G.L. c. 30, ss. 61-62L) and Section 11.06 of the MEPA Regulations (301 CMR 11.00), I have reviewed the Expanded Environmental Notification Form (EENF) and hereby determine that this project **requires** the submission of an Environmental Impact Report (EIR). In accordance with Section 11.06(8) of the MEPA regulations, the Proponent requested that I allow a Single EIR to be submitted in lieu of the usual two-stage Draft and Final EIR process. I hereby grant the request to file a Single EIR, which the Proponent should submit in accordance with the Scope included in this Certificate.

Project Description

As described in the EENF, the MWRA proposes to replace a portion of the "Section 56" drinking water pipe in Lynn and Revere. This section of water pipeline 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. Prior to removal, it provided redundancy for the MWRA Northern High Service Zone. This pipeline provides redundancy to portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus and Swampscott. This portion of the Section 56 water main has since been inoperable, leaving the Northern High Service Zone without redundancy and thus vulnerable to disruptions in water supply if the pipe providing the primary water supply to these areas were to fail. 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 the MWRA Northern High Service Zone.

The project will install approximately 4,800 feet of water pipeline, using both open-cut method for work on land (2,000 feet of water pipeline) and a trenchless underwater pipeline construction method (horizontal directional drilling (HDD) to cross the Saugus River (2,800 feet of water pipeline)). HDD is a trenchless method of installing underground utilities particularly suited for installing pipeline beneath obstructions and minimizing surface impacts. The project also proposes removal of 12 timber piles from a deteriorating sea wall along the Lynn shoreline to allow for the preferred pipeline alignment. 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.

<u>Project Site</u>

As described in the EENF, Section 56 is a water pipeline that delivers drinking water to Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus, and Swampscott. This section of 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. 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.

The section of the pipeline that will be replaced 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 area. 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.

Resource areas impacted associated with the project include coastal dune and barrier beach, coastal bank, riverfront area (RFA), and Land Subject to Coastal Storm Flowage (LSCSF) associated with FEMA AE Zone elevation 14 NAVD88 in Lynn and AE Zone elevations 10 and 11 NAVD88 in Revere.

The project site is located within two Environmental Justice (EJ) populations characterized by Minority; and Income and within one mile of 31 EJ populations characterized by Minority; Income; Minority and Income; Minority and English Isolation; and Minority, Income and English Isolation. The site is located within five miles of EJ populations designated as Minority; Income; Minority and Income; Minority and English Isolation; and Minority, Income and English Isolation. As described below, the EENF identified the "Designated Geographic Area" (DGA) for the project as 1 mile around EJ populations, included a review of potential impacts and benefits to the EJ populations within this DGA, and described public involvement efforts undertaken to date.

Environmental Impacts and Mitigation

According to the EENF, potential environmental impacts associated with the project include temporary alteration of 5,800 sf of Coastal Beach; 18,050 sf of Coastal Dune; 940 sf of Coastal Bank; 143,650 sf of LSCSF; and 15,100 sf of RFA. The project will result in temporary impacts to 4,000 square feet of NHESP Priority Habitat of Rare Species (Piping Plover, Charadrius melodus). The only permanent wetland impacts are associated with installation of six manholes in LSCSF (75 feet), and filling voids left from timber pile removal in Coastal Beach. The project will dredge 1,000 cy of sediment.

The project will minimize and mitigate environmental impacts by restoring impacted wetland resource areas upon completion of work. Erosion and sedimentation controls will be employed, including installing coir wattles downslope limits of grading, to minimize the potential for offsite sedimentation and erosion. A turbidity curtain will be installed around the perimeter of the pile removal work. A frac-out[1] plan will be prepared and submitted to the local Conservation Commissions before construction activities commence. To mitigate traffic impacts during construction, a Traffic Management Plan (TMP) will be developed. The proposed project has no impact on water supply volume or drinking water quality as replacement of this portion of the Section 56 water main is intended to provide redundancy for existing MWRA water supply and treatment facilities.

Jurisdiction and Permitting

This project is subject to MEPA review because it requires Agency Action and exceeds MEPA review thresholds at 301 CMR 11.03(3)(b)(1)(e), *New fill or structure or Expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway* and 301 CMR 11.03(3)(b)(1)(a), *alteration of coastal dune, barrier beach or coastal bank*. The project is located within a DGA around an EJ Population, and therefore an EIR is required pursuant to 301 CMR 11.06(7)(b). The project requires a Construction and Access Permit from the Department of Conservation and Recreation (DCR); an 8(m) permit from MWRA; and a Section 401 Water Quality Certification, Distribution System Modification Permit, and Chapter 91 License from Massachusetts

[1] "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.

Department of Environmental Protection (MassDEP). The project also requires a Massachusetts Board of Underwater Archaeological Resources (BUAR) Special Use Permit.

The project will require Orders of Conditions (OOCs) from the Lynn and Revere Conservation Commissions (or in the case of an appeal, a Superseding Order of Conditions (SOC) from MassDEP). The project requires a Pre-Construction Notification (PCN) to the U.S. Army Corps of Engineers (USACOE) under Section 404 and 408 of the Clean Water Act (CWA) and Federal Consistency Review by the Office of Coastal Zone Management (CZM).

Because the project is being undertaken by the Massachusetts Water Resource Authority (MWRA), an Agency as defined in MEPA regulations, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment.

<u>Request for Single EIR</u>

The MEPA regulations at 301 CMR 11.06(8) indicate that a Single EIR may be allowed provided I find that the EENF:

a) describes and analyzes all aspects of the project and all feasible alternatives, regardless of any jurisdictional or other limitation that may apply to the Scope;
b) provides a detailed baseline in relation to which potential environmental impacts and mitigation measures can be assessed; and,
c) demonstrates that the planning and design of the project use all feasible means to avoid potential environmental impacts.

For any Project for which an EIR is required in accordance with 301 CMR 11.06(7)(b), I must also find that the EENF:

d) describes and analyzes all aspects of the Project that may affect Environmental Justice Populations located in whole or in part within the Designated Geographic Area around the Project; describes measures taken to provide meaningful opportunities for public involvement by Environmental Justice Populations prior to filing the expanded ENF, including any changes made to the Project to address concerns raised by or on behalf of Environmental Justice Populations; and provides a detailed baseline in relation to any existing unfair or inequitable Environmental Burden and related public health consequences impacting Environmental Justice Populations in accordance with 301 CMR 11.07(6)(n)1.

Consistent with this request, the EENF was subject to an extended comment period under 301 CMR 11.05(8).

<u>Review of the EENF</u>

The EENF included a project description, an alternatives analysis, existing and proposed conditions plans, and estimates of project-related impacts. It identifies measures to avoid, minimize and mitigate environmental and public health impacts. It also included a description of measures taken to enhance public involvement by EJ populations and a baseline assessment of any existing unfair or inequitable Environmental Burden and related public health consequences impacting EJ Populations in accordance with 301 CMR 11.07(6)(n)1. Consistent with the MEPA Interim Protocol on Climate

Change Adaptation and Resiliency, the ENF contained an output report from the Climate Resilience Design Standards Tool prepared by the Resilient Massachusetts Action Team (RMAT) (the "MA Resilience Design Standards Tool").[2] Comments from the Office of Coastal Zone Management (CZM) and the Division of Marine Fisheries (DMF) on the EENF request a draft frac-out management plan and plans to protect project equipment from weather events. In addition, comments from the City of Revere request that MWRA coordinate with the US Army Corps of Engineers (USACE), which is constructing the Saugus River floodgate project in the same area as the project site.

SCOPE

General

The Single EIR should follow Section 11.07 of the MEPA regulations for outline and content and provide the information and analyses required in this Scope. It should clearly demonstrate that the Proponent has sought to avoid, minimize and mitigate Damage to the Environment to the maximum extent practicable.

Project Description and Permitting

The Single EIR should identify any changes to the project since the filing of the EENF. It should identify and describe state, federal and local permitting and review requirements associated with the project and provide an update on the status of each of these pending actions. The Single EIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards. The Single EIR should identify methods that will be undertaken to avoid, minimize and mitigate Damage to the Environment.

Alternatives Analysis

The EENF analyzed nine potential route alignments across the Saugus River, which were identified as potential routes to connect the underwater portion of the replacement pipeline to MWRA's existing Section 56 pipeline alignment in Lynn and Revere. The routes were evaluated based on environmental impact, cost, and schedule. Of the nine routes initially considered, two (Routes 3 and 7) were selected (see image below) as the most favorable due to having lower costs, shorter schedules, and less environmental impact compared to the other potential routes and were further evaluated; the evaluation included an extensive geotechnical investigation of these two potential alignments. This work included twelve geotechnical borings, nine marine geotechnical borings, and three test pits. Both routes connect to the Section 56 water main in Lynn on the Lynnway (State Route 1A) opposite Hanson Street. However, as seen in the below image, 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. For this reason, Route 7 was chosen as the preferred route.

[2] Available at: https://resilientma.mass.gov/rmat_home/designstandards/

Based on the chosen route, a series of alternatives were further considered for installation of the water pipeline across the Saugus River, including a No-Action Alternative, an Open Trench River Crossing Alternative, a Microtunneling Alternative, a Removal and Replacement on the General Edwards Bridge Alternative and a Horizontal Directional Drilling Alternative (Preferred Alternative).

The 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.

The Open Trench River Crossing Alternative involves dredging a trench to a depth sufficient for pipe installation and backfilling. The pipeline is lowered into place generally from a barge and the trench is typically backfilled with excavated soil. This method of pipe installation can result in significant quantities of suspended sediments and was therefore dismissed due to the potential for greater environmental impact.

The Microtunneling Alternative consists of installing the pipeline via a remote controlled Microtunnel Boring Machine. The advantages of this alternative are that the 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 pipe by microtunneling tends to reduce the risk of loss of ground and surface settlement compared to other methods. However, microtunneling can only reach a length of 1,500 feet without the need for intermediate jacking stations. As the portion of the pipeline being installed under the Saugus River is 2,800 ft, this alternative would require addition setup and thus the longest duration of schedule compared to the other alternatives. In addition, this method of pipe installation had the highest cost of all alternatives considered. For these reasons, this alternative was dismissed.

The Removal and Replacement on the General Edwards Bridge Alternative consists of installing the pipeline crossing the Saugus River above ground via the General Edwards Bridge, which was the previous route of this section of the pipeline prior to its removal in 2018. According to the EENF, 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. As the pipeline could not be placed until the bridge is replaced, planning to put the pipeline on the bridge would cause a significant delay to this project, which is necessary to ensure water supply system redundancy for several communities. For this reason, this alternative was dismissed.

The Preferred Alternative consists of installing the pipeline via HDD. HDD is a pipe installation method that involves drilling a guided borehole through the ground along a predetermined path from an entry point to an exit point. HDD accomplishes the project's goal of ensuring water system redundancy for residents and businesses in portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus, and Swampscott, while having less environmental impact and costing less than other alternatives considered.

EEOAA 1

The EENF did not include a comparison of quantitative impacts associated with each alternative. The Single EIR should include a supplemental alternatives analysis that, for each alternative, quantifies and compares environmental impacts against the Preferred Alternative.

As noted in the EENF, a 4,000-sf area of the beach in Revere will be used to store the Point of Pines Yacht Club floating docks in the boating off-season during the construction of the pipeline[3]. Comments from CZM state that the floating docks are vulnerable to higher high tides and storm surges that could cause them to float away, wash into and cause damage to the adjacent dunes, or become projectiles in a storm event. The Single EIR should discuss an alternative that would involve moving the winter storage location to a more secure inland location during the construction to better protect the floats, beach, and dunes, or provide a backup plan should they need to be moved in the event of an impending coastal storm event.

EEOAA 2

Environmental Justice

As noted above, the project site is located within two EJ populations characterized by Minority; and Income and within one mile of 31 EJ populations characterized by Minority; Income; Minority and Income; Minority and English Isolation; and Minority, Income and English Isolation. Within the census tracts containing the above EJ populations within 1 mile of the project site, the following languages are identified as those spoken by 5% or more of residents who also identify as not speaking English very well: Spanish, Russian, Mon-Khmer Cambodian, and Urdu).

Effective January 1, 2022, all new projects in "Designated Geographic Areas" ("DGA," as defined in 301 CMR 11.02, as amended) around EJ populations are subject to new requirements imposed by the Chapter 8 of the Acts of 2021: *An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy* (the "Climate Roadmap Map") and amended MEPA regulations at 301 CMR 11.00. Two related MEPA protocols—the MEPA Public Involvement Protocol for Environmental Justice Populations (the "MEPA EJ Public Involvement Protocol") and MEPA Interim Protocol for Analysis of project Impacts on Environmental Justice Populations (the "MEPA Interim Protocol for

[3] The Point of Pines Yacht Club typically stores their docks in the parking lot during the off-season, but because this will be unavailable due to construction activities, the proposal is to store them on the beach during construction.

Analysis of EJ Impacts")—are also in effect for new projects filed on or after January 1, 2022. Under the new regulations and protocols, all projects located in a DGA around one or more EJ populations must take steps to enhance public involvement opportunities for EJ populations, and must submit analysis of impacts to such EJ populations in the form of an EIR.

Consistent with the MEPA EJ Public Involvement Protocol, the Proponent sent advance notification of the project in the form of an EJ Screening Form (translated into Spanish, Russian, Mon-Khmer Cambodian, and Urdu) to a "EJ Reference List" provided by the MEPA Office and consisting of Community Based Organizations (CBOs) and tribes/indigenous organizations. Notice of the MEPA remote consultation session was also distributed to the EJ Reference List, and the meeting was held at 5:30 PM on August 24, 2023. The notice of the MEPA remote consultation session was translated into Spanish, Russian, Mon-Khmer Cambodian, and Urdu. Oral interpretation services were offered for the MEPA remote consultation session; no requests for translation were received. A project website[4] has been published that provides general information about the project such as a project description, information about where the project is in the MEPA review process, and contact information. The Single EIR should describe a public involvement plan that the project intends to follow for EJ populations within the DGA for the remainder of the MEPA review process. The Single EIR should provide an update on outreach efforts and describe how the project is implementing the public involvement plan. The Single EIR or summary thereof should be distributed to the EJ Reference List and an updated list should be obtained from the MEPA Office to ensure that contacts are up to date.

EEOAA 3

The EENF contained a baseline assessment of any existing unfair or inequitable Environmental Burden and related public health consequences impacting EJ Populations in accordance with 301 CMR 11.07(6)(n)1. and the MEPA Interim Protocol for Analysis of EJ Impacts. According to the EENF, the data surveyed show some indication of an existing "unfair or inequitable" burden impacting the identified EJ populations. Specifically, the EENF notes that the DPH EJ Tool identifies census tracts with and municipalities in which the EJ populations as exhibiting "vulnerable health EJ criteria"; this term is defined in the DPH EJ Tool to include any one of four environmentally related health indicators that are measured to be 110% above statewide rates based on a five-year rolling average.[5] Specifically, the City of Revere is identified as exhibiting "vulnerable health EJ criteria" for Childhood Asthma and Heart Attack Hospitalizations and Lynn is identified as exhibiting "vulnerable health EJ criteria" for Childhood Asthma and Childhood Blood Lead Levels. The EENF did not include census tract data for vulnerable health EJ criteria. The Single EIR should provide this information.

EEOAA 4

In addition, the EENF indicates that the following sources of potential pollution exist within one mile of the identified EJ Populations, based on the mapping layers available in the DPH EJ Tool:

- Large Quantity Generators: 17
- MassDEP Tier Classified 21E Sites: 11
- "Tier II" Toxics Release Inventory Site: 6
- MassDEP Sites with AULs: 54
- Underground Storage Tanks: 17

[4] MWRA - Update for Section 56 Saugus River Crossing (Contract 7454)

[5] See https://matracking.ehs.state.ma.us/Environmental-Data/ej-vulnerable-health/environmental-justice.html. Four vulnerable health EJ criteria are tracked at the municipal level in the DPH EJ Viewer (heart attack hospitalization, childhood asthma, childhood blood lead, and low birth weight); of these, two (childhood blood lead and low birth weight) are also available at the census tract level.

EEOAA 5

However, based on an independent review by the MEPA Office of the mapping layers available in the DPH EJ Tool, other potential sources of pollution appear to exist within the one-mile DGA. This information should be provided in the Single EIR.

As indicated in the EENF, the project impacts are anticipated to be temporary in nature and related to construction activities. Construction contractors will comply with anti-idling regulations. Construction noise will be minimized by ensuring that equipment is functioning properly and equipped with noise-reducing features.

EEOAA 6

The Single EIR should provide a discussion of construction period timing and staging, and how construction activities will impact EJ populations. The Single EIR should discuss the nature and extent of construction period traffic anticipated, and whether such traffic is likely to extend through EJ populations. The Single EIR should discuss what disruptions are anticipated for vehicular, pedestrian, transit, and bicycle travel, and how the Proponent will communicate with the public about potential disruptions to local neighborhoods. The Single EIR should discuss whether a construction management plan will be developed, and if so, submit a copy of the plan or describe its components.

<u>Wetland Resources</u>

As discussed above, the project will result in temporary impacts to Coastal Dune, Barrier Beach, Coastal Bank, Coastal Beach, and LSCSF. The only permanent impacts associated with the project include the installation of six manholes in LSCSF (75 feet), and filling voids left from timber pile removal in Coastal Beach. The project requires an Order of Conditions (OOC) issued by the Lynn and Revere Conservation Commissions, or a Superseding Order of Conditions issued by MassDEP in the event of an appeal. The project also requires a 401 Water Quality Certification for dredging greater than 100 cubic yards.

EEOAA 7

Impacts to Coastal Dune and Barrier Beach are temporary and include the staging and exit areas used for HDD. No work will be performed in undeveloped sandy beachfront and all work within the Barrier Beach/Coastal Dune will be limited to paved areas. Comments from MassDEP state that the Proponent must demonstrate that there will be no permanent impacts to the Barrier Beach or Coastal Dune system, and that all temporary impact areas are restored to the pre-construction condition. Comments state that the Proponent needs to provide geotechnical data to demonstrate that the HDD locations have enough homogenous material under the Saugus River in order to bore through without the need for an open cut trench across the river. This information should be provided during the permitting process.

EEOAA 8

A 950 square foot (sf) section of Coastal Bank will be regraded to facilitate equipment access for pile removal. The regrading will include temporary placement of geotextile reinforcement and rip rap. Following construction, those temporarily placed materials will be removed and the Coastal Bank will be regraded and returned to pre-construction condition.

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 sf.

Rare Species

The project site is located within Priority and Estimated Habitat for the Piping Plover (Charadrius melodus). This species and their habitats are protected pursuant to the Massachusetts Endangered Species Act (MESA) (M.G.L. c.131A) and its implementing regulations (321 CMR 10.00). According to the comments from Natural Heritage & Endangered Species Program (NHESP), the project requires conditions for the protection of state-listed species. Protection measures may include but are not limited to a time of year restriction to prevent disturbance to state-listed species during the nesting period (April 1 – August 31) as well as monitoring and management of state-listed species and their habitats. NHESP anticipates that any state-listed species concerns can be addressed during the MESA review process. The Single EIR should provide an update on consultations with NHESP and any mitigation measures that are finalized by that time.

EEOAA 9

The Saugus River provides essential habitat for the passage of diadromous fish species including American eel (Anguilla rostrata), alewife (Alosa pseudoharengus), blueback herring (Alosa aestivalis), rainbow smelt (Osmerus mordax), and white perch (Morone americana). The lower reaches of the Saugus River also provide essential habitat for the spawning and early development of winter flounder (Pseudopleuronectes americanus) and Atlantic tomcod (Microgadus tomcod). Comments from the Massachusetts Division of Marine Fisheries (DMF) note that portions of the tidal flats/coastal beach at the project site have been mapped as habitat for soft shell clam (Mya arenaria), blue mussel (Mytilus edulis), and razor clam (Ensus directus) in shellfish growing area N26.7, classified as Conditionally Restricted for shellfish harvest and shellfish growing area N26.0 classified as Prohibited. In addition, tidal flats provide one of the most productive marine habitats for numerous marine species and are designated "special aquatic sites" under the Federal Clean Water Act. Comments go on to state that DMF does not anticipate that the project will impact the fisheries resources provided that Best Management Practices described in the EENF are followed regarding containment and removal of debris, fluids, and sediment associated with the planned HDD under the Saugus River Creek. DMF recommends that all pile removal be accomplished from machinery operating on the upslope side of the existing Lynn timber bulkhead at low tide and that all excavation and backfill work be completed before the high tide returns (i.e. during one tidal cycle). If a barge is necessary for pile removal, DMF recommends the work be sequenced during high tide to avoid barge grounding. Comments from DMF also concur with the Proponent's intention to develop a site specific frac-out management plan and recommend a draft plan be provided in the Single EIR. A frac-out management plan should be provided in the Single EIR.

EEOAA 10

Article 97

The EENF also describes work required on land used for open space and recreation. The Massachusetts Department of Conservation and Recreation (DCR) 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. These parcels of land are designated as Article 97 land. MWRA proposes that 8,200 square feet (5,000 in Revere and 3,200 in Lynn) be transferred from DCR to MWRA to allow access to the pipeline on either side of the installation. Transfer of ownership or interests in Article 97 property must meet the requirements set forth in the Public Lands Preservation Act (M.G.L. c. 3, § 5A; the "PLPA") and the Executive Office of Energy and Environmental Affairs' Article 97 Land Disposition Policy ("the Policy") to ensure a no net loss of lands protected under Article 97. The filing states that MWRA is engaging with DCR regarding the project design and compliance with the PLPA and the Policy.

In accordance with the Policy, the Proponent must demonstrate that there are no feasible alternatives to the permanent land dispositions proposed within the layout of the Lynnway in Revere and Lynn and, should no alternatives exist, that the minimum amount of interest in DCR land is being disposed of for the purpose of the project. For instance, it appears that the Proponent could consider acquiring an easement over DCR land in lieu of an outright fee transfer to minimize impacts to Article 97 interests. The Proponent will be responsible for meeting the obligations of the PLPA, including public notification, an alternatives analysis, the identification and dedication of replacement land to Article 97 purposes, an appraisal, requests for the Secretary to waive or modify the replacement land requirement or make findings relative to funding in lieu of replacement land, if applicable, and Article 97 legislation. The Single EIR should include information to demonstrate compliance with the PLPA and the Policy. To the extent draft legislation is prepared, a copy should be attached to the Single EIR.

EEOAA 11

Chapter 91

The EENF describes work with c.91 jurisdiction including filled and flowed tidelands. Comments from MassDEP Waterways did not identify any substantive concerns regarding the proposed project. Comments state that based on the MassDEP's preliminary review, the project appears to be water-dependent in accordance with 310 CMR 9.12(2)(d). However, as the project is considered a infrastructure crossing facility, the Proponent must provide sufficient information for a determination by the EEA Secretary that the facility is water-dependent because it cannot reasonably be located or operated away from tidal or inland waters, based on a comprehensive analysis of alternatives and other information analyzing measures that can be taken to avoid or minimize adverse impacts on the environment, in accordance with M.G.L. c. 30, §§ 61 through 62L. The Single EIR should include information to support this finding, and should respond to comments from the MassDEP Waterways Program.

EEOAA 12

Historical and Archaeological Assets

According to the EENF, the Massachusetts Historical Commission (MHC) Massachusetts Cultural Resource Information System (MACRIS) interactive map shows that there are two historical assets located within the project site, including the Point of Pines Area (REV.P) and the Point of Pines Yacht Club (REV.535). 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, 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 concluded that there would be low potential for significant submerged cultural resources within the proposed HDD routes. This conclusion was affirmed by the Massachusetts Board of Underwater Archaeological Resources (MBUAR) in a communication dated September 28, 2021.

<u>Climate Change</u>

Adaptation and Resiliency

Effective October 1, 2021, all MEPA projects are required to submit an output report from the MA Resilience Design Tool to assess the climate risks of the project. Based on the output report attached to the EENF, the project has a high exposure rating based on the project's location for the following climate parameters: sea level rise/storm surge, extreme precipitation (urban flooding), and extreme heat. Based on the 50-year useful life and the self-assessed criticality of the pipeline, the MA Resilience Design Tool recommends a planning horizon of 2070 and a return period associated with a 50-year (2% annual chance) storm event for sea level rise/storm surge, and a 10-year (10% annual chance) storm event for extreme precipitation. I note that the recommended planning horizon for assets that are unlikely to be relocated (such as water distribution systems) is 60-80 years.[6] This would yield corresponding return period recommendations of the 500-year (0.2% chance) storm event for sea level rise/storm surge and the 100-year (1% chance) storm event for extreme precipitation.[7]

The EENF states that although the MA Resilience Design Tool identified the project elements as having high exposure due to their locations near the coast, and as high risk due to their criticality as water supply infrastructure, projected climate change impacts are not anticipated to affect this infrastructure due to its location below ground. The project will not result in any changes to site topography or floodwater flow paths or velocities that could impact adjacent properties or the functioning of the floodplain. Comments from CZM state that during construction, equipment and work areas are vulnerable in the event of a coastal storm event. The Single EIR should include a plan describing how the work areas and equipment will be secured in the event of an impending coastal storm.

EEOAA 13

<u>Construction Period</u>

MWRA indicates that the project will be constructed in one phase in 2028 and take approximately 12 months to complete. The EENF states that temporary impacts associated with construction may include noise, dust and emissions and that best management practices will be implemented to minimize and mitigate these impacts.

All construction and demolition (C&D) activities should be managed in accordance with applicable MassDEP regulations regarding Air Pollution Control (310 CMR 7.01, 7.09-7.10), and Solid Waste Facilities (310 CMR 16.00 and 310 CMR 19.00, including the waste ban provision at 310 CMR 19.017). The project should include measures to reduce construction period impacts (e.g., noise, dust, odor, solid waste management, etc.) and emissions of air pollutants from equipment, including anti-idling measures in accordance with the Air Quality regulations (310 CMR 7.11). I encourage the Proponent to require that its contractors use construction equipment with engines manufactured to Tier 4 federal emission standards, or select project contractors that have installed retrofit emissions control devices or vehicles that use alternative fuels to reduce emissions of volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment. Off-road vehicles are required to use ultra-low sulfur diesel fuel (ULSD). If oil and/or hazardous materials are found during construction, the Proponent should notify MassDEP in accordance with the Massachusetts

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[6] https://eea-nescaum-dataservices-assets-prd.s3.amazonaws.com/cms/GUIDELINES/V1.2_SECTION_2.pdf, p. 12.
[7] https://eea-nescaum-dataservices-assets-prd.s3.amazonaws.com/cms/GUIDELINES/V1.2_SECTION_4.pdf, pp. 12, 23.

Contingency Plan (MCP; 310 CMR 40.0000). All construction activities should be undertaken in compliance with the conditions of all State and local permits. I encourage the Proponent to reuse or recycle C&D debris to the maximum extent.

Mitigation and Draft Section 61 Findings

EEOAA 14

The Single EIR should include a separate chapter updating all proposed mitigation measures including construction-period measures. This chapter should also include a comprehensive list of all commitments made by the Proponent to avoid, minimize and mitigate the environmental and related public health impacts of the project, and should include a separate section outlining mitigation commitments relative to EJ populations. The filing should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation. The list of commitments should be provided in a tabular format organized by subject matter (traffic, water/wastewater, GHG, environmental justice, etc.) and identify the Agency Action or Permit associated with each category of impact. Draft Section 61 Findings should be separately included for each Agency Action to be taken on the project. The filing should clearly indicate which mitigation measures will be constructed or implemented based upon project phasing to ensure that adequate measures are in place to mitigate impacts associated with each development phase.

Responses to Comments

The Single EIR should contain a copy of this Certificate and a copy of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the Single EIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended, and shall not be construed, to enlarge the scope of the Single EIR beyond what has been expressly identified in this certificate.

Circulation

The Proponent should circulate the Single EIR to each Person or Agency who previously commented on the EENF, each Agency from which the project will seek Permits, Land Transfers or Financial Assistance, and to any other Agency or Person identified in the Scope. The Proponent may circulate copies of the Single EIR to commenters other than Agencies in a digital format (e.g., CD-ROM, USB drive) or post to an online website. However, the Proponent should make available a reasonable number of hard copies to accommodate those without convenient access to a computer to be distributed upon request on a first come, first served basis. A hard copy of the Single EIR should be made available for review in the Lynn and Revere Libraries.

September 15, 2023
Date

Rebecca L. Tepper

Comments received:

08/30/2023	City of Revere
09/06/2023	Natural Heritage & Endangered Species Program (NHESP)
09/07/2023	MassDEP Northeast Regional Office (NERO)
09/08/2023	Massachusetts Department of Environmental Protection (MassDEP) Waterways Program
09/08/2023	Division of Marine Fisheries (DMF)
09/08/2023	Department of Conservation and Recreation (DCR)
09/08/2023	Coastal Zone Management (CZM)

RLT/NSP/nsp

City of Revere, Massachusetts

Tom Skwierawski
Chief of Planning and Community Development
Department of Planning and Community Development
281 Broadway, Revere, MA 02151 781. 286. 8181

Patrick M. Keefe Jr.
Acting Mayor

August 30, 2023

Rebecca Tepper, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Attn: MEPA Office
Boston, MA 02114

RE: Expanded Environmental Notification Form
MWRA Section 56 Water Pipeline Replacement Project
Lynn and Revere, Massachusetts

Dear Secretary Tepper,

The City of Revere Department of Planning and Community Development would like to provide the following comments with respect to the above referenced EENF for the MWRA pipeline replacement project:

In 1993, a regional floodgate structure was designed by the US Army Corps of Engineers "the Regional Saugus River Floodgate Project", which included a floodgate at the mouth of the Saugus River. With the real threat of the consequences of sea level rise, this project continues to be seen as the only answer for the protection of over 5,000 at risk structures and for critical transportation and other infrastructure within the communities of Revere, Saugus, Lynn, Malden, and Everett. It is important that the MWRA work in close coordination with the ACOE on any plans that may potentially conflict with the alignment of the Saugus River floodgate project. The City of Revere is hopeful that the planning of both these important infrastructure projects can be completed in a seamless fashion to prevent any future constraints and costs and therefore requests continued communication between the MWRA and ACOE regarding the planning and design of both projects.

City of Revere 1

Sincerely,

Frank Stringi
Frank Stringi
City Planner

C: Tom Skwierawski, DPCD Director
Robert Hunt, Former ACOE Project Manager
Elle Baker, DPCD

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
100 Cambridge Street, Suite 900, Boston, MA 02114 • (617) 626-1200

MEMORANDUM

TO: Rebecca L. Tepper, Secretary, EEA
ATTN: Nicholas Perry, MEPA Office
FROM: Lisa Berry Engler, Director, CZM
DATE: September 8, 2023
RE: EEA-16749, MWRA Section 56 Water Pipeline Replacement Project; Lynn and Revere

Lisa Berry Engler

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the above-referenced Expanded Environmental Notification Form (EENF), noticed in the *Environmental Monitor* dated August 9, 2023, and recommends that the following comments are addressed in the scope of the Single Environmental Impact Report (SEIR) for the project.

Project Description

The proposed project includes the replacement of a section of MWRA's Section 56 Water Pipeline that provides water to portions of Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Saugus, and Swampscott. The section to be replaced was previously attached to the General Edwards Bridge over the Saugus River but was removed in 2018 due to severe corrosion. The proposed replacement includes the installation of approximately 4,800 feet of 20-inch water pipeline, using both open-cut and trenchless underwater pipeline construction methods. Horizontal directional drilling (HDD) will be used to install the 20-inch diameter water pipeline in the ground under the water at the mouth of Saugus River, from points in Lynn and Revere. The new pipe will extend from the existing Section 56 pipeline in Route 1A in Lynn along Hanson Street to the Saugus River HDD crossing point, under the Saugus River for approximately 2,800 linear feet (lf), and then 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 in Revere. The pipeline outside of the HDD area 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 in Route 1A. Twelve timber piles that are located along the proposed HDD pathway in the intertidal coastal beach in Lynn must be removed to accommodate the water line replacement. Resource area impacts associated with the project include 75 square feet (sf) of permanent and 5,800 sf of temporary impact to a coastal dune and barrier beach, 18,050 sf of temporary impact to a coastal bank, 940 sf of temporary impact to a rocky intertidal shore, 15,100 sf of temporary impact to the riverfront area, and 143,650 sf of temporary impact to Land Subject to Coastal Storm Flowage (LSCSF) associated with FEMA AE Zone elevation 14 NAVD88 in Lynn and AE Zone elevations 10 and 11 NAVD88 in Revere.

Project Comments

The entire project site is located within LSCSF and is vulnerable in the event of a coastal storm event. The SEIR should include a plan describing how the work areas and equipment will be secured in the event of an impending coastal storm to avoid impacts to coastal resource areas within and adjacent to the site.

CZM 1

According to the EENF, a 4,000-sf area of the beach in Revere will be used to store the Point of Pines Yacht Club floating docks in the boating off-season. The 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 remaining floats are typically stored in the parking lot, but because this will be unavailable due to construction activities, the proposal is to store them on the beach during construction. To avoid impacts to shorebird habitat, the floats will be stored only between October 1 to April 1 and they will be stacked to minimize their cumulative footprint on the beach. The area proposed for storage of these additional floats is above mean high water, but there is little beach above the high tide line in this location. The floats will be vulnerable to higher high tides and storm surges that could cause them to float away, wash into and cause damage to the adjacent dunes, or become projectiles in a storm event. The SEIR should provide alternatives for moving the winter storage location to a more secure inland location during the construction to better protect the floats, beach, and dunes, or provide a backup plan should they need to be moved in the event of an impending coastal storm event.

CZM 2

Federal Consistency Review

The proposed project may be subject to CZM federal consistency review, and if so, must be found to be consistent with CZM's enforceable program policies. For further information on this process, please visit the CZM website at www.mass.gov/federal-consistency-review-program.

LE/kg

cc: Jill Provencal, DEP NERO
Daniel Padien, Christine Hopps, DEP Waterways
Kathryn Glenn, CZM

dcr
Massachusetts

September 8, 2023

Secretary Rebecca L. Tepper
Executive Office of Energy and Environmental Affairs
Attn: Nicholas Perry, MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: EEA #16749 MWRA Section 56 Water Pipeline Replacement Project (Lynn and Revere) EENF

Dear Secretary Tepper:

The Department of Conservation and Recreation ("DCR" or "Department") is pleased to submit the following comments in response to the Expanded Environmental Notification Form ("EENF") submitted by the Massachusetts Water Resources Authority (the "Proponent" and "MWRA") for the MWRA Section 56 Water Pipeline Replacement Project (the "Project").

As described in the EENF, the Project involves installation of approximately 4,800 feet of water main pipeline in the ground and under the Saugus River using open-cut construction and horizontal directional drilling, respectively. The proposed pipeline installation will replace a section that was previously attached to the General Edwards Bridge, but had to be removed in 2018 due to corrosion.

Project construction activities will impact roadways and intersections under DCR jurisdiction. The Lynnway and northbound onramp onto Route 1A (Lynnway) in Revere, and the Lynnway (Route 1A) on the north side of the General Edwards Bridge in Lynn, may be temporarily restricted to one lane to enable construction access at the locations where the new water main will connect to the existing water main. MWRA states that they will coordinate with DCR and local communities regarding traffic mitigation measures. A DCR Construction and Access Permit ("CAP") will be required for access and work activities within the DCR roadways.

Article 97

State conservation and recreation property is protected by Article 97 of the Amendments to the Massachusetts Constitution ("Article 97"). Transfers of ownership or interests in DCR property must meet the requirements set forth in the Public Lands Preservation Act (M.G.L. c. 3, § 5A; the "PLPA") and the Executive Office of Energy and Environmental Affairs' Article 97 Land Disposition Policy (the "Policy") to ensure no net loss of lands protected under Article 97. Selling, transferring, or otherwise disposing of any right or interest in DCR property may occur only under exceptional circumstances, as defined in the Policy, including the determination that no feasible alternative is available and a minimum amount of land or an interest therein is being disposed for the proposed use. Such transfers also require legislative authorization by the General Court through a two-thirds roll call vote.

Department of Conservation and Recreation
State Transportation Building
10 Park Plaza, Suite 6620
Boston, MA 02116-3978
617-626-1250 617-626-1351 Fax
www.mass.gov/dcr

Maura T. Healey
Governor

Kimberley Driscoll
Lt. Governor

Rebecca L. Tepper, Secretary
Executive Office of Energy & Environmental Affairs

Brian Arrigo, Commissioner
Department of Conservation & Recreation

The Proponent has engaged with DCR regarding the Project design and compliance with the PLPA and the Policy. DCR will continue to work with MWRA to ensure that there are no feasible alternatives to the permanent easements proposed within the layout of the Lynnway in Revere and Lynn and, should no alternatives exist, that the minimum amount of interest in DCR land is being disposed of for the purpose of the Project. The Proponent will be responsible for meeting the obligations of the PLPA, including public notification, an alternatives analysis, the identification and dedication of replacement land to Article 97 purposes, an appraisal, requests for the Secretary to waive or modify the replacement land requirement or make findings relative to funding in lieu of replacement land, if applicable, and Article 97 legislation. DCR notes that it is standard practice for a CAP to be issued only after Article 97 legislation has passed with a 2/3 roll call vote of the legislature. DCR 1

Thank you for the opportunity to comment on the EENF. Please contact Jason Santos, Director of Transportation at jason.santos@mass.gov related to traffic mitigation measures. Please contact Sean Grant at sean.grant@mass.gov to request a CAP. Questions related to the Article 97 process can be directed to Land Protection Specialist Loni Fournier at loni.m.fournier@mass.gov.

Sincerely,

Brian Arrigo
Commissioner

cc: Priscilla Geigis, Patrice Kish, Laura Dietz, Jason Santos, Sean Grant, Loni Fournier

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

100 Cambridge Street 9th Floor Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

Memorandum

To: Nicholas Perry, Environmental Analyst, MEPA

From: Alice Doyle, Waterways Regulation Program, MassDEP

cc: Daniel J. Padien, Program Chief, Waterways Regulation Program, MassDEP

Re: MWRA Section 56 Water Pipeline Replacement Project, Revere and Lynn
EEA #16749 – EENF
Comments from the Chapter 91 Waterways Regulation Program

Date: September 8, 2023

The Department of Environmental Protection Waterways Regulation Program (the "Department") has reviewed the above referenced Expanded Environmental Notification Form (EENF) #16749 submitted by AECOM, Inc. on behalf of The Massachusetts Water Resource Authority (MWRA) (the "Proponent") for the MWRA Section 56 Water Pipeline Replacement Project, beneath the Saugus River from Hanson Street, Lynn to Rice Avenue, Revere (the "Project Site"). The project also proposes removal of twelve timber piles from a deteriorating sea wall along the Lynn shoreline to allow for the preferred pipeline alignment.

The total length of 20-inch diameter pipeline to be installed is approximately 4,800 feet, of which approximately 2,800 feet will be installed under the Saugus River via horizontal directional drilling (HDD). Some of the remaining 2,000 feet of pipeline will be installed within filled tidelands, and a portion within uplands.

Chapter 91 Jurisdiction

Pursuant to 310 CMR 9.04(1) and (2) and 9.02, the majority of the Project Site is located within filled and flowed tidelands in Chapter 91 jurisdiction. The EENF acknowledges that the proposed project will require a Chapter 91 License.

Regulatory Review

The Department did not identify any substantive concerns regarding the proposed project. Based on the Department's preliminary review, the project appears to be water-dependent in accordance with 310 CMR 9.12(2)(d). In the event that an EIR is submitted, the standards at 310 CMR 9.12(2)(d) shall further apply and it is recommended that the Proponent include sufficient information for a determination by the Secretary that such facility cannot reasonably be located or operated away from tidal or inland waters, based on a comprehensive analysis of alternatives and other information analyzing measures that can be taken to avoid or minimize adverse impacts on the environment, in accordance with M.G.L. c. 30, §§ 61 through 62H.

The Proponent is encouraged to coordinate with Waterways Program staff prior to submitting a Chapter 91 license application if there are any questions about the process. For any questions regarding the Department's comments, please contact Alice Doyle at alice.doyle@mass.gov.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 150 Presidential Way Woburn, MA 01801 • 978-694-3200

September 8, 2023

Rebecca L. Tepper, Secretary
Executive Office of
Energy & Environmental Affairs
100 Cambridge Street
Boston MA, 02114

RE: Revere, Lynn
MWRA Section 56 Water Pipeline
Replacement Project
EEA# 16749

Attn: MEPA Unit

Dear Secretary Tepper:

The Massachusetts Department of Environmental Protection Northeast Regional Office (MassDEP-NERO) has reviewed the Expanded Environmental Notification Form (EENF) for the proposed MWRA Section 56 Water Pipeline Replacement Project in Revere and Lynn. MassDEP provides the following comments.

Wetlands

An Expanded Environmental Notification Form (EENF) has been filed with the Executive Office of Energy and Environmental Affairs by AECOM on behalf of the Massachusetts Water Resources Authority (MWRA). The project proposes to cross the Saugus River between Lynn and Revere using horizontal directional drilling (HDD) and open cut trenching. The project involves the installation of approximately 4,800 feet of water pipeline in order to replace the existing water line.

The proposed project will result in temporary impacts to Coastal Dune, Barrier Beach, Coastal Bank, Coastal Beach, 200-foot Riverfront Area, and Bordering Land Subject to Flooding (BLSF). The only permanent impacts associated with the project include the installation of six manholes in BLSF, and filling voids left from timber pile removal in Coastal Beach.

Impacts to Coastal Dune and Barrier Beach are temporary and include the staging and exit areas used for HDD. No work will be performed in undeveloped sandy beachfront and all work within the Barrier Beach/Coastal Dune will be limited to paved areas. The Applicant must demonstrate that there will be no permanent impacts to the Barrier Beach or Coastal Dune system, and that all temporary impact areas are restored to the pre-construction condition.

The Rice Avenue and HDD staging/exit areas are located partially within the 200-foot Riverfront Area. All work, including HDD and open cut trenching will be limited to developed or paved areas.

The Applicant will need to provide geotechnical data that supports that the HDD locations have enough homogenous material under the Saugus River in order to bore through without the need for an open cut trench across the river.

A 950 square foot (sf) section of Coastal Bank will be regraded to facilitate equipment access for pile removal. The regrading will include temporary placement of geotextile reinforcement and rip rap. Following construction, those temporarily placed materials will be removed and the Coastal Bank will be regraded and returned to pre-construction condition.

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 sf.

The project requires an Order of Conditions (OOC) issued by the Lynn and Revere Conservation Commissions, or a Superseding Order of Conditions issued by MassDEP in the event of an appeal for work performed within wetland resource areas and within the 100’ buffer zone to wetland resource areas. The project also requires a 401 Water Quality Certification for dredging greater than 100 cubic yards.

Drinking Water

The project consists of an approximate 4,000 foot replacement of MWRA’s “Section 56” pipeline, where it crosses the Saugus River, and was strapped to a bridge over the river. The pipe section was badly corroded, and removed in 2018 during bridge work. As a result, the Section 56 pipeline is currently shut down and unavailable to provide redundancy. The proposed project will restore the redundancy by installing a replacement main beneath the riverbed near the bridge. This is considered a water main replacement project that does not require any permits from the MassDEP Drinking Water Program as it is not considered a substantial modification.

The MassDEP appreciates the opportunity to comment on this proposed project. Please contact Kristin.Divris@mass.gov at (508) 887-0021 for further information on wetlands issues. If you have any general questions regarding these comments, please contact me at John.D.Viola@mass.gov or at (857) 276-3161.

Sincerely,

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

John D. Viola
Deputy Regional Director

cc: Brona Simon, Massachusetts Historical Commission,
Eric Worrall, Kristin Divris, Jill Provencal, Kyle Lally, MassDEP-NERO
Melissa Balcourt, Jim Persky, MassDEP NERO

September 8, 2023

Rebecca L. Tepper, Secretary
Executive Office of Energy and Environmental Affairs
ATTN: MEPA Office, Nicholas Perry
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: EEA#16749 Expanded Environmental Notification Form

Dear Secretary Tepper:

Massachusetts Division of Marine Fisheries (MA DMF) staff have reviewed the Expanded Environmental Notification Form (EENF) submitted by the Massachusetts Water Resources Authority (MWRA) for the proposed Section 56 Water Pipeline Replacement Project crossing the Saugus River between the Cities of Lynn and Revere to the west of the General Edwards Memorial Bridge. The project consists of the installation of 4,800 ft of water pipeline, using both open-cut method for work on land and a trenchless underwater pipeline construction method: horizontal directional drilling (HDD) to cross the Saugus River. The project also includes the removal of 12 timber piles along the Lynn shoreline from either the upland or by barge.

The project site is situated at the mouth of the Saugus River. The Saugus River provides essential habitat for the passage of diadromous fish species including American eel (*Anguilla rostrata*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), rainbow smelt (*Osmerus mordax*), and white perch (*Morone americana*) [1]. The lower reaches of the Saugus River also provide essential habitat for the spawning and early development of winter flounder (*Pseudopleuronectes americanus*) and Atlantic tomcod (*Microgadus tomcod*) [1]. Parts of the tidal flat/coastal beach at the project site have been mapped by MA DMF as habitat for soft shell clam (*Mya arenaria*), blue mussel (*Mytilus edulis*), and razor clam (*Ensus directus*) in shellfish growing area N26.7, classified as Conditionally Restricted for shellfish harvest and shellfish growing area N26.0 classified as Prohibited. In addition, tidal flats provide one of the most productive marine habitats for numerous marine species and are designated "special aquatic sites" under the Federal Clean Water Act.

MA DMF provides the following comments for your consideration.

- At this time, MA DMF does not anticipate the preferred project alternatives of pipeline installation identified in the EENF will impact the fisheries resources provided that Best Management Practices described in the EENF are followed regarding containment and removal of debris, fluids, and sediment associated with the planned HDD under the Saugus River Creek. MA DMF concurs with the proponent's intention to develop a site specific frac-out management plan and recommends a draft plan be provided in the Single EIR.

- MA DMF does not recommend a TOY restriction for any of the proposed work.
- MA DMF recommends all pile removal be accomplished from machinery operating on the upslope side of the existing Lynn timber bulkhead at low tide and that all excavation and backfill work be completed before the high tide returns (i.e. during one tidal cycle). If a barge is necessary for pile removal, MA DMF recommends the work be sequenced during high tide to avoid barge grounding.

Thank you for considering our comments. Questions about this review may be directed to Forest Schenck in our Gloucester office at dmf.envreview-north@mass.gov.

Sincerely,

Daniel J McKiernan

Daniel J. McKiernan
Director

DM/FS/sd

Cc.
R. Joyce, MA DMF
E. Reiner, EPA
D. Wong, MA DEP
K. Glenn, CZM
P. Maniccia, USACE
K. Ronan, MWRA

References:

[1] Evans, NT, KH Ford, BC Chase and JJ Sheppard (2011). Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts. Technical Report DMF TR-47.

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

September 6, 2023

Rebecca Tepper, Secretary
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Nicholas Perry, EEA No. 16749
100 Cambridge Street
Boston, Massachusetts 02114

Project Name:	MWRA Section 56 Water Pipeline Replacement Project
Proponent:	Massachusetts Water Resources Authority
Location:	Hanson Street, Lynn across the Saugus River to Rice Avenue, Revere
Project Description:	Section 56 Water Pipeline Replacement via HDD under Saugus River
Document Reviewed:	Expanded Environmental Notification Form (EENF)
EEA File Number:	16749
NHESP Tracking No.:	23-8528

Dear Secretary Tepper,

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the Division) reviewed the Expanded Environmental Notification Form (EENF) for the *MWRA Section 56 Water Pipeline Replacement Project* located at Hanson Street in Lynn across the Saugus River to Rice Avenue in Revere and would like to offer the following comments.

Portions of the proposed project are located within *Priority Habitat* and *Estimated Habitat* according to the *Massachusetts Natural Heritage Atlas* (15th Edition). Piping Plover (*Charadrius melodus*) and state-listed Tern species may be found within the project area. State-listed species and their habitats are protected pursuant to the Massachusetts Endangered Species Act (M.G.L c. 131A) and its implementing regulations (MESA, 321 CMR 10.00). Rare wetland wildlife habitat is protected in accordance with the rare species provisions of the Massachusetts Wetlands Protection Act (WPA, 310 CMR 10.00). The Piping Plover is also listed as Threatened and protected pursuant to the U.S. Endangered Species Act (ESA, 50 CFR 17.11). This project requires a direct filing with the Division for compliance with the Massachusetts Endangered Species Act (MESA 321 CMR 10.00).

Based on the information contained within the EENF and in advance of a formal filing pursuant to the MESA, the Division anticipates this project may require conditions for the protection of state-listed species. Protection measures may include but are not limited to a time of year restriction to prevent disturbance to state-listed species during the nesting period (April 1 – August 31) as well as monitoring and management of state-listed species and their habitats. The Division anticipates that any state-listed species concerns can be addressed during the MESA review process.

The Division cannot render a final decision until all required MESA filing materials are submitted by the proponent to the Division. As our MESA review is not complete, no alteration to the soil, surface, or vegetation and no work associated with the proposed project shall occur until the Division has made a final determination.

If you have any questions about this letter, please contact Amy Hoenig, Senior Endangered Species Review Biologist at Amy.Hoenig@mass.gov. We appreciate the opportunity to comment on this project.

Sincerely,

Everose Schlüter

Everose Schlüter, Ph.D.
Assistant Director

cc: Katherine Ronan, MWRA
Lynn Board of Selectmen
Lynn Conservation Commission
Lynn Planning Department
Revere Board of Selectmen
Revere Conservation Commission
Revere Planning Department
DEP Northeast Regional Office, MEPA

Table 1. EENF Comments and Location of Responses in SEIR
(comments are identified by author and comment number, and the attached letters identify each comment accordingly)

Comment Source and Number	Comment	Response
EEOAA 1	The EENF did not include a comparison of quantitative impacts associated with each alternative. The Single EIR should include a supplemental alternatives analysis that, for each alternative, quantifies and compares environmental impacts against the Preferred Alternative.	An expanded analysis of the project alternatives environmental impacts is included in **Section 3.3.**
EEOAA 2	The Single EIR should discuss an alternative that would involve moving the winter storage location to a more secure inland location during the construction to better protect the floats, beach, and dunes, or provide a backup plan should they need to be moved in the event of an impending coastal storm event.	Float storage has been moved off of the Coastal Beach.
EEOAA 3	The Single EIR should describe a public involvement plan that the project intends to follow for EJ populations within the DGA for the remainder of the MEPA review process. The Single EIR should provide an update on outreach efforts and describe how the project is implementing the public involvement plan. The Single EIR or summary thereof should be distributed to the EJ Reference List and an updated list should be obtained from the MEPA Office to ensure that contacts are up to date.	The SEIR will be distributed to the EJ Reference List. See **Section 9.0** of the project narrative (Opportunities for Public Involvement) for additional information.
EEOAA 4	The EENF did not include census tract data for vulnerable health EJ criteria. The Single EIR should provide this information.	After reviewing the data available via the MA DPH Environmental Justice tool, it was determined that the tool does not contain census tract-level Childhood Asthma ED Visits Rate per 10,000 and Heart Attack Rate per 10,000 for the census tracts in this area. Census tract-level data concerning Elevated Blood Level Prevalence and Low Birth Weight per 1,000 has been added to **Section 4.11.3**.

EEOAA 5	However, based on an independent review by the MEPA Office of the mapping layers available in the DPH EJ Tool, other potential sources of pollution appear to exist within the one-mile DGA. This information should be provided in the Single EIR.	In **Section 4.11.3** (Environmental Justice), **Figure 7** (a map showing potential sources of pollution within one mile of the project area) has been updated with additional layers from the DPH EJ Tool. Specifically, the map now includes MassDEP Large Quantity Toxic Users (3), Air Permits (2), Chapter 21E Tier Classified sites (14), and Toxics release inventory sites (13). Table 5 (a list of the potential sources of pollution shown in **Figure 7**) has been updated accordingly.
EEOAA 6	The Single EIR should provide a discussion of construction period timing and staging, and how construction activities will impact EJ populations. The Single EIR should discuss the nature and extent of construction period traffic anticipated, and whether such traffic is likely to extend through EJ populations. The Single EIR should discuss what disruptions are anticipated for vehicular, pedestrian, transit, and bicycle travel, and how the Proponent will communicate with the public about potential disruptions to local neighborhoods. The Single EIR should discuss whether a construction management plan will be developed, and if so, submit a copy of the plan or describe its components.	Additional details pertaining to construction period timing and staging, and how they are anticipated to impact EJ populations have been added to **Section 5.11** (Socioeconomic Characteristics / Environmental Justice).

EEOAA 7	Comments from MassDEP state that the Proponent must demonstrate that there will be no permanent impacts to the Barrier Beach or Coastal Dune system, and that all temporary impact areas are restored to the pre-construction condition.	The float storage that was previously proposed on Coastal Beach in Revere is now no longer located on the Coastal Beach. The only permanent impacts to the Barrier Beach or Coastal Dune system are approximately three at-grade manholes to be installed in existing impervious surface. Additional details concerning the extent of permanent impacts in these areas can be found in **Section 5.2**, and details concerning the restoration of these areas following construction can be found in **Section 8.6**.
EEOAA 8	Comments state that the Proponent needs to provide geotechnical data to demonstrate that the HDD locations have enough homogenous material under the Saugus River in order to bore through without the need for an open cut trench across the river. This information should be provided during the permitting process.	MWRA has provided MassDEP additional geotechnical data that demonstrates that the HDD locations have enough homogenous material under the Saugus River in order to install the proposed pipe via HDD without the need for an open-cut trench across the river. MWRA also provided confirmation to DEP that AECOM geotechnical and HDD specialists have reviewed the geotechnical data that has been collected and believe the soil conditions, as understood, are appropriate for an HDD construction method.

EEOAA 9	The Single EIR should provide an update on consultation with NHESP and any mitigation measures that are finalized by that time.	Work will occur adjacent to but not in NHESP Habitat.
EEOAA 10	A frac-out management plan should be provided in the Single EIR.	A draft frac-out management plan has been included in **Attachment K**.
EEOAA 11	The Single EIR should include information to demonstrate compliance with the PLPA and the Policy. To the extent draft legislation is prepared, a copy should be attached to the Single EIR.	MWRA is in discussions with DCR to determine whether there is a need for a property interest disposition for the project where the MWRA has existing water infrastructure and rights in the land appurtenant thereto, which it acquired from the Commonwealth pursuant to its Enabling Act. If it is determined that a disposition of a property interest by the Commonwealth is needed for the project and that the disposition of the property interest is subject to Article 97, the MWRA will comply with the PLPA and its established requirements and process and the EEA's Article 97 Land Disposition Policy to avoid net loss of lands protected under Article 97. For example, in accordance with the requirements of the PLPA, the MWRA would notify the Secretary of the EEA and the public by

		submitting the proposed disposition request within the online PLPA Portal and performing appropriate additional notifications. Further, prior to submission, the MWRA would continue its coordination with DCR, as required by the PLPA. Finally, as noted in the September 15, 2023 EENF Certificate, the MWRA would be responsible for meeting the obligations of the PLPA, including public notification, an alternatives analysis, the identification and dedication of replacement land to Article 97 purposes as applicable, an appraisal, requests for the Secretary to waive or modify the replacement land requirement or make findings relative to funding in lieu of replacement land, if applicable, and Article 97 legislation.
EEOAA 12	The Single EIR should include information to support [the determination that the facility is water-dependent] and should respond to comments from the MassDEP Waterways Program.	Additional information has been added to **Section 3.2** (Waterway Avoidance Alternative) to support and provide evidence for this determination.
EEOAA 13	The Single EIR should include a plan describing how the work areas and equipment will be secured in the event of an impending coastal storm.	A section has been added to **Section 8**, Mitigation Measures titled Coastal Storm Preparedness with details concerning how the site will be prepared in the event of a coastal storm.

EEOAA 14	The Single EIR should include a separate chapter updating all proposed mitigation measures including construction-period measures. This chapter should also include a comprehensive list of all commitments made by the Proponent to avoid, minimize and mitigate the environmental and related public health impacts of the project, and should include a separate section outlining mitigation commitments relative to EJ populations. The filing should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation. The list of commitments should be provided in a tabular format organized by subject matter (traffic, water/wastewater, GHG, environmental justice, etc.) and identify the Agency Action or Permit associated with each category of impact. Draft Section 61 Findings should be separately included for each Agency Action to be taken on the project.	See **Section 8.6** of the project narrative. A Draft Section 61 Findings has been included in **Section 8.4** for each agency.
City of Revere 1	It is important that the MWRA work in close coordination with the [US Army Corp of Engineers] on any plans that may potentially conflict with the alignment of the Saugus River floodgate project.	MWRA has been in contact with the USACE. USACE staff confirmed on October 11, 2023, and February 23, 2024 that the floodgate project has been deauthorized and is no longer an active project. MWRA will continue to work with the USACE on other topics that may arise.
CZM 1	The SEIR should include a plan describing how the work areas and equipment will be secured in the event of an impending coastal storm to avoid impacts to coastal resource areas within and adjacent to the site.	A section has been added to **Section 8** (Mitigation Measures) titled Coastal Storm Preparedness with details concerning how the site will be prepared in the event of a coastal storm.

CZM 2	The SEIR should provide alternatives for moving the winter storage location to a more secure inland location during the construction to better protect the float, beach, and dunes, or provide a backup plan should they need to be moved in the event of an impending coastal storm.	Float storage has been moved off of the Coastal Beach. The MWRA has been in contact with CZM on this topic.
DCR 1	The Proponent has engaged with DCR regarding the Project design and compliance with the PLPA and the Policy. DCR will continue to work with MWRA to ensure that there are no feasible alternatives to the permanent easements proposed within the layout of the Lynnway in Revere and Lynn and, should no alternatives exist, that the minimum amount of interest in DCR land is being disposed of for the purpose of the Project. The Proponent will be responsible for meeting the obligations of the PLPA, including public notification, an alternatives analysis, the identification and dedication of replacement land to Article 97 purposes, an appraisal, requests for the Secretary to waive or modify the replacement land requirement or make findings relative to funding in lieu of replacement land, if applicable, and Article 97 legislation. DCR notes that it is standard practice for a CAP to be issued only after Article 97 legislation has passed with a 2/3 roll call vote of the legislature.	MWRA is in discussions with DCR to determine whether there is a need for a property interest disposition for the project where the MWRA has existing water infrastructure and rights in the land appurtenant thereto, which it acquired from the Commonwealth pursuant to its Enabling Act. If it is determined that a disposition of a property interest by the Commonwealth is needed for the project and that the disposition of the property interest is subject to Article 97, the MWRA will comply with the PLPA and its established requirements and process and the EEA's Article 97 Land Disposition Policy to avoid net loss of lands protected under Article 97. For example, in accordance with the requirements of the PLPA, the MWRA would notify the Secretary of the EEA and the public by submitting the proposed disposition request within the online PLPA Portal and performing appropriate additional notifications. Further, prior to submission, the MWRA would continue its coordination with DCR, as required by the PLPA. Finally, as noted in the September 15, 2023 EENF Certificate, the MWRA would be responsible for meeting the obligations of the PLPA, including public notification, an alternatives analysis, the identification

		and dedication of replacement land to Article 97 purposes as applicable, an appraisal, requests for the Secretary to waive or modify the replacement land requirement or make findings relative to funding in lieu of replacement land, if applicable, and Article 97 legislation. There were no alternatives to avoid work in land protected under Article 97 because of the need to reconnect to existing water supply infrastructure within land mapped as Article 97. All alternatives for routing the new pipeline will require a connection to the existing main to make the pipeline operational.
MassDEP 1	In the event that an EIR is submitted, the standards at 310 CMR 9.12(2)(d) shall further apply and it is recommended that the Proponent include sufficient information for a determination by the Secretary that such facility cannot reasonably be located or operated away from tidal or inland waters, based on a comprehensive analysis of alternatives and other information analyzing measures that can be taken to avoid or minimize adverse impacts on the environment, in accordance with M.G.L. c. 30, 61 through 62H.	A Waterway Avoidance alternative has been added as **Section 3.2** in the Detailed Project Description of the SEIR.