Massachusetts Water Resources Authority

Metropolitan Water Tunnel Program

Supplemental Draft Environmental Impact Report

July 2023

MWRA Contract 7159

Volume 2

Prepared by

CDM Smith in association with

VHB and JACOBS

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11 Noise and Vibration

11.1 Introduction

This chapter provides an overview of the existing noise and vibration conditions at the two new alternative sites considered in the Supplemental Draft Environmental Impact Report (SDEIR) for the terminus of the North Tunnel, Segment 1, in place of the Draft Environmental Impact Report (DEIR) Fernald Property site. Included is an assessment of potential construction period noise and vibration impacts using guidance from the Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment Manual*.[1]

The University of Massachusetts (UMass) Property site would serve as a large connection shaft site in the City of Waltham in SDEIR Alternatives 3A and 4A. Receptors near this site include the Cedar Hill Girl Scouts Camp to the north, an educational area associated with the Waltham Agricultural Fields to the south, and Cornelia Warren Field to the southeast. The nearest receptors are approximately 360 to 825 feet from the midpoint of the temporary construction area limits of disturbance (LOD) of the proposed UMass Property large connection shaft site.

The Lower Fernald Property site would serve as a receiving shaft site in the City of Waltham in SDEIR Alternative 10A. Receptors near this site include residences to the east on Waverley Oaks Drive, Parkview Road, and Bishop Terrace, as well as the Cedar Hill Girl Scouts Camp to the west. The nearest receptors are approximately 325 to 1,950 feet from the midpoint of the temporary construction LOD of the proposed Lower Fernald Property receiving shaft site.

Refer to **DEIR Chapter 4.12, Noise and Vibration**, for the regulatory context associated with noise and vibration, resource definitions, and for background information on how noise and vibration is measured.

No comments related to noise and vibration were received in the Certificate on the DEIR issued by the Commonwealth of Massachusetts, Secretary of the Executive Office of Energy and Environmental Affairs (EEA) on December 16, 2022. See **SDEIR Chapter 15, Responses to Comments**, for the full list of delineated comments received on the DEIR in the Certificate and the associated comment letters.

11.1.1 Summary of Findings

Key findings of the Program related to noise and vibration are summarized below.

- Construction noise levels would typically range depending on time of day, location, and construction activities:
    - During the first shift of construction (daytime), maximum noise levels would range from 45 to 84 decibels (dBA) equivalent sound level (Leq) at the closest noise receptors.

1 U.S. Department of Transportation, Federal Transit Administration, "Transit Noise and Vibration Impact Assessment Manual," FTA Report No. 0123, prepared by John A. Volpe National Transportation System Center, September 2018.

- During the second shift (afternoon/evening), maximum construction noise levels would typically range from 37 to 78 dBA (L_{eq}) at the closest noise receptors since a smaller subset of construction equipment would be used.
- During the third shift (evening/night), maximum construction noise levels would typically range from 28 to 54 dBA (L_{eq}) at the closest noise receptors.
- Over a typical 24-hour period, construction noise emissions would range from 71 to 89 dBA (L_{dn}) at 50 feet, which would be on the construction site.

- Prior to mitigation, a total of 23 to 24 noise-sensitive receptors (depending on SDEIR Alternative) would be subject to potential temporary construction noise impacts that may exceed the U.S. Housing and Urban Development (HUD) or Massachusetts Department of Environmental Protection (MassDEP) noise limits.
- Activities associated with vibration impacts, such as pile driving, drilling, and blasting, where those activities would occur would generally only occur during the day with limits on the allowed vibration criteria to minimize the potential for impact due to human annoyance or sensitive structures; these activities would also be conducted far enough away from buildings and structures to minimize the risk of structural damage. Blasting would be controlled according to the Code of Massachusetts Regulations (527 CMR 13.00) to minimize the risk of impact due to structural damage or the risk adversely impacting architectural features of surrounding building. As such, no vibration impacts are anticipated as a result of construction activities at any of the Program sites considered in the three SDEIR Alternatives; however, the contract documents will require installation of monitoring instruments, where warranted, and will define limits for vibration so that construction activities are within the anticipated limits.

11.1.2 Noise and Vibration Context

Consistent with the methodology described in **DEIR Chapter 4.12, Noise and Vibration**, the construction noise and vibration impact assessment is based on the following:

- The anticipated construction activities and equipment that could be used at the Program sites for all three SDEIR Alternatives, including equipment such as excavators, cranes, impact pile drivers, tunnel boring machines (TBMs), bulldozers, front-end loaders, and air compressors.
- A doubling of traffic volumes is necessary to cause a 3-dB increase in noise; a 3-dB increase in noise is generally the smallest change in noise that humans can perceive. The additional traffic volumes due to construction activities would be less than a 2 percent increase. Since the existing traffic volumes would not double, it is assumed that there would be no noise impact due to mobile construction sources such as trucks and equipment hauling.
- The actual number of shifts and when they would occur during construction would depend on specific contractor construction schedule and methods. For the purposes of the noise analysis, a worst-case condition is assumed, where there would be three construction shifts at a receiving shaft site: one from the morning to the afternoon, one from the afternoon to evening, and one from the evening to the night, work at the large connection shaft site will be only performed during one shift (from the

morning to the afternoon). The evening to night shift at a receiving shaft site typically would not include truck traffic or equipment hauling and would be characterized by ventilation and pumping activities.

11.1.2.1 Noise Criteria and Guidelines

The sound level metrics used in this evaluation are described as follows:

- The **equivalent sound level** (L_{eq}) is a single value that represents the same acoustic energy as the fluctuating noise levels that exist over a given time interval.
- Statistical noise metrics provide information about the statistical distribution of sound levels over a given time interval and represent the sound level that is exceeded for a certain percentage of time. For example, L_{90} is the sound level exceeded 90 percent of the time and so represents the lower range of sound levels. MassDEP defines the ambient sound level in terms of the L_{90}.
- The **day-night average sound level** (L_{dn} or DNL) is similar to L_{eq} because it is a single value that represents the time-varying sound level. The difference is that L_{dn} represents sound levels over a 24-hour period with a 10-decibel penalty applied to noise at night (10:00 PM to 7:00 AM) to account for an increased annoyance during these hours.

A-weighted sound levels in units of decibels (abbreviated “dBA”) are used throughout this assessment to evaluate potential noise impacts, since they approximate the way humans hear sound.

As described in **DEIR Section 4.12.1.6, Construction Noise Levels Methodology (pg. 4.12-7)**, construction noise levels were predicted based on the maximum noise levels of the equipment, the utilization factor (a measure of how often the equipment is used or the duty cycle), the distance between the equipment and noise receptors, and presence of intervening terrain or objects, such as buildings. Construction noise was predicted using methods and reference noise emissions from the Federal Highway Administration’s Roadway Construction Noise Model (RCNM). **DEIR Chapter 4.12, Table 4.12-3 (pg. 4.12-8)** provides the maximum reference sound emissions at 50 feet and utilization factors for the construction equipment used in the model. The construction phase with the greatest noise level was assessed to determine the extent of potential noise impact.

HUD 24 Code of Federal Regulations (CFR) Part 51[2] defines noise thresholds for residences that are developed with HUD funding; these thresholds are a basis for many other federal agencies noise limits. Although the Program does not involve development of residential receptors, the HUD noise limits provide context for evaluating potential noise impact from the Program. The HUD regulation includes the following criteria:

- Limits exterior noise levels at residential buildings to 65 dBA (L_{dn}) and considers exterior noise exposure levels below 65 dBA (L_{dn}) to be Acceptable for residential land use.
- Considers exterior noise levels between 65 and 75 dBA (L_{dn}) to be Normally Unacceptable, and noise levels above 75 dBA (L_{dn}) to be Unacceptable.

2 U.S. Department of Housing and Urban Development, 24 CFR Part 51, Subpart B, Noise Abatement and Control.

- Assumes that most buildings can provide 20 dB, or more, of noise reduction with the windows closed, and considers an interior noise level of no more than 45 dBA (L_{dn}) for residences as a limit to minimize indoor activity interference and annoyance.

The MassDEP adopted a Noise Control Regulation, 310 CMR 7.10, under the authority of M.G.L. Chapter 111, Section 142B and 142D.[3] The Noise Control Regulation goal is to limit the potential for noise impact from industrial and commercial sources of sound.

The MassDEP established a Noise Level Policy[4] for implementing the regulation, which states that a source of sound violates the MassDEP's noise regulation if it:

- Increases the broadband sound level by more than 10 dB(A) above ambient (background conditions)
- Produces a "pure tone" condition – when any octave-band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

The MassDEP criteria identified in the Noise Level Policy are commonly evaluated at the property line and at the nearest inhabited residence. "Ambient" is defined as the background L_{90} sound level measured during hours that construction activities would occur. Evaluations typically assess potential impact during the quietest ambient period, which would typically be during the night for equipment that operates 24-hours a day. For construction activity, assessments are commonly conducted according to L_{eq} levels that have shown to correspond well to human annoyance.

The SDEIR Alternatives include above-ground construction in Waltham, Weston, Wellesley, Needham, Brookline, and Boston. The Town of Newton would include subterranean work only. These seven municipalities have ordinances related to the hours of construction and allowable noise limits. All of the municipalities prohibit construction noise in the early morning (i.e., before 7:00 AM to 8:30 AM, depending on the municipality), during the night (i.e., after 5:00 PM to 8:00 PM, depending on municipality), on weekdays and Saturdays, and anytime on Sundays or holidays. Some municipalities prohibit construction noise levels above maximum noise level limits for specific construction equipment such as air compressors, generators, power tools, backhoes, dump trucks, and loaders and cumulative noise levels at the property line. The City of Boston Air Pollution Control Commission regulation limits construction noise to 75 dBA (L_{10}), and 86 dBA (L_{max}) at residential or institutional land uses, 80 dBA (L_{10}) at business or recreational land uses, and 85 dBA (L_{10}) at industrial land uses.

The City of Waltham has an ordinance[5] that places maximum noise limits on construction equipment. Jackhammers, pavement breakers, pile drivers, and rock drills are exempt from the maximum noise limitations set forth in the ordinance, provided such pieces of equipment are used with noise barriers or noise shields in place. Whether or not certain pieces of equipment are exempt from the noise limitations in the City's ordinance, all equipment must be operated in accordance with Section 10-6 (f) (1) b, which places time of day restrictions on the use of construction equipment in any residential zone or within

3 The Commonwealth of Massachusetts Department of Environmental Protection (MassDEP), Noise Control Regulation 310 CMR 7.10, https://www.airandnoise.com/MA310CMR710/ (accessed May 11, 2023).

4 MassDEP Noise Policy DAQC 90-001.

5 City of Waltham, Massachusetts, Article I, In General, Part II: the General Ordinances, Section 10-6, "Noise," https://ecode360.com/26932259.

300 feet of any building or structure used as a residence. Construction equipment is prohibited between the hours of 5:00 PM and 7:00 AM on weekdays, on Saturdays before 8:00 AM and after 4:00 PM, and at any time on Sundays and holidays.

- Although several municipal ordinances prohibit construction noise during the overnight period, it is necessary for the Program to have certain equipment (e.g., pumps and fans) operating at all times. Since the HUD noise limit of 65 dBA (L_{dn}) accounts for noise during the overnight period, and the MassDEP noise policy accounts for the lower existing ambient noise conditions at night, they are reasonable criteria against which to assess potential adverse noise impact from overnight construction activities. **DEIR Chapter 4.12, Table 4.12-2 (pg. 4.12-6)** summarizes the local noise requirements for the communities in which the construction sites are located.

Based on the U.S. Environmental Protection Agency (USEPA) noise guidelines, HUD noise regulation, MassDEP noise policy, and municipal noise ordinances, the following construction noise limit thresholds would apply to all construction sites:

- No more than 65 dBA (L_{dn}) from construction sources at receptor buildings
- No more than nighttime ambient (L_{90}) plus 10 dBA from construction sources at receptor locations for nighttime/continuous equipment

As a state authority, the MWRA is not subject to state agency or municipal noise ordinances, but the MWRA seeks to minimize potential noise and vibration impacts and comply with such limits, as feasible and practicable. For continuous construction activities that include aboveground ventilation fans and/or pumps, there may be an increased sensitivity to noise from these sources that would occur throughout the nighttime period.

11.1.2.2 Vibration Criteria and Guidelines

Vibration due to blasting activities does not typically cause human annoyance due to the short duration of the vibration effect; however, blasting does have the potential to increase the risk of damage to nearby structures due to vibration and air over-pressure. Vibration due to blasting activities would be controlled in accordance with 527 CMR 13, which requires the completion of a Blast Analysis and a Blast Design Plan. The Blast Analysis establishes the relationship between the blast design and potential effects upon the neighborhood in the blast area. The Blast Design Plan establishes the precautions that would be taken to prevent damage and adverse effects such as determining the appropriate size of the blast, borehole size, depth, delay periods, initiation techniques, location of seismographs, and other factors

Vibration limits for Program-related construction activities are based on well-established limits for damage to residential structures, thresholds for human perception and annoyance, and effects on sensitive equipment from a variety of sources including the U.S. Bureau of Mines (USBM),[6] FTA,[7] and the International Standards Organization (ISO).[8]

Table 11-1 presents the vibration thresholds used to assess potential damage, human annoyance, and effects on sensitive equipment.

Table 11-1 Vibration Impact Thresholds

Human/Structural Response	Vibration (in/s)
USBM Structural Damage Limit (>40 Hz)	2.0 (PPV)
USBM Structural Damage Limit for Plaster Walls (<40 Hz)	0.75 (PPV)
USBM Structural Damage Limit for Drywall Walls (<40 Hz)	0.5 (PPV)
FTA Vibration Impact for Historic Properties Especially Susceptible to Vibration Damage	0.12 (PPV)
Office (ISO) limit for perceptible vibration in non-sensitive areas	0.016 (RMS)
Residential (ISO) limit for barely perceptible vibration in sleeping areas	0.008 (RMS)
General Vibration Criteria VC-A Curve (microscopes with 400 times zoom)	0.002 (RMS)
General Vibration Criteria VC-B Curve (microscopes with 1000 times zoom)	0.001 (RMS)
General Vibration Criteria VC-C Curve (inspection equipment to 1 micron)	0.0005 (RMS)
General Vibration Criteria VC-D Curve (electron-scanning microscopes)	0.00025 (RMS)
General Vibration Criteria VC-E Curve (extremely vibration-sensitive equipment)	0.000125 (RMS)

Source: USBM 1980, ISO 2003, and FTA 2018.
USBM = U.S. Bureau of Mines
ISO = International Standards Organization
FTA = Federal Transit Administration
PPV = peak-particle velocity
RMS = root-mean square

11.1.2.3 Noise Assessment Methodology

Construction noise and vibration were evaluated based on methods typically used for infrastructure projects. Construction equipment evaluated in the analysis includes stationary sources such as drills, impact pile driving, TBMs, excavators, muck trains, dump trucks, generators, pumps, and fans for ventilating the tunnel. Off-site construction vehicles, including trucks and worker vehicles, would travel on prescribed truck routes that are generally on major roadways and avoid noise-sensitive areas. For traffic noise to increase by 3 decibels, which is generally the threshold for a perceptible change in noise, the traffic volumes would need to double. Onsite construction vehicles such as dump trucks generally do not generate substantial noise since they are not allowed to idle for more than 5 minutes, in accordance with Massachusetts idling regulation (310 CMR 7.11).

Ambient sound measurements were conducted at 20 locations to establish the existing conditions at receptor locations near the construction sites, as shown in **Figure 11-1** and **Figure 11-2**. Receptors were

6 U.S. Bureau of Mines, "Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting", Report of Investigations 8507, 1980.

7 U.S. Department of Transportation, Federal Transit Administration, "Transit Noise and Vibration Impact Assessment Manual," FTA Report No. 0123, prepared by John A. Volpe National Transportation System Center, September 2018.

8 ISO Standard 2631-2 "Evaluation of Human Exposure to Whole-Body Vibration."

identified using the local municipality's zoning maps and Massachusetts geographic information system (MassGIS) database.

DEIR Section 4.12.1.1, Resource Definitions (pg. 4.12-1) provides resource definitions and other background information on noise and vibration.

11.1.2.4 Vibration Assessment Methodology

Construction vibration was evaluated based on methods typically used for infrastructure projects. Construction equipment vibration evaluated in the analysis includes stationary sources such as impact pile driving, TBMs, and excavators.

Construction activities, particularly those involving earthwork operations, have the potential to cause ground-borne vibration. Typical equipment that generates vibration includes impact or vibratory pile driving, the TBM, drilling, clam shovel drops, bulldozers/excavators, and dump trucks. **DEIR Chapter 4.12, Table 4.12-9 (pg. 4.12-60)** provides the source vibration levels at 25 feet for different pieces of equipment. Source vibration levels are given in units of in/s peak-particle velocity (PPV), which corresponds to the peak vibration levels that are used to evaluate potential damage to structures and in/s RMS, which corresponds more to an average vibration level that is used to evaluate potential human annoyance. Vibration levels from TBM operations are generally low compared to other types of construction, such as drilling or blasting.

For blasting operations, special precautions would be used to monitor and control vibration in accordance with 527 CMR 13 to minimize potential damage to nearby structures and minimize potential annoyance to humans. These precautions generally would include using small test charges to gauge the vibration response to small blasts and scaling the size of the charges while using geophones to monitor vibration levels.

Construction vibration levels were predicted based on methods in the FTA's noise and vibration guidance manual. Vibration is assessed at the building exterior in regard to potential structural damage. Vibration is assessed inside buildings to evaluate potential effects to vibration-sensitive operations, such as those associated with laboratories.

Vibration levels inside buildings are reduced relative to ground levels, based on the mass of the building, type of foundation, and floor spans. According to the FTA methods, vibration levels inside most wood-framed buildings are reduced by 5 vibration decibels (VdB) (which is a factor of approximately 1.77 for vibration levels measured in in/s) and large masonry or steel buildings are reduced by 10 VdB (a factor of 3.17 for vibration levels measured in in/s).

11.2 Noise Impact Assessment

The following section discusses the impact analysis for noise associated with the two new alternative sites considered for the terminus of the North Tunnel, Segment 1, in place of the DEIR Fernald Property receiving shaft site: the UMass Property site in SDEIR Alternatives 3A and 4A, and the Lower Fernald Property site in SDEIR Alternative 10A.

11.2.1 Noise Existing Conditions

The predominant sources of existing ambient sound include traffic on nearby roadways and natural sources such as wind blowing through trees and ground cover, and birds and insects. The ambient measurements serve as a baseline for the assessment of potential noise impacts. Noise-sensitive noise receptors near the two new alternative sites include residences, the Cedar Hill Girl Scouts Camp, Cornelia Warren Field, and educational sites associated with Waltham Agricultural Fields. The following sections describe the specific receptors at each site **Figure 11-1** identifies the location of the noise monitoring locations and receptors near the UMass Property site, and **Figure 11-2** identifies the noise monitoring locations and receptors near the Lower Fernald Property site.

Nearby sensitive noise receptors were identified using the most recent City of Waltham zoning map and information from MassGIS, and observations from local public roads. Ambient noise measurements were taken near the DEIR Fernald Property site on February 28, 2022, and March 1, 2022, and are representative of the existing noise conditions at the SDEIR UMass Property site and Lower Fernald Property site. The measurement locations and corresponding existing ambient sound levels are presented in **Table 11-2**. The results of the sound measurements presented in **Table 11-2** indicate short-term (20 minutes) monitoring locations with a prefix “S” and long-term (24 hours) monitoring locations with a prefix “L.”

Table 11-2 Ambient Sound Levels Measured near the UMass and Lower Fernald Properties

Site	ID	Location Address	Time/Date Monitored	Measured Sound Level (dBA)				
				L_{eq} day	$L_{eq,}$ night	L_{dn}	L_{90} day	L_{90} night
Launching, Receiving, and Large Connection Sites (Alternative)								
UMass Property (3A, 4A)	*S1*	*360 Waverley Oaks Rd., Waltham (Lower)*	*11:10 AM to 11:31 AM 2/28/2022*	*72*	63 [1]	73 [1]	*60*	51 [1]
	L2	*Chapel Rd., Waltham (Upper)*	*9:04 AM 2/28 to 8:55 AM 3/1/2022*	*45*	*40*	*48*	*35*	*35*
Lower Fernald Property (10A)	*S1*	*360 Waverley Oaks Rd., Waltham (Lower)*	*11:10 AM to 11:31 AM 2/28/2022*	*72*	63 [1]	73 [1]	*60*	51 [1]
	L2	*Chapel Rd., Waltham (Upper)*	*9:04 AM 2/28 to 8:55 AM 3/1/2022*	*45*	*40*	*48*	*35*	*35*

Daytime sound levels are between 7:00 AM and 7:00 PM. Nighttime sound levels are between 7:00 PM and 7:00 AM.

S – short-term monitoring location; L – long-term monitoring location; Leq – energy average sound level, which describes noise as a single value that is equivalent in sound energy to the fluctuating levels over a period of time; Ldn – average sound level that accounts for the fluctuation of acoustic energy over a 24-hour period; L90 – represents the range of sound level exceeded 90% of the time during the given time period.

1 The average nighttime L90 at Site S1 was estimated based on the measurement results at Site S3, which was judged to be equivalent to Site S1 due to the proximity of Site S3 to the road. At Site S3, the measured nighttime L90 was 9 dBA less than the measured daytime L90. Assuming Site S1 would have a similar diurnal pattern of sound levels, the nighttime L90 at Site S1 would be approximately 9 dBA less than 60 dBA, or 51 dBA.

Source: Ambient noise measurements were taken near the DEIR Fernald Property site on February 28, 2022, and March 1, 2022, and are representative of the existing noise conditions at the SDEIR UMass Property and Lower Fernald Property sites.

Italicized text within the table indicates no change from the DEIR.

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Noise and Vibration - Noise Monitoring Locations and Receptors
UMass Property Large Connection Shaft Site (Alternatives 3A and 4A)
Figure 11-1

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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11.2.1.1 Alternative 3A/Alternative 4A Noise Existing Conditions

UMass Property

Noise-sensitive receptors near the UMass Property site in Waltham include the Cedar Hill Girl Scouts Camp to the northwest Cornelia Warren Field, and an educational area associated with the Waltham Agricultural Fields. As shown on **Figure 11-1**, nearby noise-sensitive receptors are approximately 360 to 825 feet away from the midpoint of the temporary construction area LOD. Predominant noise sources near the site include traffic on Beaver Street and Waverley Oaks Road.

Figure 11-1 identifies the noise monitoring locations where measurements were taken to determine ambient sound conditions near the UMass Property site in Waltham. These monitoring locations were representative of the existing noise environment for sensitive receptors along Beaver Street near the UMass Property site. Site S1 is on Waverley Oaks Road and Site L2 is setback into the Fernald Property. The daytime ambient sound levels ranged from 45 to 72 dBA (L_{eq}) and 35 to 60 dBA (L_{90}). Nighttime ambient sound levels ranged from 40 to 63 dBA (L_{eq}) and 35 to 51 dBA (L_{90}). The day-night average noise level was 73 dBA (L_{dn}) at Site S1 and 48 dBA (L_{dn}) at Site L2.

Based on the MassDEP Noise Policy, which limits the increase in project-related noise levels to 10 dBA above ambient levels, the applicable nighttime construction noise limits would be 45 and 61 dBA (L_{eq}) for L2 and S1 sites, respectively. Existing ambient noise levels do not exceed the HUD threshold for acceptable noise exposure [65 dBA (L_{dn})] for either of the sites evaluated; as such there would generally be a higher potential for construction noise adverse effects due to low existing ambient conditions.

11.2.1.2 Alternative 10A Noise Existing Conditions

Lower Fernald Property

Noise-sensitive receptors near the Lower Fernald Property site in Waltham include seven residences on Parkview Road, Bishop Terrace, and Waverley Oaks Road to the northeast and the Cedar Hill Girl Scouts Camp to the west. Nearby receptors are approximately 325 to 1,950 feet away from the midpoint of the temporary construction area LOD (see **Figure 11-2**). Predominant sources of existing ambient sound include traffic on Waverley Oaks Road.

Figure 11-2 identifies the noise monitoring locations where measurements were taken to determine ambient sound conditions near the Lower Fernald Property site. Site S1 is near Waverley Oaks Road and Site L2 is setback into the Fernald Property site. The daytime ambient sound levels ranged from 45 to 72 dBA (L_{eq}) and 35 to 60 dBA (L_{90}). Nighttime ambient sound levels ranged from 40 to 63 dBA (L_{eq}) and 35 to 51 dBA (L_{90}). The day-night average noise level was 73 dBA (L_{dn}) at Site S1 and 48 dBA (L_{dn}) at Site L2.

Based on the MassDEP Noise Policy, which limits the increase in project-related noise levels to 10 dBA above ambient levels, the applicable nighttime construction noise limits would be 45 and 61 dBA (L_{eq}) for L2 and S1 sites, respectively. Existing ambient noise levels do not exceed the HUD threshold for acceptable noise exposure [65 dBA (L_{dn})] for either of the sites evaluated; as such, there would be a higher potential for construction noise adverse effects due to low existing ambient conditions.

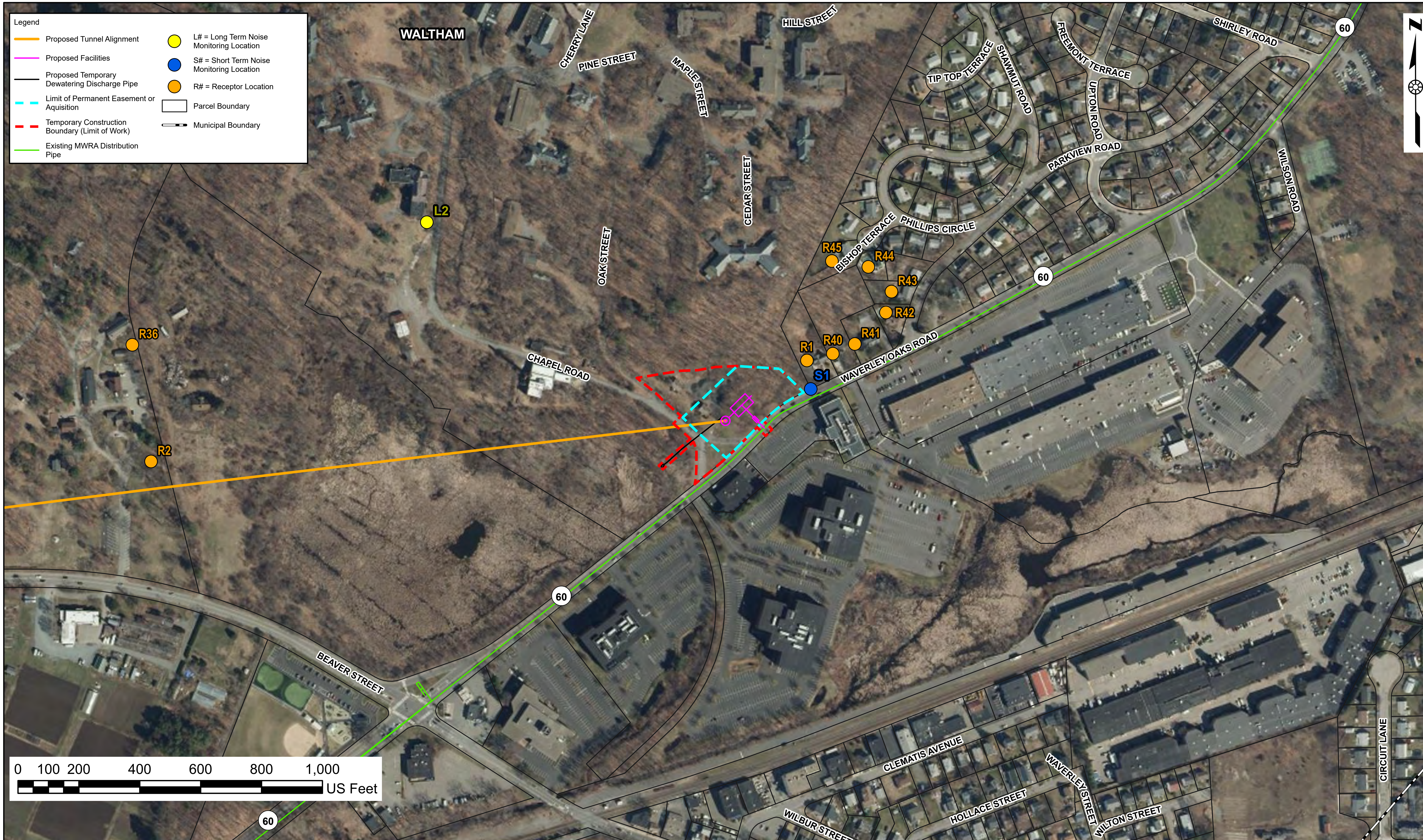
11.2.2 Noise Construction Period Impacts

This section presents the results of the updated construction noise impact assessment for SDEIR Alternatives 3A, 4A, and 10A, which incorporates the revised northern terminus of the North Tunnel, Segment 1, in place of the DEIR Fernald Property site. The construction period impacts at all other Program sites are the same as previously described in DEIR. Consideration of construction noise levels in proximity to environmental justice (EJ) communities is discussed in **SDEIR Chapter 3, Outreach and Environmental Justice, Section 3.4.3, Environmental Justice Construction Period Impacts.**

Construction activities at the UMass Property site and the Lower Fernald Property site would differ since the UMass Property site would be a large connection shaft and would not be a receiving site for a TBM. In SDEIR Alternatives 3A and 4A, the UMass Property site shaft (approximately 13 feet in rock, 10-foot finished diameter) would be constructed using the raisebore method, which consists of constructing from the tunnel upwards, with limited activities at the surface. See **SDEIR Section 11.2.2.1** for specific construction equipment anticipated to be used at the UMass Property site.

In SDEIR Alternative 10A, the Lower Fernald Property site would be the terminus site of the North Tunnel, Segment 1, and the location where the TBM would be extracted in pieces from the tunnel through the shaft opening. The receiving shaft would be constructed utilizing drill and blast methods and would be larger in diameter (approximately 30 feet in rock; 10-foot finished diameter) than at the UMass Property site. Construction equipment and methods would be more intensive at the Lower Fernald Property site compared to the UMass Property site, as described below (refer also to **SDEIR Chapter 2, Alternatives, Section 2.4, Construction Methodology**).

The additional traffic due to construction activities from equipment hauling and vehicles entering and leaving the Program sites would not substantially increase existing traffic noise conditions. A doubling of traffic volumes is necessary to cause a 3-decibel increase in noise, and a 3-decibel increase in noise is generally the smallest change in noise that humans can perceive. Since the additional traffic due to Program-related construction activities would not double, no significant noise impact due to mobile construction sources (equipment hauling and vehicles entering and leaving the Program sites) would be expected.



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Noise and Vibration - Noise Monitoring Locations and Receptors
Lower Fernald Property Receiving Shaft Site (Alternative 10A)
Figure 11-2

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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11.2.2.1 Alternative 3A/4A Noise Construction Period Impacts

The results of the construction noise impact assessment at the closest receptors to the UMass Property site, which would serve as a large connection shaft site in SDEIR Alternatives 3A and 4A, are shown in **Table 11-3**. The construction noise impact assessment results at all receptors, across all sites, for SDEIR Alternative 3A are the same as for SDEIR Alternative 4A, except that there would be construction at the Highland Avenue Northwest/Southwest launching site in SDEIR Alternative 4A instead of the Bifurcation launching site in SDEIR Alternative 3A. Additionally, there would be construction at the Park Road West receiving site in SDEIR Alternative 4A instead of the Highland Avenue Northwest receiving site in SDEIR Alternative 3A. The following section summarizes the construction noise impact assessment results for the UMass Property site in Waltham.

UMass Property

Construction activities at the UMass Property site are anticipated to take place for an overall duration of approximately nine months, with no evening or nighttime activities occurring. As shown in **Table 11-3**, estimated construction noise levels at the closest noise-sensitive receptors to the UMass Property site would be 60 to 69 dBA (L_{eq}) during the first shift.[9] No construction activities would occur during evening or nighttime shift hours. Construction noise levels would exceed both the HUD limit and MassDEP daytime noise limit at one receptor (R36) prior to mitigation (refer to **Figure 11-1** and **Table 11-3**).

Table 11-3 Construction Noise Assessment Results at UMass Property Site (Alternatives 3A and 4A)

Receptor	Existing Ambient Sound Level			Construction Noise Level (dBA)				Potential Impact
	Day (L_{90})	Night (L_{90})	Day-night Level (L_{dn})	First Shift (L_{eq})	Second Shift (L_{eq})	Night (L_{eq})	Day-night Level (L_{dn})	
R2 [1]	60	51	73	66	N/A	N/A	63	No
R36	35	35	48	60	N/A	N/A	**56**	**Yes**
R37 [1]	60	51	73	69	N/A	N/A	65	No
R38 [1]	60	51	73	67	N/A	N/A	64	No
R39 [1]	60	51	73	62	N/A	N/A	58	No

Sources: VHB, 2023; U.S. Department of Housing and Urban Development (HUD), 24 CFR Part 51, Subpart B, Noise Abatement and Control; Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Massachusetts Department of Environmental Protection and Massachusetts Division of Air Quality Control Policy 90-001, February 1, 1990, https://www.mass.gov/doc/massdep-noise-policy/download (accessed April 18, 2023).

*Note: **Bold and** highlighted values indicate unmitigated construction noise levels would exceed applicable criteria, including the HUD noise regulation, which considers exterior noise levels between 65 and 75 dBA (Ldn) to be Normally Unacceptable, and noise levels above 75 dBA (Ldn) to be Unacceptable; and the MassDEP Noise Level Policy, which establishes a noise limit of a 10 dBA increase over existing ambient levels during the nighttime period.*

1 Receptor is institutional use that is not sensitive to noise at night.

9 For the purposes of the noise analysis, it has been assumed that there would be three construction shifts: the first shift would run from the morning to the afternoon; the second shift would run from the afternoon to the evening; and the third shift would run overnight from the evening to the morning on the following day (i.e., to the start of the next first shift).

Construction phases with the highest potential to result in construction noise impacts to nearby receptors would include shaft site setup, shaft excavation, and shaft lining. One receptor associated with the Cedar Hill Girl Scouts Camp (R36) is subject to potential temporary construction noise impacts due to the relatively low existing ambient nighttime sound levels (see **Table 11-3**). See **SDEIR Section 11.2.4** for noise avoidance, minimization, and mitigation measures.

11.2.2.2 Alternative 10A Noise Construction Period Impacts

The results of the construction noise impact assessment at the closest receptors to the Lower Fernald Property site, which serves as a receiving shaft site in SDEIR Alternative 10A, are shown in **Table 11-4.** The following section summarizes the construction noise impact assessment results for the Lower Fernald Property site.

Lower Fernald Property

Construction activities at the Lower Fernald Property site are anticipated to take place for an overall duration of approximately 18 months, with construction activities occurring during daytime, evening, and nighttime hours. As shown in **Table 11-4**, estimated construction noise levels at the closest noise-sensitive receptors would be 51 to 71 dBA (L_{eq}) during the first shift, 50 to 69 dBA (L_{eq}) during the second shift, and 34 to 54 dBA (L_{eq}) at night, and day-night average levels would be 55 to 74 dBA (L_{dn}). Construction noise levels would exceed both the HUD noise limit during the daytime at one receptor (R1); would exceed MassDEP noise limit during daytime hours at two receptors (R1 and R36); and would exceed MassDEP noise limit during the nighttime hours at four receptors (R1, R36, R44, and R45) prior to mitigation (refer to **Figure 11-2** and **Table 11-4**).

The City of Waltham Noise Ordinance prohibits construction activities between 5:00 PM and 7:00 AM. All construction phases for this site have the potential to cause construction noise impacts during daytime hours. Some construction activities would be during the evening/nighttime hours for shaft construction and tunnel lining construction phases, lasting approximately three months out of the total 18-month construction duration. No construction activities in other construction phases occur during evening/nighttime hours except for the shaft/tunnel pump system, which needs to operate continually for a period of time during shaft excavation. Exceedances of the noise exposure limits are due in part to the operation of this shaft/tunnel pump system and ventilation fans. The potential construction noise impacts are due to the close proximity of the residential receptors directly west of the LOD and the relatively low ambient sound levels at more distant receptors to the north associated with the Cedar Hill Girl Scouts Camp. While nighttime noise impacts are expected, the actual number of shifts and when they would occur during construction will depend on specific contractor construction methods. See **SDEIR Section 11.2.4** for noise avoidance, minimization, and mitigation measures.

Table 11-4 Construction Noise Assessment Results at Lower Fernald Property Site (Alternative 10A)

Receptor	Existing Ambient Sound Level			Construction Noise Level (dBA)				Potential Impact
	Day (L_{90})	Night (L_{90})	Day-night Level (L_{dn})	First Shift (L_{eq})	Second Shift (L_{eq})	Night (L_{eq})	Day-night Level (L_{dn})	
R1	60	51	73	71	69	54	**74**	**Yes**
R2 [1]	60	51	73	52	50	N/A	55	No
R36	35	35	48	51	50	34	**55**	**Yes**
R40	60	51	73	58	57	41	62	No
R41	60	51	73	56	55	39	60	No
R42	60	51	73	54	52	37	57	No
R43	60	51	73	53	51	36	56	No
R44	60	51	73	63	61	46	**66**	**Yes**
R45	60	51	73	64	63	47	**68**	**Yes**

Sources: VHB, 2023; U.S. Department of Housing and Urban Development (HUD), 24 CFR Part 51, Subpart B, Noise Abatement and Control; Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Massachusetts Department of Environmental Protection and Massachusetts Division of Air Quality Control Policy 90-001, February 1, 1990, https://www.mass.gov/doc/massdep-noise-policy/download (accessed April 18, 2023).

*Note: **Bold and** highlighted values indicate unmitigated construction noise levels would exceed applicable criteria, including the HUD noise regulation, which considers exterior noise levels between 65 and 75 dBA (Ldn) to be Normally Unacceptable, and noise levels above 75 dBA (Ldn) to be Unacceptable; and the MassDEP Noise Level Policy, which establishes a noise limit of a 10 dBA increase over existing ambient levels during the nighttime period.*

1 Receptor is institutional use that is not sensitive to noise at night.

Program-wide maximum noise levels were reported in **DEIR Chapter 4.12, Section 4.12.1.9, Noise Construction Period Impacts (pg. 4.12-49)**, and have been updated to reflect the inclusion of the two new alternative sites evaluated in the SDEIR in place of the DEIR Fernald Property site. Updated maximum noise levels by shift for the two new alternative sites, as shown in **Tables 11-3** and **11-4**, are as follows:

- During the first construction shift (daytime), maximum noise levels (all Program sites) would range from 45 to 84 dBA (L_{eq}) at the closest noise receptors. Maximum construction noise levels evaluated in the SDEIR at the two new alternative sites would be below the Program-wide maximum of 84 dBA (L_{eq}).
- During the second shift (afternoon/evening), maximum construction noise levels (all Program sites) would typically range from 43 to 70 dBA (L_{eq}) at the closest noise receptors since only a subset of construction equipment would be used. Maximum noise levels anticipated at the closest noise receptors to the Lower Fernald Property site evaluated in the SDEIR would be below the Program-wide maximum of 70 dBA (L_{eq}) (no evening or nighttime construction activities would take place at the UMass Property site).
- During the third shift (evening/night), maximum construction noise levels (all Program sites) would typically range from 28 to 54 dBA (L_{eq}) at the closest noise receptors, including the new Lower Fernald Property site, due to the operation of the shaft/tunnel pump system and ventilation fans (no evening or nighttime construction activities would take place at the UMass Property site).

- Maximum noise levels, expressed in terms of L_{eq}, would not occur throughout the entire duration of construction.

Potential construction noise impact has been predicted at the closest receptor locations to each construction site based on the methodology described in **DEIR Section 4.12.1.5, Noise Methodology (pg. 4.12-6)**. There would be a potential temporary construction noise impact at receptors where construction noise levels would exceed the HUD threshold for acceptable noise exposure of 65 dBA (L_{dn}) and/or the MassDEP noise limit[10] of 10 dBA increase over existing ambient levels. See **SDEIR Section 11.2.4** for noise avoidance, minimization, and mitigation measures.

11.2.3 Noise Final Conditions

Valve chambers and shaft structures would be present at Program sites in the final conditions for all three SDEIR alternatives. The valve chambers and shaft structures would not generate ongoing operational noise after construction is complete. Periodic maintenance of these sites that may temporarily generate noise would include mowing the grassed areas and plowing snow from the driveways. Noise associated with these ongoing maintenance activities in the final conditions would be temporary in nature and would not result in significant adverse noise impacts.

11.2.4 Noise Avoidance, Minimization, and Mitigation

As discussed in **SDEIR Section 11.2.2**, the noise-sensitive receptors subject to temporary construction noise impacts at the UMass Property site (SDEIR Alternatives 3A and 4A) and at the Lower Fernald Property site (SDEIR Alternative 10A) are summarized below in **Table 11-5**.

10 Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Massachusetts Department of Environmental Protection and Massachusetts Division of Air Quality Control Policy 90-001, February 1, 1990, https://www.mass.gov/doc/massdep-noise-policy/download (accessed April 18, 2023).

Table 11-5 Summary of Receptors Subject to Potential Adverse Construction Noise Impacts at the UMass Property and Lower Fernald Property Sites

Site	Number of Impacted Receptors by Alternative		Receptor Labels	Estimated Duration of Construction Activities		Mitigation Considerations
	3A/4A	10A		Total Duration	Shaft Excavation	
Launching, Receiving, and Large Connection Sites						
UMass Property Large Connection	1	-	R36	9 months	3-6 months	A temporary noise barrier around equipment on the construction site, along with other best practices, would be anticipated to mitigate noise impacts
Lower Fernald Property Receiving	-	4	R1, R36, R44, R45	18 months	9-12 months	A temporary noise barrier around equipment on the construction site, along with other best practices, would be anticipated to mitigate noise impacts

Construction activities at the Program sites would be temporary in nature. Upon completion of construction, construction equipment would be removed from the sites and permanent Program-related infrastructure would not generate ongoing operational noise after construction is complete. Upon completion of construction, construction equipment would be removed from the sites and permanent Program-related infrastructure would not generate ongoing operational noise after construction is complete.

As described in **SDEIR Section 11.2.3**, noise generated during periodic maintenance activities in the final conditions would be temporary in nature and would not require mitigation. Prior to the incorporation of any mitigation measures, temporary construction noise levels may exceed the HUD and/or MassDEP noise limits at some sensitive receptor locations. The MWRA will require that the contractor develop and follow a Noise Control Plan (NCP) for the duration of Program construction. The NCP will include noise level criteria that the contractor will have to meet, as well as a construction noise monitoring program. Prior to the start of work, the contractor will submit the NCP to the MWRA for review and approval. The NCP will include preconstruction noise monitoring to help establish construction noise limits, estimates of construction noise levels during each phase of construction, alternative noise mitigation measures to be implemented by the contractor (as needed), procedures for noise measurements to confirm equipment noise emission levels, public outreach requirements, and an outline of a complaint resolution process.

Construction noise avoidance, minimization, and mitigation measures would be implemented as practicable to minimize the potential for impacts to noise-sensitive receptors. The following are construction noise control methods and best practices that could be implemented at Program construction sites, as feasible and reasonable:

- Outfit construction equipment with noise-control features such as mufflers.
- Deploy properly functioning equipment and schedule maintenance to avoid louder operation associated with mechanical issues.

- Locate especially noisy construction equipment, such as pumps and air compressors, away from sensitive receptor locations, as feasible.
- Use quieter equipment and methods, as feasible, such as smaller backhoes and excavators, predrilling in lieu of or prior to pile driving during support of excavation, electric power instead of diesel-generators, and concrete saws to breakup pavement prior to excavation rather than hoe rams or jackhammers.
- Where possible, perform certain construction activities during periods of the day that are less sensitive to noise (e.g., mid-day periods near residences or evening periods near schools).
- Install temporary noise barriers around the perimeter of the equipment at the construction site or along the sides of the construction site that are adjacent to noise-sensitive receptors. Temporary noise barriers are often constructed using 3- to 4-foot tall concrete highway barriers with plywood (3/4-inch or thicker) installed on top or chain-linked fencing with acoustical curtains. Noise barriers up to approximately 12- or 15-foot tall can be constructed using these materials. When noise barriers break the line-of-sight between the construction equipment and the receptors, they can reduce noise by 10 dBA or more.
- Place smaller stationary equipment such as air compressors, generators, and pumps in portable acoustic enclosures. Enclosures around the shaft/tunnel pump system would be installed when no other construction activities are slated to occur during the evening/nighttime hours to mitigate impacts to nearby receptors.
- Maintain strong communication with the public regarding the Program and continue Program-specific public outreach to keep the public informed of the schedule of construction activities and to respond to potential concerns.
- Provide site-specific information about the time and nature of construction activities to adjacent neighbors.

These measures are anticipated to be effective in keeping temporary construction-related noise to acceptable levels and minimizing the potential for adverse impacts. In particular, the installation of temporary noise barriers around equipment at Program construction sites that are adjacent to noise-sensitive receptors subject to adverse impacts is anticipated to reduce noise by 10 dBA or more.[11]

As part of the NCP, the MWRA will work the contractor to identify and implement site-specific mitigation measures where appropriate and as necessary to minimize potential adverse impacts to noise-sensitive receptors. The potential components of a NCP include:

1. Introduction identifying the objectives of the NCP
2. Project description identifying project limits, location, schedule, types of construction equipment to be used, and noise- and vibration-sensitive land uses
3. Identification of construction equipment noise and vibration levels and criteria in contract specification

11 The potential noise level reduction benefit provided by these mitigation measures at specific receptor locations would be based on the specific mitigation measure or best practice, the distance from the construction site, elevation and height of the source and receptor, and other considerations.

4. Establishment of construction noise limits
5. Identification of equipment operation limits
6. Requirements for monitoring noise levels periodically during construction
7. Estimation of construction noise levels
8. Identification of feasible and reasonable noise control measures where necessary
9. Identification and retention of an acoustical engineer to oversee the execution of the NCP
10. Development of a complaint resolution process and community outreach plan

11.3 Vibration Impact Assessment

The following section discusses the impact analysis for vibration associated with the two new alternative sites considered for the terminus of the North Tunnel, Segment 1, in place of the DEIR Fernald Property site: the UMass Property site in SDEIR Alternatives 3A and 4A, and the Lower Fernald Property site in SDEIR Alternative 10A. The impact assessment for all other Program sites remains unchanged from the DEIR.

11.3.1 Vibration Existing Conditions

Refer to **DEIR Chapter 4.12, Noise and Vibration**, for the regulatory context associated with vibration, impact criteria and thresholds, and methodology relating to the vibration impact assessment conducted and reported below. Vibration sensitive receptors near the two new alternative sites generally include residences and institutional land uses associated with the Cedar Hill Girl Scouts Camp and the Waltham Agricultural Fields. Although there is ongoing construction projects and commercial activities that produce vibration in the vicinity of some potential construction sites, it was conservatively assumed that there are no existing sources of vibration for the purposes of this analysis.

11.3.2 Vibration Construction Period Impacts

This section presents the results of the vibration impact assessment for the two new alternative sites considered for the terminus of the North Tunnel, Segment 1, in SDEIR Alternatives 3A, 4A, and 10A. The construction period impacts at all other Program sites are the same as previously described in the DEIR (see **DEIR Chapter 4.12, Table 4.12-9 (pg. 4.12-60)** for the vibration thresholds for human and structural response as vibration velocity levels in units of inches per second).

Table 11-6 provides the distances from construction activities to the threshold of vibration impact for the onset of structural damage for different types of buildings, as well as the onset of perceptible vibration in offices and residences, and the onset of interference with vibration sensitive equipment.

Table 11-6 Distances to Threshold of Vibration Impact (feet)

Construction Equipment	Structural Damage		Office (0.016 in/s RMS)		Residential (0.008 in/s RMS)		VC-A Curve (0.002 in/s RMS)	
	Exterior (0.5 in/s PPV)	Extremely Susceptible to Damage (0.12 in/s PPV)	Wood-framed	Large Masonry/ Steel	Wood-framed	Large Masonry/ Steel	Wood-framed	Large Masonry/ Steel
Impact Pile Driver (Typical)	30	77	80	54	126	86	319	216
Vibratory Pile Driver (Typical)	12	32	33	22	52	35	131	89
TBM	11	28	29	20	46	31	115	78
Caisson Drilling	8	20	21	14	34	23	85	58
Clam Shovel (Slurry Wall)	14	35	37	25	58	40	147	100
Bulldozer	8	20	21	14	34	23	85	58
Dump Trucks	7	18	19	13	30	21	77	52
Hydromill (in rock)	3	7	7	5	11	8	28	19

Sources: USBM 1980, ISO 2003; U.S. Department of Transportation, Federal Transit Administration, "Transit Noise and Vibration Impact Assessment Manual," FTA Report No. 0123, September 2018.
PPV - peak-particle velocity TBM Tunnel Boring Machine
RMS - root-mean square
General Vibration Criteria VC-A Curve (microscopes with 400 times zoom)

Pile driving during construction shaft site setup would be the most common source for vibration impacts. Pile driving would only occur during the day to minimize the potential for annoyance and would be controlled and/or conducted far enough away from buildings and structures to minimize the risk of structural damage. Vibration-generating equipment such as pile drivers, drills, TBM, clam shovel drops, and bulldozers would generally be 100 feet or farther away from nearby buildings. Additionally, blasting is not anticipated to occur at the large connection shaft sites and therefore no impacts from blast would occur. Therefore, no potential structural damage is anticipated due to construction vibration. Vibration-generating equipment would not exceed the threshold for potential annoyance in residences (0.08 in/s) since buildings are typically 100 feet or farther from construction activities. Vibration levels in each of the SDEIR Alternatives would be substantially below the referenced thresholds for potential structural damage, and interior vibration levels would be below the VC-A curve (0.002 in/s RMS).

11.3.2.1 Alternative 3A/Alternative 4A

UMass Property

Vibration levels due to construction activities at the UMass Property site in SDEIR Alternatives 3A and 4A are expected to be below the thresholds for perceptible vibration and damage in structures due to the distances between the construction activity and adjacent vibration-sensitive land use. The closest structures to the UMass Property site are beyond the threshold distances and would not be expected to experience any vibration impact.

11.3.2.2 Alternative 10A

Lower Fernald Property

Construction at the Lower Fernald Property site would utilize drill and blast for shaft excavation; however, for controlled blasting, special precautions would be used to monitor and control vibration in accordance with 527 CMR 13 to minimize potential damage. It is expected that vibration levels due to construction activities at the Lower Fernald Property site in SDEIR Alternative 10A be below the thresholds for perceptible vibration and damage in structures due to the relatively large distances between the construction activity and adjacent vibration-sensitive land use. All nearby noise-sensitive buildings at the Lower Fernald Property site are beyond the threshold distances and would not be expected to experience any vibration impact.

11.3.3 Vibration Final Conditions

The proposed valve chambers and shaft structures would not generate operational vibration in the final conditions. After construction is complete, there would be no difference between the pre- and post-construction vibration conditions. Maintenance of Program sites would include mowing the grassed areas and plowing snow from the driveways. No vibration impacts are anticipated from the temporary use of maintenance equipment.

11.3.4 Vibration Avoidance, Minimization, and Mitigation

No construction vibration impact associated with potential structural damage is anticipated, therefore, specific avoidance, minimization, and mitigation measures are not required. However, standard construction practices would be implemented to minimize the potential for perceptible vibration. These practices include:

- Performing pre-construction surveys for all nearby structures
- Construction documents will include limits for maximum allowable ground borne vibration
- Construction will include an instrumentation and monitoring plan to continuously evaluate construction activities with proper mitigation plans
- Performing construction activities that generate vibration during less sensitive periods of the day, where possible (e.g., mid-day periods near residences or evening periods near schools)
- Using construction methods that generate less vibration when in close proximity to sensitive buildings, where possible (e.g., pre-drilling prior to pile driving, or drilling in lieu of pile driving)

11.4 Technical Analysis to Respond to Certificate Comments

The DEIR was filed with the EEA in October 2022. The Secretary's Certificate on the DEIR did not include any specific comments on noise or vibration but did request additional information on how potential Program impacts may affect EJ populations. Consideration of construction noise in relation to EJ populations is provided in **SDEIR Chapter 3, Section 3.4.3, Environmental Justice Construction Period Impacts**.

Comment letters were received on the DEIR during the public review period in November and December of 2022. See **SDEIR Chapter 15** for the full list of delineated comments received on the DEIR in the Certificate and the associated comment letters.

12 Cultural and Historic Resources

12.1 Introduction

The potential impact of the Supplemental Draft Environmental Impact Report (SDEIR) Alternatives on properties within the Metropolitan Water Tunnel Program Area of Potential Effects (APE) that are listed in, or eligible for listing in, the State Register of Historic Places (State Register) and/or the National Register of Historic Places (National Register) are described in this section.

The section provides information on the two new alternative sites for the terminus of the North Tunnel, Segment 1, in place of the Fernald Property site previously assumed in the Draft Environmental Impact Report (DEIR): the University of Massachusetts (UMass) Property large connection shaft site in SDEIR Alternatives 3A and 4A, and the Lower Fernald Property receiving shaft site in SDEIR Alternative 10A. No aboveground historic properties listed in or considered eligible for the State/National Registers were identified within the UMass Property site APE (refer to **Figure 12-1**).

The DEIR was filed with the Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs (EEA) in October 2022. The Massachusetts Historical Commission (MHC) received the DEIR on October 14, 2022. No comments were received from the MHC on the DEIR during the public review period and the Secretary's Certificate on the DEIR, issued on December 16, 2022, did not indicate any specific comments related to cultural and historic resources. Refer to **SDEIR Chapter 15, Responses to Comments,** for the full list of delineated comments received on the DEIR. The MHC will receive the SDEIR and associated documentation as part of its regulatory review role under the Massachusetts Environmental Policy Act (MEPA). The MHC reviewed the draft cultural resources and archaeological assessments, as well as the Environmental Notification Form (ENF), and provided comments on the ENF in April 2021. Refer to **DEIR Appendix E, Historic/Cultural Resources Supporting Documentation, E.1, Agency Correspondence**, for a copy of the written correspondence between the MHC and the MWRA that has taken place during the Program's MEPA environmental review process.

12.1.1.1 Summary of Findings

Key findings related to cultural and historic resources are listed below.

- The Program is not anticipated to cause any adverse impacts to aboveground historic resources in SDEIR Alternative 3A or 4A.
- In SDEIR Alternative 10A, there are 13 individual resources within both the Lower Fernald Property site APE and the Fernald School Historic District (WLT.AB) in Waltham, seven of which are contributing resources to the Walter E. Fernald State School Historic District (WLT.AB) (refer to **Figure 12-2**). Two contributing resources are in the Program's construction area limit of disturbance (LOD) and would be impacted (demolished). These two resources contributing to the Walter E. Fernald State School Historic District (WLT.AB) are listed in the State and National Registers (see **SDEIR Section 12.2.3.2**).

In addition, one non-contributing resource located within the Lower Fernald Property site LOD (a concrete block garage) would also be demolished.

- The MWRA completed an archaeological assessment of all Program sites. The assessment for the UMass Property site and Lower Fernald Property site will be submitted to the MHC for review along with a copy of this SDEIR chapter and associated **SDEIR Appendix G, Historic/Cultural Resources Supporting Documentation**.
- The MWRA is planning to conduct an Intensive (Locational) Survey of the UMass Property site subject to the issuance of a State Archaeologist permit. The MHC will review the results and either concur with the findings or request additional information.
- The MWRA will prepare an Inadvertent Discovery Plan to apply to all Program sites, in the event of an unanticipated finding of archaeological resources during construction.

12.2 Cultural and Historic Resources Impact Assessment

12.2.1 Cultural and Historic Resources Existing Conditions

The discussion of historic properties within the APEs associated with the UMass Property site (SDEIR Alternatives 3A and 4A) and the Lower Fernald Property site (SDEIR Alternative 10A) is organized by site. For each site, the discussion includes a description of the setting, a summary of resources included in the Massachusetts Cultural Resource Information System (MACRIS) online database and geographic information system (GIS) mapping tool that are within the APE, and brief details regarding properties and districts that are listed in, or eligible for listing in, the State/National Register(s).

As described in **DEIR Chapter 4.7, Cultural and Historic Resources, Section 4.7.3, Methodology (pg. 4.7-2)**, the Program APE was established based on the potential for effects, both direct (from construction) and indirect (noise, vibration, visual, etc.) and would differ for aboveground historic properties (historic districts, buildings, objects, and structures) and below-ground historic properties (archaeological sites). Only aboveground properties are considered in this section. A Study Area of 400 feet around the temporary construction area LOD was assumed to account for potential visual effects associated with the Program at all sites. As stated in **DEIR Section 4.7.3, Methodology (pg. 4.7-2)**, at some sites, there are areas within the LOD that would be used solely for the construction of underground infrastructure or for equipment access. As there are no anticipated permanent visual effects associated with surface piping work, the APE surrounding the surface piping work extends only to the boundary of the LOD.

Visibility of and from the sites was considered in determining the APE boundaries within the Study Area, and fieldwork was undertaken to verify visibility. As described in **DEIR Section 4.7.3.3**, **Fieldwork, (pg. 4.7-3)** the original fieldwork consisted of site visits to each DEIR Program site during the winter and spring of 2022 to document existing resources and verify APE boundaries based on visual inspection. Previously identified historic properties were field verified, and photographs were taken to assess and document each property's historic integrity. Additional fieldwork was conducted in February 2023 to assess potential visual impacts from resources in the vicinity of the SDEIR UMass Property site and Lower

Fernald Property site. Photographs of the UMass Property and Lower Fernald Property sites and properties within their respective APEs are included in **SDEIR Appendix G**, **Historic/Cultural Resources Supporting Documentation**, and the photograph locations are identified on **Figure 12-1** and **Figure 12-2**. Photograph numbers that pertain to each site are cross-referenced in the text.

12.2.1.1 Alternative 3A/Alternative 4A Existing Conditions

UMass Property

The UMass Property site is located northeast of Waltham's city center and is bordered by land associated with the former Walter E. Fernald State School to the north, marshland to the east, the Waltham Agricultural Fields to the south across Beaver Street, and the Girl Scouts of America Camp Cedar Hill to the west. See **SDEIR Appendix G** Photographs 1-9.

The UMass Property site is located within the boundary of the MHC-inventoried area of the Warren Estate (MHC number WLT.E). The site is at the southeast edge of the 16-acre Warren Estate area, surrounded by wooded areas and a rise in elevation to the west abutting Camp Cedar Hill, the Samuel D. Warren House (WLT.431) to the north, and Beaver Street to the south (see **SDEIR Appendix G** Photographs 3-4, 7, 9).

The University of Massachusetts owns the UMass Property site, which is part of a larger, 31-acre property known as Lawrence Meadow. Lawrence Meadow, along with the Waltham Agricultural Fields (a 28-acre parcel on the south side of Beaver Street owned by the City of Waltham), have been continuously occupied or farmed since 1650.[1] In the nineteenth century, both parcels were incorporated as part of a larger estate developed by Samuel D. Warren (1817–1888), a Maine paper magnate.

At the UMass Property site, the APE is variable in extent, reflecting two different types of work across the Program Area. Firstly, the APE includes a 400-foot Study Area buffer around the proposed LOD associated with the large connection shaft to account for physical and visual effects. Secondly, the APE includes the LOD associated with the proposed water distribution pipeline traveling from the shaft site southeastward under Beaver Street to the intersection with Waverley Oaks Road. Work in this area along Beaver Street would involve the construction of a water distribution pipeline and therefore only physical impacts are anticipated for this portion of the UMass Property site LOD (see **Figure 12-1**). Aboveground historic resources identified within the UMass Property site APE are included in **Table 12-1**. None of the identified aboveground resources are listed in or eligible for the State/National Registers.

1 Waltham Land Trust, "Three Hundred Sixty-Nine Years of Farming at the Waltham Field Station," Journal Spring 2019, https://walthamlandtrust.org/wp-content/uploads/2019/04/WLT-Spring-2019.pdf.

Table 12-1 Aboveground Historic Properties Within the APE of the UMass Property Site

MHC #	Property Name [1]	Address	Date	Designation(s)
WLT.E	Warren Estate	N/A	ca. 1850	INV
WLT.430	Massachusetts Agricultural College Field Station [2]	240 Beaver Street	1925	INV

Source: Massachusetts Cultural Resource Information System (MACRIS).
INV: Inventory of Historic and Archaeological Assets of the Commonwealth of Massachusetts

1 *The table lists resources included in the MACRIS that are within the APE, but only properties and districts that are listed in, or eligible for listing in, the State/National Register(s) are discussed in-depth and included in the effects evaluation.*

2 *The City of Waltham purchased the Massachusetts Agricultural College Field Station from the University of Massachusetts on March 1, 2022 (now referred to as the Waltham Agricultural Fields) (https://walthamfieldstation.org/).*

Warren Estate (WLT.E)

The Warren Estate (WLT.E) is not considered eligible for listing in the State/National Registers. However, MACRIS indicates there are three contributing resources to the inventoried area. This includes one resource that is individually listed in the National Register, the 1775 Ephraim Hammond House (WLT.333), which predates the purchase and creation of the summer estate by Samuel D. Warren in the mid-19th century. All three of the individual contributing resources to the Warren Estate inventoried area (WLT.E), including the National Register-listed Ephraim Hammond House (WLT.333), are outside of the APE.

The MWRA is planning to conduct an archaeological investigation at the UMass Property site and will coordinate with the MHC on the archaeological investigation.

12.2.1.2 Alternative 10A Existing Conditions

Lower Fernald Property

The Lower Fernald Property site (see **SDEIR Appendix G** Photographs 10-18) is northeast of Waltham's city center within the approximately 190-acre, National Register-listed Walter E. Fernald State School (MHC number WLT.AB; Fernald School). The Lower Fernald Property site is at the southeast edge of the Fernald School Historic District. Three buildings, an associated parking lot, and access road are located within the LOD and are surrounded by wooded areas with a rise in elevation to the northeast (see **Figure 12-2**). The Lower Fernald Property site encompasses a section of Chapel Road leading to its intersection with Waverley Oaks Road (see **SDEIR Appendix G** Photographs 14, 16-18). At the Lower Fernald Property site, the APE boundary adhered to the 400-foot Study Area due to the LOD's location entirely within the Fernald School Historic District north of Waverley Oaks Road, as well as visibility of the site from commercial development on the south side of the road, which includes parking lots and access driveways (see **Figure 12-2**). Aboveground historic resources that are located within the Lower Fernald Property site APE are included in **Table 12-2**.

Table 12-2 Aboveground Historic Properties Within the APE of the Lower Fernald Property Site

MHC #	Property Name [1]	Address	Date	Designation(s)
WLT.AB	Walter E. Fernald State School	200 Trapelo Road	ca. 1888-1980	NRDIS, NRMPS
WLT.AW	Waverley Oaks – Beaver Brook Reservation	N/A	ca. 1892-1893	INV

Source: Massachusetts Cultural Resource Information System (MACRIS).
NRDIS: National Register of Historic Places, District Listing
NRMPS: National Register Multiple Property Submission
INV: Inventory of Historic and Archaeological Assets of the Commonwealth

1 The table lists resources included in the MACRIS that are within the APE, but only properties and districts that are listed in, or eligible for listing in, the State/National Register(s) are included in the discussion below.

Walter E. Fernald State School (WLT.AB)

The Walter E. Fernald School (Fernald School) was founded by Boston reformer Samuel Gridley as the Massachusetts School for Idiotic and Feeble-Minded Youth in 1848. It was listed in the National Register in 1994 as part of the National Register Multiple Property Submission (NRMPS) for Massachusetts State Hospitals and State Schools. The Fernald School was listed in the National Register under Criteria A, B, and C, with Areas of Significance in Architecture, Health/Medicine, and Social History. The Historic District's period of significance extends from 1888, when construction of the Waltham campus began, to 1940, when the efficacy of the Massachusetts State Hospital and School System was called into question and its size began to decrease.

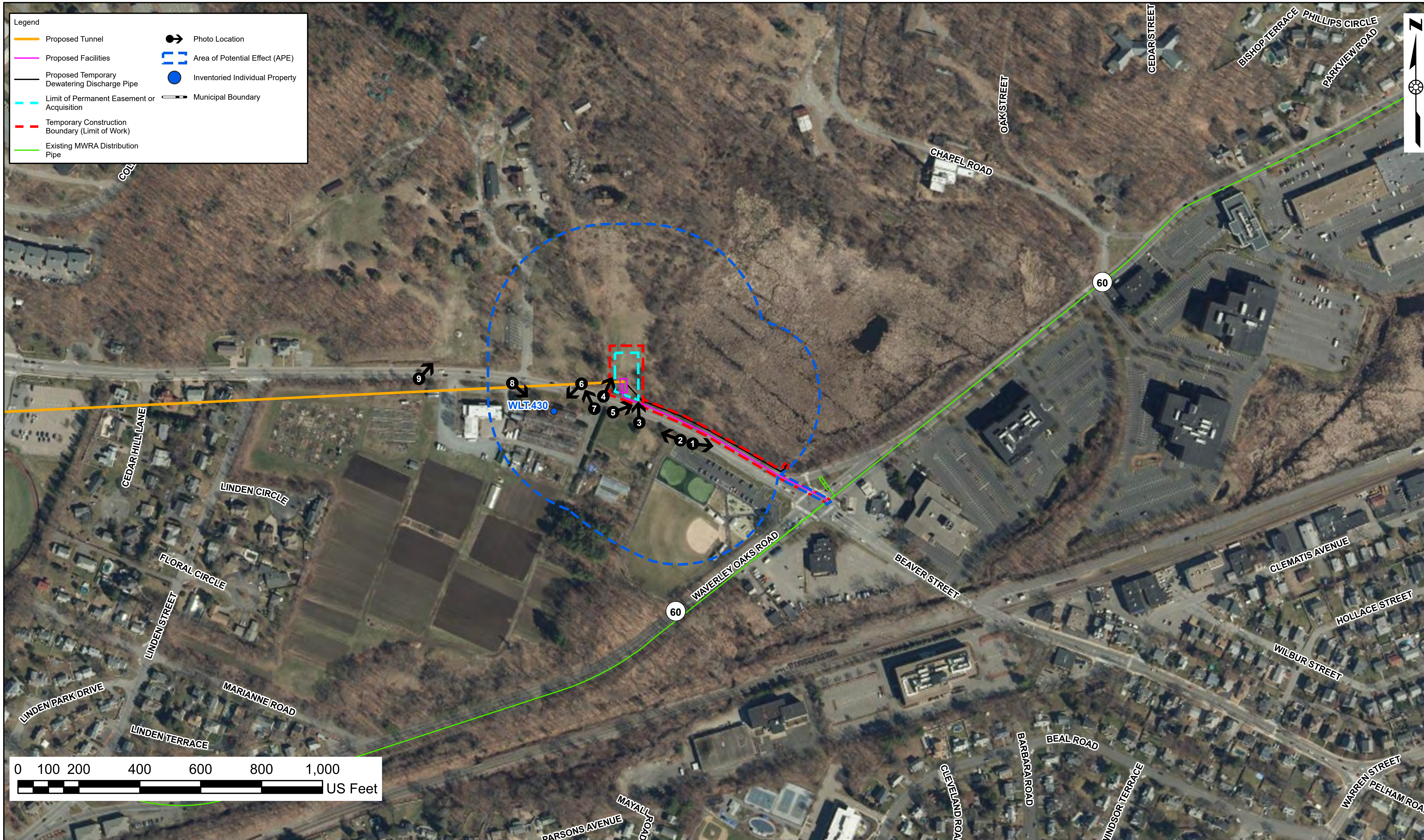
Individual contributing and noncontributing resources within the Fernald School Historic District (WLT.AB) that are also in the Lower Fernald Property site APE are listed in **Table 12-3**. Some are within or adjacent to the Program's temporary construction area LOD, while others are within the 400-foot visual effects buffer.

Table 12-3 Individual Resources within the Lower Fernald School APE and the Walter E. Fernald State School Historic District (WLT.AB)

MHC #	Property Name	Date of Construction	In or Adjacent to Limits of Work	Contributing to Historic District	Proposed for Demolition
WLT.731	Cottage #17 – Staff Residence	1925	No	Yes	No
WLT.732	Cottage #18 – Staff Residence	1925	No	Yes	No
WLT.733	Cottage #19 – Staff Residence	1925	Yes	Yes	Yes
WLT.734	Cottage #20 – Staff Residence	1925	Yes	Yes	Yes
WLT.739	Greenhouse	ca. 1940	No	No	No
WLT.740	Electric Substation	ca. 1960	No	No	No
WLT.759	Wallace Hall	1936	No	Yes	No
WLT.768	Garage	ca. 1950	No	No	No
WLT.769	Garage	ca. 1930	Yes	Yes	No
WLT.770	Garage	1955	Yes	No	Yes
WLT.788	Shed	ca. 1970s	Yes	No	No
WLT.789	Concrete Shed	ca. 1970s	No	No	No
WLT.935	Power Plant	1921	No	Yes	No

Source: Massachusetts Cultural Resource Information System (MACRIS).

Five resources within the APE were constructed after the period of significance and are therefore noncontributing, including two ca. 1950s garages (WLT.768, WLT.770), two ca. 1970s sheds (WLT.788, WLT.789), and one ca. 1960 electric substation (WLT.740). One ca. 1940 greenhouse (WLT.739) was listed as noncontributing in the nomination and is presumed to have been constructed after the period of significance.



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Cultural and Historic Resources

UMass Property Large Connection Shaft Site (Alternatives 3A and 4A)

Figure 12-1

Waltham, MA

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS

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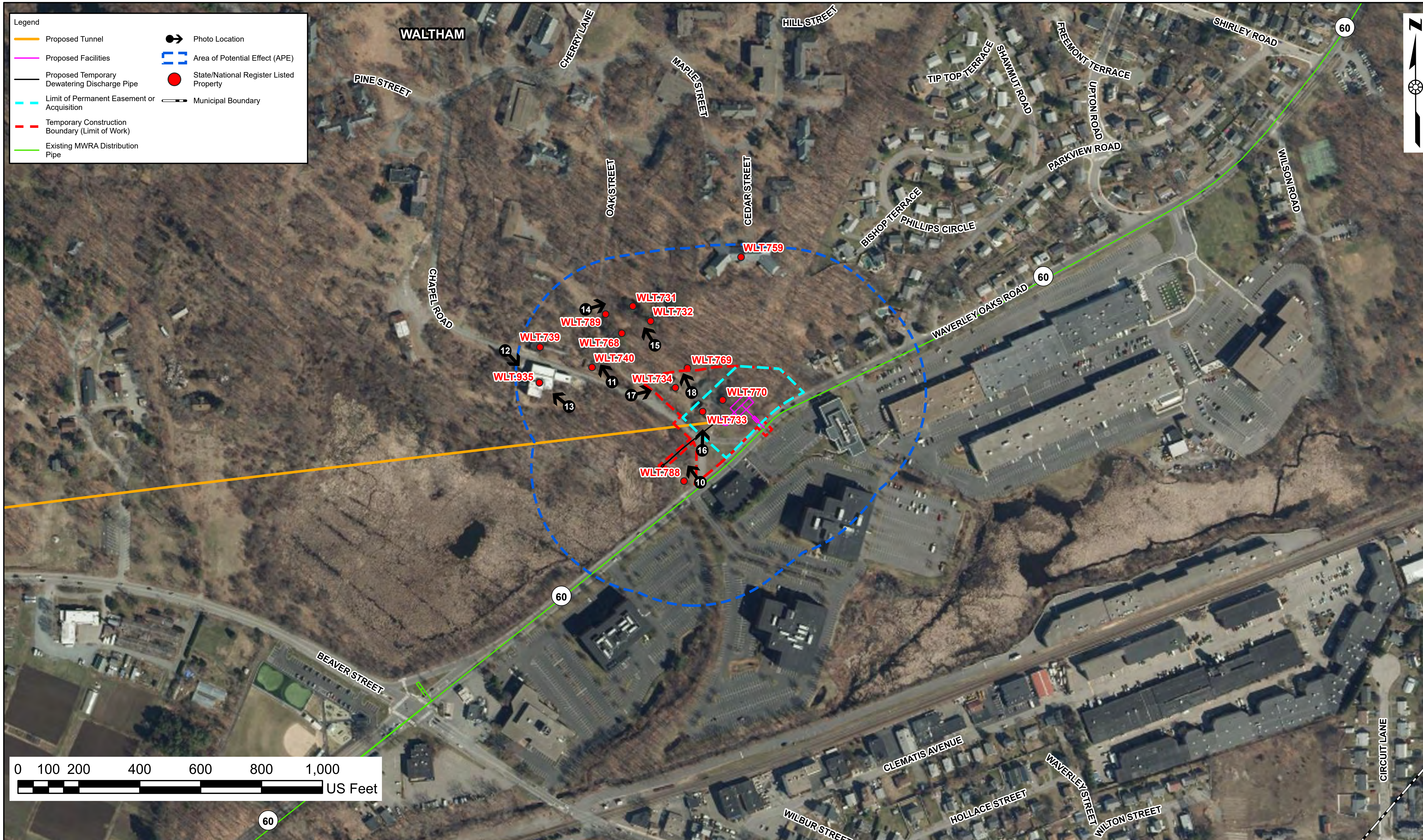

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CDM Smith in association with vhb
Jacobs GREEN

Cultural and Historic Resources
Lower Fernald Property Receiving Shaft Site (Alternative 10A)
Figure 12-2

Waltham, MA

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS

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12.2.2 Cultural and Historic Resources Construction Period Impacts

As described in the **DEIR Section 4.7.5, Construction Period Impacts, (pg. 4.7-48)** resources that are listed in or eligible to be listed in the State/National Registers, and that may be subject to physical, direct temporary impacts such as vibration, and non-physical, indirect temporary impacts such as noise, have been identified and evaluated for potential effects.

Predictions of potential noise and vibration effects on historic properties were based on the methods described in **SDEIR Chapter 11, Noise and Vibration**. Noise and vibration levels due to Program-related construction activities are expected to be below applicable significance thresholds at historic properties and no significant impacts are anticipated[2] (see **SDEIR Chapter 11, Noise and Vibration**). The MWRA will conduct vibration monitoring during construction and temporary noise and vibration levels would be minimized through the implementation of proper monitoring controls and construction best practices.

12.2.2.1 Alternative 3A/Alternative 4A Construction Period Impacts

The Program is not anticipated to cause any adverse construction-period impacts on historic resources in SDEIR Alternative 3A or 4A.

UMass Property

There are no aboveground historic properties that are listed in or eligible for listing in the State/National Registers within the APE of the UMass Property site. Therefore, no construction-period impacts to aboveground historic resources are anticipated at this location.

Archaeological investigations of this site are planned. If significant archaeological resources are identified, coordination and consultation with the MHC and appropriate Tribes will identify ways to avoid, minimize, or mitigate adverse effects to those resources.

12.2.2.2 Alternative 10A Construction Period Impacts

No temporary construction-period impacts to historic resources are anticipated in SDEIR Alternative 10A (direct/physical impacts to the Fernald School Historic District (WLT.AB) associated with the Lower Fernald Property site in SDEIR Alternative 10A are considered permanent in nature as discussed in **SDEIR Section 12.2.3**).

2 Direct/physical impacts to the Walter E. Fernald State School Historic District (WLT.AB) are considered long-term and are discussed in **SDEIR Section 12.2.3**.

Lower Fernald Property

As shown in **Table 12-3**, three buildings within the Fernald School Historic District (WLT.AB) are located within the construction area LOD and are proposed for demolition:

- Cottage #19 – Staff Residence (WLT.733; Contributing to Historic District; **SDEIR Appendix G** Photograph 16)
- Cottage #20 – Staff Residence (WLT.734; Contributing to Historic District; **SDEIR Appendix G** Photograph 17)
- Circa 1955 garage (WLT.770; Non-Contributing; **SDEIR Appendix G** Photograph 16)

For the purposes of this evaluation, direct/physical impacts to the Fernald School Historic District (WLT.AB) are considered permanent in nature as discussed in **SDEIR Section 12.2.3**.

Vibration monitoring will be conducted during construction and temporary noise and vibration levels would be minimized through the implementation of proper monitoring controls and construction best practices. Thus, no temporary construction-period impacts to historic resources are anticipated at the Lower Fernald Property site.

12.2.3 Cultural and Historic Resources Final Conditions

Impacts that are relevant at each property would be dependent on the nature of the proposed work to be carried out at the nearby site. The discussion of potential permanent impacts has been limited to properties that have been listed in or are considered eligible for listing in the State/National Registers; long-term impacts to properties that are not listed or eligible for the State/National Registers are not discussed. The analysis is also separated into two categories: direct/physical (from new construction) and indirect/nonphysical (visual). As discussed in **SDEIR Section 11.2.3, Noise Final Conditions**, and **SDEIR Section 11.3.3, Vibration Final Conditions**, no long-term operational noise or vibration impacts are anticipated and therefore noise and vibration impacts would not be considered to cause permanent impacts.

12.2.3.1 Alternative 3A/Alternative 4A Final Conditions

The Program is not anticipated to cause any permanent, direct adverse impacts to historic properties in SDEIR Alternative 3A or 4A.

UMass Property

Direct/Physical Impacts

No historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at the UMass Property site (see **Figure 12-1**). Therefore, no permanent, direct impacts to aboveground historic resources are anticipated at this location. As noted in **SDEIR Section 12.2.2.1**, an archaeological assessment is planned.

12.2.3.2 Alternative 10A Final Conditions

Table 12-4 summarizes potential permanent, direct effects to historic properties in SDEIR Alternative 10A. As shown, in SDEIR Alternative 10A, the Program would physically impact the Fernald School Historic District (WLT.AB) due to Program activities at the Lower Fernald Property site.

Table 12-4 Permanent, Direct Impacts to Historic Properties, SDEIR Alternative 10A

Program Site	Historic Resource	MHC No.	Designation	Direct Impacts
Lower Fernald Property Site	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	Adverse Effect

NRDIS: National Register of Historic Places, District Listing
NRMPS: National Register Multiple Property Submission

Lower Fernald Property

Direct/Physical Impacts

There are 13 individual resources within both the Lower Fernald Property site APE and the Fernald School Historic District (WLT.AB), seven of which are contributing. Of the seven contributing resources within the APE, two are within the LOD and would be directly impacted by demolition (see **Figure 12-2** and **Table 12-3**). The contributing buildings that would be demolished in SDEIR Alternative 10A include two staff residences (1925; WLT.733 and WLT.734; **SDEIR Appendix G** Photographs 16-17). A concrete block garage is also proposed for demolition but is not a contributing resource (1955; WLT.770; **SDEIR Appendix G** Photograph 18). Thus, the Program would have a permanent, direct adverse effect on the Fernald School Historic District (WLT.AB).

12.2.4 Cultural and Historic Resources Avoidance, Minimization, and Mitigation Measures

No historic resources were identified for SDEIR Alternatives 3A and 4A. As stated in **SDEIR Section 12.2.3**, resources in the Lower Fernald Property site APE that contribute to the Walter E. Fernald State School Historic District (WLT.AB) would be directly (physically) affected by the Program in SDEIR Alternative 10A.

12.2.4.1 Alternative 3A/Alternative 4A

SDEIR Alternatives 3A and 4A are not anticipated to have any permanent, direct effects on cultural or historic resources.

12.2.4.2 Alternative 10A

In SDEIR Alternative 10A, the proposed demolition of two contributing resources within the Walter E. Fernald State School Historic District (WLT.AB) would result in a direct adverse effect on the Historic District. This impact, however, would be minimized by the specific location of the buildings proposed for demolition, which is away from the Walter E. Fernald State School and the core of the associated Historic

District (see **Figure 12-2**). Program-related activities would not jeopardize the listing of the Walter E. Fernald State School Historic District (WLT.AB). As described in **DEIR Appendix E, Historic/Cultural Resources Supporting Documentation, E.1, Agency Correspondence**, the MWRA will continue to work with the MHC as appropriate to identify ways to avoid, minimize, or mitigate the adverse effects to the Walter E. Fernald State School Historic District (WLT.AB) under SDEIR Alternative 10A, should this alternative be selected.

12.3 Technical Analysis to Respond to Comments

No comments specific to historic or archaeological cultural resources were received on the DEIR. See **SDEIR Chapter 15, Responses to Comments,** for the full list of delineated comments received on the DEIR.

13 Hazardous Materials, Materials Handling, and Recycling

13.1 Introduction

This chapter of the Supplemental Draft Environmental Impact Report (SDEIR) includes an assessment of hazardous materials, materials handling, and recycling associated with the two new alternative sites considered for the terminus of the North Tunnel, Segment 1, in place of the Fernald Property receiving shaft site that was previously evaluated in the Draft Environmental Impact Report (DEIR). The University of Massachusetts (UMass) Property large connection shaft site is included in SDEIR Alternatives 3A and 4A, and the Lower Fernald Property receiving shaft site is included in SDEIR Alternative 10A. All other sites associated with the SDEIR Alternatives remain unchanged from the DEIR. Updates to existing conditions, construction period impacts, and final conditions are provided for the two new alternative sites.

No comments related to hazardous materials, materials handling, and recycling were received in the Secretary's Certificate on the DEIR, issued on December 16, 2022. See **SDEIR Chapter 15, Responses to Comments**, for the full list of delineated comments received on the DEIR.

13.1.1 Summary of Findings

Key findings related to hazardous materials, materials handling, and recycling are listed below. Key findings associated with the two new alternative sites considered in the SDEIR for the terminus of the North Tunnel, Segment 1 in place of the DEIR Fernald Property receiving shaft site include:

- At the UMass Property site (SDEIR Alternatives 3A and 4A), six state-listed disposal sites indicated to have residual contamination were identified in the Study Area, with one located in the temporary construction area limit of disturbance (LOD). At the Lower Fernald Property site (SDEIR Alternative 10A), 13 state-listed disposal sites were identified (12 of which are indicated to have residual contamination), with none located in the LOD.
- Based on the existing conditions assessment, and as assumed for the DEIR Fernald Property site, a U.S. Environmental Protection Agency (USEPA) National Pollutant Discharge Elimination System (NPDES) Dewatering and Remediation General Permit (DRGP) would likely be required at the UMass Property site in SDEIR Alternatives 3A and 4A, or at the Lower Fernald Property site in SDEIR Alternative 10A.

Key findings associated with the three SDEIR Alternatives, which are consistent with the findings of the three DEIR Alternatives, include:

- State-Listed Disposal Sites within the Study Area of Program sites with the potential to impact soil or groundwater varies among the SDEIR Alternatives; 31 sites are within the Study Area of

SDEIR Alternative 3A, 29 sites are within the Study Area of SDEIR Alternative 4A, and 34 sites are within the Study Area of SDEIR Alternative 10A.

- Excavated material removed from the tunnel during Program construction and disposed off-site is anticipated to total approximately 941,000 cubic yards in SDEIR Alternatives 3A and 4A, and approximately 955,000 cubic yards in SDEIR Alternative 10A.
- The Program may have a positive effect on confirmed areas of soil and groundwater contamination within the LOD, since environmental media (i.e., soil and groundwater) that would otherwise remain undisturbed would be appropriately managed to minimize exposures to surrounding receptors.
- Excess soil generated as part of the Program that is determined to be unimpacted (i.e., concentrations of petroleum and/or hazardous substances are below the applicable Massachusetts Contingency Plan [MCP] standards) will be reused to the extent possible. Soil reuse would minimize the potential impacts associated with off-site disposal, including vehicle emissions, fuel consumption, and landfill capacity restraints. Soil that cannot be reused as part of the Program would be excavated and disposed of off-site at approved and licensed sites identified by the contractor.
- Detailed in **SDEIR Section 13.2.4**, avoidance, minimization, and mitigation measures would include:
    - A Program-wide Soils and Materials Management Plan (SMMP) would be developed during final design to manage contaminated materials encountered during construction.
    - Potentially hazardous building materials may be encountered during construction and demolition activities, including asbestos, lead-based paint, mercury, and polychlorinated biphenyls (PCB). Prior to demolition, a licensed hazardous materials contractor would conduct sampling of any suspect materials. If these hazardous materials were found to be present in the structures, they would be removed in accordance with state regulations by a licensed contractor and disposed of at a licensed receiving facility.
    - Contaminated groundwater encountered during Program construction would be managed in accordance with applicable regulations. A USEPA NPDES Construction General Permit (CGP) or USEPA DRGP would be required to discharge to surface waters. A DRGP may be required during construction dewatering where groundwater is suspected or confirmed to be impacted.
    - Construction workers performing any necessary response actions would have the appropriate health and safety training in accordance with the U.S. Department of Labor Occupational Safety and Health Administration (OSHA).

13.2 Hazardous Materials, Materials Handling, and Recycling Impact Assessment

The following discusses the impact analysis for hazardous materials, materials handling, and recycling associated with the two new alternative sites considered for the terminus of the North Tunnel, Segment 1, in place of the DEIR Fernald Property site: the UMass Property site in SDEIR Alternatives 3A and 4A, and the Lower Fernald Property site in SDEIR Alternative 10A.

13.2.1 Hazardous Materials, Materials Handling, and Recycling Existing Conditions

Disposal sites are regulated under the MCP. As part of the existing conditions assessment, the Massachusetts Department of Environmental Protection (MassDEP) Bureau of Waste Site Cleanup (BWSC) database of disposal sites and the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA) Waste Site Cleanup File Viewer were reviewed to identify reported petroleum and/or hazardous substance concerns near the temporary construction area LOD and the limits of permanent easements. The presence of a state-listed disposal site indicates that a release of Oil and Hazardous Material (OHM) was reported to the MassDEP. Approximate disposal site location information was determined using the MassDEP and EEA databases and online mapping services, which may not always be accurate and should be considered a general estimate.

The presence of a disposal site indicates that petroleum and/or hazardous substances may be present in the soil and/or groundwater; therefore, special consideration would be taken during construction to properly manage these materials to prevent adverse impacts. Information on the sites is summarized in the following section.

13.2.1.1 Alternative 3A/Alternative 4A Existing Conditions

UMass Property

Six state-listed disposal sites were identified in the Study Area associated with the proposed UMass Property site (disposal sites within 500 feet of the construction area LOD). The disposal sites are listed in **Table 13-1** and shown on **Figure 13-1**. One of these sites is located within the LOD of the UMass Property site.

Table 13-1 Disposal Sites in the UMass Property Site Study Area

Release Tracking Number (RTN)	Site Name/Location Aid	Address	Regulatory Status [1]	Distance to UMass LOD
3-28049	University of Massachusetts (UMass)	225-227 Beaver Street	Temporary Solution	Within LOD
3-28048	UMass	240 Beaver Street	Class B1 Response Action Outcome (RAO)	Abutting to the south
3-15883	UMass	240 Beaver Street	Class A2 RAO	Abutting to the south
3-13458	Gas Station	277 Waverley Oaks Road	Class A2 RAO	70 feet
3-29921 & 3-27761	Gas Station	225 Waverley Oaks Road	Class A2 RAO	70 feet

Sources: Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, Waste Site / Reportable Release File Viewer, Version 2.3.8, 2016, http://eeaonline.eea.state.ma.us/DEP/wsc_viewer/main.aspx; Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs Data Portal, Waste Site Cleanup File Viewer, Search for Waste Site & Reportable Releases, 2018, https://eeaonline.eea.state.ma.us/portal#!/search/wastesite.

1 RAO classes have been discontinued as part of the 2014 MCP regulatory changes; however, disposal sites that achieved regulatory closure prior to the 2014 regulatory updates still maintain their RAO closure status. Different RAO classes indicate the conditions of the regulatory closure and the type of response actions performed (if any). For more information, see pages 6 and 7 of EEA's "MassDEP Waste Site / Reportable Releases Look Up Tool Definitions of Fields Listed in Search Results," updated August 9, 2017, https://www.mass.gov/files/2017-08/MassDEP%20Waste%20Site%20-%20Reportable%20Release%20Look%20Up%20Terms.pdf.

Based on a review of the MassDEP online disposal site files and the EEA Waste Site Cleanup File Viewer, the regulatory closure status of all six disposal sites indicate that residual contamination may be present. Residual contamination, if present, must be managed appropriately during construction. A summary of the disposal sites with Release Tracking Numbers (RTNs) within the Study Area associated with the UMass Property site are provided below:

- **University of Massachusetts, 225-227 Beaver Street, RTN 3-28049, Within the LOD**: Elevated concentrations of lead and cadmium were detected in soil and wetland sediment as well and cadmium in groundwater in October 2008. RTN 3-28049 was assigned to the disposal site. The source of metals was reportedly due to the disposal of approximately 60 to 70 tons of municipal incinerator ash residue on the property. Response actions are ongoing, and the disposal site has a Temporary Solution regulatory status, which means that achieving a Permanent Solution is not currently feasible. The exact limits of the disposal site are unclear based on available documentation. According to the latest regulatory documentation, fly ash was disposed near the LOD associated with the UMass Property site (see **SDEIR Figure 13-1**). Although the fly ash area is fenced in, there is the potential that fly ash extends into the LOD.
- **University of Massachusetts, 240 Beaver Street, RTN 3-28048, Abutting the LOD to the South**: In 2008, concentrations of petroleum hydrocarbons were detected in soil and groundwater in the vicinity of a boiler house at 240 Beaver Street and assigned RTN 3-28048. In October 2008, a Class B-1 Response Action Outcome (RAO) Statement was submitted for RTN 3-28048 indicating a

Condition of No Significant Risk existed and no response actions were performed. Therefore, residual petroleum constituents remain in soil and groundwater at the disposal site.

- **University of Massachusetts, 240 Beaver Street, RTN 3-15883, Abutting the LOD to the South:** In January 1998, a release of approximately 200 gallons of gasoline occurred from an underground storage tank (UST). Response actions included the removal of the UST and associated petroleum-impacted soils. Groundwater was also impacted by the release. In December 2001, a Class A-2 RAO Statement was submitted under RTN 3-15883 indicating that a Condition of No Significant Risk was achieved; however, residual concentrations of petroleum constituents remained in soil and groundwater. According to the closure documentation, groundwater at the property flows to the south.
- **Gas Station, 225 & 277 Waverley Oaks Road, RTNs 3-13458, 3-29921 & 3-27761, Approximately 70 feet from the LOD**: In February 1996, a sudden release of approximately 100 to 150 gallons of gasoline occurred at the above-noted gas station at 277 Waverley Oaks Road and RTN 3-13458 as assigned to the release condition. The release impacted nearby stormwater catch basins which were subsequently cleaned as part of response actions. In February 1997, a Class A-2 RAO Statement was submitted for the disposal site under RTN 3-13458 indicating a Condition of No Significant Risk was achieved; however, residual petroleum constituents remained in soil. Groundwater was reportedly not impacted by the release. In July 2008, elevated concentrations of petroleum constituents in soil and methyl tert-butyl ether (MTBE) in groundwater at the above-noted property were identified in excess of the applicable reportable concentrations. The release was reported to MassDEP and RTN 3-27761 was assigned to the disposal site. During response actions under RTN 3-27761, a related release was identified during the removal of a UST and secondary RTN 3-29921 was assigned to the disposal site. Secondary RTN 3-29921 was linked to primary RTN 3-27761, and all response actions were conducted under the primary RTN. In December 2011, a Class A-2 RAO Statement was submitted for the disposal site under RTN 3-27761 indicating a Condition of No Significant Risk was achieved; however, residual concentrations of petroleum constituents remained in soil and groundwater at the disposal site.

13.2.1.2 Alternative 10A Existing Conditions

Lower Fernald Property

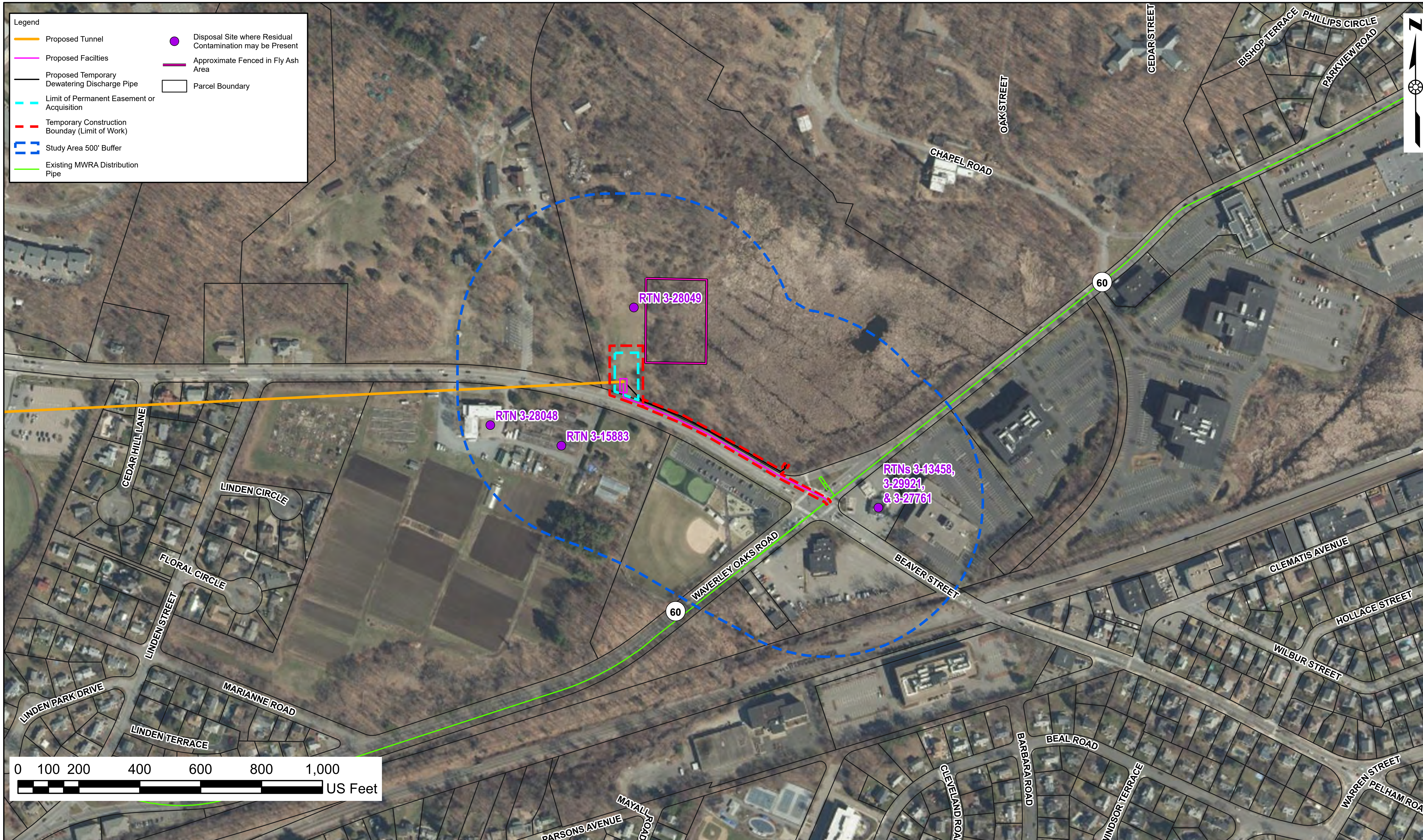
Thirteen state-listed disposal sites were identified in the Study Area associated with the proposed Lower Fernald Property site (disposal sites within 500 feet of the construction area LOD). The disposal sites are listed in **Table 13-2** and shown on **Figure 13-2**.

Table 13-2 Disposal Sites in the Lower Fernald Property Site Study Area

Release Tracking Number (RTN)	Site Name/Location Aid	Address	Regulatory Status [1]	Distance to the Lower Fernald Property Site LOD
3-28049	University of Massachusetts	225-227 Beaver Street	Temporary Solution Statement	500 feet
3-10367	Within Complex on Chapel Street at Power Plant	200 Trapelo Road	Class C1 RAO	200 Feet
3-10725	Fernald State School	200 Trapelo Road	Class A2 RAO	370 Feet
3-13467	Power Plant Near Waverley Oaks Entrance	200 Trapelo Road	Class A3 RAO	200 Feet
3-15442	Powerplant	200 Trapelo Road	Class A2 RAO	400 Feet
3-15149	Powerplant	200 Trapelo Road	Class B1 RAO	300 Feet
3-18952	No Location Aid	313 Waverley Oaks Road	RTN Closed	500 Feet
3-20538	UTM 4694592N 318350E	313 Waverley Oaks Road	RTN Closed	250 Feet
3-3078	Former Shell Product Dist. Plant	313 Waverley Oaks Road	Class A3 RAO	150 Feet
3-11878	Rear Gate Waverley Oaks Road	200 Trapelo Road	Class A1 RAO Statement	150 Feet
3-454	Duffy Brothers Construction	411 Waverley Oaks Road	Class C2 RAO	150 Feet
3-10717	Rear Area of Site	411 Waverley Oaks Road	Class A2 RAO	150 Feet
3-31506	No Location Aid	411 Waverley Oaks Road	Permanent Solution No Conditions	150 Feet

Sources: Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, Waste Site / Reportable Release File Viewer, Version 2.3.8, 2016, http://eeaonline.eea.state.ma.us/DEP/wsc_viewer/main.aspx; Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs Data Portal, Waste Site Cleanup File Viewer, Search for Waste Site & Reportable Releases, 2018, https://eeaonline.eea.state.ma.us/portal#!/search/wastesite.

1 RAO classes have been discontinued as part of the 2014 MCP regulatory changes; however, disposal sites that achieved regulatory closure prior to the 2014 regulatory updates still maintain their RAO closure status. Different RAO classes indicate the conditions of the regulatory closure and the type of response actions performed (if any). For more information, see pages 6 and 7 of EEA's "MassDEP Waste Site / Reportable Releases Look Up Tool Definitions of Fields Listed in Search Results," updated August 9, 2017, https://www.mass.gov/files/2017-08/MassDEP%20Waste%20Site%20-%20Reportable%20Release%20Look%20Up%20Terms.pdf.



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Hazardous Materials, Materials Handling, and Recycling
UMass Property Large Connection Shaft Site (Alternatives 3A and 4A)
Figure 13-1

Waltham, MA

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS

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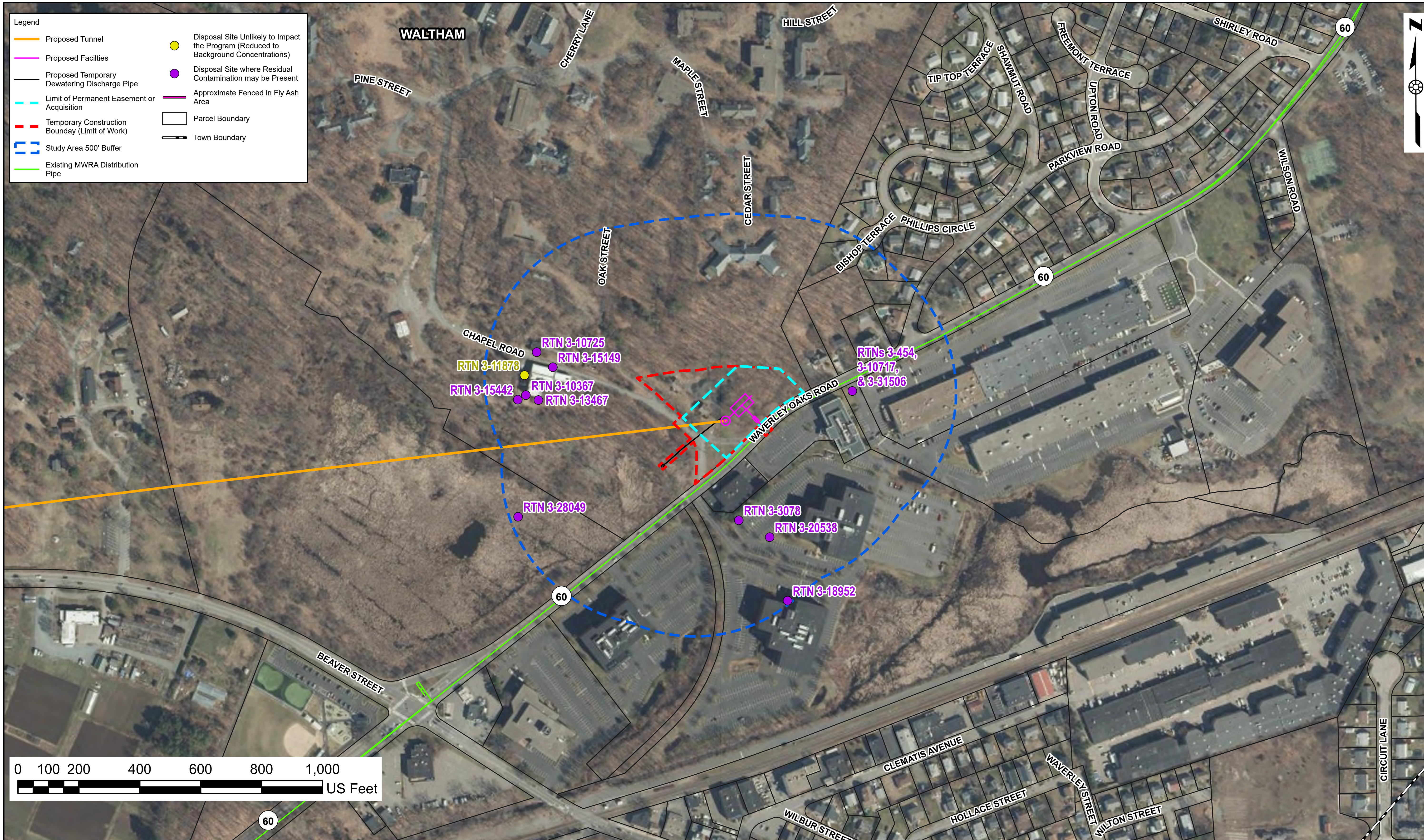

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Hazardous Materials, Materials Handling, and Recycling
Lower Fernald Property Receiving Shaft Site (Alternative 10A)
Figure 13-2

Waltham, MA

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS

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Based on a review of the MassDEP online disposal site files and the EEA Waste Site Cleanup File Viewer, the regulatory closure status of 12 of the 13 disposal sites indicates that residual contamination may be present. Should residual contamination be present, it must be managed appropriately during construction. A summary of the disposal sites within the Study Area associated with the proposed Lower Fernald Property site are provided below:

- **Fernald State School, 200 Trapelo Road**: The following five disposal sites with RTNs are documented between 200 and 500 feet from the Lower Fernald Property site LOD:
    - **RTN 3-10725:** This RTN was assigned to a Threat of Release due to two failed UST tightness tests indicating a possible release from the tanks. The release achieved regulatory closure in June 2000 through the submittal of a Class A2 RAO Statement; however, residual concentrations of petroleum constituents remained in the soil at the site.
    - **RTN 3-15149:** In May 1997, a release of gasoline was identified during the removal of a UST. Regulatory closure was achieved through the submittal of a Class B1 RAO Statement in July 1997; however, residual concentrations of petroleum constituents remained in the soil.
    - **RTN 3-10367**: A suspected release of approximately 15 to 20 gallons of No. 6 fuel oil from three USTs was identified in December 1993. Upon further assessment, separate phase petroleum product was observed in a brook approximately 300 feet downgradient from the original release area. In June 2002, a Class C2 RAO Statement was submitted for the disposal site, indicating that response actions are ongoing. Limited documentation was available regarding the status of response actions, the extents of the disposal site boundary, or recent separate phase petroleum product measurements. In addition, there has not been a recent review of the Class C RAO/Temporary Solution, which is required every five years. Although unclear, it is possible that this disposal site may have been addressed under RTN 3-13467.
    - **RTN 3-13467**: In February 1996, a second release of No. 6 fuel oil was identified that had resulted from leaking USTs on the property. The release impacted an adjacent stream. In March 2008, regulatory closure was achieved through the submittal of a Class A3 RAO Statement, including the implementation of an Activity and Use Limitation (AUL) (i.e., deed restriction) due to residual concentrations of petroleum constituents in the soil above certain risk-based thresholds. Although not formally linked, based on the discussion of RTN 3-10367 under the RAO Statement for RTN 3-13467, it is likely that impacts from both releases were addressed under RTN 3-13467.
    - **RTN 3-15442**: In August 1997, a release of approximately 100 gallons of No. 6 fuel oil occurred at the property. The release achieved regulatory closure in October 1997 through the submittal of a Class A2 RAO Statement; however, residual concentrations of petroleum constituents remained in the soil at the disposal site.

- **Former Shell Product Plant, 313 Waverley Road, RTNs 3-18952, 3-20538, and 3-3078, Between 150 and 250 feet south of the LOD**: Between 1939 and 1992, this property operated as a Shell Bulk Oil Storage facility, which involved the storage of various petroleum products. Primary RTN 3-3078 was assigned to the disposal site in January 1993. Secondary RTNs 3-18952 and 3-20538 were assigned in November 1999 and March 2001, due to the observation of petroleum product within a catch basin and the detection of lead in the soil. Both secondary RTNs were linked to primary RTN 3-3078, and response actions were conducted under the primary RTN. In August 2004, a Class A3 RAO Statement was submitted for the disposal site indicating regulatory closure was achieved through the implementation of a AUL (i.e., deed restriction) to reduce future exposures to the residual concentrations of metals and petroleum constituents present in the soil.

- **Duffy Brothers Construction, 411 Waverley Oaks Road, RTNs 3-454, 3-10717, and 3-31506, approximately 150 feet west of the LOD**: RTN 3-454, assigned in May 1990, is associated with waste oil that has been detected in the subsurface including non-aqueous phase liquid (NAPL) associated with the previous waste oil management activities that occurred at the property until 1973. Extensive MCP assessments have been conducted at the disposal site to assess the nature and extent of NAPL in the subsurface.
    - In February 1996, a Partial Class B-1 RAO Statement was submitted for two parcels associated with the disposal site identified as Parcels 2 and 3 indicating that no response actions were required because a Condition of No Significant Risk exists. In August 2008, a Partial Class C RAO Statement was submitted for two additional parcels associated with the disposal Site identified as Parcels 2 and 3 indicating that although there was no Substantial Hazard, additional response actions were required to achieve a Condition of No Significant Risk. In October 2019, a Permanent Solution Statement with Conditions was submitted for Parcels 2 and 3 indicating that a Condition of No Significant Risk was achieved with the implementation of an AUL on only Parcels 2 and 3 associated with the disposal site. The wetland area at the disposal site remains in a Temporary Solution status and response actions are ongoing.
    - In March 1994, a release of between 10 and 30 gallons of PCB-containing waste oil reportedly occurred to the rear area of the property and RTN 3-10717 was assigned to the release. Minimal information was obtained regarding the location of the response actions performed for this release; however, in May 1994 a Class A-2 RAO Statement was submitted for the disposal site indicating a Condition of No Significant Risk was achieved, and residual concentrations of contaminants remained in soil and/or groundwater.
    - During assessment activities under RTN 3-454, indoor air sampling conducted in May 2013 detected concentrations of trichloroethene (TCE) in excess of the Commercial/industrial Threshold values and RTN 3-31506 was assigned to the new release condition. Upon further assessment, the source of the TCE in indoor air was determined to be from the storage of chemicals in the building and did not represent a completed vapor intrusion pathway. Therefore, in May 2014, a Class B-1 RAO Statement was submitted for the disposal site under RTN 3-31506 indicating that a Condition of No Significant Risk existed, and no response actions were required.

- **University of Massachusetts, 225-227 Beaver Street, RTN 3-28049, Approximately 500 feet west of the LOD**: Elevated concentrations of lead and cadmium were detected in soil and wetland sediment as well and cadmium in groundwater in October 2008 at the above-noted property, and RTN 3-28049 was assigned to the disposal site. The source of metals was reportedly due to the disposal of approximately 60 to 70 tons of municipal incinerator ash residue on the property. Response actions are ongoing, and the disposal site is regulated under a Temporary Solution where the exact limits of the disposal site are unclear based on available documentation.

- The remaining disposal site associated with RTN 3-11878 is associated with a Class A1 RAO Statement, where concentrations of petroleum and/or hazardous substances were reduced to background conditions.

13.2.2 Hazardous Materials, Materials Handling, and Recycling Construction Period Impacts

During tunnel excavation, a large volume of rock and excavated material would be generated that would require proper management during construction. Excess soil generated as part of the Program that is determined to be unimpacted (i.e., concentrations of petroleum and/or hazardous substances are below the applicable MCP standards) will be reused to the extent possible. Soil reuse would minimize the potential impacts associated with off-site disposal, including vehicle emissions, fuel consumption, and landfill capacity restraints. The contractor would be responsible for finding suitable locations for reuse or disposal of excavated material from the tunnel excavation; however, the Program-wide SMMP will require that the contaminated materials excavated as part of the Program be disposed of at licensed disposal facilities. Protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so that it can be handled appropriately and disposed of at suitable locations. Most of the excavated material from all three SDEIR Alternatives is anticipated to be clean, crushed rock, which could be reused beneficially at other locations that will be identified in a Program-wide SMMP.

In all three SDEIR Alternatives, the tunnel alignment would be located between approximately 200 and 400 feet below ground surface within the rock. Based on its depth, the excavated material is unlikely to be contaminated by anthropogenic (human-made) sources; however, naturally occurring contaminants, such as asbestos-containing rock and arsenic, may be present, which would require proper management. Excavated material will be tested as needed following removal to determine potential disposal and/or reuse options. Depending on the composition of the excavated material (igneous and metamorphic rocks are generally preferred), the size and shape of the excavated material (how much post-processing is required), and the timing of its removal, some excavated material could be used for embankment, backfill, paving material, or other uses. There is the potential for naturally occurring contaminants such as asbestos-containing rock and arsenic to be present in the rock, and, therefore, excavated material and groundwater generated during the Program would require proper management in accordance with the applicable regulations (see **SDEIR Section 13.2.4**).

Groundwater dewatering would be required during construction and would require proper management to avoid impacts to the surrounding environment. The proposed construction sites associated with the UMass Property site and the Lower Fernald Property site are near state-listed disposal sites, as discussed in the Existing Conditions assessment in **SDEIR Section 13.2.2**. These state-listed disposal sites have the potential to impact groundwater which if encountered, would require proper management during dewatering efforts. Prior to being discharged, dewatering effluent would be managed in accordance with applicable regulatory requirements, as described in **SDEIR Section 13.2.4**. Therefore, no significant impact from groundwater discharges is anticipated.

Building materials generated during construction would be reused to the extent practicable. Prior to demolition, building materials would be assessed for the presence of hazardous materials to determine proper management protocols (see **SDEIR Section 13.2.4**). Therefore, no significant impact from the generation of building materials is anticipated.

13.2.2.1 Alternative 3A/Alternative 4A Construction Period Impacts

The construction period impacts associated with the UMass Property site (SDEIR Alternatives 3A and 4A) are described below. The construction period impacts associated with all other sites associated with the SDEIR Alternatives remain unchanged from the DEIR. Construction of SDEIR Alternative 3A/Alternative 4A is anticipated to require the removal of approximately 941,000 cubic yards of excavated material from the tunnel that would require off-site disposal or reuse at another location.

UMass Property

A large connection shaft would be constructed at the UMass Property site in SDEIR Alternative 3A or 4A. As part of construction for the large connection shaft, approximately 300 cubic yards of excess soil is anticipated to be generated and excavation associated with surface connections are anticipated to generate approximately 12,000 cubic yards of excess soil. Excess soil generated during shaft construction and surface connections will require off-site disposal or reuse. All volumes of excavated material are presented as bulked cubic yards.

Based on the existing conditions assessment, there are six state-listed disposal sites within the Study Area associated with the UMass Property site, all of which have the potential to impact soil and groundwater within the construction area LOD. According to the latest regulation documentation for RTN 3-8049, fly ash was disposed near the LOD for the UMass Property site and likely extends into the work area (see **Figure 13-1**). Therefore, of the approximately 12,300 cubic yards of soil generated during the construction of the large connection shaft at the UMass Property site, a portion of which would likely contain measurable concentrations of OHM requiring proper management during construction. Soil containing measurable concentrations of OHM will be properly handled and disposed of in accordance with the MCP as further discussed in **DEIR Chapter 4.8, Hazardous Materials, Materials Handling, and Reuse, Section 4.8.2, Regulatory Framework (pg. 4.8-1)**.

During construction, dewatering effluent would be discharged to the wetlands adjacent to the site that drains to Clematis Brook. According to the existing conditions assessment, these wetlands have been previously impacted in association with the disposal site assigned RTN 3-28049. Lead-impacted sediment and soil are reportedly present within the wetlands; the disposal site has not achieved regulatory closure and is regulated under a Temporary Solution status. Therefore, mitigation measures would be implemented during the discharge to these wetlands to avoid exacerbating the contaminated sediments as further discussed in **SDEIR Section 13.2.4**. Due to the potential to encounter impacted groundwater during construction, dewatering effluent treatment and a USEPA NPDES DRGP would likely be required to facilitate discharge. Additionally, coordination with the Licensed Site Professional (LSP) of record for RTN 3-28049 will be conducted prior to conducting any activities within the disposal site.

13.2.2.2 Alternative 10A Construction Period Impacts

The construction period impacts associated with the Lower Fernald Property site (SDEIR Alternative 10A) are described below. The construction period impacts associated with all other sites associated with the SDEIR Alternatives remain unchanged from the DEIR. Construction of SDEIR Alternative 10A is anticipated to require the removal of approximately 955,000 cubic yards of excavated material from the tunnel that would require off-site disposal or reuse at another location.

Lower Fernald Property

A receiving shaft would be constructed at the Lower Fernald Property site in SDEIR Alternative 10A. As part of construction for the receiving shaft, approximately 2,000 cubic yards of excess soil is anticipated to be generated and excavations associated with surface connections are anticipated to generate approximately 3,000 cubic yards of excess soil. Excess soil generated during shaft construction and surface connections will require off-site disposal or reuse at a licensed facility selected by the contractor.

Three buildings within the Lower Fernald Property site LOD would require demolition during construction of the Program. Based on the age of the buildings (i.e., between 1925 and 1970), there is the potential for hazardous building materials to be present such as asbestos containing materials (ACMs), including roof flashing, tiles, and other materials as well as lead-based paint and other hazardous building materials. Therefore, a hazardous building material assessment would be conducted prior to demolition and managed appropriately during construction as described in **SDEIR Section 13.2.4**.

Based on the existing conditions assessment, 13 state-listed disposal sites were identified within the Study Area associated with the Lower Fernald Property site, 12 of which have the potential to impact soil and groundwater within the construction area LOD. Therefore, the approximately 5,000 cubic yards of soil generated during the construction of the receiving shaft at the Lower Fernald Property site would likely contain measurable concentrations of OHM requiring proper management during construction.

During construction, dewatering effluent may be temporarily discharged to the wetlands adjacent to the site that drains to Clematis Brook. According to the existing conditions assessment, these wetlands are associated with the disposal site under RTN 3-28049. Lead-impacted sediment and soil are still present within the wetlands; the disposal site has not achieved regulatory closure and is regulated under a Temporary Solution Statement. Therefore, mitigation measures would be implemented during the discharge to these wetlands to avoid exacerbating the contaminated sediments as further discussed in **SDEIR Section 13.2.4**. Due to the potential to encounter impacted groundwater during construction, dewatering effluent treatment and a USEPA NPDES DRGP would likely be required to facilitate discharge. Additionally, coordination with the LSP-of-record for RTN 3-28049 would be conducted during final design.

13.2.2.3 Comparison of Alternatives

A summary table of the existing conditions at each SDEIR Alternative, and the associated impacts, is provided in **Table 13-3**.

Table 13-3 Summary of Existing Conditions and Construction Period Impacts by Site

		Existing Conditions		Construction Period Impacts	
Proposed Site	**Alternative**	**Total Number of Disposal Sites [1]**	**Disposal Sites with Potential to Impact Soil or Groundwater (Residual Contamination may be Present)**	**Potentially Impacted Groundwater Present and DRGP Potentially Required**	**Potentially Impacted Soil Present**
Launching, Receiving, and Large Connection Shaft Sites					
UMass Property	3A and 4A	6	6	Yes	Yes
Lower Fernald Property	10A	13	12	Yes	Yes
Tandem Trailer and Park Road East	*3A and 4A*	*3*	*1*	*No*	*Yes*
Bifurcation	*3A*	*5*	*3*	*Yes*	*Yes*
Park Road West (Receiving Site and Large Connection)	*4A and 10A*	*2*	*0*	*No*	*No*
Highland Avenue Northwest Site	*3A*	*7*	*5*	*Yes*	*Yes*
Highland Avenue Northwest/Southwest	*4A and 10A*	*8*	*6*	*Yes*	*Yes*
Highland Avenue Northeast/Southeast	*All*	*5*	*4*	*Yes*	*Yes*
American Legion	*All*	*0*	*0*	*No*	*No*
Connection Shaft and Isolation Valve Sites					
School Street	*All*	*4*	*4*	*Yes*	*Yes*
Cedarwood Pumping Station	*All*	*2*	*0*	*No*	*No*
Hegarty Pumping Station	*All*	*0*	*0*	*No*	*No*
St. Mary Street Pumping Station	*All*	*0*	*0*	*No*	*No*
Newton Street Pumping Station	*All*	*7*	*7*	*Yes*	*Yes*
Southern Spine Mains	*All*	*2*	*1*	*No*	*Yes*
Hultman Aqueduct Isolation Valve	*All*	*0*	*0*	*No*	*No*

1 A disposal site is defined in the Massachusetts Contingency Plan (MCP) as the place or area where an uncontrolled release of oil and/or hazardous materials has come to be located.

DRGP: Dewatering and Remediation General Permit

Sources: Commonwealth of Massachusetts, Massachusetts Department of Environmental Protection, Waste Site / Reportable Release File Viewer, Version 2.3.8, 2016, http://eeaonline.eea.state.ma.us/DEP/wsc_viewer/main.aspx; Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs Data Portal, Waste Site Cleanup File Viewer, Search for Waste Site & Reportable Releases, 2018, https://eeaonline.eea.state.ma.us/portal#!/search/wastesite.
Items in italics have not changed since the DEIR.

13.2.3 Hazardous Materials, Materials Handling, and Recycling Final Conditions

The following sections discuss the permanent impacts (final conditions) associated with the construction of the three SDEIR Alternatives. In general, it is anticipated that the Program may have a positive effect on confirmed areas of soil and groundwater contamination within the LOD, since environmental media (i.e., soil and groundwater) that would otherwise remain undisturbed would be appropriately managed to minimize exposures to surrounding receptors.

13.2.3.1 Alternative 3A/Alternative 4A Final Conditions

UMass Property

In the final conditions, ongoing activities at the UMass Property site would include periodic landscaping (e.g., mowing); inspection and maintenance of shafts, valve chambers, and associated utilities; maintenance of access roadways and parking areas (e.g., snow plowing); and maintenance of stormwater management areas. The valve chambers and parking areas would be fenced-in with gated access. None of these activities during tunnel operation would be anticipated to adversely affect hazardous materials.

13.2.3.2 Alternative 10A Construction Final Conditions

Lower Fernald Property

In the final conditions, ongoing activities at the Lower Fernald Property site would be the same as described above for the UMass Property site. The permanent impacts for SDEIR Alternative 10A would be the same as for SDEIR Alternatives 3A and 4A.

13.2.4 Hazardous Materials, Materials Handling, and Recycling Avoidance, Minimization, and Mitigation Measures

Due to the presence of documented releases of oil and/or hazardous materials near and/or within the Lower Fernald Property site and the UMass Property site, and considering the generally developed nature of the Program Area, there is the potential to encounter oil and/or hazardous materials and urban fill that would require special handling and management during construction phases of all SDEIR Alternatives. Spills and leaks associated with vehicles, concrete plants, and heavy machinery would be mitigated through spill response programs that would specify emergency response procedures for spill and leak events. In the unlikely event that a spill or discharge occurred during construction phases of the Program, it may also be necessary to contact regulatory agencies such as the National Response Center, the USEPA, or MassDEP.

13.2.4.1 Management of Impacted Soil

A Program-wide SMMP would be developed during final design to manage contaminated materials encountered during construction. SMMPs provide procedures for materials handling during construction, including procedures for stockpiled or containerized material, and testing procedures for sampling material prior to off-site disposal or on-site reuse. In addition, the contractor would implement Best Management Practices (BMPs) for stockpiles as well as other BMPs developed specifically for construction sites to prevent the potential for cross-contamination and potential exposures to surrounding sensitive receptors such as surface water bodies, wetlands, and nearby residences. These BMPs would be detailed in the site-specific NPDES Stormwater Pollution Prevention Plan (SWPPP) to be developed and implemented by the contractors.

Properties with confirmed OHM impacts would be managed in accordance with the MCP, 310 Code of Massachusetts Regulations (CMR) 40.0000, the Program-wide SMMP, and associated policies or guidance issued by MassDEP. Depending on the type and concentrations of OHM present at a property, other federal regulations implemented by the USEPA may apply (e.g., Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and/or Resource Conservation and Recovery Act).

Preliminary assessment activities would help identify the type and quantity of OHM-impacted media requiring management under these protocols and would help with selecting the optimal disposal methods and/or destination prior to generation. Based on the antidegradation policy and a pre-risk screening, which would be performed by the contractor to determine the risk associated with the existing and foreseeable use of the property, it may be possible to reuse soil that is above the MCP standards within the Program, as long as regulatory endpoints could be met.

Under the MCP, notification to the MassDEP would be required if a reporting condition is identified, such as when OHM is detected in the soil and/or groundwater above the applicable standards, referred to as Reportable Concentrations. Contract documents and the Program-wide SMMP would state that the contractor hire a LSP who would:

- Verify that notification is required
- Further assess and manage the site
- Develop direct response actions
- In accordance with the MCP, specify procedures for work, such as soil excavation, performed in the contaminated areas
- Render appropriate opinions
- Determine if risk reduction measures are required

Based on the concentrations of OHM in the soil, soil shipment documentation (e.g., Bill of Lading, Manifest, Material Shipping Record) would be prepared for soil to be disposed of off-site at an appropriately licensed disposal facility.

Soil and groundwater handling and management during construction would be conducted in accordance with the appropriate submittals (i.e., Release Abatement Measures, Immediate Response Actions, and/or Soil Management Plans), including appropriate permits and permissions. The MWRA would also work with the other Responsible Parties such as property owners and their LSPs that oversee response actions at disposal sites within the Program Areas to coordinate work.

13.2.4.2 Management of Hazardous Building Materials and Demolition Debris

Based on the age of the buildings proposed to be demolished at the Lower Fernald Property site, ACMs, including roof flashing, tiles, and other materials, may be present in the buildings that would be undergoing demolition. Lead-based paint, mercury, and PCBs may also be present in building materials and/or fixtures. Prior to demolition, a licensed asbestos and hazardous materials contractor would sample the building material as well as suspected lead-based paint, mercury, and PCBs. If these hazardous materials were found to be present in the structures, they would be removed in accordance with state regulations by a licensed contractor and disposed of at a licensed receiving facility.

The MWRA would make every effort to reuse building materials, such as asphalt, brick, and concrete—as their reuse could reduce disposal costs and may not require a permit. The reuse would depend on whether they are coated with a contaminant or considered "contaminated" based on the concentrations of contaminants on the material.

The disposal of the ACMs outside the jurisdictional boundaries of the Commonwealth would comply with applicable laws and regulations of the state receiving the material. Pursuant to 310 CMR 16.05, ACMs, including asphaltic asbestos felts or shingles, may not be disposed of at a facility operating as a recycling facility.

13.2.4.3 Management of Impacted Groundwater

Contaminated groundwater encountered during Program construction would be managed in accordance with applicable regulations. A USEPA NPDES CGP or a USEPA DRGP would be required to discharge to surface waters.

A DRGP may be required during construction dewatering where groundwater is suspected or confirmed to be impacted. Based on the existing conditions assessment, a DRGP would likely be required for at both the Lower Fernald and UMass Properties.

In all cases, contract documents would require that groundwater collected at each construction site be treated prior to discharge to meet applicable regulatory requirements. Depending on site-specific conditions such as the existing groundwater quality and the dewatering methods selected by the contractor, groundwater management protocols would include siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary, to meet discharge state and federal permits requirements. For additional details on management of groundwater discharges including triggers for using a NPDES DRGP rather than the 2022 CGP are provided in **DEIR, Chapter 4.6, Wetlands and Waterways, Section 4.6.5.4, Tunnel Dewatering and Disinfection (pg. 4.6-150).**

13.2.4.4 Health and Safety Requirements

Health and safety procedures are governed by OSHA. Construction workers involved in performing the response actions would have the appropriate health and safety training in accordance with OSHA, which mandates procedures that must be followed to protect them from exposure to contaminated media.

Mitigation measures during construction would include special handling, dust control, and management and disposal of contaminated soil and groundwater. These measures prevent construction delays and protect workers and nearby sensitive receptors, including environmental justice populations (see **SDEIR Chapter 3, Outreach and Environmental Justice**).

Fugitive dust would be minimized using dust-related mitigation measures such as wet suppression, truck wheel cleaning, and covering of truck loads and stockpiles. Dust monitoring would be conducted during excavation, and a monitoring plan would be detailed in the contractor health and safety plans.

13.3 Technical Analysis to Respond to Certificate Comments

No comments were received in the EEA Secretary's Certificate related to hazardous materials, materials management, and recycling. See **SDEIR Chapter 15, Responses to Comments**, for the full list of delineated comments received on the DEIR in the Certificate and the associated comment letters.

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14 Mitigation

14.1 Introduction

The Massachusetts Environmental Policy Act (MEPA) regulations, at 301 Code of Massachusetts Regulations (CMR) 11.07(j), outline mitigation measures to be addressed in the Environmental Impact Report (EIR) process, including an "assessment of physical, biological and chemical measures and management techniques designed to limit negative environmental impacts or to cause positive environmental impacts during development and operation of a Project." This chapter addresses the Secretary's Certificate on the Draft Environmental Impact Report (DEIR) for the Metropolitan Water Tunnel Program (the Program), and updates the mitigation associated with the two new alternative sites (University of Massachusetts [UMass] Property large connection shaft site in Waltham, and Lower Fernald Property receiving shaft site in Waltham), and the Supplemental DEIR (SDEIR) Alternatives 3A, 4A and 10A.

Massachusetts General Law Chapter 30, Section 61 authorizes state agencies with permitting responsibilities to make an official determination regarding potential impacts from a proposed project and whether impacts have been avoided, minimized, and/or mitigated for appropriately. The law requires agencies/authorities to issue a determination that includes a finding describing the environmental impact, if any, of the Project and whether all feasible measures have been taken to avoid or minimize that impact.

This chapter summarizes mitigation measures proposed by the Massachusetts Water Resources Authority (MWRA) and refers to the Draft Section 61 Findings by Agency as documented in **SDEIR Appendix H, Draft Section 61 Findings by Agency**. Avoidance and minimization of impacts would be incorporated into project design and construction methods and are described for each environmental resources in the following chapters of the **SDEIR; Chapter 2 Alternatives**, **Chapter 3 Outreach and Environmental Justice**, **Chapter 4 Land Alteration and Article 97**, **Chapter 5 Wetlands and Waterways, Chapter 6 Water Supply and Water Management Act**, **Chapter 7 Climate Change**, **Chapter 8, Air Quality and Greenhouse Gas (GHG) Emissions**, **Chapter 9 Transportation**, **Chapter 10 Rare Species and Wildlife Habitat**, **Chapter 11 Noise and Vibration, Chapter 12 Cultural and Historical Resources**, and **Chapter 13 Hazardous Materials**.

A number of agency actions are needed for the Program, as listed in **Table 14-1**. The state agency actions are further described in **SDEIR Appendix H**. **Section 14.4** in the chapter includes responses to comments that pertain to mitigation as outlined in the Secretary's Certificate on the DEIR that was filed October 17, 2022.

Table 14-1 Potential Permits and Approvals

Agency/Department	Permit/Approval/Action	Status
Federal		
U.S. Environmental Protection Agency (USEPA)	*National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP)*	*To be obtained*
	NPDES Dewatering and Remediation General Permit, if needed	*To be obtained, if needed*
U.S. Army Corps of Engineers (USACE)	*Section 404 Department of the Army Permit (General and Project Construction Notice)*[1]	*To be obtained*
Commonwealth of Massachusetts		
Executive Office of Energy and Environmental Affairs (EEA)	*Massachusetts Environmental Policy Act (MEPA) Review*	*Underway; ENF filed in March 2021, DEIR filed December 2022, SDEIR herein*
Massachusetts Historical Commission (MHC)	*Review pursuant to Massachusetts General Law Ch. 9, Section 26-27C*	*Underway through MEPA review*
Massachusetts Department of Transportation (MassDOT)[2]	*Land disposition/easements*[1]	*To be obtained*
	Highway Access/Construction Access Permits[1]	*To be obtained*
Massachusetts Bay Transportation Authority (MBTA)[2]	*MBTA Right of Way Access License Agreement*	*To be obtained, if needed*
Department of Conservation and Recreation (DCR)[2]	*Land disposition/easements*[1]	*To be obtained*
	Construction/Access Permits[1]	*To be obtained*
Massachusetts Department of Environmental Protection (MassDEP)[2]	*Water Management Act Permit*	*To be obtained*
	Chapter 91 Licenses	*To be obtained, if needed*
	Superseding Order of Conditions, upon appeal[1]	*To be obtained, if needed*
	Section 401 Water Quality Certificate[1]	*To be obtained*
	Distribution System Modification	To be obtained
Massachusetts Division of Capital Asset Management and Maintenance	*Article 97 Land Disposition Legislation*[1]	*To be completed*
Municipal		
Conservation Commissions	*Wetlands Protection Act Order of Conditions*[1]	*To be obtained*
Departments of Public Works	*Roadway Access Permits/Street Opening Permit*[1]	*To be obtained*
Boston Water and Sewer Commission	Hydrant Permit	To be obtained
	Drainage Discharge Permit	To be obtained, if needed

1 Indicates that the permit or approval is site specific.

2 Indicates State agency that will issue Section 61 Findings

Italicized text within the table indicates no change from the DEIR.

Note: This is a preliminary list of permits and approvals that may be sought for the Program. This list is based on current information about the Program and is subject to change as the design of the Program progresses.

SDEIR Appendix H, includes proposed draft Section 61 Findings for the agencies listed below. Anticipated impacts, proposed mitigation measures, and site-specific information are included in the draft findings.

- Massachusetts Department of Environmental Protection (MassDEP)
- Massachusetts Department of Transportation (MassDOT)
- Massachusetts Department of Conservation Resources (DCR)
- Massachusetts Bay Transportation Authority (MBTA)

14.2 Summary of Mitigation by Resource

The MWRA strives to establish redundancy within the Metropolitan Tunnel System while appropriately balancing the direct and indirect impacts to resources and seeking effective mitigation strategies. This iterative process will continue to identify and incorporate additional avoidance and minimization strategies through design, construction, and operation. Impacts to resources are unavoidable for any of the alternatives explored by the Program that would provide effective redundancy to the Water Supply System.

This section describes the proposed mitigation for construction period and permanent impacts applicable to the following:

- Environmental Justice (EJ)
- Land Alteration and Article 97
- Wetland and Waterways
- Water Supply and Water Management Act
- Climate Change
- Air Quality and GHG Emissions
- Transportation
- Rare Species and Wildlife Habitat
- Noise and Vibration
- Cultural and Historical Resources
- Hazardous Materials

The MWRA, where practicable, will mitigate or compensate for unavoidable impacts. This section provides a summary of impacts from and mitigation required for the Program. As the Program advances into design, more site-specific mitigation measures would be identified, and a more defined implementation schedule would be developed.

The analysis in the following section describes efforts to provide mitigation to both construction period and permanent impacts. The proposed mitigation measures by environmental category are summarized in **Table 14-2.**

Table 14-2 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Environmental Justice	No mitigation required; the Program will provide redundancy to water systems that serve populations including environmental justice populations and facilitates continued access to safe drinking water	Not applicable	Not applicable	Not applicable
Land Alteration and Article 97	*Revegetating construction areas*	*Contractors*	*TBD*	*Construction completion*
	Construction of stormwater management areas	*Contractors*	*TBD*	*During construction*
	Restore appearance of areas temporarily disturbed during construction to existing conditions; include fencing and signage as needed	*Contractors*	*TBD*	*Construction completion*
	Follow and comply with Article 97 land disposition process for protected-parcels used by the Program for permanent facilities	*MWRA*	*TBD*	*Prior to construction*
Wetlands and Waterways	*Restoration and revegetation of areas disturbed by construction, including Bank, Bordering Vegetated Wetlands (BVW) / Vegetated Wetlands (VW), Bordering Land Subject to Flooding (BLSF), Land Under Waterways (LUW) / Waterway (WW) and Riverfront Area (RA)*	*Contractors*	*TBD*	*Construction completion*
	Implementation of erosion control and sedimentation Best Management Practices (BMPs)	*Contractors*	*TBD*	*During construction*
	Regular inspection and monitoring of discharges in accordance with National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) and/or Dewatering and Remediation General Permit (DRGP) to avoid permanent and indirect effects due to construction	*Contractors*	*TBD*	*During construction*
	Implementation of Stormwater Pollution Prevention Plan (SWPPP), including appropriate construction measures to prevent siltation in wetlands and waterways	*Contractors*	*TBD*	*During construction*

Table 14-2 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Wetlands and Waterways	*Construction of compensatory flood storage volume areas to offset fill for discharge structures within BLSF*	*Contractors*	*TBD*	*During construction*
	Construction of stormwater management areas	*Contractors*	*TBD*	*During construction*
Water Supply and Water Management Act	*Preconstruction survey to verify well locations and characteristics*	*Contractors*	*TBD*	*Prior to construction*
	Probing and pre-excavation grouting of water-bearing features in advance of tunnel boring machine (TBM) under certain prescribed conditions	*Contractors*	*TBD*	*During construction*
	Limitations on volumes of groundwater inflows to require initiation of pre-excavation and/or post-excavation grouting	*Contractors*	*TBD*	*During construction*
	Monitoring groundwater and implementing post-excavation drilling and cut-off grouting in water-bearing features	*Contractors*	*TBD*	*During construction*
	Monitoring groundwater and implementation of Water Supply Contingency Plan with alternative sources	*Contractors*	*TBD*	*During construction*
	Implement Water Supply Contingency Plan with alternate source of water	*MWRA*	*TBD*	*Prior to Construction*
Climate Change	*Construct stormwater management areas that are sized to accommodate the latest recommended design standards for climate change*	*Contractors*	*TBD*	*During construction*
	Revegetate sites	*Contractors*	*TBD*	*Construction completion*
Air Quality and GHG Emissions	Use alternatively fueled equipment (natural gas or electric) instead of diesel-fueled equipment as feasible	Contractors	TBD	During construction
	Restrict vehicle idling	*Contractors*	*TBD*	*During construction*
	Use ultra-low sulfur diesel fuel	*Contractors*	*TBD*	*During construction*
	Deploy methods to contain dust and debris to the construction site	*Contractors*	*TBD*	*During construction*

Table 14-2 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Transportation	*When possible, conduct trucking during off-peak hours*	*Contractors*	*TBD*	*During construction*
	If necessary and where appropriate, coordinate with the Massachusetts Department of Transportation (MassDOT) or local municipal officials to adjust traffic signal timings at intersections subject to potential temporary traffic increases.	*Contractors*	*TBD*	*During construction*
	Where possible and as necessary, install near-surface pipelines during off peak hours or at night	*Contractors*	*TBD*	*During construction*
	Accommodate bikes and pedestrians through on-street work zones	*Contractors*	*TBD*	*During construction*
	Evaluate the use of trenchless technology construction methods where feasible to limit potential roadway impacts	*Final Design Engineers*	*TBD*	*Prior to construction*
	Restripe crosswalks at select sites where near-surface piping is to be laid	*Contractors*	*TBD*	*During construction*
	Maintain two-way traffic whenever possible and one lane traffic at a minimum.	*Contractors*	*TBD*	*During construction*
Rare Species and Wildlife Habitat	*Revegetation of construction areas with native species*	*Contractors*	*TBD*	*Construction Completion*
	Compliance with Time of Year Restrictions for work within potential Northern Long-Eared Bat habitat	*Contractors*	*TBD*	*During construction*
Noise and Vibration	Establish noise limits through preconstruction noise monitoring. Construction noise monitoring may be conducted at select locations to monitor compliance with the established thresholds.	Final Design Engineers	TBD	Prior to construction
	Construction vibration monitoring may be conducted at select locations to ensure no adverse impacts on nearby communities or structures.	Construction Manager	TBD	During construction
	Controlled blasting and test blasts may be necessary prior to beginning construction to demonstrate that no adverse vibration impacts are anticipated.	Contractors	*TBD*	*During construction*

Table 14-2 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Noise and Vibration	*Ensure that construction equipment is functioning properly, is outfitted with noise control features such as mufflers, and does not make unnecessary noise.*	*Contractors*	*TBD*	*During construction*
	Perform construction that generates high amounts of noise and vibration during less sensitive times of day (for example mid-day periods near residences)	*Contractors*	*TBD*	*During construction*
	Install temporary noise barriers and other acoustic barriers and enclosures	*Contractors*	*TBD*	*During construction*
	Use quieter construction equipment and methods that would reduce construction noise such as drilling prior to pile driving	*Contractors*	*TBD*	*During construction*
	Locate equipment away from sensitive receptors	*Contractors*	*TBD*	*During construction*
	Maintain ongoing public communication	*MWRA*	*TBD*	*Ongoing*
	Provide vibration monitoring for sensitive buildings during construction	*Contractor*	*TBD*	*During construction*
	Provide site specific information about time and nature of construction to adjacent neighborhoods	MWRA	TBD	Prior to Construction
	Require the contractor to implement and follow a Noise Control Plan (NCP)	MWRA	TBD	Prior to Construction
Cultural and Historical Resources	*Provide vibration monitoring for sensitive buildings during construction*	*Contractor*	*TBD*	*During construction*
	Revegetation of construction areas with native species	*Contractors*	*TBD*	*Construction Completion*
	Prepare Inadvertent Discovery Plan for unanticipated finding of archaeological resources during construction	*Final Design Engineers*	*TBD*	*Prior to Construction*
	Provide photo documentation, if requested by the Massachusetts Historical Commission (MHC).	*MWRA*	*TBD*	*Prior to Construction*
	Coordinate review of proposed plans for the affected historic resource, if requested by MHC.	*MWRA*	*TBD*	*Prior to Construction*

Table 14-2 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Cultural and Historical Resources	*Prepare continuation sheets for existing inventoried forms with additional information and photographs of current conditions, if requested by MHC.*	*MWRA*	*TBD*	*Prior to Construction*
Hazardous Materials	*Assess excavation areas to identify impacted resources*	*Final Design Engineer*	*TBD*	*Prior to construction*
	Develop/implement a Soils and Materials Management Plan (SMMP) for materials handling, testing, and material reuse	*Final Design Engineer/* Contractors	*TBD*	*Prior to construction*
	Reuse of building materials when possible	*Contractors*	*TBD*	*During construction*
	Special handling and management of contaminated soil and groundwater	*Contractors*	*TBD*	*During construction*
	Management of fugitive dust through wet suppressions, truck wheel cleaning, covering of truck loads and monitoring siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary	*Contractors*	*TBD*	*During construction*

TBD: To Be Determined
Italicized text within the table indicates no change from the DEIR.

14.2.1 Environmental Justice

As demonstrated in **SDEIR Chapter 3, Outreach and Environmental Justice**, no environmental justice communities would be disproportionally impacted by any of the three SDEIR Alternatives. Where environmental impacts require mitigation, they will be applied to all populations regardless of EJ designation. No mitigation is required; the Program will provide redundancy to water systems that serve EJ populations and facilitate continued access to safe drinking water.

14.2.2 Land Alteration and Article 97

Potential impacts associated with the Program would primarily be related to construction at the surface of the sites (where vertical shafts would connect the deep rock tunnel to the surface), management of material removed from the tunnel, and treatment of groundwater inflow. Construction activities at each shaft site would be contained within the temporary limit of disturbance (LOD) boundary to minimize the area of potential disruptions at the surface. Construction-related activities for the Program would take place primarily underground. The proposed tunnel excavation would use the tunnel boring machine (TBM) and drill-and-blasting excavation techniques to allow for tunnel excavation to occur below the surface with limited disruption to land uses at the surface above. The proposed valve chambers and connecting pipelines would be underground structures with no or minimal surface-level features visible.

The Program is anticipated to result in the creation of up to three acres of new impervious surface compared to existing conditions. The total construction area LOD would encompass up to 42 acres, depending on the selected alternative, across up to 13 Program sites, depending on the SDEIR Alternative.

Some open space and community resources would be subject to temporary impacts during construction. Open space and community resources near Program sites would be subject to temporary increases in noise and vibration, traffic, and air quality and GHG emissions during construction activities.

Permanent impacts on community resources and open space would be due to acquisition of land and easements on community resources and open space. Three sites include land that may be protected under the Executive Office of Energy and Environmental Affairs (EEA) Article 97 Land Disposition Policy,[1,2] and would need to be disposed of to the MWRA following Article 97 legislation, which includes a 2/3 vote of the Legislature. Additionally, subterranean easements would need to be obtained for properties protected by Article 97 that the tunnel alignment passes beneath. This would not change the property use or above-ground conditions, and therefore would not be required to be disposed of, as discussed in **SDEIR Chapter 4, Land Alteration and Article 97.**

14.2.2.1 Land Alteration and Article 97 Construction Period Impacts and Mitigation

Construction-period impacts would be temporary in nature. Trees removed during the construction process would be replaced, where required and as appropriate. Estimated areas of impact and associated mitigation are summarized in **Table 14-3** and discussed in detail in the following sections.

1 Commonwealth of Massachusetts Executive Office of Environmental Affairs, "Article 97 Land Disposition Policy," February 19, 1998, https://www.mass.gov/files/documents/2018/06/06/article97_LandDisposition_Policy.pdf.

2 Commonwealth of Massachusetts, "Guidance on Public Lands Preservation Act Implementation," February 2023, https://www.mass.gov/doc/guidance-on-public-lands-preservation-act-implementation-january-2023/download (accessed May 9, 2023).

Table 14-3 Land Use Construction Period Impacts and Mitigation

Estimated Impact				Mitigation
Construction Period Impacts				
Temporary construction area limits of disturbance, in acres (totals may not add due to rounding):				*Revegetate areas disturbed during construction, including replacing removed trees where required and as appropriate.*
Proposed Site	**Alt. 3A**	**Alt. 4A**	**Alt. 10A**	
UMass Property	0.9	0.9	-	
Lower Fernald Property	-	-	2.3	
Tandem Trailer and Park Road East	*5.5*	*5.5*	*-*	
Bifurcation	*12.2*	*-*	*-*	
Park Road West	*-*	*2.7*	*2.7*	
Highland Avenue Northwest/Southwest	*5.6*	*8.7*	*8.7*	
Highland Avenue Northeast/Southeast	*9.5*	*9.5*	*9.5*	
American Legion	*5.4*	*5.4*	*5.4*	
School Street	*0.6*	*0.6*	*0.6*	
Cedarwood Pumping Station	*0.7*	*0.7*	*0.7*	
Hegarty Pumping Station	*0.3*	*0.3*	*0.3*	
St. Mary Street Pumping Station	*0.6*	*0.6*	*0.6*	
Newton Street Pumping Station	*0.3*	*0.3*	*0.3*	
Southern Spine Mains	*0.5*	*0.5*	*0.5*	
Hultman Aqueduct Isolation Valve	*0.3*	*0.3*	*0.3*	
Total	**42.4**	**36.1**	**32.0**	

Italicized text within the table indicates no change from the DEIR.

14.2.2.2 Land Alteration and Article 97 Final Conditions Mitigation

Upon completion of construction, the appearance of the sites would be similar to existing conditions apart from concrete slabs visible at the surface, where applicable. After construction, sites would be revegetated with native species, where possible, to return construction areas to look similar to their existing condition. Program sites would be located on state- or municipality-owned land, including sites adjacent to existing MWRA infrastructure and MassDOT right-of-way (ROW) land, and land owned by the Commonwealth of Massachusetts under care, custody, and control of the MWRA. Three sites may require the use of land protected under Article 97, which would require a disposition, and are described in **SDEIR Section 4.2.3, Land Alteration and Article 97 Resources Final Conditions** and summarized in **Table 14-4.**

Disposition of Article 97 land can only occur when exceptional circumstances are met in the following conditions:

- All other options to avoid the Article 97 disposition have been explored and no feasible and substantially equivalent alternatives exist (monetary considerations notwithstanding).
- The disposition of the subject parcel and its proposed use do not destroy or threaten a unique or significant resource (e.g., significant habitat, rare or unusual terrain, or areas of significant public recreation), as determined by EEA and its agencies.
- As part of the disposition, real estate of equal or greater fair market value or value in use of proposed use, whichever is greater, and significantly greater resource value as determined by EEA and its agencies, are granted to the disposing agency or its designee, so that the mission and legal mandate of EEA and its agencies and the constitutional rights of the citizens of Massachusetts are protected and enhanced.
- The minimum acreage necessary for the proposed use is proposed for disposition and, to the maximum extent possible, the resources of the parcel proposed for disposition continue to be protected.
- The disposition serves an Article 97 purpose or another public purpose without detracting from the mission, plans, policies, and mandates of EEA and its appropriate department or division.
- The disposition of a parcel is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests therein to the Commonwealth.

As demonstrated in **SDEIR Section 4.2.4, Land Alteration and Article 97 Avoidance, Minimization, and Mitigation**, the MWRA will comply with the Article 97 Land Disposition Policy and there are no other possible means to avoid disposition. To mitigate the impacts of the disposition, the MWRA will identify and provide compensatory land of equal or greater value to offset any disposed of land required for the Program when applicable or comply with other provisions of the policy.

Additionally, subterranean easements of Article 97 protected open space may be required for properties overlaying the tunnel alignment. As described in **SDEIR Section 4.2.3.3, Tunnel Alignment**, a 1,000-foot corridor around the preliminary tunnel alignment (500 feet on either side) was used to identify existing Article 97 properties that may require a subterranean easement, depending on the final tunnel alignment. Properties that may require a subterranean easement are also listed in **Table 14-4**.

Table 14-4 Land Alteration and Article 97 Final Conditions Impacts and Mitigation

Estimated Impact				Mitigation
Permanent Impacts				
New impervious area, in acres (totals may not add due to rounding):				*Unpaved section of land on the site would serve as a stormwater management area for each site and be designed in accordance with the latest Massachusetts Stormwater Handbook published by Massachusetts Department of Environmental Protection (MassDEP).*
Proposed Site	**Alt. 3A**	**Alt. 4A**	**Alt. 10A**	
UMass Property	0.1	0.1	-	
Lower Fernald Property	-	-	0.1	
Tandem Trailer and Park Road East	*0.2*	*0.2*	-	
Bifurcation	*0.7*	-	-	
Park Road West	-	*0.4*	*0.5*	
Highland Avenue Northwest/Southwest	-	-	-	
Highland Avenue Northeast/Southeast	*0.7*	*0.7*	*0.7*	
American Legion	*0.5*	*0.5*	*0.5*	
School Street	-	-	-	
Cedarwood Pumping Station	*0.1*	*0.1*	*0.1*	
Hegarty Pumping Station	*0.1*	*0.1*	*0.1*	
St. Mary Street Pumping Station	*0.1*	*0.1*	*0.1*	
Newton Street Pumping Station	*0.1*	*0.1*	*0.1*	
Southern Spine Mains	*0.1*	*0.1*	*0.1*	
Hultman Aqueduct Isolation Valve	*0.1*	*0.1*	*0.1*	
Total Acres	**2.7**	**2.4**	**2.3**	
Permanent easement or acquisition area, in acres (totals may not add due to rounding):				*Include fencing and proper signage surrounding shaft excavation areas, where appropriate. Upon completion of construction, restore the appearance of the sites similar to existing conditions apart from concrete slabs visible at the surface, where applicable.*
Proposed Site	**Alt. 3A**	**Alt. 4A**	**Alt. 10A**	
UMass Property	0.3	0.3	-	
Lower Fernald Property	-	-	1.4	
Tandem Trailer and Park Road East	*1.1*	*1.1*	-	
Bifurcation	*1.5*	-	-	
Park Road West	-	*1.1*	*1.1*	
Highland Avenue Northwest/Southwest	-	-	-	
Highland Avenue Northeast/Southeast	*1.5*	*1.5*	*1.5*	
American Legion	*3.5*	*3.5*	*3.5*	
Cedarwood Pumping Station	*0.1*	*0.1*	*0.1*	
Hegarty Pumping Station	*0.1*	*0.1*	*0.1*	
Southern Spine Mains	*0.2*	*0.2*	*0.2*	
Total Acres	**8.4**	**8.0**	**7.9**	

Table 14-4 Land Alteration and Article 97 Final Conditions Impacts and Mitigation

Estimated Impact	Mitigation
Subterranean easements for the tunnel alignment where it crosses beneath Article 97 properties would be required. This would not be a disposition but would still require a state review and 2/3 legislature vote. The list below includes properties within a 1,000-foot corridor of the preliminary tunnel alignment. Depending on final design, properties may include:	*While the properties overlaying the tunnel alignment would require a subterranean easement to be approved by 2/3 of the state legislature, this would not be a disposition of the Property. Based on analysis conducted for the SDEIR, no impacts are expected to the use and owner would not be impacted by the subterranean easement therefore maintaining the Article 97 goal of no net loss of open space. Therefore, compensatory mitigation would not be needed.*

Article 97 Properties Within 1,000-Foot Corridor of Preliminary Tunnel Alignment	Alt. 3A	Alt. 4A	Alt. 10A
Cornelia Warren Field	X	X	N/A
Waltham Agricultural Fields	X	X	X
Waltham Woods	X	X	X
Storer Conservation Area	X	X	X
Square Pond Woods	X	X	X
Thompson Playground[1]	X	X	X
Bobby Connors Playground	X	X	X
Charles River Reservation I	X	X	X
City of Cambridge Water[1]	X	X	X
River Road	X	X	X
Summer Road	X	X	X
River Street	X	X	N/A
Loring Road Covered Tanks	X	X	X
Fitzgerald Well	X	X	N/A
Hultman Aqueduct	X	X	X
Nickerson Well	X	N/A	N/A
Leo J. Martin Memorial Golf Course	X	X	X
Hamilton Park/Lower Falls Playground[1]	X	X	X
Charles River Reservation II	X	X	X
Cochituate Aqueduct Trail	X	X	X
Schofield Tennis Courts	N/A	X	X
Ouellet Park	X	X	X
Wellesley Water Supply Land	X	X	X
Hurd Brook CR[1]	X	X	X
Sudbury Aqueduct	X	X	X
Chester F Mills Field[1]	X	X	X
Riverside Terrace[1]	X	X	X
Charles River Reservation III	X	X	X
Goddard Christina Conservation Area	X	X	X
Nahanton Park[1]	X	X	X
Gables Condominium CR[1]	X	X	X
Baldpate Meadow	X	X	X

Table 14-4 Land Alteration and Article 97 Final Conditions Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td>
<table>
<tr><th>Article 97 Properties Within 1,000-Foot Corridor of Preliminary Tunnel Alignment</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Skyline Park[1]</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Robert T. Lynch Memorial Golf Course</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Newton Street Parcel</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Arnold Arboretum</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Arborway</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Southwest Corridor Park</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Total</td><td>37</td><td>36</td><td>34</td></tr>
</table>
1 Article 97 status unknown indicates that the Article 97 status of the property was listed as unknown by MassGIS and deed research. As design progresses the properties listed as unknown along the alignment will be confirmed through coordination with the appropriate agencies and municipalities.
CR = Conservation Restriction
</td><td></td></tr>
<tr><td>
Acquisition of sites that may be protected under the Executive Office of Energy and Environmental Affairs (EEA) Article 97 Land Disposition Policy is anticipated to be required, which would require a 2/3 majority vote by the Massachusetts State Legislature:
<table>
<tr><th>Proposed Site</th><th>All Alternatives</th></tr>
<tr><td>American Legion</td><td>3.5 acres at Morton Street Property</td></tr>
<tr><td>Hegarty Pumping Station (Article 97 status TBD)</td><td>0.1 acres of Ouellet Park</td></tr>
<tr><td>Southern Spine Mains</td><td>0.2 acres of Southwest Corridor Park/Arborway I</td></tr>
</table>
</td><td>Follow and comply with Article 97 land disposition process by identifying and providing compensatory land of equal or greater value to offset any disposed of land required for the Program when applicable or complying with other provisions of the policy</td></tr>
</table>

Italicized text within the table indicates no change from the DEIR.

14.2.3 Wetlands and Waterways

As a result of implementation of the avoidance measures described in **SDEIR Chapter 5, Wetlands and Waterways**, neither of the proposed new SDEIR Alternative sites would involve temporary nor permanent impacts to any federally jurisdictional Vegetated Wetland (VW) or Waterway (WW) resources, or state-regulated Bordering Vegetated Wetlands (BVW), Land Under Waterway (LUW), Bank, Riverfront Areas (RA) or Bordering Land Subject to Flooding (BLSF). Temporary and permanent wetlands and waterways impacts are described below:

- The Program would require temporary impacts to BVW and VW for connection to the existing water supply infrastructure at the American Legion site.

- The Program would require permanent and temporary impacts to Land Under Waterways (LUW)/Waterway (WW), Bank, and BLSF for rip rap splash pads at permanent dewatering discharge locations (Tandem Trailer or Bifurcation and Highland Avenue), depending on the SDEIR Alternative. Compensatory flood storage volume would be provided at appropriate elevations within the same floodplains.
- The Program would require temporary impacts to RA at the Highland Avenue Site for the pipeline to the dewatering discharge location.
- The Program would require temporary impacts to LUW/WW, Bank and RA at the American Legion Site for the discharge pipe and rip rap splash pad at the temporary dewatering discharge location.
- The pipeline connection to Hegarty Pumping Station would require permanent and temporary impacts to RA.
- Permanent impacts to RA would be required for top of shaft/valve structures and associated paved access roads and parking at the Tandem Trailer site and at the Hultman Aqueduct Isolation Valve.

In accordance with Wetlands Protection Act (WPA) and Clean Water Act (CWA) requirements, mitigation would be provided for all potential permanent and temporary wetland resource impacts. These impacts and associated mitigation measures are summarized in **Table 14-5** and discussed further in the following sections. The issuance of a Section 401 Water Quality Certification by MassDEP would be required for the discharges of fill into waters of the U.S. for splash pad and pipeline construction. Notice of Intent (NOI) filings pursuant to the WPA would be required for Program construction in Waltham, Weston, Wellesley, Needham, and Boston.

Since no new wetland or waterway impacts would occur at the new SDEIR Alternative sites, wetlands and waterways mitigation would remain as described in **DEIR Chapter 4.6, Wetlands and Waterways, Section 4.6.7, Avoidance, Minimization, and Mitigation Measures (pg. 4.6-160)** and would include restoration and revegetation of disturbed areas outside the limits of the riprap for impacts to RA and provision of compensatory flood storage volume within the same floodplain sufficient to offset the volume of flood water displaced by the permanent dewatering discharge infrastructure for impacts to BLSF.

14.2.3.1 Wetlands and Waterways Construction Period Mitigation

To minimize impacts, the following sedimentation and erosion control measures and construction methods would be used:

- The program would incorporate Best Management Practices (BMPs) specified by MassDEP and U.S. Environmental Protection Agency (USEPA) guidelines.
- Proper implementation of the erosion and sedimentation control program would minimize exposed soil areas through sequencing and temporary stabilization, place structures to manage stormwater runoff and erosion, and establish a permanent vegetative cover or other forms of stabilization as soon as practicable. Stabilization measures may include biodegradable and wildlife friendly erosion control blankets and native seed mixes for vegetative stabilization.

- The structural and non-structural practices proposed for the Program would comply with criteria contained in the 2022 National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP), including inspection, monitoring and implementation of corrective actions. Nonstructural practices include temporary stabilization, temporary seeding, permanent seeding, pavement sweeping, and dust control.
- Structural practices include erosion-control barriers, stabilized construction exits, temporary sediment basins, diversion swales, temporary check dams, catch basin inlet protection, and dewatering filters.
- Silt fence lines, staked straw bales, compost filter tubes and/or similar devices would be installed along the downgradient slopes at each of the limit-of-work lines to provide erosion and sedimentation controls and define the limits of disturbance for contractor(s).

Regular inspection and monitoring of discharges in accordance with the NPDES CGP (or DRGP) would be carried out by construction contractors to avoid permanent, temporary, and indirect effects due to construction site runoff and/or dewatering flows.

Mitigation measures for construction period impacts are summarized in **Table 14-5**. Mitigation measures identified below are consistent with the DEIR unless otherwise stated.

Table 14-5 Wetlands and Waterways Construction Period Impacts and Mitigation

Estimated Impact				Mitigation
Construction Period Impacts				
Construction staging impact to state regulated Riverfront Areas (RA), in square feet (sf):				*Restoration and revegetation of areas disturbed by construction, including RA.*
Proposed Site	***Alt. 3A***	***Alt. 4A***	***Alt. 10A***	*Implementation of erosion and sedimentation Best Management Practices (BMPs).*
Tandem Trailer and Park Road East	*105,722*	*105,722*	*-*	
Bifurcation	*33,987*	*-*	*-*	
Hegarty Pumping Station	*5,757*	*5,757*	*5,757*	
Hultman Aqueduct Isolation Valve	*7,837*	*7,837*	*7,837*	
Total	***153,303***	***119,316***	***13,594***	
Construction of a near-surface pipeline for a connection to existing water supply infrastructure would cause temporary impacts to state regulated Bordering Vegetated Wetland (BVW) and federally jurisdictional Vegetated Wetland (VW), in sf:				*Restoration and revegetation of areas disturbed by construction.*
Proposed Site	***Alt. 3A***	***Alt. 4A***	***Alt. 10A***	
American Legion	*1,558*	*1,558*	*1,558*	
Total	***1,558***	***1,558***	***1,558***	

Table 14-5 Wetlands and Waterways Construction Period Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="2">Construction Period Impacts</td></tr>
<tr><td rowspan="2">Temporary Impacts to state regulated Bordering Land Subject to Flooding (BLSF) for construction of rip rap splash pads at dewatering discharge locations, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>300</td><td>300</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>250</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>1,340</td><td>1,340</td><td>1,340</td></tr>
<tr><td>Total</td><td>1,890</td><td>1,640</td><td>1,340</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td></tr>
<tr><td>Provide compensatory flood storage volume within the same floodplain sufficient to offset the volume of flood water displaced by the permanent dewatering discharge infrastructure</td></tr>
<tr><td>Construction of dewatering discharge pipes and rip rap splash pads would cause temporary impacts to Bank, in linear feet:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>8</td><td>8</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>8</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>8</td><td>8</td><td>8</td></tr>
<tr><td>American Legion</td><td>19</td><td>19</td><td>19</td></tr>
<tr><td>Total</td><td>43</td><td>35</td><td>27</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td></tr>
<tr><td>Construction of dewatering discharge pipes and rip rap splash pads would cause temporary impacts to WW and Land Under Waterway (LUW), in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>652</td><td>652</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>652</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>652</td><td>652</td><td>1,034</td></tr>
<tr><td>American Legion</td><td>380</td><td>380</td><td>380</td></tr>
<tr><td>Total</td><td>2,336</td><td>1,684</td><td>1,414</td></tr>
</table></td><td>Restore the wetland in-place, in-kind upon completion of pipeline construction.</td></tr>
<tr><td>Construction of dewatering discharge pipes would cause temporary impacts to RA, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Highland Avenue Sites</td><td>4,322</td><td>4,322</td><td>4,322</td></tr>
<tr><td>American Legion</td><td>845</td><td>845</td><td>845</td></tr>
<tr><td>Total</td><td>5,167</td><td>5,167</td><td>5,167</td></tr>
</table></td><td>Restore the wetland in-place, in-kind upon completion of pipeline construction.</td></tr>
<tr><td colspan="2">Potential Construction Period Impacts</td></tr>
<tr><td rowspan="3">Potential impacts on wetlands, surface waters on or adjacent to site to be impacted by erosion or sedimentation
All sites</td><td>Restoration and revegetation of areas disturbed by construction, including Riverfront.</td></tr>
<tr><td>Implementation of erosion and sedimentation BMPs.</td></tr>
<tr><td>Development of Stormwater Pollution Prevention Plan (SWPPP), including</td></tr>
</table>

Table 14-5 Wetlands and Waterways Construction Period Impacts and Mitigation

Estimated Impact	Mitigation
Construction Period Impacts	
	appropriate construction measures to prevent siltation in wetlands and waterways
Potential impact on surface water quality due to pollutants used in tunnel dewatering discharges, disinfection, and flushing *All sites*	*Regular inspection and monitoring of discharges in accordance with NPDES Construction General Permit (CGP) or Dewatering and Remediation General Permit (DRGP) to avoid permanent and indirect effects due to construction.*
Potential for groundwater drawdown due to tunnel inflows temporarily impacting surface water levels *All sites*	*Limitations on volumes of groundwater inflows to require initiation of probing and pre-excavation and/or post-excavation grouting.*

Italicized text within the table indicates no change from the DEIR.

14.2.3.2 Wetlands and Waterways Final Condition Mitigation

Mitigation would be provided for all proposed impervious cover created at all project sites, including the two new SDEIR Alternative sites. As described in **DEIR Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards (pg. 4.6-179)**, sites would be designed to meet the Massachusetts Stormwater Standards, which are focused on protecting wetlands and water resources through maintenance of predevelopment conditions for such characteristics as recharge, peak flow rates, and water quality. Low Impact Development (LID) and/or structural Stormwater Control Measures (SCMs) would be implemented at each site so that each site meets the Stormwater Standards.

The MWRA is committed to meeting state and federal requirements for stormwater and dewatering for the construction period and under the Program's Final Condition. Mitigation measures for final condition impacts are summarized in **Table 14-6.** Mitigation measures identified below are consistent with the DEIR unless otherwise stated.

Table 14-6 Wetlands and Waterways Final Condition Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="2">Permanent Impacts</td></tr>
<tr><td>Permanent impact to state regulated Riverfront Areas (RA), in square feet (sf):
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer and Park Road East</td><td>1,685</td><td>1,685</td><td>-</td></tr>
<tr><td>Hegarty Pumping Station</td><td>157</td><td>157</td><td>157</td></tr>
<tr><td>Hultman Aqueduct Isolation Valve</td><td>2,989</td><td>2,989</td><td>2,989</td></tr>
<tr><td>Total</td><td>4,831</td><td>4,831</td><td>3,146</td></tr>
</table>
</td><td>Restoration and revegetation of areas disturbed by construction.</td></tr>
</table>

Table 14-6 Wetlands and Waterways Final Condition Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="2">Permanent Impacts</td></tr>
<tr><td>Impacts to state regulated Bordering Land Subject to Flooding (BLSF) rip rap splash pads at dewatering discharge locations, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>368</td><td>368</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>368</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>660</td><td>660</td><td>660</td></tr>
<tr><td>Total</td><td>1,396</td><td>1,028</td><td>660</td></tr>
</table></td><td>Provision of compensatory flood storage volume equal to the volume occupied by the structure within the same floodplain.
Compliance with MassDEP Stormwater Management Standards</td></tr>
<tr><td>Permanent impacts to Bank for rip rap splash pads at dewatering discharge locations, in linear feet:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>26</td><td>26</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>26</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>26</td><td>26</td><td>36</td></tr>
<tr><td>Total</td><td>78</td><td>52</td><td>36</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed outside of the footprint of the splash pad.</td></tr>
<tr><td>Permanent impacts to Waterways (WW) and Land Under Waterway (LUW) for rip rap splash pads at dewatering discharge locations, in square feet:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>368</td><td>368</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>368</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>368</td><td>368</td><td>726</td></tr>
<tr><td>Total</td><td>1,104</td><td>736</td><td>726</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed outside of the footprint of the splash pad.</td></tr>
</table>

Italicized text within the table indicates no change from the DEIR.

14.2.4 Water Supply and Water Management Act

As discussed in **SDEIR Chapter 6**, **Water Supply and Water Management Act**, and **SDEIR Appendix C, Updated Draft Water Supply Contingency Plan**, there would be the potential for groundwater drawdown due to tunnel inflows to temporarily impact water levels in surface waters and wells during construction. Groundwater withdrawal volumes associated with dewatering are estimated to vary between less than 100,000 gallons per day (GPD) up to an estimated 8 Million GPD, triggering the need for a WM03 Water Management Withdrawal Permit for construction period withdrawals only. There will be no permanent withdrawals. No impacts to groundwater resources would be anticipated in the Final Condition. The tunnel will convey water that is under higher pressure than the groundwater pressure, thus groundwater will not infiltrate and cannot cause a groundwater drawdown condition. Loss of annual recharge resulting from new impervious area at launching and receiving shaft sites, and connection and isolation valve sites would be minimized and mitigated in accordance with the Stormwater Management Standards as discussed in **SDEIR Section 6.2.3, Water Supply Final Conditions.**

Mitigation would occur for construction period impacts to Water Supply as described in the following Section, as there are no permanent impacts associated with Water Supply. Mitigation measures and impacts are summarized in **Table 14-7**. Mitigation described in **Table 14-7** is unchanged from what was presented in Chapter 7 of the DEIR.

14.2.4.1 Water Supply and Water Management Construction Period Mitigation

In areas of concern, the TBM has the capability to simultaneously drill and pre-excavation grout the tunnel route, which would reduce the volume of groundwater inflow into the tunnel and help mitigate potential impacts to surface waters and water supply wells. These impacts are summarized in **Table 14-7** and described in detail in the following sections.

The contract documents would specify that the contractor conduct a pre-construction survey to verify the locations of wells and document well characteristics. The updated Water Supply Contingency Plan **(see SDEIR Appendix C**) includes a summary of mitigation measures the Contractor would implement if water supplies would be impacted during construction.

The mitigation to reduce the potential for groundwater inflow and resulting possible drawdown during construction would be probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting (also from the tunnel heading) in the event the probing encounters water-bearing features. Probing and pre-excavation grouting would be implemented before the tunnel proceeds beneath select important areas of groundwater well production or beneath local water bodies; the determination for probing (both where this may be required and the number and relative position of probe holes) would be assessed during the final design phase of the Program. Construction contract specifications for hard-rock tunnels typically have limits for groundwater inflows into probe holes, which trigger the need for pre-excavation grouting. These limits would also be set during final design.

For cases where groundwater is affected by tunnel excavation after implementation of the grouting programs, mitigation for disruption of water supply from groundwater wells is to provide users with an alternative water supply until groundwater levels can be restored. For impacted residential irrigation wells, the contractor could arrange for a landscaping service to provide watering of lawns and other outdoor uses. For impacted commercial irrigation wells, like a golf course, water could be provided by MWRA through its existing interconnection to the community. Although most geothermal wells today are closed circuit systems that would not be affected by the tunnel construction, if there are impacted geothermal wells that are non-closed systems, other heating sources, such as use of space heaters or existing oil, electric, or natural gas services could be utilized until the well has returned to pre-construction conditions and the geothermal well can be operated again. In the event of disruption to a surface water, an alternative water supply will be provided until surface water levels can be restored. These mitigation measures are described in the Water Supply Contingency Plan in **SDEIR Appendix C**.

Table 14-7 Water Supply Construction Period Impacts and Mitigation

Estimated Impact	Mitigation
Potential Construction Period Impacts	
Potential for groundwater drawdown *All sites*	*Pre-construction survey to verify well locations and characteristics*
	Probing and pre-excavation grouting before the tunnel proceeds beneath select important areas of groundwater well production or beneath local water bodies
	Limitations on volumes of groundwater inflows to require initiation of pre-excavation and/or post-excavation grouting
	Monitoring groundwater and implementing post-excavation drilling and cut-off grouting in water-bearing features
Surface water impact or *loss of potable or irrigation well along the tunnel Alignment* *All sites*	*Implement Water Supply Contingency Plan with alternate source of water*

Italicized text within the table indicates no change from the DEIR.

As described in **DEIR Chapter 4.8**, **Hazardous Materials, Materials Handling, and Reuse**, **Section 4.8.5**, **Construction Period Impacts (pg. 4.8-51)**, "The contractor would be responsible for finding suitable locations for reuse or disposal of excavated material from the tunnel excavation. Protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so that it can be handled appropriately and disposed of at suitable locations. Most of the excavated material from all three DEIR Alternatives is anticipated to be clean, crushed rock, which could be reused beneficially at other locations." The final design and contract documents will have testing requirements for disposed materials to comply with either the reuse of rock cuttings and / or permit requirements for disposal. Approved disposal sites would comply with regulations to protect public water supplies.

Water management considerations have been made for coldwater fisheries that may be impacted during construction. The Tandem Trailer shaft site has been identified as a proposed location for tunnel dewatering, which would discharge to the Seaverns Brook. Seaverns Brook is classified as a coldwater fishery. The MWRA will include language in the contract documents to monitor the ambient temperature of the water in the brook and the temperature of discharge water prior to entering Seaverns Brook. Contract provisions would be carried to implement mitigation measures, such as underground storage, to lower the temperature of the water to meet the water quality standards before it is discharged.

14.2.5 Climate Change

Although the Environmental Notification Form (ENF) was filed prior to the MEPA Interim Protocol on Climate Change Adaptation and Resiliency (the Interim Protocol)[3] was issued, the MWRA voluntarily

3 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, *Massachusetts Environmental Policy Act (MEPA) Interim Protocol on Climate Adaptation and Resiliency*, Effective October 1, 2021, https://www.mass.gov/doc/mepa-interim-protocol-on-climate-change-adaptation-and-resiliency-effective-oct-1-2021/download.

evaluated potential climate change-related risks and exposures for the Program as part of the DEIR and with updated sites for the SDEIR. Consistent with the DEIR, the majority of SDEIR sites in the Final Condition were identified as being exposed to extreme heat and extreme precipitation causing flooding and all are at risk for not effectively supplying water redundancy during a natural hazard event. These exposures and risk determinations were based on deploying the Resilient Massachusetts's Action Team Climate Resilience Design Tool (RMAT Tool), which provides guidance to avoid, minimize, and mitigate the predicted impacts associated with climate change. These RMAT Best Practice Design Considerations are summarized in **Table 14-8**.[4] These design elements will be considered as the Program proceeds into final design.

No identified construction-period impacts are anticipated with climate change.

Table 14-8 RMAT Best Practice Design Considerations

Considerations	***Best Practice***
Site Suitability (SS)	*1. Reduce exposure to climate hazards*
	2. Mitigate adverse climate impacts and provide benefits
	3. Protect, conserve, and restore critical natural resources on-site and off-site
Regional Coordination (RC)	*1. Assess regional context of vulnerability*
	2. Evaluate impacts beyond site-specific design
	3. Optimize capital investment opportunities
	4. Prioritize services and assets that serve vulnerable populations
Flexible Adaptation Pathways (AP)	*1. Embed future capacity and design for uncertainty*
	2. Design for incremental change
	3. Encourage climate mitigation and other co-benefits
	4. Prioritize nature-based solutions
	5. Prepare for current and future operational and maintenance needs

Italicized text within the table indicates no change from the DEIR.

14.2.5.2 Climate Change Final Condition Mitigation

The following section identifies methods that were outlined in the DEIR to minimize the Program's exposure to extreme precipitation causing flooding and extreme heat. None of the climate-related impacts are caused by the Program. Impacts and associated mitigation are summarized in **Table 14-9** and described in detail in the following sections. With the addition of UMass Property site and Lower Fernald Property site in Alternatives 3A/4A and 10A respectively, no new mitigation measures are anticipated.

4 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Resilient Massachusetts Action Team (RMAT), *Climate Resilience Design Standards & Guidelines*, Climate Resilience Design Standards Tool, Version 1.2, *User Guide*, July 2022, https://eea-nescaum-dataservices-assets-prd.s3.amazonaws.com/cms/GUIDELINES/UserGuide_V1.2.pdf.

Table 14-9 Climate Change Impacts and Mitigation

Possible Climate-Related Impact[1]			Mitigation
Permanent Impacts			
Sites could be exposed to extreme precipitation causing urban or riverine flooding over the Program's useful life.			*Construct stormwater management areas sized to accommodate future flooding conditions.* *Revegetate sites, including use of loam and seed.*
Proposed Site	**Exposure to Urban Flooding**	**Exposure to Riverine Flooding**	
UMass Property	High	Moderate	
Lower Fernald Property	High	Moderate	
Tandem Trailer/Park Road East	*High*	*High/* Moderate	
Bifurcation	*High*	*Moderate*	
Park Road West	*High*	*Moderate*	
Highland Avenue Northwest/Southwest	*High*	*Not Exposed*	
Highland Avenue Northeast/Southeast	*High*	*Not Exposed*	
American Legion	*High*	Moderate	
School Street	*High*	*Not Exposed*	
Cedarwood Pumping Station	*High*	*Moderate*	
Hegarty Pumping Station	*High*	*Moderate*	
St. Mary Street Pumping Station	*High*	*Not Exposed*	
Newton Street Pumping Station	*High*	*Not Exposed*	
Southern Spine Mains	*High*	*Not Exposed*	
Hultman Aqueduct Isolation Valve	*High*	*Moderate*	
Prior to mitigation, sites could be exposed to extreme heat over the Program's useful life			*Revegetate sites, including use of loam and seed.*
Proposed Site	**Exposure to Extreme Heat**		
UMass Property	High		
Lower Fernald Property	High		
Tandem Trailer and Park Road East	*High*		
Bifurcation	*High*		
Park Road West	*High*		
Highland Avenue Northwest/Southwest	*High*		
American Legion	*High*		
School Street	*High*		
Cedarwood Pumping Station	*High*		
Hegarty Pumping Station	*High*		
St. Mary Street Pumping Station	*High*		
Newton Street Pumping Station	*High*		
Southern Spine Mains	*High*		
Hultman Aqueduct Isolation Valve	*High*		

Italicized text within the table indicates no change from the DEIR.

1 According to the RMAT model

Extreme Precipitation Causing Flooding

As described below, best practices to reduce potential impacts on critical infrastructure from flooding include incorporating designated stormwater management areas, designing stormwater management systems to manage runoff in accordance with the latest guidelines, and restoring areas disturbed during construction with loam and seed and/or other vegetation where appropriate.

Stormwater Management

Climate change-related risks, including increased precipitation events, would be considered in the design of the proposed stormwater management systems associated with each proposed launching shaft, receiving shaft, large connection shaft, connection shaft, and isolation valve site. Stormwater management compliance has been described in **DEIR Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards (pg. 4.6-179).**

Stormwater management system design and designated stormwater management areas are anticipated to help meet the following RMAT best practice guidelines:[5]

- SS-2: Mitigate adverse climate impacts and provide benefits
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

Revegetating Sites Including Loam and Seed

Upon completion of the proposed tunnel and near-surface valve vaults and connection piping, areas disturbed during construction would be restored with loam and seed and other native vegetation, which would help diminish flood risk by minimizing additional impervious areas and maintaining existing pervious areas to provide infiltration space for floodwater. It would also reduce erosion risks by providing greater soil cohesion. The School Street connection site would experience a proposed net decrease in impervious surface since the existing paved site would be restored with loam and seed. Other sites would be revegetated after construction with native vegetation. The use of loam and seed and other native revegetation is anticipated to meet the following RMAT best practice guidelines:

- SS-2: Mitigate adverse climate impacts and provide benefits
- SS-3: Protect, conserve, and restore critical natural resources on-site and off-site
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

Extreme Heat

The Program would remove some trees and vegetation during construction-related activities, which would reduce available shade cover at the proposed sites. The addition of impervious areas may also

5 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Resilient Massachusetts Action Team (RMAT), *Climate Resilience Design Standards & Guidelines*, Climate Resilience Design Standards Tool, Version 1.2, *User Guide*, July 2022, https://eea-nescaum-dataservices-assets-prd.s3.amazonaws.com/cms/GUIDELINES/UserGuide_V1.2.pdf.

increase the overall level of heat absorption at the sites compared to existing conditions, contributing to the heat island effect.

The Program would replace trees and vegetation where required and as appropriate. Sites disturbed during construction would be restored with loam and seed, which would assist in reducing potential increases in extreme heat risk, as grass does not absorb and reflect as much heat as paved surfaces. The School Street connection site would experience a net decrease in impervious surface since some of the existing paved site would be restored with loam and seed upon completion of construction activities.

Planting trees and landscaping sites after construction, where required and as feasible, would help to recover lost shade and minimize potential increases in extreme heat as a result of the Program. By minimizing tree clearing to the extent practicable, planting trees where possible and appropriate, and revegetating sites using loam and seed, the Program would seek to implement the following RMAT best practice guidelines:

- SS-2: Mitigate adverse climate impacts and provide benefits
- SS-3: Protect, conserve, and restore critical natural resources on-site and off-site
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

14.2.6 Air Quality and GHG Emissions

Air quality and GHG emission impacts were identified from the use of construction equipment, trucks, and transportation during the construction period. There would be no permanent impacts on air quality and GHG emissions because the Final Condition of the Program would generate minimal emissions. A mesoscale analysis resulted in construction period impacts to be general and non-site specific. Mitigation measures are therefore general and would apply to all sites during the construction period.

14.2.6.1 Air Quality and GHG Emissions Construction Period Mitigation

As assumed in the DEIR, the MWRA intends to incorporate the following measures to reduce emissions from Program-related construction activities:

- Where feasible, the MWRA would use electrified construction equipment, including use of an electrified TBM instead of a TBM powered by fossil fuels, which would avoid direct pollutant emissions from one of the largest pieces of construction equipment.
- Contractors would 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 would be trained accordingly.
- Contractors would use Ultra Low Sulfur Diesel fuel, and construction contracts would stipulate that all diesel-fuel construction equipment be fitted with after-engine emission controls. Any non-road diesel equipment would have to be rated 50 horsepower or greater to meet USEPA’s Tier 4 emission limits or be retrofitted with appropriate emission-reduction equipment. Emission-reduction

equipment could include USEPA-verified or California Air Resources Board (CARB)-verified diesel oxidation catalysts or diesel particulate filters.

- Contractors would be encouraged to use cleaner alternatively fueled equipment (natural gas or electric) rather than diesel-fueled equipment where available and feasible. This mitigation measure was previously, "When possible, use electric equipment over other fuel-based options." This was updated from the DEIR due to uncertain availability of electric equipment.
- Contractors would be required to implement measures to protect residents, visitors, passengers, and passers-by from off-site exposure to dust and debris.
- Dust control measures would be incorporated to minimize potential fugitive dust emissions associated with construction vehicles tracking dirt and debris offsite and to minimize the potential for strong winds to disperse dry layers of soils temporarily stored onsite. Appropriate methods of dust control would be determined according to the surfaces concerned (roadways or disturbed areas) and would include, as applicable, application of water during ground-disturbing activities; seeding of areas of exposed soils; wheel washing; using covered trucks; and regular sweeping of paved roadways (see also **SDEIR Chapter 9, Transportation**).

14.2.7 Transportation

Consistent with the DEIR, potential impacts to the transportation network may occur temporarily during the construction period, through an increase in truck trips to and from the construction sites, transportation of contractors, and physical construction of near-surface pipelines in public roadways at some Program sites. No significant Program-related permanent transportation-related impacts are anticipated.

The primary source of traffic expected to be generated temporarily by the Program would be construction worker trips to and from the sites, as well as trucks hauling equipment and excavated material. Near-surface piping construction at some locations would require traffic management measures, including lane closures, sidewalk closures, and detours.

14.2.7.1 Transportation Construction Period Mitigation

If construction activities were to result in significant traffic congestion during the peak hour, work within the roadway may not be permitted during weekday peak hours, which normally occur from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM in accordance with local ordinances. Coordination with the roadway owner is recommended if the proposed construction work needs to be completed during the weekday peak hours. On heavily traveled urban arterials, work within the roadway may primarily be permitted during off-peak, overnight hours. In some residential areas, work may be restricted to daytime hours only so as not to disturb residents. In some areas, time restrictions also may be used to avoid impacts to routine street sweeping or other activities.

Measures that will be considered to mitigate potential traffic impacts caused by Program-related construction-period activities are summarized in **Table 14-10**. Most of the potential mitigation measures described in this section would require approval and/or permits from the MassDOT, DCR, or applicable municipalities. Applicability of these measures will be discussed with the municipalities or agencies prior to submitting permit applications. These potential impacts and associated mitigation measures considered are also detailed in **SDEIR Chapter 9, Section 9.2.4, Transportation Avoidance, Minimization, and Mitigation**.

Table 14-10 Potential Transportation Construction Period Impacts and Mitigation

Potential Construction Period Impact		Mitigation
Temporary increase in traffic at local intersections		*When possible and as necessary, conduct trucking during off-peak hours.*
Town (Program Sites)	***Intersections***	
Waltham (UMass Property, Lower Fernald Property, School Street, and Cedarwood Pumping Station)	*Trapelo Rd. at Lexington St.* *Waverley Oaks Rd. at Trapelo Rd.* *Beaver St. at Waverley Oaks Rd.* *Main St. at Linden St./Ellison Park* *Elm St. at Main St.* *Moody St. at Main St.* *Bacon St. at Main St.* *Weston St. at Main St.* *South St. at Weston St.* *Shakespeare Rd. at South St.*	
Weston (Tandem Trailer, Park Road East, Bifurcation, Park Road West, and Hultman Aqueduct Isolation Valve)	*River Rd. at South Ave.* *I-95 N Off Ramp at South Ave.* *Park Rd. at South Ave.*	
Wellesley (Hegarty Pumping Station)	*Worcester St. at Cedar St.*	
Needham (Highland Avenue Sites, St. Mary Street Pumping Station)	*Cedar Avenue at Cedar St.*	
Brookline (Newton Street Pumping Station)	*Grove Street at Newton St.* *Newton St. at Clyde St.* *Dudley Street at Lee St.* *Lee St. at Route 9* *Chestnut Hill Avenue at Route 9* *Hammond Street at Route 9*	

Table 14-10 Potential Transportation Construction Period Impacts and Mitigation

Potential Construction Period Impact		Mitigation
Boston (Southern Spine Mains, and American Legion)	*Canterbury Ln. at Morton St.* *Morton St. at Harvard St.* *Morton St. at Blue Hill Ave.* *Morton St. at Norfolk St.* *Morton St. at Corbet St.* *Morton St. at Gallivan Blvd.* *Gallivan Blvd. at Washington St.* *Gallivan Blvd. at Dorchester Ave.* *Gallivan Blvd. at Granite Ave./Adams St.* *Gallivan Blvd. at Hallet St.* *Gallivan Blvd. at Neponset Ave.* *Neponset Ave. at Morrissey Blvd.* *South St. at Washington St.* *South St. at Arborway.* *Washington St. at Arborway* *Arborway at Circuit Dr.*	
Temporary increase in traffic at intersections along construction vehicle routes:		*When possible, conduct trucking during off-peak hours.*
Town (Program Sites)	**Intersections**	
Waltham (UMass Property, Lower Fernald Property, School Street, and Cedarwood Pumping Station)	Trapelo Road at Waverly Oaks Road Main St. at Ellison Park/ Linden St.	
Weston (Tandem Trailer, Park Road East, Bifurcation, Park Road West, and Hultman Aqueduct Isolation Valve)	*River Rd. at South Ave.* *Park Rd. at South Ave. (Alt. 4A and 10A)* *I-95 Northbound off-ramp at South Ave./Commonwealth*	
Needham (Highland Avenue Sites, St. Mary Street Pumping Station)	*Cedar Avenue at Cedar St.*	
Newton (no sites, traffic from Newton Street Pumping Station)	*Woodward St./Elliot St. at Route 9*	
Brookline (Newton Street Pumping Station)	*Newton St. at Clyde St.*	
Boston (Southern Spine Mains, and American Legion)	*Morton St. at Blue Hill Ave.* *Morton St. at Norfolk St.* *South St. at Washington St.*	
Temporary impacts to bicycle and pedestrian pathways during installation of near-surface piping *Southern Spine Mains: temporary bicycle and pedestrian detour along the Arborway*		*Accommodate bikes and pedestrians through on-street work zones.* *Maintain safe access at all times.*
Installation of near-surface piping requiring traffic management and/or local detours		*Install during off-peak and overnight hours, where possible*

Table 14-10 Potential Transportation Construction Period Impacts and Mitigation

Potential Construction Period Impact		Mitigation
Proposed Site	**Location**	*and as necessary, to minimize potential disturbance to traffic, bicyclists, and pedestrians.*
UMass Property	Beaver Street and Waverley Oaks Road	
Lower Fernald Property	Waverley Oaks Road	*Where possible and as appropriate, restripe crosswalks with high-visibility markings and construct Americans with Disabilities Act (ADA)-compliant curb ramps with detectable warning panels on each corner where existing crosswalks or curb ramps are impacted.*
Highland Avenue Sites	*Brook Road, Wexford Road, and Freemont Street*	
American Legion	*American Legion Highway and Morton Street*	
School Street	*School Street*	
		Maintain two-way traffic whenever possible and one lane traffic at a minimum.
		Provide temporary local detours where necessary.
***Temporary increase in truck traffic**:* *Routes along Program sites*		*When possible and as necessary, conduct trucking during off-peak hours.*

Intersection Operations

Study Area intersections subject to potential temporary increases in delay associated with Program-related construction activities could be mitigated, if necessary and where appropriate, by adjusting the traffic signal timings.

The maximum amount of temporary Program-related traffic would occur at tunnel launching shaft sites where there is a shift change conservatively modeled to take place during the evening peak hour (construction worker trips are not expected to occur during the evening peak hour as shift change is usually at approximately 3:00 PM). Launching shaft locations (i.e., Tandem Trailer, Bifurcation, and Highland Avenue sites) are adjacent to highway ramps and are therefore not expected to cause a significant traffic impact to nearby local roadways.

Any alterations in the vicinity of the I-90/I-95 interchange in Weston will be closely coordinated with the MassDOT interchange reconstruction project (MassDOT Project No. 606783), which is expected to begin construction in 2023 and conclude in 2027.

Sensitive Receptors

Safe access to sensitive receptors will be maintained at all times (refer to **DEIR Appendix F.4, Transportation Impact Assessment, Section F.4.7.1, Sensitive Receptors [pg. F.4-16]**).

Bicycles and Pedestrians

Bicycles and pedestrians will be accommodated through all on-street work zones. Specific details will be worked out through the final design process.

Near-Surface Piping

Near-surface piping installed in public roadways would have potential temporary impacts on traffic and roadways. Details on roadways subject to potential impacts are provided in **Table 14-10**. Depending on the site, mitigation measures may include:

- Install near-surface piping during off-peak and/or overnight hours where possible and as necessary, to minimize potential disturbance to traffic, bicyclists, and pedestrians.
- Where possible and as appropriate, restripe crosswalks with high-visibility markings and construct Americans with Disabilities Act (ADA)-compliant curb ramps with detectable warning panels on each corner where existing crosswalks or curb ramps are impacted.
- Maintain two-way traffic whenever possible. If not possible, maintain at least one-way traffic.
- Evaluate and implement trenchless technologies where feasible.

14.2.8 Rare Species and Wildlife Habitat

Consistent with the DEIR, construction-period impacts to this resource were identified as potential impacts to Northern Long-Eared Bat (NLEB) habitat, which is regulated by the Endangered Species Act (ESA), and monarch butterflies, which are a candidate species. Additionally, tree clearing to accommodate construction activities may impact other wildlife. No permanent impacts are anticipated to this resource.

14.2.8.1 Rare Species and Wildlife Habitat Construction Period Mitigation

During construction, compliance with applicable Time of Year Restrictions on tree cutting and other measures specified in the applicable U.S. Fish and Wildlife Service 4(d) Rule for the Northern Long-Eared Bat will be required at all sites with tree clearing. At the conclusion of the construction phase, all sites would have vegetation restored with the planting of native trees and plants. The addition of native trees and plants would restore construction areas to provide similar wildlife habitat characteristics as they had prior to construction. Mitigation measures identified below are consistent with the DEIR unless otherwise stated. These impacts and associated mitigation measures are summarized in **Table 14-11**.

Table 14-11 Rare Species and Wildlife Habitat Construction Period Impacts and Mitigation

Estimated Impact				Mitigation
Construction Period Impacts				
Tree clearing to accommodate construction activities (acres)				*Revegetate areas disturbed during construction, including replace removed trees where required and as appropriate.*
Proposed Site	**Alt. 3A**	**Alt. 4A**	**Alt. 10A**	
UMass Property	0.2	0.2	-	
Lower Fernald Property	-	-	1.1	
Tandem Trailer and Park Road East	*0.9*	*0.9*	-	
Bifurcation	*6.1*	-	-	
Park Road West	-	*0.2*	*0.2*	
Highland Avenue Northwest/Southwest	*2.5*	*2.5*	*2.5*	
Highland Avenue Northeast/Southeast	-	-	-	
American Legion	*1.5*	*1.5*	*1.5*	
School Street	-	-	-	
Cedarwood Pumping Station	*0.1*	*0.1*	*0.1*	
Hegarty Pumping Station	*0.2*	*0.2*	*0.2*	
St. Mary Street	-	-	-	
Newton Street Pumping Station	*0.1*	*0.1*	*0.1*	
Southern Spine Mains	*0.3*	*0.3*	*0.3*	
Hultman Aqueduct Isolation Valve	-	-	-	
Total	**11.9**	**6.0**	**6.0**	
Potential Construction Period Impacts				
Potential incidental take of federally listed Northern Long-Eared Bat (Myotis septentrionalis; NLEB) due to tree clearing				*Revegetation of construction areas with native species.*
Changes in wildlife habitat characteristics due to construction activities *All sites*				*Compliance with Time of Year Restrictions for work within potential NLEB habitat.*

Italicized text within the table indicates no change from the DEIR.

14.2.9 Noise and Vibration

Construction activities would cause temporary noise and vibration impacts to some sites requiring mitigation, as discussed in **SDEIR Chapter 11, Noise and Vibration**. There would be no permanent noise and vibration impacts on sensitive receptors in the Program's Final Condition.

14.2.9.1 Noise and Vibration Construction Period Mitigation

Potential impacts and associated mitigation measures are summarized in **Table 14-12** and discussed in detail in the following sections. The MWRA will require that the contractor develop and follow a Noise Control Plan (NCP) for the duration of the Program. The NCP will include noise level criteria that the contractor will have to meet, as well as a construction noise monitoring program. Prior to the start of work, the contractor will submit the NCP to the MWRA for review and approval. The NCP will include preconstruction noise monitoring to help establish construction noise limits, estimates of construction noise levels during each phase of construction, alternative noise mitigation measures to be implemented by the contractor (as needed), procedures for noise measurements to confirm equipment noise emission levels, public outreach requirements, and an outline of a complaint resolution process. The NCP will detail the contractor's strategy and means to comply with contract-specific noise limits. Copies of the NCP would be maintained in each field office where work is being performed. See **SDEIR Section 11.2.4, Noise Avoidance, Minimization, and Mitigation (pg. 11-20)**, for an example list of requirements that may be included in a NCP.

Construction noise avoidance, minimization, and mitigation measures would be implemented as practicable to minimize the potential for impacts to noise-sensitive receptors. The following are construction noise control methods and best practices that could be implemented at construction sites, as feasible and reasonable, where there would be potential construction noise impact:

- Outfit construction equipment with noise-control features such as mufflers.
- Deploy properly functioning equipment and schedule maintenance to avoid louder operation associated with mechanical issues.
- Locate especially noisy construction equipment, such as pumps and air compressors, away from sensitive receptor locations, as feasible.
- Use quieter equipment and methods, as feasible, such as smaller backhoes and excavators, predrilling in lieu of or prior to pile driving during support of excavation, electric power instead of diesel-generators, and concrete saws to breakup pavement prior to excavation rather than hoe rams or jackhammers.
- Where possible, perform certain construction activities during periods of the day that are less sensitive to noise (e.g., mid-day periods near residences or evening periods near schools).
- Install temporary noise barriers around the perimeter of the equipment at the construction site or along the sides of the construction site that are adjacent to noise-sensitive receptors. Temporary noise barriers are often constructed using 3- to 4-foot tall concrete highway barriers with plywood (3/4-inch or thicker) installed on top or chain-linked fencing with acoustical curtains. Noise barriers up to approximately 12- or 15-foot tall can be constructed using these materials. When noise barriers break the line-of-sight between the construction equipment and the receptors, they can reduce noise by 10 dBA or more.
- Place smaller stationary equipment such as air compressors, generators, and pumps in portable acoustic enclosures. Enclosures around the shaft/tunnel pump system would be installed when no other construction activities are slated to occur during the evening/nighttime hours to mitigate impacts to nearby receptors.
- Maintain strong communication with the public regarding the Program and continue Program-specific public outreach to keep the public informed of the schedule of construction activities and to respond to potential concerns.
- Provide site-specific information about the time and nature of construction activities to adjacent neighbors.

No construction vibration impact associated with potential structural damage is anticipated, therefore, specific avoidance, minimization, and mitigation measures are not required. However, standard construction practices would be implemented to minimize the potential for perceptible vibration. These practices include:

- Performing pre-construction surveys for all nearby structures
- Construction documents will include limits for maximum allowable ground borne vibration
- Construction will include an instrumentation and monitoring plan to continuously evaluate construction activities with proper mitigation plans
- Performing construction activities that generate vibration during less sensitive periods of the day, where possible (e.g., mid-day periods near residences or evening periods near schools)
- Using construction methods that generate less vibration when adjacent to sensitive buildings, where possible (e.g., pre-drilling prior to pile driving, or drilling in lieu of pile driving)

Table 14-12 Noise and Vibration Construction Period Impacts and Mitigation

Potential Impact	Mitigation
Construction Period	
Exceedance of Housing and Urban Development (HUD) or Massachusetts Department of Environmental Protection (MassDEP) nighttime noise limits would occur prior to mitigation	*Install temporary noise barriers and other acoustic barriers.* *Locate equipment away from sensitive receptors.* *Perform construction that generates high amounts of noise and vibration during less sensitive times of day (for example mid-day periods near residences).* *Use quieter construction equipment and methods that would reduce construction noise such as drilling prior to pile driving.* *Regularly service construction equipment to ensure proper function and outfit with noise control features.* *Maintain ongoing public communication.*

Proposed Site	Alt.	Night level	Day-night level
UMass Property	3A, 4A		X
Lower Fernald Property	10A		X
Tandem Trailer and Park Road East	*3A, 4A*		*X*
American Legion	*All*		*X*
School Street	*All*		*X*
Cedarwood Pumping Station	*All*		*X*
Hegarty Pumping Station	*All*		*X*
St. Mary Street Pumping Station	*All*		*X*
Newton Street Pumping Station	*All*		*X*

Table 14-12 Noise and Vibration Construction Period Impacts and Mitigation

Potential Impact	Mitigation
Potential for vibration damage or impact to interior conditions would be from impact pile driving that may occur during excavation. *Southern Spine Mains site: The William A. Hinton State Laboratory Institute at the Massachusetts Department of Public Health (DPH) is approximately 400 feet from the proposed Southern Spine Mains site. Since the proposed shaft location would be approximately 400 feet or farther from the DPH building, both exterior and interior vibration levels would be below the applicable impact thresholds. Therefore, no potential vibration impact would be anticipated at the DPH building and there would be no need for mitigation measures.* *School Street site: The St. Mary's Roman Catholic Church Complex is approximately 200 feet from the proposed limits of work associated with the School Street site and therefore not at risk of structural damage from vibration; no potential impacts to stained glass would be anticipated.*	*Construction noise and/or vibration monitoring may be conducted throughout the project to monitor the noise and vibration levels in the nearby communities. Should monitored levels be above the established thresholds for impact, mitigation may be required.* *In the vicinity of the DPH facility, the MWRA will direct the contractor to not deploy pile-driving measures for construction.*

Italicized text within the table indicates no change from the DEIR.

14.2.10 Cultural and Historical Resources

Consistent with the DEIR, there would be no detrimental construction-period impacts on cultural and historical resources. In SDEIR Alternative 10A, construction period disturbance and permanent impacts on cultural and historical resources would occur from the demolition of up to three contributing resources within the Walter E. Fernald State School (WLT.AB) and would lead to a direct adverse effect on the historic district. This impact, however, would be minimized by the specific location of the buildings proposed for demolition, which are away from the Walter E. Fernald State School and the core of the associated Historic District. Program-related activities would not jeopardize the listing of the Walter E. Fernald State School Historic District (WLT.AB) as described in **DEIR Appendix E, Historic/Cultural Resources Supporting Documentation, E.1, Agency Correspondence**.

14.2.10.1 Cultural and Historical Resources Construction Period Mitigation

For all SDEIR Alternatives, the distance from the School Street connection shaft site to St. Mary's Roman Catholic Church is beyond the area of potential impact; however, as needed, monitoring for vibration during connection shaft construction would be put in place to protect the integrity of the church's stained-glass windows. The MWRA will also prepare an Inadvertent Discovery Plan, should anticipated archaeological resources be found during construction. See **Table 14-13** for anticipated construction period impacts. For disturbance of the Lower Fernald Property site, revegetation of disturbed areas would be conducted after construction.

Table 14-13 Cultural and Historic Resources Construction Period Impacts and Mitigation

Estimated Impact		Mitigation
Construction Period Impacts		
Town	**All Alternatives**	
Waltham	Lower Fernald Property site (site disturbance)	Revegetation of disturbed areas, including loam and seed and tree and shrub plantings; specifics to be determined in cooperation with the municipality and/or landowner in final design.
Waltham	*St. Mary's Roman Catholic Church (possible vibration)*	*Monitoring for vibration as necessary.*
All sites		*Prepare an Inadvertent Discovery Plan.*

Italicized text within the table indicates no change from the DEIR.

14.2.10.2 Cultural and Historic Resources Final Condition Mitigation

Prior to the demolition of the three resources at the Lower Fernald Property (SDEIR Alternative 10A), the MWRA would continue to consult with the Massachusetts Historical Commission (MHC) regarding ways to avoid, minimize, or mitigate the adverse effects to the Walter E. Fernald State School Historic District (WLT.AB). Final condition mitigation measures are shown in **Table 14-14.**

Table 14-14 Cultural and Historical Resources Final Condition Impacts and Mitigation

Estimated Impact		Mitigation
Permanent Impacts		
Demolition of three contributing resources that would lead to a direct adverse effect on the historic district		*Provide photo documentation, if requested by the Massachusetts Historical Commission (MHC).*
Proposed Site	**All Alternatives**	*Coordinate review of proposed plans for the affected historic resource, if requested by MHC.*
Lower Fernald Property (10A)	Two contributing resources within the Walter E. Fernald State School	*Prepare continuation sheets for existing inventoried forms with additional information and photographs of current conditions, if requested by MHC.*

Italicized text within the table indicates no change from the DEIR.

14.2.11 Hazardous Materials

Due to the presence of documented releases of oil and/or hazardous materials near and/or within the UMass Property site and Lower Fernald Property site and considering the generally developed nature of the Program area, there is the potential to encounter oil and/or hazardous materials and urban fill that would require special handling and management during construction phases of all SDEIR Alternatives. Spills and leaks associated with vehicles, concrete plants, and heavy machinery would be mitigated through spill response programs that would specify emergency response procedures for spill and leak events. In the unlikely event that a spill or discharge occurred during construction phases of the Program, it may also be necessary to contact regulatory agencies such as the National Response Center, the USEPA, or MassDEP. There would be no permanent hazardous materials impacts in the Program's Final Condition.

14.2.11.1 Hazardous Materials Construction Period Mitigation

Spills and leaks associated with vehicles, concrete plants, and heavy machinery would be mitigated through spill response programs that would specify emergency response procedures for spill and leak events. Depending on the nature of the spill or discharge to the environment, it may also be necessary to contact regulatory agencies such as the National Response Center, the USEPA, or MassDEP. There would be no permanent impacts from hazardous materials. These potential impacts and associated mitigation are summarized in **Table 14-15** and discussed in detail below. Details on the specific mitigation activities follow the table and include additional mitigation as well.

Table 14-15 Hazardous Materials Construction Period Impacts and Mitigation

Estimated Impact	Mitigation
Potential Construction Impacts	
Potential of discovery of contaminated soil or groundwater during construction, however the Program would have a positive impact by reducing exposure to surrounding receptors *All sites*	*Assess excavation areas to identify impacted resources.*
	Development and implementation of a Soils and Materials Management Plan (SMMP) for materials handling, testing, and material reuse.
	Reuse of building materials when possible.
	Special handling and management of contaminated soil and groundwater.
	Management of fugitive dust through wet suppressions, truck wheel cleaning, covering of truck loads and monitoring siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary.

Italics indicate no change since the DEIR.

Management of Impacted Soil

A Program-wide Soils and Materials Management Plan (SMMP) would be developed during final design to manage all soil and excavated material including contaminated and uncontaminated materials encountered during construction. SMMPs provide procedures for materials handling during construction, including procedures for stored or containerized material, and testing procedures for sampling material prior to off-site disposal or on-site reuse. In addition, the contractor will implement BMPs for material storage and other BMPs developed specifically for construction sites to prevent the potential for cross-contamination and potential exposures to surrounding sensitive receptors such as surface water bodies, wetlands, and nearby residences. These BMPs will be detailed in the site-specific NPDES Stormwater Pollution Prevention Plan (SWPPP) to be developed and implemented by the contractors.

Properties with confirmed oil and hazardous materials (OHM) impacts will be managed in accordance with the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000; the Program-wide SMMP; and associated policies or guidance issued by MassDEP. Depending on the type and concentrations of OHM present at a property, however, other federal regulations implemented by the USEPA may apply (e.g., Comprehensive

Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and/or Resource Conservation and Recovery Act).

Preliminary assessments would help identify the type and quantity of OHM-impacted media requiring management under these protocols and would help with selecting the optimal disposal methods and/or destination prior to generation. Based on the antidegradation policy and a pre-risk screening, which would be performed by the contractor to determine the risk associated with the current and foreseeable use of the property, it could be possible to reuse soil that is above the MCP standards within the Program, as long as regulatory endpoints could be met.

Under the MCP, notification to the MassDEP would be required if a reporting condition is identified, such as when OHM is detected in the soil and/or groundwater above the applicable standards, referred to as Reportable Concentrations. Contract documents and the Program-wide SMMP would state that the contractor hire a licensed site professional (LSP) who would:

- Verify that notification is required
- Further assess and manage the site
- Develop direct response actions
- In accordance with the MCP, specify procedures for work, such as soil excavation, performed in the contaminated areas
- Render appropriate opinions
- Determine if risk-reduction measures are required

Based on the concentrations of OHM in the soil, soil shipment documentation (e.g., Bill of Lading, manifest, Material Shipping Record) would be prepared for soil to be disposed of off-site at an appropriate disposal facility.

Soil and groundwater handling and management during construction would be conducted in accordance with the appropriate submittals (e.g., Release Abatement Measures, Immediate Response Actions, and/or Soil Management Plans), including appropriate permits and permissions. The MWRA would also work with the other responsible parties that oversee response actions at disposal sites within the Study Area to coordinate work.

Management of Hazardous Building Materials and Demolition Debris

Based on the age of the buildings proposed to be demolished at the Lower Fernald Property site, asbestos containing materials (ACMs), including roof flashing, tiles, and other materials, may be present in the buildings that would be undergoing demolition. Lead-based paint, mercury, and polychlorinated biphenyl (PCBs) may also be present in building materials and/or fixtures. Prior to demolition, a licensed asbestos and hazardous materials contractor would sample the building material as well as suspected lead-based paint, mercury, and PCBs. If these hazardous materials were found to be present in the structures, they would be removed in accordance with state regulations by a licensed contractor and disposed of at a licensed receiving facility.

The MWRA will make every effort to reuse building materials, such as asphalt, brick, and concrete—as their reuse could reduce disposal costs and may not require a permit. The reuse would depend on whether they are coated with a contaminant or considered "contaminated" based on the concentrations of contaminants on the material.

The disposal of the ACMs outside the jurisdictional boundaries of the Commonwealth would comply with applicable laws and regulations of the state receiving the material. Pursuant to 310 CMR 16.05, ACMs, including asphaltic asbestos felts or shingles, may not be disposed of at a facility operating as a recycling facility.

Management of Impacted Groundwater

Contaminated groundwater encountered during construction would be managed in accordance with applicable regulations. An USEPA NPDES CGP or a USEPA Dewatering and Remediation General Permit (DRGP) to discharge to surface waters or authorization from the appropriate local authorities for discharge to a municipal stormwater management system would be obtained to manage dewatering effluent during construction.

A DRGP may be required during construction dewatering where groundwater is suspected or confirmed to be impacted. In locations where OHM-impacted groundwater is not anticipated to be encountered, there would be the potential for naturally occurring contaminants to be present in groundwater, which may require a USEPA NPDES DRGP to facilitate discharge.

In all cases, contract documents would require that groundwater collected at each construction site be treated prior to discharge to meet applicable regulatory requirements. Depending on site-specific conditions such as the existing groundwater quality and the dewatering methods selected by the contractor, groundwater management protocols would include siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary, to meet discharge state and federal permits requirements. For additional details on management of groundwater discharges see For additional details on management of groundwater discharges including triggers for using a NPDES DRGP rather than the 2022 CGP are provided in **DEIR Section 4.6.5.4, Tunnel Dewatering and Disinfection (pg. 4.6-150).**

Health and Safety Requirements

Health and safety procedures are governed by the Occupational Safety and Health Administration (OSHA). Construction workers involved in performing the response actions would have the appropriate health and safety training in accordance with OSHA, which mandates procedures that must be followed to protect them from exposure to contaminated media.

Mitigation measures during construction would include special handling, dust control, and management and disposal of contaminated soil and groundwater. These measures prevent construction delays and protect workers and nearby sensitive receptors, including environmental justice populations (see **SDEIR Chapter 3, Environmental Justice**).

Fugitive dust would be minimized using dust-related mitigation measures such as wet suppression, truck wheel cleaning, and covering of truck loads and stockpiles. Dust monitoring would be conducted during excavation, and a monitoring plan would be detailed in the contractor health and safety plans.

14.3 Technical Analysis to Respond to Certificate Comments

As requested in the EEA Secretary's Certificate on the DEIR, this Chapter also provides responses to the Mitigation section of the Scope of the DEIR Certificate (with references to SDEIR sections in **bold**). Refer to **SDEIR Chapter 15, Responses to Comments**, for the full list of delineated comments received on the DEIR. The following comments were identified in the Certificate. Responses follow delineated comment.

Certificate Comment C-51

The SDEIR should include separate chapter summarizing all proposed mitigation measures including construction-period measures. Include comprehensive list of all commitments made by the Proponent to avoid, minimize and mitigate the impacts of the project. Describe 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.

Response to C-51

Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category are summarized in **SDEIR Section 14.2**. **SDEIR Appendix H** includes draft Section 61 Findings for each permit to be issued by state agencies.

Table 14-2 summarizes construction period mitigation commitments by environmental category for each of the SDEIR Alternatives. Commitments to implement these mitigation measures are described as well as the parties responsible for implementation, and an estimated schedule for implementation. The Program is in the preliminary design phase, and it is thus difficult to estimate the cost of the mitigation measures. Cost estimates will be developed during the final design phase and included in construction costs.

Certificate Comment C-52

The list of commitments should be provided in a tabular format organized by subject matter (traffic, water/wastewater, GHG, EJ, etc.) and identify the Agency Action or Permit associated with each category of impact.

Response to C-52

Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category are summarized in **SDEIR Section 14.2. SDEIR Section 14.2** includes tables documenting mitigation commitments by environmental category, with mitigation commitments summarized in **Table 14-2**. Potential impacts are identified by SDEIR Alternative and Program site where applicable. **Table 14-1** outlines the anticipated permits, by agency, for the Program.

Certificate Comment C-53

Draft Section 61 Findings should be separately included for each Agency Action to be taken on the project.

Response to C-53

SDEIR Appendix H, includes separate draft Section 61 Findings for each of the agencies for which an agency action is required. Environmental Impacts and associated mitigation measures identified in this Chapter have been restated in **SDEIR Appendix H** where applicable.

15 Responses to DEIR Certificate Comments and Comment Letters

15.1 Introduction

This chapter of the Supplemental Draft Environmental Impact Report (SDEIR) includes responses to the Draft Environmental Impact Report (DEIR) Certificate issued by the Commonwealth of Massachusetts, Secretary of the Executive Office of Energy and Environmental Affairs (EEA) on December 16, 2022. The Certificate, along with each comment letter received on the Draft Environmental Impact Report (DEIR) during the public review comment period, are listed in **Table 15-1**. The comments received from the Secretary of the EEA in the DEIR Certificate are assigned a letter ("C") and all other comment letters are assigned a number. Each individual comment is assigned a comment code (e.g., "C-20" or "1-2") that corresponds to how the comment is delineated in the DEIR Certificate or referenced comment letter. Technical responses to Certificate comments are also included in the SDEIR chapters.

Table 15-1 Certificate and Comment Letters Received on the DEIR

Letter No.	Affiliation	Commenter	Date
Certificate (C)	Commonwealth of Massachusetts, Secretary of the Executive Office of Energy and Environmental Affairs (EEA)	Secretary Bethany A. Card	December 16, 2022
Letter 1	Commonwealth of Massachusetts, Water Resources Commission (WRC)	Vandana Rao, Executive Director	November 22, 2022
Letter 2	Commonwealth of Massachusetts, Department of Environmental Protection (MassDEP), Waterways Regulation Program	Alice Doyle, Waterways Reviewer	November 23, 2022
Letter 3	Commonwealth of Massachusetts, Department of Environmental Protection, Northeast Regional Office (MassDEP-NERO)	John D. Viola, Deputy Regional Director	December 9, 2022
Letter 4	Commonwealth of Massachusetts, Department of Conservation and Recreation (DCR)	Douglas J. Rice, Commissioner	December 12, 2022
Letter 5	Boston Water and Sewer Commission	John P. Sullivan, Chief Engineer	November 17, 2022
Letter 6	City of Waltham	Jeannette A. McCarthy, Mayor; and Patricia A. Azadi, First Assistant Solicitor	December 7, 2022
Letter 7	Town of Needham	Kate Fitzpatrick, Town Manager	December 9, 2022

A copy of the Certificate and of each comment letter received are provided prior to the Massachusetts Water Resources Authority's (MWRA's) responses. **Table 15-2** includes the comments received on the DEIR in the Secretary's Certificate and the MWRA's responses. **Tables 15-3** through **15-9** include the comments received on the DEIR in the comment letters and the MWRA's responses. In total, seven comment letters were received on the DEIR, as shown in **Table 15-1**.

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December 16, 2022

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
DRAFT ENVIRONMENTAL IMPACT REPORT

PROJECT NAME	: Metropolitan Water Tunnel Program
PROJECT MUNICIPALITY	: Waltham, Belmont, Watertown, Weston, Newton, Wellesley, Needham, Brookline, Boston, Dedham
PROJECT WATERSHED	: Charles River and Boston Harbor
EEA NUMBER	: 16355
PROJECT PROPONENT	: Massachusetts Water Resources Authority (MWRA)
DATE NOTICED IN MONITOR	: October 24, 2022

Pursuant to Section 11.08(8)(b)(iii) of the MEPA regulations, I hereby determine that the Draft Environmental Impact Report (DEIR) submitted on this project **does not adequately and properly comply** with the Massachusetts Environmental Policy Act (MEPA; M.G.L. c. 30, ss. 61-62L) and with its implementing regulations (301 CMR 11.00), and therefore requires the filing of a Supplemental DEIR (SDEIR). Specifically, I find that substantive issues remain to be addressed related to the viability of the proposed receiving shaft site[1] at the Fernald Property in Waltham, which is common to all alternatives considered for the project for the northern alignment. C-1 In addition, potential alternate receiving locations that could replace the Fernald Property have not been disclosed nor have the impacts of any such locations been analyzed. C-2 As such, I cannot find that the project has satisfied the regulatory requirement to adequately describe and analyze the environmental impacts of the project, including all feasible alternatives to the receiving shaft location and routes for the northern alignment. As an adequate alternatives analysis is a central component of the MEPA review process, I am requiring a supplemental filing before the project proceeds to the Final EIR phase of review.

Project Description

As described in the DEIR, the Massachusetts Water Resources Authority (MWRA) is proposing

[1] Shafts sites are locations where vertical concrete lined tunnels will connect the deep rock tunnel to the surface and/or water distribution infrastructure.

to construct two new deep rock water supply tunnels (north and south alignments totaling ±14.5 miles) that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (constructed in 1950), City Tunnel Extension (constructed in 1963) and Dorchester Tunnel (constructed in 1976). This tunnel system has been in continuous service since construction. While the concrete lined deep rock tunnels have a long design life, some of the associated valves and piping have exceeded their design life and are currently in poor condition. A redundant system is needed to maintain and/or replace some of these valves and piping without interruption to water supply. The project will provide the redundancy to allow for system maintenance and repair, without disrupting service to over 2.5 million water customers. Under current conditions, if the Metropolitan Tunnel System is shut down, water must be supplied from open reservoirs containing nonpotable water, backup aqueducts, and undersized surface mains to distribute the nonpotable water with inadequate pressure. These backup options require use of emergency chlorination and issuance of a boil water order to customers. The project will support MWRA’s responsibility to protect public health, provide sanitation, and provide fire protection through adequate water supply.

Water from the Quabbin Reservoir and Wachusett Reservoir is conveyed to the John J. Carroll Water Treatment Plant (WTP) in Marlborough. Treated water is conveyed from the WTP through the MetroWest Water Supply Tunnel (MWWST) and the Hultman Aqueduct (Shaft 5/5A). From there, the existing Metropolitan Tunnel System conveys ±60 percent of the metropolitan Boston area's daily demand. The new, redundant deep rock tunnels will originate near the convergence of MWWST and the Hultman Aqueduct (Shaft 5/5A) at a site located at the western most portion of the Metropolitan Tunnel System generally in the vicinity of the Interstate 95 (I-95)/Interstate 90 (I-90) Interchange. From this point, one tunnel would take a northerly route toward Waltham (North Tunnel) and the other a southerly route toward Boston and Dorchester (South Tunnel). Each tunnel will connect to existing water supply infrastructure at key locations to provide water supply redundancy to the existing system.

Ten DEIR Alternatives were evaluated and ranked to ultimately determine the Preferred Alternative and two backup alternatives. The Preferred Alternative would propose tunnel construction in three segments including the North Tunnel (Segment 1) and the South Tunnel (Segments 2 and 3) with the South Tunnel proceeding first. Both tunnels are proposed to begin in the Town of Weston near the terminus of the Hultman Aqueduct and MWWST. The North Tunnel Alternative would extend ±4.5 miles to the north, ending near the Waltham/Belmont line with a connection to the existing 60-inch diameter Weston Aqueduct Supply Main Number Three (WASM3). The South Tunnel Alternative would extend ±10.1 miles to the south, with a connection to the distribution pipes near Shaft 7C of the Dorchester Tunnel and ending in Boston (Dorchester).

After preliminary and final design are complete, construction is estimated to take ±8 to 12 years and is planned to occur between 2027 and 2040, with the new deep-rock tunnel system placed into service before or around 2040 (useful life of more than 100 years). When sizing proposed facilities, MWRA considered projected future water demands due to population and employment increases within the service area as well as increased water use efficiency. The intent of the project is not to increase total capacity of the system, but to ensure redundancy by providing a backup to the existing Metropolitan Tunnel System if it were ever out of service for planned or unplanned reasons. Temporary construction impacts will be associated with construction of the deep rock tunnels, associated construction shaft sites and intermediate shaft sites, as well as management of material removed from the tunnel and treatment of groundwater inflow (i.e., dewatering excavated material).

Study Area

The MWRA is a Massachusetts public authority established by an act of the Legislature in 1984 to provide wholesale water and sewer services to 3.1 million people and more than 5,500 businesses in 61 communities in eastern and central Massachusetts. The MWRA water transmission system consists of Quabbin and Wachusett Reservoirs, the Ware River intake, and the deep rock tunnels and surface aqueducts that deliver water by gravity. The overall transmission and distribution system consists of ±100 miles of tunnels and aqueducts and 280 miles of surface pipeline that carry water from the source reservoirs to communities. The Quabbin and Wachusett Reservoirs, which are the main water supply sources, are located 65 and 35 miles west of Boston, respectively. Water from the reservoirs is treated at the John J. Carroll WTP in Marlborough before being conveyed to the metropolitan Boston area through the Hultman Aqueduct and the MWWST completed in 2003 which provides redundancy for the Hultman Aqueduct. Water from the Hultman Aqueduct and MWWST is then conveyed to the existing Metropolitan Water Tunnel System, which does not have a redundant system (east of Shaft 5/5A).

Each tunnel comprising the Metropolitan Tunnel System (City Tunnel, City Tunnel Extension, and Dorchester Tunnel) consists of concrete-lined deep rock tunnel sections linked to the surface through steel and concrete vertical shafts. At the top of each shaft, cast iron or steel pipe and valves connect to the MWRA surface pipe network. These pipes and valves are accessed through subsurface vaults and chambers. The tunnel and shafts themselves require little or no maintenance and represent a low risk of failure however, many of the valves and piping are in poor condition.

The project Study Area encompasses ±14.5 miles of deep rock tunnels and connections to existing water supply infrastructure (±200-400 ft) below the surface of several communities. Potential impacted areas in the Study Area include the communities of Boston, Belmont, Brookline, Dedham, Needham, Newton, Watertown, Waltham, Wellesley, and Weston. The Study Area includes wetlands, Areas of Critical Environmental Concern (ACECs), Outstanding Resource Waters (ORWs), historic resources, and mapped habitats for endangered species. As discussed below, the 14 site locations within the Study Area are within 1 mile of several Environmental Justice (EJ) Populations.[2] While the project was originally filed prior to January 1, 2022, when new MEPA protocols related to EJ outreach and analysis took effect, the DEIR voluntarily provides a description of public outreach activities and analysis of impacts over the 1-mile area around the 14 shaft site locations.

Environmental Impacts and Mitigation

Proposed shaft chambers and connecting pipelines would be underground structures. permanent above-ground features, such as concrete slabs and concrete vaults or top of shafts, would not extend more than three feet above finished grade. Potential impacts associated with the project (depending on the alternative) include alteration of up to 46.0 acres of land (surface impacts); creation of up to 4 acres of new impervious surface; and temporary and permanent alteration of wetlands including 1,674 square feet (sf) of Bordering Vegetated Wetlands (BVW)/Isolated Vegetated Wetlands (IVW), up to 106 sf of Bank, up to 3,286 sf of Bordering Land Subject to Flooding (BLSF), up to 2,800 sf of Land Under Water (LUW), and up to 290,963 sf of Riverfront Area (RFA). Greenhouse Gas (GHG) emissions and other air pollutants will be generated during construction period activities, including the use of heavy equipment, trucks and other emitting sources employed during construction. Table 4.2-1 of the DEIR

[2] "Environmental Justice Population" is defined in M.G.L. c. 30, § 62 under four categories: Minority, Income, English Isolation, and a combined category of Minority and Income.

provides a qualitative summary of environmental impacts associated with the project.

Specific shaft site locations have been selected with the intent to avoid resource areas and sensitive receptors to the greatest extent practicable. Measures to avoid, minimize, and mitigate Damage to the Environment include avoiding direct impacts to BVW/IVW; revegetating areas disturbed during construction with native species including replacing removed trees; providing compensatory storage for loss of flood storage; identifying and providing compensatory land for parcels protected by Article 97 that would be disposed to MWRA; monitoring construction noise and vibration with implementation of mitigation if established thresholds are exceeded; implementation of a Water Supply Contingency Plan with alternate sources of water as required (Appendix J); and implementation of comprehensive construction-period Best Management Practices (BMPs) including erosion and sedimentation controls.

Jurisdiction and Permitting

The project is undergoing MEPA review and is subject to a Mandatory EIR pursuant to 301 CMR 11.03(4)(a)(3) because it requires Agency Actions and involves the construction of one or more new water mains ten or more miles in length. The DEIR indicates that the project exceeds the Environmental Notification Form (ENF) threshold pursuant to 301 CMR 11.03(1)(b)(3) for the conversion of land held for natural resources purposes in accordance with Amendments to the Constitution of the Commonwealth Article 97 (Article 97) to any purpose not in accordance with Article 97. The project also exceeds the ENF review thresholds pursuant to 301 CMR 11.03(1)(b)(2) for alteration of 25 or more acres of land and 301 CMR 11.03(3)(b)(1)(f) for alteration of one-half or more acres of other wetlands (RFA)[3].

The project requires or potentially requires Highway Access/Construction Access Permits and land disposition/easements from the Massachusetts Department of Transportation (MassDOT); Right of Way Access License Agreement from the Massachusetts Bay Transportation Authority (MBTA); Construction and Access Permits and land disposition/easements from the Massachusetts Department of Conservation and Recreation (DCR); Water Management Act (WMA) Water Withdrawal Permit (WM03), Section 401 Water Quality Certificate (WQC), Chapter 91 (c. 91) License and a Distribution System Modification Permit (BRPWS32) from the Massachusetts Department of Environmental Protection (MassDEP); review by the Natural Heritage and Endangered Species Program (NHESP); review by the Massachusetts Historical Commission (MHC) pursuant to MGL c. 9 Section 23-27C; review by the Water Resources Commission (WRC) pursuant to the WMA; and Article 97 Land Disposition legislation from the Massachusetts Division of Capital Asset Management and Maintenance (DCAMM). The project is subject to review under the May 2010 MEPA GHG Emissions Policy and Protocol (GHG Policy).

The project will also require an Order of Conditions from the Conservation Commissions in Waltham, Weston, Needham, Wellesley, and Boston (or in the case of an appeal, a Superseding Order of Conditions (SOC) from MassDEP) depending on the specific site selected; a National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) and Dewatering and Remediation General Permit (potentially) from the U.S. Environmental Protection Agency (EPA); and Section 404 review from the U.S. Army Corps of Engineers (ACOE).

Because the project is being undertaken by MWRA, an Agency as defined in MEPA regulations,

[3] The DEIR did not identify that the project exceeds both ENF review thresholds.

MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment.

Review of the DEIR

The DEIR provides a comprehensive description of existing conditions, analysis of alternatives, and assessment of environmental impacts (temporary and permanent) for the Preferred Alternative and two backup alternatives including land alteration (including protected open space), wetlands and waterways, rare species and wildlife habitat, cultural and historic resources, hazardous materials/materials handling/recycling, transportation, air quality, noise, and community resources. It identifies measures to avoid, minimize and mitigate impacts and provides draft Section 61 Findings. The DEIR includes a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards.

The DEIR includes conceptual site plans for existing and post-development conditions (proposed temporary and permanent limits of disturbance) for each DEIR Alternative and identifies environmental resources including wetlands and waterways, protected open space, c.91 jurisdictional limits, stormwater, wastewater and water supply infrastructure (including private wells), rare species and wildlife habitat, cultural and historic resources, land use including land ownership, transportation, noise, and community resources.

The DEIR identifies and describes state, federal and local permitting and review requirements associated with the project and provides an update on the status of each of these pending actions. It includes a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards.

MWRA provided supplemental information to the MEPA Office on December 13, 2022 to respond to comments from the City of Waltham. For purposes of clarity, all supplemental materials are included in references to the "DEIR" unless otherwise referenced.

Alternatives Analysis

Based on previous studies (including identification of the type and size of the tunnels), the ENF identified 13 North Tunnel Alternatives and 15 South Tunnel Alternatives (28 alternatives). The 13 preliminary alternatives evaluated for the north portion of the system were grouped into three categories: operational changes to the system; increasing the capacity of the existing 60-inch WASM3 pipeline by pumping or replacing it with a larger capacity pipeline; and increasing capacity through construction of a new tunnel. The 15 preliminary alternatives considered for the south portion of the system were grouped into three categories: construction of a surface pipeline or deep rock tunnel from Shaft 5/5A or Shaft N to connect to the Sudbury Aqueduct, and sliplining the Sudbury Aqueduct to the Chestnut Hill Emergency Pumping Station; construction of a surface pipeline from Shaft 5/5A to a connection along the Dorchester Tunnel; and increasing redundancy through construction of a new deep-rock tunnel with connections to the existing MWRA distribution system. The ENF concluded that a deep-rock tunnel to the north and south would be the preferred solution to advance for further evaluation.

Since the ENF, MWRA conducted further supplemental high-level analysis of the 28 ENF alternatives using available GIS data. The total disturbed area for each of the 28 alternatives was estimated based on an assumed trench width and shaft construction requirements. Those alternatives that passed the Tier 1 requirements (meeting water demand and system reliability and resilience) were then further evaluated to gauge impacts to the following resources: open space, wetlands, rare species, and historic and cultural areas. This supplemental analysis (summarized in Appendix C Table C-1 and Table C-2) reached the same conclusion as the original qualitative analysis that the deep rock tunnel alternatives 8N (North Tunnel) and 20S (South Tunnel) described in the ENF are MWRA's preferred alternatives, and associated impacts to the above resources are equal to or less than that of the other 26 alternatives.

Each tunnel alternative would include a tunnel boring machine (TBM) launching shaft at the starting point for each tunnel segment and a TBM receiving shaft at each tunnel segment terminus. Since the ENF, MWRA identified and evaluated potential launching (entry), receiving (exit), and connection point (primary and secondary) locations to determine the alternatives that would advance to the DEIR. Since the DEIR Alternatives are made up of different combinations of launching, receiving, and connection sites and different tunnel segments, a multicriteria decision tool was developed to consistently apply the evaluation criteria and subcriteria to each site or tunnel segment, and to score the alternative components to develop a mechanism for comparing one against the other and in combination.

Since the ENF was filed, MWRA focused on the deep-rock tunnel concept to develop alternatives with the goal of identifying a small set of tunnel alignment alternative that would be assessed in the DEIR. MWRA identified 10 potential alternatives that considered the following factors: sufficient acreage to serve the evaluated function; proximity to highways; land ownership; availability of land; and a high-level screening of environmental impacts. The ten DEIR Alternatives are composed of two or three deep rock tunnel segments, each with a launching shaft site at the start of the tunnel segment, a receiving shaft site at the terminus of the tunnel segment, connection shaft sites where the tunnels are connected to the existing water distribution system, and deep rock tunnel segments connecting the various shaft sites. Together these shaft sites and tunnel segments comprise a tunnel alignment. The DEIR provides an evaluation of potential environmental impacts associated with the project for each alternative. The 10 potential DEIR Alternatives were then further screened to identify three alternatives that proceeded into more detailed environmental impact assessment in the DEIR. This alternatives' screening process in described in detail in Appendix C. The DEIR depicts the location of shaft sites and isolation valve sites for each alternative. The 10 candidate DEIR Alternatives differ in the combination of sites, direction of excavation of the TBMs, and the lengths of the tunnel segments. They also have several common characteristics such as all alignment alternatives include the Fernald Property in Waltham, which is the location of the former Fernald School, as the most northern point of the North Tunnel. All alignment alternatives include the American Legion site, which is under the care, custody, and control of the DCR as the most southern point of the South Tunnel. In addition, all alternatives include the same six intermediate connection shaft sites and the Hultman Aqueduct isolation valve site.

As indicated above, the DEIR presents a Preferred Alternative and two back up alternatives from among the ten DEIR Alternatives reviewed. It is unclear from the alternatives analysis if other alternatives that were less impactful to environmental resources were dismissed. The DEIR Alternatives screening evaluated and scored each of the DEIR tunnel alignment shaft and connection sites individually, and then cumulatively for the entire tunnel alignment, considering the relative ability of the respective alternatives to achieve the project goals while minimizing environmental impacts. High-level DEIR evaluation criteria included: Engineering/Constructability; Land Availability; Environmental; Social/Community; Operations; Cost; and Schedule. All three alternatives provide the required hydraulic, redundancy and operational features to meet project goals.

The Preferred Alternative among these was Alternative 4, which was preferred in four categories (engineering/constructability, land availability, cost differential and schedule). Alternative 4 consists of three tunnel segments and would require three TBM drives (one for the North Tunnel and two for the South Tunnel). The North Tunnel (4.5 miles long) starts by launching from the Tandem Trailer site near the Hultman Aqueduct with a connection tunnel to Park Road East and receiving at the Fernald Property near the WASM3. The South Tunnel (3 miles long) launches from the Highland Avenue Northwest site near the Highland Avenue and receiving at the Park Road West near the Hultman Aqueduct. A third tunnel (7 miles long) drive would launch from the Highland Avenue Northeast site and receive at the American Legion site near the Shaft 7C. According to the DEIR, the three alternatives all have comparable impacts for rare species and Article 97 Lands and generally traverse the same horizontal alignment and would have comparable potential impacts on wetlands, wells or surface water bodies along the tunnel alignment. The only differing factor is how each alternative addresses launch shaft groundwater management and its potential impact on surface water bodies.

Alternative 4 would require six construction shaft sites, three for launching and three for receiving, on land owned by MassDOT, DCR, the City of Waltham, and the Town of Weston. Each of the three tunnel segments would have connections to the MWRA water system at two additional tunnel shafts along their courses. The tunnels will be concrete lined in most areas. In locations where the ground conditions necessitate that the tunnels have greater structural strength, a mortar-coated steel lining will be installed.

Comments from the City of Waltham raise concerns with the adequacy of information presented in the DEIR regarding the Fernald Property. These comments appear to throw into question the viability of the Fernald site in Waltham as the receiving shaft location for the northern tunnel alignment. The Fernald site is identified as the receiving shaft location for the northern alignment for all ten DEIR Alternatives, and no alternate locations in Waltham or Belmont were considered. The SDEIR should address the comments raised by the City of Waltham and continue to study alternatives for the northern tunnel alignment. C-3 The SDEIR should also clarify how environmental factors were considered in the choice of a Preferred Alternative for the tunnel alignments, and if less impactful alternatives were dismissed, provide a clear justification for the dismissal. C-4

Environmental Justice

Table 2.4-1 summarizes each of the proposed sites and the presence of EJ populations near those sites or within the limit of disturbance (LOD).

Table 2.4-1 Summary of Environmental Justice Populations by Site

Proposed Site	Number of EJ Block Groups within 1 mile	Approximate Area of EJ Block Groups in a site's DGA (%)	LOD within EJ Block Group?	Languages Spoken by at least 5% of census tract population[1]
Fernald Property, Waltham	10	34%	No	Spanish or Spanish Creole Chinese
Tandem Trailer and Park Road East, Weston	2	2%	No	Chinese
Bifurcation, Weston	2	<1%	No	Chinese
Park Road West, Weston	0	0%	No	*None*
Highland Avenue Northwest/ Southwest, Needham	1	<1%	No	Chinese
Highland Avenue Northeast/ Southeast, Needham	1	<1%	No	Chinese
American Legion, Boston	18	75%	Yes	Spanish or Spanish Creole French Creole
School Street, Waltham	25	83%	Yes	Spanish or Spanish Creole Chinese
Cedarwood Pumping Station, Waltham	21	79%	Yes	Spanish or Spanish Creole Chinese
Hegarty Pumping Station, Wellesley	1	13%	Yes	Chinese
St. Mary Street Pumping Station, Needham	1	1%	No	Chinese
Newton Street Pumping Station, Brookline	9	80%	Yes	*None*
Southern Spine Mains, Boston	22	44%	Yes	Spanish or Spanish Creole French Creole
Hultman Aqueduct Isolation Valve, Weston	2	<1%	No	Chinese

Source: EJ Maps Viewer, 2021.

1 Data is from "Languages Spoken in Massachusetts" tab of the EJ Maps Viewer to determine languages spoken by at least 5 percent of population in the census tract who do not speak English very well.

The DEIR provides a summary of MWRA's public outreach that have occurred since the ENF was submitted. MWRA has implemented a robust community outreach initiative and continues to actively communicate with communities and stakeholders. The DEIR outlines the outreach plan (Table 2.3-1) that MWRA will follow after issuance of the Certificate on the DEIR. MWRA consulted with the MEPA Office to present its outreach plan on September 15, 2022. The outreach strategy includes meetings within each community in the Study Area, formation of a working group, coordination with MWRA's Advisory Board and Commonwealth agencies, as well as outreach to environmental advocacy groups. MWRA made six presentations to the working group regarding selection of the Preferred Alternative and two backup alternatives. Furthermore, MWRA is participating as a member of an EJ task force led by the Executive Office of Energy and Environmental Affairs (EEA) and will follow EEA guidelines pertaining to outreach to and inclusion of EJ populations.

The DEIR analysis identifies EJ communities within the Study Area for each of the 14 proposed sites. MWRA will tailor outreach to EJ communities and use a combination of methods to facilitate participation in the environmental review process. Each of the 14 proposed sites has its own Designated Geographic Area (DGA), which is the 1-mile radius or buffer around the site. The DEIR presents an analysis of impacts on EJ populations within each of these DGAs. Collectively, the 14 DGAs make up what the DEIR refers to as the "EJ Study Area." Outreach methods will include translating outreach materials to languages prevalent in EJ communities within the EJ Study Area, publishing notices in foreign language local newspapers, and using various social media platforms and media outlets to reach the intended population. MWRA will hold public information sessions or workshops as requested; provide wide dissemination of project summaries and fact sheets for topics such as traffic, noise and vibration, shaft site selection process, and natural and cultural resource impacts (with translations); and provide project website and make information available on community websites. Interpretation services will automatically be provided for communities where at least 5% of census tract population in each community speak a specific language; MWRA will provide interpreters as requested for all other communities. MWRA proposes to provide advance notification of the project no later than 45 days, and no earlier than 90 days, prior to filing of EIRs to community-based organizations (CBOs) and tribes based on a recommended list provided by the EEA EJ Director.

The DEIR makes the following assertions on project-related impacts regarding EJ populations:

- analysis of new average daily trips (ADT) of diesel vehicle traffic was separated by site due to the different geographies and EJ block groups at proposed sites (the DEIR concludes that the project would not generate more than 150 net new ADT of diesel vehicle traffic)
- EJ populations were identified within 1 mile of all launching, receiving, and connection and isolation valve sites, except the Park Road West site where no EJ populations were present
- Per the Massachusetts Department of Public Health (DPH) EJ Tool (including review of Vulnerable Health EJ criteria) environmental pollutant and health data and the Climate Resilience Design Tool climate exposure data, existing unfair or inequitable environmental and health burdens on EJ populations are potentially present for the American Legion site, School Street site, Cedarwood Pumping Station, Hegarty Pumping Station, Newton Street Pumping Station, and Southern Spine Mains
- Based on emissions levels, locations, and timeframe, criteria pollutant air quality impacts during construction for all alternatives are expected to be relatively minor, and well below state and federal air quality risk management standards. Thus, impacts to EJ communities are expected to be insignificant (mitigation measures will be implemented to further reduce emissions during construction as described below)
- GHGs (primarily CO_2), although attributed to causing climate change, are not a direct health-based pollutant (no significant construction-period impacts to EJ or non-EJ populations related to air quality or climate change exposure are anticipated for the project)

Based on a review of the existing EJ populations and anticipated project-related impacts, no disproportionate construction period impacts or full-build impacts would be anticipated for any identified EJ population at any of the project sites. The SDEIR should supplement this EJ analysis in accordance with the Scope. C-5

Land Alteration, Open Space and Article 97

The DEIR describes land alteration, creation of impervious area, and removal of trees. The DEIR indicates that land alteration and tree clearing has been limited to the maximum extent practicable and proposes supplemental landscaping or tree planting to mitigate impacts associated with land alteration, which will be coordinated with the owner of the land. MWRA should continue to reduce impervious area through incorporation of pervious surfaces and landscaped areas. The DEIR describes how the project is consistent with the EEA Article 97 Land Disposition Policy, which ensures no net loss of Article 97 lands under ownership/control of the Commonwealth, with a general premise that EEA and its agencies shall not sell, transfer or otherwise dispose of any right or interest in Article 97 lands. Exceptional circumstances, as defined in the Policy, include 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. DCR comments note that with the recent passage of St. 2022, c. 274, *An Act Preserving Open Space in the Commonwealth*, additional requirements may apply to a transfer of Article 97 property. C-6

Table 4.2-4 of the DEIR provides a summary comparison of land use characteristics associated with the three DEIR Alternatives including proposed changes in impervious surface compared to existing conditions (up to 2.7 acres), temporary construction area limits of disturbance (LOD) (up to 46 acres), permanent easements or land acquisition, and estimated Article 97 land disposition anticipated to be required. Key findings on impacts of the project regarding land use include:

- proposed sites would be located on state- or municipality-owned land
- no relocation of residential units and proposed sites would be located away from residential uses and protected and recreational open spaces, to the extent feasible
- restoration of areas temporarily disturbed during construction
- potential removal of public shade trees as defined in MGL c. 87, which will be identified pending advancement of site design
    - MWRA would not plant, trim, cut, or remove a public shade tree without permission of the Tree Warden (and/or in coordination with the park commissioner, DCR, and/or MassDOT where appropriate) and would follow requirements for public hearings and public notification in accordance with c. 87, as well as Chapter 40, Section 15C (the "Scenic Roads Act"), where applicable
- replacement of trees removed during construction where required and as appropriate
- existing open space areas protected by Article 97 will be avoided (greatest extent practicable)
    - Three sites may require disposition of land protected under Article 97: the Hegarty Pumping Station (Ouellet Park) (Article 97 status to be determined); Southern Spine Mains (Southwest Corridor Park/Arborway I) on DCR land; and the American Legion (Morton Street Property) on DCR land
    - Three additional sites have resources protected under Article 97 that would not result in an Article 97 land disposition since the protected resources (Hultman Aqueduct and Sudbury Aqueduct) are owned by the Commonwealth of Massachusetts under the care, custody, and control of MWRA: Park Road East (Hultman Aqueduct); Bifurcation launching site (Hultman Aqueduct); and St. Mary Street Pumping Station connection site (Sudbury Aqueduct)

Proposed sites on DCR land that require permanent easements will trigger Article 97; it appears that up to 5 acres of DCR property may be needed as staging locations for tunnel construction over several years, which will require a DCR Construction and Access Permit. As described above, two sites (the Southern Spine Mains connection site and American Legion receiving site) may require disposition of DCR land that is protected under Article 97. The DEIR also describes locations where tunnel construction is proposed beneath DCR properties, including the Leo J. Martin Golf Course in Weston and portions of the Charles River Reservation. Tunnel construction beneath DCR property will require permanent easements triggering Article 97. DCR comments identify support for granting of a Construction and Access Permit for temporary tunnel staging sites and permanent easements on and under DCR land, and it will continue to work with MWRA to ensure that the process is compliant with the Article 97 Policy.

Comments from the City of Waltham indicate MWRA has not yet completed test borings which would enable it to determine whether the project may be constructed in any of the public or private locations identified in Waltham as possible locations. Supplemental information from MWRA indicates that only the subsurface (underground) tunnel alignment between shaft sites would be influenced by future test borings. The DEIR indicates that at this stage in the alternatives development and evaluation process, the specific subsurface (underground) alignment that a tunnel segment may take would be refined throughout the design phases of the project based on additional geotechnical data. The DEIR identifies Required Connection Points (hydraulic connection points where tunnel facilities must connect to existing surface infrastructure to achieve redundancy goals) and Secondary Connection Points (connection points identified to facilitate tunnel construction or to provide benefit to its customers and reinforcement to its transmission network). These connection points (shaft sites) will not change based on the results of future geotechnical borings. MWRA maintains that impacts have been described in the DEIR based on identification of the shaft sites.

MWRA is currently conducting the second phase (Phase 1B) of preliminary work, which includes deep rock borings and geophysical investigations. MWRA will continue to conduct additional geotechnical investigations and testing as the project moves through final design. The data derived from borings will determine the extent of easements needed from landowners. It will prepare a draft and final Preliminary Design Report to support and provide the technical basis for the information included in the EIRs, including design criteria, construction considerations, and operational requirements for the tunnels, shafts, and valve chambers and pipe connections; a detailed hydraulic analysis of the proposed tunnels using projected future water demands; and preliminary design drawings, proposed construction packaging, a proposed schedule, and a preliminary cost estimate. Final Design and the development of construction contract documents (including Final Plans, Specifications, and a detailed Construction Cost Estimate) is anticipated in 2024. Based on these, MWRA will initiate a public bidding process to select a contractor (or contractors if multiple construction contracts are issued). Construction is anticipated to begin in 2027.

Wetlands and Stormwater

The DEIR (Table 4.2-2) provides a summary of wetland impacts by municipality for each DEIR Alternative. The project will temporarily and permanently impact BVW, IVW, Bank, BLSF, LUW, and RFA, and associated buffer zones. The Conservation Commissions will review the project for its consistency with the WPA, Wetlands Regulations (310 CMR 10.00) and associated performance standards including stormwater management standards (SMS). MassDEP will review the project for its consistency with the 401 WQC regulations (314 CMR 9.00) and the c. 91 Waterways Regulations (310 CMR 9.00).

Total impacts associated with Alternative 3 are estimated to include 1,674 sf of BVW/IVW (temporary), 106 sf of Bank (32 sf temporary and 74 sf permanent), 3,286 sf of BLSF (1,890 sf temporary and 1,396 sf permanent), 3,820 sf of LUW (2,534 sf temporary and 1,286 sf permanent), and

290,963 sf of RFA (273,822 sf temporary and 17,141 sf permanent). Total impacts associated with Alternative 4 are estimated to include 1,674 sf of BVW/IVW (temporary), 106 sf of Bank (32 sf temporary and 74 sf permanent), 2,668 sf of BLSF (1,640 sf temporary and 1,028 sf permanent), 2,800 sf of LUW (1,882 sf temporary and 918 sf permanent), and 256,976 sf of RFA (239,835 sf temporary and 17,141 sf permanent). Total impacts associated with Alternative 10 are estimated to include 1,674 sf of BVW/IVW (temporary), 82 sf of Bank (24 sf temporary and 58 sf permanent), 2,000 sf of BLSF (1,340 sf temporary and 660 sf permanent), 2,520 sf of LUW (1,612 sf temporary and 908 sf permanent), and 149,569 sf of RFA (134,113 sf temporary and 15,456 sf permanent).

Key findings of impacts of the project regarding wetland resource areas are summarized below (the majority of potential impacts would occur during construction):

- no permanent impacts to BVW or IVW associated with construction or operation
- temporary impacts to BVW and IVW at the Fernald Property due to a dewatering discharge pipe and at American Legion for a pipeline connection to the existing water supply infrastructure (impacted areas would be restored)
- permanent impacts to RFA due to top-of-shaft and/or valve structures and associated pavement at four locations (Fernald Property, Hegarty Pumping Station, Tandem Trailer and Hultman Aqueduct Isolation Valve) (impacted areas would be restored and revegetated)
- temporary impacts to RFA due to construction staging at four locations (Fernald Property, Tandem Trailer, Bifurcation, and American Legion), one connection site (Hegarty Pumping Station) and the Hultman Aqueduct Isolation Valve (impacted areas would be restored and revegetated)
- impacts to BLSF for rip rap splash pads at dewatering discharge locations (Tandem Trailer or Bifurcation and Highland Avenue) depending on the alternative (compensatory flood storage volume would be provided at appropriate elevations within the same floodplains)
- implementation of appropriate BMPs in accordance with the Stormwater Pollution Prevention Plan (SWPPP) required under the NPDES CGP to avoid and minimize potential impacts to wetland and surface waters on or adjacent to sites during construction
- prior to discharge, all flows would be treated as necessary to meet water quality standards for the receiving water body and any other requirements of environmental permits issued for the project to avoid and minimize potential impacts to water quality in surface waters during construction by pollutants in tunnel dewatering discharges and in discharges related to tunnel cleaning, disinfection, and flushing
- grouting of water-bearing rock features in advance of TBM excavation activities and after its passage will reduce groundwater inflows to avoid and minimize impacts of groundwater drawdown due to tunnel inflows which may temporarily impact water levels in surface waters and wells (if necessary, alternative water supplies would be provided as described in the Water Supply Contingency Plan (Appendix J))
- no impacts to surface or groundwater resources is anticipated post-construction
- water conveyed in the tunnel will be under higher pressure than groundwater pressure, thus groundwater will not infiltrate and cannot cause a groundwater drawdown condition
- loss of annual recharge resulting from new impervious area at project sites will be minimized in accordance with the SMS
- no impacts to water quality are anticipated post-construction; stormwater runoff from impervious surfaces would be treated and managed in accordance with the SMS
- groundwater withdrawal volumes associated with dewatering are estimated to vary between

less than 100,000 GPD up to an estimated 8 MGD, which would trigger the need for a WM03 Water Management Withdrawal Permit

The project would require work within BLSF associated with Seavern's Brook and the Charles River for construction of flared end discharge pipes and associated rip rap splash pads as mitigation for potential scour due to dewatering discharges. Impacts include permanent alteration of ±25 cubic yards each of BLSF at two locations on Seavern's Brook (Tandem Trailer and Bifurcation) and 50 cubic yards at one location on the Charles River. An equal volume of material would be excavated and removed within the same floodplains at location to provide compensatory flood storage at each elevation interval impacted during construction.

Waterways

According to comments from the MassDEP Waterways Regulation Program (WRP), the preferred tunnel alignment and two backup alternatives will all ‘intersect’ waterways in several locations. In addition, several dewatering discharge locations are proposed within waterways that are subject to c. 91 jurisdiction pursuant to 310 CMR 9.04. Dewatering sites will include placement of structures and fill consisting of outlet pipes with riprap splash pads to mitigate potential scour. All structures and fill and any associated dredging that will be located waterward of the ordinary high water mark will require c. 91 authorization. The tunnels and associated infrastructure installations underneath jurisdictional waterways are potentially exempt from licensing pursuant to 310 CMR 9.05(3)(g)(3) “pipelines, cables, conduits, sewers, and aqueducts entirely embedded in the soil beneath such river or stream”, provided that they are consistent with all criteria in the referenced section of the regulations.

Rare Species

According to the DEIR, key findings regarding project-related impacts to rare species and wildlife habitat include the following:

- No state-listed rare species are mapped in the vicinity of project sites and therefore, would not be impacted during or post-construction
- Temporary alterations of wildlife habitat, including potential Northern Long-Eared Bat (NLEB) habitat regulated under the federal Endangered Species Act (ESA) would occur due to the construction
    - Adherence to applicable time-of-year restrictions on tree clearing would avoid incidental take of NLEB
    - Habitat impacts would be mitigated through restoration of disturbed areas after completion of work
- Permanent and temporary impacts to wildlife habitats are not anticipated to adversely affect the overall Study Area wildlife populations
- Post-construction inspection and maintenance activities are not expected to impact state or federally listed species or other wildlife (normal operations would not involve additional tree removal that could affect NLEB)
- No impacts are anticipated from dewatering activities

Water Management Act/Water Supply

The DEIR describes groundwater resources and surface water supplies located in the vicinity of the launching and receiving sites, the connection and isolation valve sites, and along the three alternative tunnel alignments of the DEIR Alternatives under consideration. Groundwater resources assessed include public drinking water wells and available information on private wells. Potential impacts to these resources and measures to avoid, minimize, and mitigate impacts are also addressed. Information on the existing quality and usage of these resources is based on publicly accessible information. Surface waters assessed include those with WMA registrations in the project area.

The project will require a Distribution System Modification Permit (BRPWS32) from the MassDEP Drinking Water Program. It will also require a Water Withdrawal Permit (WM03) in accordance with the WMA because groundwater withdrawal volumes associated with dewatering are expected to vary from less than 100,000 gallons per day to about 8 million gallons per day (MGD). According to MassDEP comments, dewatering at launch sites and tunnel shafts should not affect any public water supply.

The DEIR states that the volume of the proposed tunnels will be about 66 million gallons (MG) of water. Following initial disinfection of the tunnels, up to four volumes of water will be used to flush the tunnels (i.e., up to 264 MG). According to MassDEP, the amount of water that MWRA provides to the Boston metropolitan area averages just under 200 MGD. Therefore, the disinfection/flushing process may have to take place during a time of the year when water demand is low.

The DEIR identifies the volumes of rock cuttings that will be excavated in the process of boring the rock tunnels but does not identify where the long-term deposition of this material will be. During construction of the MWWST, this material was referred to as "tunnel muck" based on how fine the cuttings were. The boring process creates a great deal of freshly-cut surface area that is subject to leaching. Long-term disposal of these cuttings near a water supply could increase the total dissolved solids (TDS) content of the water, which would in turn increase the corrosivity of the water. Therefore, large volumes of this material should not be deposited adjacent to a public water supply.

The DEIR examines the project impacts on public and private wells. Construction mitigation measures related to water supply are the same for all three DEIR alternatives. In areas of concern, the TBM has the capability to simultaneously drill and pre-grout the tunnel heading along the tunnel route, which would reduce the volume of groundwater inflow into the tunnel and help to mitigate any potential impacts to water supply wells. A preconstruction survey will be conducted to verify locations of wells and well characteristics prior to construction. The Water Supply Contingency Plan (Appendix J) includes a summary of mitigation measures that would be implemented if water supplies would be impacted during construction: reduce the potential for groundwater drawdown during construction by probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting (also from the tunnel heading) in the event water-bearing features are encountered by the probing (probing and pre-grouting may be made mandatory before the tunnel proceeds beneath important areas of groundwater well production or beneath sensitive local water bodies); reduce groundwater inflow into the tunnel by drilling and cut-off grouting of water-bearing features in the rock through the walls of the unlined tunnel after the TBM has passed (this type of grouting is not as effective as the pre-excavation probing and grouting); and to avoid disruption of water supply from groundwater wells by provide users with an alternative water supply until groundwater levels can be restored.

Adaptation and Resiliency

According to the DEIR, MWRA already considers the impacts of climate change as part of its capital improvement projects[4] to ensure infrastructure is resilient to climate change-related risks. The DEIR emphasizes that the fundamental goal of the project is to provide redundancy for the Metropolitan Water Tunnel System to ensure continued access to clean and reliable water. It includes a discussion of the project's vulnerability to climate change over the course of its design life and identifies how the project has considered and incorporated climate vulnerability, resiliency and climate data into the design to increase the resiliency of infrastructure and services that will be provided by the project.

The DEIR contains an output report from the MA Climate Resilience Design Standards Tool prepared by the Resilient Massachusetts Action Team (RMAT) (the "MA Resilience Design Tool"),[5] together with information on climate resilience strategies to be undertaken by the project. The output report indicates that all proposed sites have at least a portion of land within their site boundary that would have a high exposure to flooding (urban and riverine) associated with extreme precipitation (except the Highland Avenue Northeast/Southeast site) and a high exposure to extreme heat. The DEIR provides a comparison between the three alternatives (preferred and backup) for climate change-related risks and exposures identified by the Tool. As identified by the Tool, during the useful life of the project (100 years) precipitation depth over 24 hours for a 100-year storm event in 2070 is projected to reach up to 11.2 inches depending on the site. The project would primarily consist of underground structures. The DEIR identifies infrastructure (rip rap splash pads) that will be located within floodplain at the Tandem Trailer site, Bifurcation site, and Highland Avenue sites.

The preliminary design for the project incorporates the following elements and best practices to avoid and minimize these potential climate change-related risks:

- site selection to avoid proximity to areas designated by FEMA as having potential flood risk to the greatest extent feasible
- sites would be restored post-construction with loaming and seeing or include additional trees and landscaping where feasible
- launching, receiving, connection, and isolation valve sites considered in Alternatives 3, 4, and 10 primarily consist of previously disturbed open space areas and right-of-way space
- proposed stormwater management systems (incorporating unpaved areas) for each site would be designed to treat stormwater runoff associated with the addition of impervious areas
- proposed covers, hatches, and isolation valve chambers would be designed to prevent infiltration of floodwaters in the event of flooding
- land alteration and tree clearing would be limited to the extent practicable (tree impact avoidance and protection strategies would be implemented where feasible)

Greenhouse Gas (GHG) Emissions / Air Quality

Because the project requires the preparation of an EIR, it is subject to the MEPA Greenhouse Gas Policy and Protocol (GHG Policy). The DEIR includes a GHG analysis in accordance with the GHG Policy. According to MWRA, the majority of GHG emissions are associated with construction period activities. The DEIR provides an accounting of the estimated total number of trucks and other

[4] Consistent with Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth
[5] https://resilientma.org/rmat_home/designstandards/

mobile sources, as well as all fossil fuel burning equipment, to be used during the construction period, including a breakdown by location and time period (e.g., peak time period within 10-year construction period) for the three alternatives (preferred and backup). The DEIR quantifies the GHG emissions associated with these emitting sources, and the volatile organic compounds (VOC) and nitrogen oxides (NOx) projected to be emitted in the Study Area. The DEIR indicates that the project will have minimal GHG emissions during its operation (i.e., post-construction). As such, a quantitative GHG assessment of project operations was not conducted.

Estimates of on-road mobile source emissions were conducted in accordance with the MassDEP *Guidelines for Performing Mesoscale Analysis of Indirect Sources*. During the peak emissions year of construction, each of the three alternatives would result in a total pollutant emission of up to 33.8 tons per year (tpy) of NOx, up to 2.6 tpy of VOCs, and up to 6,287 tpy of GHG (both off-road and on-road emissions). Peak-year emissions are similar among the three DEIR Alternatives reviewed. The DEIR asserts that emissions from all alternatives are not expected to be significant and will generally occur from a variety of locations within the Study Area, limiting potential health impacts.

Construction-related activities would primarily take place underground with limited disruption to the surface above. The DEIR asserts that no significant construction-period impacts related to air quality or climate change exposure are anticipated for the project.

MWRA intends to incorporate mitigation measures into the construction methodology, which is reflected in the emissions analysis. Where feasible, MWRA would use electrified construction equipment with no direct emissions (i.e., use of an electrified TBM and associated equipment, which would remove direct pollutant emissions from one of the larges pieces of construction equipment). MWRA would also require the following mitigation measures to further reduce emissions from construction activities:

- limit vehicle idling time in compliance with the Massachusetts idling regulation (310 CMR 7.11) with appropriate signage and operator training
- use Ultra Low Sulfur Diesel fuel and fit all diesel-fuel construction equipment with after-engine emission controls meeting EPA’s Tier 4 emission limits (emission-reduction equipment could include EPA-verified or CARB-verified diesel oxidation catalysts or diesel particulate filters)
- encourage use of cleaner alternatively fueled equipment (natural gas or electric) by contractors rather than diesel-fueled equipment where available and feasible
- implement measures to protect residents and others from off-site exposure to dust and debris
- use dust control (i.e., application of water during ground-disturbing activities, stone surfacing of construction roads, seeding areas of exposed/stockpiled soils, wheel washing, covered trucks, regular sweeping of paved roadways, and recycling construction waste and demolition materials)

Transportation

Key findings on project-related impacts to transportation include the following:

- truck routes were established for each shaft site location by identifying the shortest path to and from the nearest highway (critical intersections and roadways along these routes were examined and sensitive receptors, defined as properties/locations that may be impacted by construction of the project were identified and described; a high-level crash analysis was performed for each study intersection identified by MassDOT as a high-crash location potentially eligible for Highway Safety Improvement Program funding)

- most traffic expected to be generated by construction activities at proposed shaft sites would be due to construction workers driving to and from the sites
- the maximum amount of traffic would occur at launching shaft sites where there is a shift change during the evening peak hour (these launching shaft locations are adjacent to highway ramps and are not expected to cause a significant traffic impact to nearby local roadways)
- construction of surface pipes at some shaft locations would require traffic management measures, including lane closures, sidewalk closures, and detours (surface piping operations are expected to impact traffic at the Fernald Property and School Street sites in Waltham, St. Mary Street Pumping Station in Brookline, and American Legion site in Boston, which could require short-term detours along roadways functionally classified as arterials; where possible, trenchless construction methods will be used)
- at locations where surface piping construction would be expected to impact traffic, the activities would be limited to certain time periods depending on the characteristics of the roadways and surrounding land use (mitigation measures consist of adjusting traffic signal timings, potential roadway widening, and traffic signal warrant evaluation)
- at locations where additional traffic due to construction may increase intersection delays, mitigation measures consist of adjusting traffic signal timings, and traffic signal warrant evaluation (adjusted traffic signal timings are expected to result in either minimal increases or reductions in delay when compared to existing conditions)

Cultural Resources

According to the DEIR, three properties within the project's Area of Potential Effects (APE) including the Walter E. Fernald State School (WLT.AB) at the Fernald Property site in Waltham, the St. Mary's Roman Catholic Church Complex (WLT.AM) at the School Street site in Waltham, and the Sudbury Aqueduct Linear District (NEE.F) at the St. Mary Street Pumping Station in Needham are listed in the State and National Registers of Historic Places. Two additional properties within the APE (the Hultman Aqueduct (WSN.O) at the Tandem Trailer/Park Road East, Bifurcation, and Park Road West sites in Weston and Pumping Station #1 (WEL.311) at the Hegarty Pumping Station site in Wellesley) are eligible for listing.

Key findings on impacts of the project regarding cultural and historic resources are listed below:

- The only listed or eligible property that may be impacted by permanent direct adverse effects is the Walter E. Fernald State School based on proposed demolition of three buildings that contribute to the significance of the district (along with three to five noncontributing buildings) - contributing buildings (a stucco shed, a barn foundation, and a woodshed) are located at the southern perimeter of the campus, distant from its historic core
- No anticipated construction period impacts are anticipated to any of the listed or eligible properties within the APE
- No permanent indirect adverse effects are expected at any of the listed or eligible properties
- An archaeological assessment was completed of project sites (using historical and archaeological research and walkover surveys to assess the history of land use and existing conditions) which concluded that none of the sites were archaeologically sensitive and recommended no further archaeological investigation due to extensive landscape disturbance

at each site

MWRA will prepare an Inadvertent Discovery Plan, should there be an unanticipated finding of archaeological resources during construction. MHC will review the report results and either indicate concurrence with the findings or request additional information.

Construction Period

The DEIR provides a comprehensive review of the project's construction-period impacts and mitigation relative to noise, air quality, water quality, and transportation, including pedestrians, bicyclists and transit riders. The DEIR includes measures that will avoid and minimize damage to the sites and adjacent areas that could result from storm events including flooding from extreme precipitation. It identifies the schedule and phasing for design and construction of various project elements. It is anticipated that construction would take place at as many as 14 site locations as part of the deep-rock tunnel construction, including up to three launching sites, up to three receiving sites, six connection sites, and one stand-alone isolation valve site. Construction activities would be contained within the temporary construction LOD designated for each proposed site to minimize the area of potential disruptions at the surface.

The DEIR provides an inventory of construction equipment that will be in use during the construction and estimates the number of truck trips to provide information on the potential air quality impacts associated with construction period mobile emissions as described above. It outlines mitigation measures that will be undertaken to avoid, minimize and mitigate these impacts. It summarizes construction period materials management plans (including management of contaminated materials). It describes potential operational and construction period noise impacts at each site.

The DEIR includes an analysis of the project's potential environmental impacts regarding hazardous materials on and in the vicinity of the shaft sites and isolation valves sites. It includes a description of how contaminated soil or groundwater encountered during construction will be managed in accordance with M.G.L. c. 21E and the Massachusetts Contingency Plan (MCP). Protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so it can be handled appropriately and disposed at suitable locations. Most of the excavated material is anticipated to be clean, crushed rock, which could be reused beneficially at other locations. Naturally present contaminants, such as asbestos-containing rock and arsenic, may be present in the excavated material, which would require proper management. Some excavated material could be used for embankment depending on its size and timing of its removal. Uncontaminated excavated material could also be used as road-paving materials, depending on its consistency. Groundwater dewatering would be required during construction with proper management to avoid impacts to the surrounding environment. Prior to discharge, dewatering effluent would be managed in accordance with applicable regulatory requirements. Shaft and isolation valve sites that may require a NPDES Dewatering and Remediation General Permit to facilitate groundwater dewatering were identified. The DEIR provides information on excavation, excavated material removal/transportation, and construction dewatering.

SCOPE

General

The SDEIR 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 feasible. C-7

Project Description and Permitting

The SDEIR should include a detailed and updated description of the project and identify any changes since the filing of the DEIR. C-8 The SDEIR should identify additional MEPA thresholds that will be exceeded, including any not identified in this Certificate, based on the location of the proposed shaft sites and other design refinements (i.e., removal of public shade trees, etc.). C-9 The SDEIR should include an updated description of the project's temporary and permanent impacts to environmental resources, including but not limited to the following: land alteration (including protected open space), wetlands, rare species habitat, cultural and historic resources and open space. C-10 The SDEIR should identify methods that will be undertaken to avoid, minimize and mitigate Damage to the Environment. C-11

The SDEIR should include updated site plans for existing and post-development conditions for each project alternative (preferred and backup) that clearly identify environmental resources, either existing land ownership or acquisitions, easements and associated rights (e.g., rail operations, sewer lines, drainage culverts, etc.) required for project construction, and roadway and intersection jurisdictions. C-12 The SDEIR should include a Construction Management Plan that identifies how the project will minimize traffic disruption during construction particularly in areas within or near EJ populations. C-13

The SDEIR 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. It 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 SDEIR should clearly describe the permits and/or regulatory approvals required for each component of the project. C-14

The information and analyses identified in this Scope should be addressed within the main body of the SDEIR and not in appendices. In general, appendices should be used only to provide raw data, such as drainage calculations, traffic counts, capacity analyses and energy modelling, that is otherwise adequately summarized with text, tables and figures within the main body of the SDEIR. Information provided in appendices should be indexed with page numbers and separated by tabs, or, if provided in electronic format, include links to individual sections. Any references in the SDEIR to materials provided in an appendix should include specific page numbers to facilitate review. C-15

Alternatives Analysis

The objective of the MEPA review process is to support analysis of the environmental impacts of a project and measures to avoid, minimize and/or mitigate Damage to the Environment to the maximum extent practicable within the context of the project purpose and goals. Alternatives analyses are required to consider what effect changing the parameters and/or siting of a project, or components thereof, will have on the environment. The DEIR provides a comprehensive analysis of alternatives; however, it relies exclusively on one receiving shaft site for all North Tunnel options (Fernald Property) which appears to be uncertain based on comments from the City of Waltham. In addition, MWRA has preliminarily identified an alternative receiving shaft site location in proximity of the WASM8 in Belmont, which could serve as an alternative to Fernald Property. The details of this alternative location have not been disclosed. C-16

The SDEIR should confirm MWRA's commitment to use the Fernald Property with demonstrated concurrence from the City of Waltham or disclose the environmental impacts associated with alternative receiving shaft site location(s). C-17 Specifically, the SDEIR should include a discussion that describes and estimates the environmental impacts associated with any new alternatives presented in the DEIR including changes in shaft sites. To the extent a change in shaft site location necessitates a new or revised north tunnel alignment, the details of any such revision and associated impacts should be discussed. C-18

The DEIR indicates that the three DEIR Alternatives (preferred and backup) generally traverse the same horizontal alignment and would have comparable potential impacts on wetlands, wells or surface water bodies along the tunnel alignment. However, it does not indicate if any dismissed alternative included less impacts to environmental resources that the preferred or backup alternatives selected. The SDEIR clarify if any of the other seven alternatives that were dismissed would include less environmental impacts. C-19 The SDEIR should clearly indicate if the Preferred Alternative is also the most environmentally preferred or provide justification why it was selected over a less environmentally impactful alternative. C-20

Environmental Justice

I expect that the MWRA will continue to actively seek public input and work closely with the Stakeholder Working Group(s) and other stakeholders in developing the SDEIR for this project. The SDEIR should provide an overview of outreach activities that have taken place since the DEIR was submitted. C-21

The SDEIR should supplement the EJ analysis presented in the DEIR. While the DEIR identifies certain site locations where the DPH EJ Tool data show indication of an existing "unfair or inequitable burden," it does not specifically assess project impacts on the surrounding EJ populations at those locations, other than to state that impacts, such as traffic and emissions, will be relatively minor and insignificant. C-22 The SDEIR should discuss, in greater detail, how the various impacts of the project, including land alteration/Article 97, wetlands/stormwater, traffic, and GHG/air emissions, will specifically affect the EJ populations that are identified as incurring existing environmental burdens. C-23 In particular, the SDEIR should discuss whether the anticipated routes of travel for construction period trucks and traffic will extend adjacent to any of those neighborhoods, and whether EJ populations may be disproportionately affected by Article 97 dispositions of parkland and other land takings/easements that may be needed for the project. C-24 The SDEIR should confirm that the project will not generate more than 150 new adt associated with diesel vehicle trips (Table 4.2-5 appears to indicate the project may produce up to 158 truck trips per day during the construction period). C-25 The SDEIR should discuss whether stormwater or other flood impacts, including from extreme storm events that may occur during the construction period, may affect EJ populations due to their proximity to any applicable infrastructure. C-26 The SDEIR should supplement the climate change and GHG/air quality analyses in C-27 accordance with the Scope below. C-27 (cont'd)

Land Alteration / Article 97

The SDEIR should provide an update on the project's consistency with the Article 97 Policy. As requested by DCR, the SDEIR should describe how MWRA will minimize the size and extent of impacts to DCR land. MWRA should work closely with DCR to identify mitigation for the loss of Article 97 conservation lands as the shaft, staging and tunnel locations are finalized. The SDEIR should provide a summary of the outcome of consultations with DCR regarding Article 97 protection and mitigation. C-28 C-29

The SDEIR should provide an update on the borings and geotechnical analysis underway, including presenting the results of any analysis completed by the time of the SDEIR filing. The SDEIR should clearly describe the plans to conduct geotechnical analysis during the course of construction, how such analysis may affect any choice of routing or excavation methods along the chosen tunnel alignment, and what steps MWRA will take to secure easements from landowners along the tunnel alignment route. The SDEIR should discuss what contingency plans will be in place in the event of unforeseen circumstances, such as geotechnical conditions or opposition from landowners, that may preclude the project's ability to site the tunnel alignment in the exact location anticipated prior to commencing excavation. C-30 C-31 C-32

Wetlands

The SDEIR should provide an update on temporary and permanent impacts to wetland resource areas. The SDEIR should clarify impacts associated with each wetland resource area as the DEIR includes conflicting estimates (Table 4.2-2 versus Table 7.4-2). C-33

The SDEIR should address concerns regarding the impacts of increased volume and velocities of dewatering discharges to several waterways associated with construction of the new tunnels (discharge to Clementis Brook on the Fernald Property, discharge to Canterberry Brook at the American Legion site, and discharge to Seavern's Brook for the launching and receiving shafts for the Bifurcation site). The SDEIR should clarify whether impacts to BVW and Inland Bank will be permanent or temporary due to the installation of splash pads and culvert outlets. As recommended by MassDEP, the SDEIR should examine the possibility of moving these structures farther from the BVW. The SDEIR should provide calculations demonstrating that proposed pipes and splash pads, intended to dissipate velocity to avoid eroding effects on the resource areas, have been properly sized to regulate flows and prevent scour. The SDEIR should provide a plan to monitor the outfalls during dewatering activities to ensure that scour and erosion does not occur, including a contingency plan to address any unexpected negative impacts. C-34 C-35 C-36 C-37

The SDEIR should confirm that stormwater runoff as a result of any increase in impervious areas, however small, will be treated in accordance with the SMS. C-38

Waterways

The SDEIR should include a list or table that specifies all waterways where work will occur in, on, over, or under the waterway, an indication of whether the waterway is jurisdictional pursuant to the regulations at 310 CMR 9.00, and the scope of work that will occur in, on, over, or under any c. 91 C-39

jurisdictional area to allow MassDEP WRP to identify all portions of the project that will be located C-39 (cont'd)
within c. 91 jurisdiction. The SDEIR should describe the project's consistency with c. 91 regulations. C-40
The SDEIR should describe how tunnels and associated infrastructure installations underneath jurisdictional waterways will be constructed consistent with all criteria pursuant to 310 CMR 9.05(3)(g)(3) to demonstrate these project elements will be exempt from licensing pursuant. C-41

Water Management Act/Water Supply

MWRA's water supply sources are in the Chicopee River Basin and the Nashua River Basin. According to WRC comments, the current transfer of water supply from these basins to communities in eastern Massachusetts in different basins would be considered an existing interbasin transfer and includes transfers that occurred prior to 1984 and any subsequent transfers that received interbasin transfer approval by the WRC. The Interbasin Transfer Act (ITA; 313 CMR 4.00) regulates the transfer of water supply or wastewater across major basin boundaries. The DEIR asserts that the project is proposed to ensure redundancy by providing a backup to the existing Metropolitan Tunnel System and not to increase the capacity of the MWRA water supply system. The ITA regulations (313 CMR 4.05 (5)) exempt projects whose "sole purpose is to provide redundancy, provided that any increase in capacity cannot be used to increase the ability to transfer water out of the Donor Basin and provided further that streamflow in the Donor Basin is not adversely affected".

According to WRC comments, the project may not be subject to the ITA provided that there was no increase in the present rate of interbasin transfer. However, the DEIR does not appear to contain the existing capacities of the existing tunnels, and the capacities of the proposed redundant tunnels. The SDEIR should provide these capacities to allow the WRC to determine if there is a possibility of exceeding the present rate of interbasin transfer. The SDEIR should confirm that the transfer of water will be limited to the existing capacity if there is no intent to increase the present rate of interbasin transfer. Specifically, the SDEIR should provide the capacity of the City Tunnel, City Tunnel Extension and Dorchester Tunnel, and also provide the capacity of each of the two new deep rock tunnels. C-42
The SDEIR should clearly state if the existing capacity will not be exceeded and what steps will be taken to limit flow to the present rate of interbasin transfer. C-43

Groundwater volumes associated with dewatering are estimated to vary between less than 100,000 GPD up to an estimated 8 MGD. No transfers over 1 MGD may be considered insignificant under the ITA. However, the DEIR states that all construction dewatering activities will take place in the Charles River Basin. WRC comments indicate that as long as all bedrock infiltration will occur from and be discharged to the Charles River Basin and will not cross a basin boundary, then the ITA will not apply to the dewatering portion of the project. The SDEIR should confirm that all construction dewatering will take place in the Charles River Basin and not cross a basin boundary. C-44

Based on the study area and the preferred South and North Alternative, the project may require WMA Permits in more than one river basin (the tunnel may pass through the Charles and Boston Harbor Basins). The DEIR should clarify the need for this Permit and address the permit criteria at 310 CMR 36.00 that incorporate: streamflow criteria (Biological Category, Groundwater Withdrawal Category and Seasonal Groundwater Withdrawal Categories) and potential impacts to coldwater fish resources. MWRA should consult with MassDEP regarding this analysis prior to preparing the DEIR. C-45

The SDEIR should include a commitment to manage the long-term disposal of rock cuttings excavated in the process of boring the rock tunnels and identify where the long-term deposition of this C-46

material will be. Large volumes of this material should not be deposited adjacent to a public water C-46 (cont'd)
supply because it could increase the total dissolved solids (TDS) content of the water, which would in
turn increase the corrosivity of the water.

Climate Change

The SDEIR should clarify what infrastructure is proposed to be sited in floodplain, and what
measures will be taken to minimize the risk of flooding including through elevation of structures or C-47
other wet or dry proofing methods.

GHG/Air Quality

The SDEIR should supplement the GHG/air quality analysis presented in the DEIR to clarify
how the anticipated emissions associated with the peak construction year compare to Existing and future
No Build conditions (both as tpy and % increases/decrease); if the calculated emissions are assumed to C-48
increase from Existing/No Build levels of 0 tpy, this should be stated, and the associated percentages
calculated. The SDEIR should clarify the total number of years that construction related emissions are
anticipated from the project, and what the anticipated rate of decline in emissions is as compared to the C-49
peak year (e.g., expect to decline by X% each year from the peak year). The SDEIR should clarify what
traffic study area (including specific intersections) was used to calculate the emissions presented in the
mesoscale analysis and indicate whether EJ populations are present near any of the intersections that
were studied. To the extent additional EJ populations are identified outside the traffic study area but C-50
along routes of travel for construction related traffic, the SDEIR should estimate the anticipated increase
in traffic and air emissions at intersections adjacent to those EJ populations. To the extent data is
available, the revised air quality analysis should report emissions of PM2.5, PM10, NOx, lead, and DPM
at the specified locations above.

Mitigation and Draft Section 61 Findings

The SDEIR should include a separate chapter summarizing 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 impacts of the project. The C-51
SDEIR 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, EJ, etc.) and identify the Agency Action or C-52
Permit associated with each category of impact. Draft Section 61 Findings should be separately included C-53
for each Agency Action to be taken on the project.

Responses to Comments

The SDEIR should contain a copy of this Certificate and a copy of each comment letter received.
It should include a comprehensive response to comments on the DEIR that specifically address each
issue raised in the comment letter; references to a chapter or sections of the SDEIR alone are not C-54
adequate and should only be used, with reference to specific page numbers, to support a direct response.
This directive is not intended to, and shall not be construed to, enlarge the Scope of the SDEIR beyond
what has been expressly identified in this certificate.

Circulation

The Proponent should circulate the SDEIR to the same distribution list the ENF and DEIR were sent to, including all community contacts identified for the Study Area; any additional stakeholders identified during MWRA's public outreach program; to any Agencies from which MWRA will seek Permits, Land Transfers or Financial Assistance; and to any parties specified in Section 11.16 of the MEPA regulations. Pursuant to 301 CMR 11.16(5), the Proponent may circulate copies of the SDEIR to commenters in a digital format (e.g., CD-ROM, USB drive) or post to an online website. However, the Proponent must 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. The Proponent should send correspondence accompanying the digital copy or identifying the web address of the online version of the SDEIR indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. A copy of the SDEIR should be made available for review at public libraries of the Study Area communities. C-55

Bethany A. Card

December 16, 2022
Date

Bethany A. Card

Comments received:

11/22/2022	Massachusetts Water Resources Commission
11/23/2022	Massachusetts Department of Environmental Protection (MassDEP) – Waterways Regulation Program (WRP)
12/08/2022	City of Waltham
12/09/2022	Town of Needham
12/12/2022	MassDEP Northeast Regional Office (NERO)
12/13/2022	Massachusetts Department of Conservation and Recreation (DCR)

BAC/PPP/ppp

15.3 Responses to Comments Received in the EEA Secretary's Certificate on the DEIR

Table 15-2 Responses to Comments Received in the EEA Secretary's Certificate on the DEIR

#	Comment	Response
C-1	I find that substantive issues remain to be addressed related to the viability of the proposed receiving shaft site at the Fernald Property in Waltham, which is common to all alternatives considered for the project for the northern alignment.	The Massachusetts Water Resources Authority (MWRA) had identified the Fernald Property as a possible end point for the North Tunnel, Segment 1, as early as 2016 and has been working with the City of Waltham on siting the shaft site on the property since that time. The Fernald Property is over 150 acres and there are several areas within the Property that could support shaft and tunnel construction/permanent facility operations. The portion of the Fernald Property presented in the DEIR (the DEIR Fernald Property site) for a shaft site had been evaluated as presented in the DEIR and was previously discussed with the City staff, Mayor and City Council. However, that portion of the site is not the only portion of the Property that could support construction and operation of the permanent facilities. Based on the comments received from the City of Waltham on the DEIR, the MWRA has had additional discussions with the City of Waltham (i.e., Mayor) regarding an alternative siting for the tunnel work, which is now proposed to be at a portion of the Fernald Property closer to Waverley Oaks Road (the SDEIR Lower Fernald Property site).
C-2	Potential alternate receiving locations that could replace the Fernald Property have not been disclosed nor have the impacts of any such locations been analyzed.	Alternative shaft site locations, within or outside the overall Fernald Property, that could replace the DEIR Fernald Property site were not previously presented as the DEIR Fernald Property site as a receiving shaft location was previously discussed with City of Waltham personnel, understood to be acceptable to the City, impacts were evaluated to be minimal/mitigatable/manageable, and aligned with the MWRA's goals for the Program. Based on the comments since received from the City of Waltham on the DEIR, the MWRA has evaluated shaft site locations outside the Fernald Property including the UMass property for which impacts are presented in this SDEIR.
C-3	Comments from the City of Waltham raise concerns with the adequacy of information presented in the DEIR regarding the Fernald Property. These comments appear to throw into question the viability of the Fernald site in Waltham as the receiving shaft location for the northern tunnel alignment. The Fernald site is identified as the receiving shaft location for the northern alignment for all ten DEIR Alternatives, and no alternate locations in Waltham or Belmont were considered. The SDEIR should address the comments raised by the City of	The MWRA had identified the Fernald Property as a possible end point for the North Tunnel, Segment 1, as early as 2016. There are several areas within the Fernald Property that could support shaft and tunnel construction/permanent facility operations. The portion of the Fernald Property presented in the DEIR for a shaft site (DEIR Fernald Property site) had been evaluated as presented in the DEIR and was previously discussed with the City of Waltham. Based on the comments received from the City of Waltham on the DEIR, the MWRA has had additional discussions with the City of Waltham (i.e., Mayor) regarding an alternative siting for the tunnel work, which is now proposed to be at a portion of the Fernald Property closer to Waverley Oaks

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#	Comment	Response
	Waltham and continue to study alternatives for the northern tunnel alignment.	Road (Lower Fernald Property). In addition, the MWRA has evaluated shaft site locations outside the Fernald Property including the UMass property for which impacts are presented in this SDEIR.
C-4	The SDEIR should also clarify how environmental factors were considered in the choice of a Preferred Alternative for the tunnel alignments, and if less impactful alternatives were dismissed, provide a clear justification for the dismissal.	As described in SDEIR Chapter 2, Alternatives, Section 2.8, Selecting the Preferred Alternative (pg. 2-32), and in DEIR Chapter 3, Section 3.9, Selecting the Preferred Alternative (pg. 3-153), the alternatives were evaluated against environmental factors within the evaluation criteria of land availability, environmental, social/community. The technical studies, environmental resource impact assessments included in the DEIR and SDEIR, geotechnical investigations, and field surveys described in the SDEIR and in DEIR Chapter 4, Existing Conditions and Environmental Assessment, informed the process to select the Preferred Alternative and two back-up alternatives. As described in SDEIR Section 2.8.2, Land Availability Considerations (pg. 2-34), SDEIR Section 2.8.3, Environmental Considerations (pg. 2-35), and SDEIR Section 2.8.4, Social/Community Considerations (pg. 2-36), the following environmental factors were evaluated: • Space and right-of-way for construction • Space and right-of-way for permanent facilities • Possibility of precluding other beneficial uses • State and federally listed threatened and endangered species • Massachusetts Contingency Plan (MCP) sites • Article 97 lands • Wetlands and waterways • Groundwater and water supply infrastructure • Cultural and historic Resources • Community impacts • Environmental justice • Traffic disruption • Air and greenhouse gas emissions • Noise As shown in **SDEIR Chapter 2, Table 2-7 (pg. 2-41)**, the top ranked SDEIR Alternative is Alternative 4A, followed by Alternative 3A and then Alternative 10A. All three SDEIR Alternatives were considered to have similar potential environmental impacts based on

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#	Comment	Response
		the discussion in **SDEIR Section 2.8.3 (pg. 2-35)** and based on the evaluation of potential impacts included in the DEIR and SDEIR technical chapters.
C-5	The SDEIR should supplement this EJ analysis in accordance with the Scope.	The SDEIR includes additional EJ analysis to address items noted in the Scope, including land alteration/Article 97, wetlands/stormwater, traffic, and GHG/air emissions. Results of these analyses can be found in **SDEIR Chapter 3, Outreach and Environmental Justice** and in the relevant technical chapters. Detailed information on specific topics are as follows: • Certificate Comment C-22: Traffic, air quality, and GHG emissions impacts on EJ populations are described below. • Certificate Comment C-23: Potential Program-related land alteration, Article 97, wetlands and stormwater, and noise and vibration impacts in proximity to EJ populations. • Certificate Comment C-27: Potential Climate Change Impacts to EJ communities.
C-6	DCR comments note that with the recent passage of St. 2022, c. 274, *An Act Preserving Open Space in the Commonwealth*, additional requirements may apply to a transfer of Article 97 property.	The MWRA has reviewed the enactment of *An Act Preserving Open Space in the Commonwealth* (Chapter 274 of the Acts of 2022),[1] also known as the Public Lands Preservation Act (PLPA) and is committed to working with the DCR and other agencies to meet the additional requirements for the transfer of Article 97 property. Approved in November 2022, the PLPA complements the existing Article 97 policy by establishing a process for notifying the Secretary of the EEA and the public of a proponent's plans to perform a take of Article 97 protected lands before the proponent approaches the legislature for the disposition. The PLPA applies to Program sites requiring Article 97 disposition and the MWRA will be subject to the requirements of the 2022 PLPA. In accordance with the requirements of the PLPA, the MWRA will notify the Secretary and public by submitting the proposed disposition request within the PLPA portal (forthcoming as of July 2023[2]) and perform additional notification as required by the EEA as part of the Massachusetts Environmental Policy Act (MEPA)

1 Commonwealth of Massachusetts, Chapter 274, An Act Preserving Open Space in the Commonwealth, https://malegislature.gov/Laws/SessionLaws/Acts/2022/Chapter274#:~:text=Acts%20%282022%29%20Chapter%20274%20AN%20ACT,PRESERVING%20OPEN%20SPACE%20IN%20THE%20COMMONWEALTH (accessed March 24, 2023).

2 Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, "Article 97 & The Public Lands Preservation Act," https://www.mass.gov/info-details/article-97-the-public-lands-preservation-act (accessed July 15, 2023).

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#	Comment	Response
		process. Prior to the submission, the MWRA will coordinate with the current owner/maintainer of the parcel of interest, as required by the PLPA. As outlined in the PLPA, the MWRA will need to prepare a brief alternatives analysis in the EEA portal submission for site use and select an acceptable replacement parcel or request a waiver from the Secretary to modify or eliminate the replacement land requirement. Alternatively, the MWRA may request to provide in-lieu funding for part or all of the replacement land. The MWRA will seek to comply with applicable requirements specified in the 2022 PLPA in association with the Commonwealth's "Guidance on Public Lands Preservation Act Implementation."[3] The MWRA will continue to work with the appropriate agencies regarding the most appropriate option for each applicable site subject to the PLPA and the Article 97 policy.
C-7	The SDEIR 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 feasible.	The organizational framework, methodology, analysis, and content contained in this SDEIR have been prepared in accordance with MEPA Regulations set forth in 301 CMR Section 11.00 et seq., including 301 CMR Section 11.07, "EIR Preparation and Filing." The SDEIR contains the information and analyses required per the Scope issued by the EEA. Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category have been developed and are discussed in the relevant technical chapters. Mitigation measures and draft Section 61 Findings are provided in **SDEIR Chapter 14, Mitigation** and **SDEIR Appendix H, Draft Section 61 Findings by Agency**.
C-8	The SDEIR should include a detailed and updated description of the project and identify any changes since the filing of the DEIR.	As detailed in **DEIR Chapter 1, Program Description and Permitting, Section 1.1, Program Description (pg. 1-1)**, the MWRA plans to construct two new deep rock water supply tunnels (north and south alignments). The new, redundant deep-rock tunnels will originate at a site located at the westernmost portion of the Metropolitan Tunnel System roughly in the vicinity of the Interstate I-90/I-95 Interchange (I-90/I-95). The tunnels will be constructed such that water flows in two directions, with one tunnel extending north towards Waltham and the other south towards Boston/Dorchester. Each tunnel will connect to existing water supply infrastructure at key locations to achieve redundancy goals. Program construction is estimated to take approximately 8 to 12 years and is planned to occur between 2027 and 2040. The

3 Commonwealth of Massachusetts, "Guidance on Public Lands Preservation Act Implementation," February 2023, https://www.mass.gov/doc/guidance-on-public-lands-preservation-act-implementation-january-2023/download (accessed May 9, 2023).

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#	Comment	Response
		MWRA expects that the proposed new deep-rock tunnel system would be placed into service before or around 2040 and that the system will have a useful life of more than 100 years. As discussed in **SDEIR Chapter 1, Program Description, Section 1.1.1, Summary of Program Changes Since the DEIR (pg. 1-2)**, the purpose and general layout of the Program remains unchanged. The Secretary's Certificate on the DEIR issued on December 16, 2022, required that the MWRA file a Supplemental DEIR to address concerns "related to the viability of the proposed receiving shaft site at the Fernald Property in Waltham, which is common to all alternatives considered for the project for the northern alignment." The Certificate requested that alternative locations that could replace the DEIR Fernald Property site be disclosed and the potential impacts of those alternative sites be analyzed. In response to the Certificate, the MWRA considered other sites for the terminus of the North Tunnel, Segment 1, in place of the DEIR Fernald Property site. A description of the process to identify alternative sites for the North Tunnel terminus in place of the DEIR Fernald Property site is provided in **SDEIR Section 2.2.1, Revised North Tunnel Terminus Site (pg. 2-1)**, along with a summary of the two sites that were identified as potentially viable options for the terminus of the North Tunnel in place of the DEIR Fernald Property site. A property owned by the University of Massachusetts (UMass), School of Agriculture located at 25 Beaver Street and a different area of Fernald Property (Lower Fernald) closer to Waverley Oaks Road were identified as candidate sites. The UMass Property would serve as the end point for SDEIR Alternatives 3A and 4A. The UMass Property would be a large connection and unlike under the DEIR scenario, would not be a receiving location for the Tunnel Boring Machine (TBM). The TBM will be disassembled in the tunnel, parts will be transported back through the tunnel and removed through the launch shaft with the shell of the TBM left abandoned in the ground at the large connection site, or the TBM may be backed out the whole length to the launching site at Tandem Trailer. The Lower Fernald Property would serve as the end point for SDEIR Alternative 10A. The Lower Fernald Property would be a receiving site for the TBM and would have a larger shaft site diameter than the large connection for the UMass Property. The change in the terminus points for the SDEIR Alternatives led to a slight adjustment in

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#	Comment	Response
		the alignment of Segment 1 of the North Tunnel that was also assessed in relation to wetlands and waterways, water supply and Article 97 resources. This SDEIR evaluates the existing conditions for the two new sites, including conducting an impact assessment, and identifying mitigation where needed. The SDEIR also updates environmental resource analysis for each SDEIR Alternative incorporating the new sites and the refined tunnel alignment. See **SDEIR Chapter 3 to Chapter 14** for documentation of these findings. The assessment identified that SDEIR Alternative 4A is the Preferred Alternative, and that the two-back up alternatives are SDEIR Alternative 3A and 10A. See **SDEIR Section 2.7, SDEIR Alternatives Evaluation and Methodology (pg. 2-29)** and **SDEIR Section 2.8 (pg. 2-32)**, which describe the alternatives evaluation process and the selection of the preferred alternative, respectively. This SDEIR responds to the comments raised in the Certificate and by commenters.
C-9	The SDEIR should identify additional MEPA thresholds that will be exceeded, including any not identified in this Certificate, based on the location of the proposed shaft sites and other design refinements (i.e., removal of public shade trees, etc.).	As discussed in **DEIR Section 1.4, Regulatory Context (pg. 1-15)**, MEPA review is required when: • A project is undertaken by a state agency, requires a permit from a state agency, or involves financial assistance or a land transfer by a state agency • One or more thresholds, as defined in 301 CMR 11.03, are met or exceeded As described in the DEIR, the Program is subject to the preparation of a Mandatory EIR pursuant to 301 CMR 11.03(4)(a)(3) because it requires State Agency Actions and involves the construction of one or more new water mains 10 or more miles in length. The project also exceeds the additional Environmental Notification Form (ENF) threshold pursuant to 301 CMR 11.03(1)(b)3 for the conversion of land held for natural resources purposes in accordance with Article 97 to any purpose not in accordance with Article 97. The MWRA filed an ENF with the MEPA Office on March 31, 2021, to initiate MEPA review and the Secretary of the EEA issued an ENF Certificate on May 7, 2021. As requested by the Secretary's Certificate, MEPA thresholds that would be exceeded by the Program are identified below: • **301 CMR 11.03(1)(b)(3)**: Disposition or change in use of land or an interest in land subject to Article 97 of the Amendments to the Constitution of the Commonwealth • **301 CMR 11.03(1)(b)(1)**: Direct alteration of 25 or more acres of land • **301 CMR 11.03(3)(b)(1)(f)**: Alteration of ½ or more acres of any other wetlands

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#	Comment	Response
		• **301 CMR 11.03(6)(b)(2)(b)**: Construction, widening or maintenance of a roadway or its right-of-way that will cut five or more living public shade trees of 14 or more inches in diameter at breast height.
C-10	The SDEIR should include an updated description of the project's temporary and permanent impacts to environmental resources, including but not limited to the following: land alteration (including protected open space), wetlands, rare species habitat, cultural and historic resources, and open space.	Relevant technical chapters were updated in the SDEIR as they related to the two new alternatives sites and/or supplemental analysis required in the Scope: • **Chapter 3 – Outreach and Environmental Justice/Appendix A** • **Chapter 4 – Land Alteration and Article 97** • **Chapter 5 – Wetlands and Waterway/Appendix B** • **Chapter 6 – Water Supply and Water Management Act/Appendix C** • **Chapter 7 – Climate Change/Appendix D** • **Chapter 8 – Air Quality and Greenhouse Gas Emissions/Appendix E** • **Chapter 9 – Transportation/Appendix F** • **Chapter 10 – Rare Species and Wildlife Habitat** • **Chapter 11 – Noise and Vibration** • **Chapter 12 – Cultural and Historic Resources/Appendix G** • **Chapter 13 – Hazardous Materials, Materials Handling, and Recycling** • **Chapter 14 – Mitigation/Appendix H**
C-11	The SDEIR should identify methods that will be undertaken to avoid, minimize and mitigate Damage to the Environment.	Relevant technical chapters were updated in the SDEIR as they related to the two new alternatives sites and/or supplemental analysis required in the Scope. Methods that will be undertaken to avoid, minimize and mitigate Damage to the Environment are documented for each environmental resource category in the respective technical resource **SDEIR Chapters** listed below and collectively summarized in **SDEIR Chapter 14**: • **Chapter 3 – Outreach and Environmental Justice/Appendix A** • **Chapter 4 – Land Alteration and Article 97** • **Chapter 5 – Wetlands and Waterway/Appendix B** • **Chapter 6 – Water Supply and Water Management Act/Appendix C** • **Chapter 7 – Climate Change/Appendix D** • **Chapter 8 – Air Quality and GHGs/Appendix E** • **Chapter 9 – Transportation/Appendix F** • **Chapter 10 – Rare Species and Wildlife Habitat** • **Chapter 11 – Noise and Vibration**

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#	Comment	Response
		• **Chapter 12 – Cultural Resources/Appendix G** • **Chapter 13 – Hazardous Materials, Materials Handling, and Recycling**
C-12	The SDEIR should include updated site plans for existing and post-development conditions for each project alternative (preferred and backup) that clearly identify environmental resources, either existing land ownership or acquisitions, easements and associated rights (e.g., rail operations, sewer lines, drainage culverts, etc.) required for project construction, and roadway and intersection jurisdictions.	Updated site plans depicting the two alternative sites considered for the terminus of the proposed North Tunnel, Segment 1, are provided in **SDEIR Section 2.3, Alternative Sites for the North Tunnel Terminus (pg. 2-7)**. **SDEIR Chapter 2, Figure 2-2 (pg. 2-2)** provides a schematic layout of the UMass Property site that identifies the temporary construction area limits of disturbance (LOD), and **SDEIR Chapter 2, Figure 2-3 (pg. 2-10)** provides the proposed post-development final conditions. Similarly, for the Lower Fernald Property site, a schematic layout with the LOD depicted is provided in **SDEIR Chapter 2, Figure 2-4 (pg. 2-12)**, and the proposed post-development conditions are shown in **SDEIR Chapter 2, Figure 2-5 (pg. 2-14)**. The environmental resources in the study area associated with the UMass Property site and the Lower Fernald Property site are depicted for each environmental resource category in each respective technical resource chapter of the SDEIR as listed below. • **Chapter 1 – Program Description and Permitting** • **Chapter 2 – Alternatives** • **Chapter 3 – Outreach and Environmental Justice/Appendix A** • **Chapter 4 – Land Alteration and Article 97** • **Chapter 5 – Wetlands and Waterways/Appendix B** • **Chapter 6 – Water Supply and Water Management Act/Appendix C** • **Chapter 7 – Climate Change/Appendix D** • **Chapter 8 – Air Quality and Greenhouse Gas Emissions/Appendix E** • **Chapter 9 – Transportation/Appendix F** • **Chapter 10 – Rare Species and Wildlife Habitat** • **Chapter 11 – Noise and Vibration** • **Chapter 12 – Cultural and Historic Resources/Appendix G** • **Chapter 13 – Hazardous Materials, Materials Handling, and Recycling** • **Chapter 14 – Mitigation/Appendix H** All other Program sites associated with the SDEIR Alternatives are the same as described and depicted in the DEIR. Conceptual plans by site for the DEIR Alternatives illustrating the existing conditions, as well as the proposed temporary and permanent limits of disturbance, are provided against each environmental resource evaluated in

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#	Comment	Response
		DEIR Chapter 4, Existing Conditions and Environmental Assessment, Existing Conditions and Environmental Assessment. This includes rare species and wildlife habitat in **DEIR, Chapter 4, Figure 4.5-1 (pg. 4.5-7)** through **DEIR, Chapter 4, Figure 4.5-16**, **(pg. 4.5-37)**, wetlands and waterways in **DEIR, Chapter 4, Figure 4.6-1 (pg. 4.6-17)** through **DEIR, Chapter 4, Figure 4.6-16**, **(pg. 4.6-57)**, cultural and historic resources in **DEIR, Chapter 4, Figure 4.7-1 (pg. 4.7-5)** through **DEIR, Chapter 4, Figure 4.7-16**, **(pg. 4.7-35)**, hazardous materials/materials handling/recycling in **DEIR, Chapter 4, Figure 4.8-1 (pg. 4.8-5)** through **DEIR, Chapter 4, Figure 4.8-16**, **(pg. 4.8-49)**, land use including land ownership in **DEIR Chapter 4, Figure 4.9-1 (pg. 4.9-11)** through **DEIR Chapter 4, Figure 4.9-16**, **(pg. 4.9-55)**, transportation in **DEIR, Chapter 4, Figure 4.10-1 (pg. 4.10-3)** through **DEIR, Chapter 4, Figure 4.10-37**, **(pg. 4.10-87)**, noise in **DEIR, Chapter 4, Figure 4.12-2 (pg. 4.12-15)** through **DEIR, Chapter 4, Figure 4.12--17**, **(pg. 4.12-47)**, and community resources in **DEIR, Chapter 4, Figure 4.13-1 (pg. 4.13-7)** through **DEIR, Chapter 4, Figure 4.13-25**. **(pg. 4.13-77)**. Wetlands and water supply infrastructure are illustrated in **DEIR, Chapter 5, Figure 5.1-1 (pg. 5-8)** through **DEIR, Chapter 5, Figure 5.1-24 (pg. 5-53)** of **DEIR Chapter 5, Water Supply and Water Management Act**. The identified EJ populations within each Designated Geographic Area (DGA) are provided in **DEIR Chapter 2, Outreach and Environmental Justice**, in **DEIR, Chapter 2, Figure 2.4-1 (pg. 2-17)** through **DEIR, Chapter 2, Figure 2.4-19**. **(pg. 2-57)**. Figures depicting the final conditions at each site are included in **DEIR Section 3.8 (pg. 3-68)**.
C-13	The SDEIR should include a Construction Management Plan that identifies how the project will minimize traffic disruption during construction particularly in areas within or near EJ populations.	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 serve as the basis for a Construction Management Plan (CMP) to be prepared by the contractor. The CMP will further detail construction and contractor measures to avoid, minimize, and mitigate potential traffic disruptions, and potential air quality and noise impacts. The CMP will document requirements for the contractors to accept and follow prior to the start of construction activity. The following requirements will be included in the CMP to limit potential impacts to Environmental Justice (EJ) populations and will require contractor sign-off: • The contractor would perform construction activities associated with near-surface piping within sidewalks or roadways during off-peak times to minimize disturbance to traffic.

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#	Comment	Response
		• Surface pipe work hours would be context-sensitive; there would be no night work conducted in residential areas. • 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 would 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 would be trained accordingly. • Contractors would use Ultra Low Sulfur Diesel fuel, and construction contracts would stipulate that all diesel-fuel construction equipment be fitted with after-engine emission controls. Any non-road diesel equipment would have to be rated 50 horsepower or greater to meet the U.S. Environmental Protection Agency's (USEPA's) Tier 4 emission standards or be retrofitted with appropriate emission-reduction equipment. Emission-reduction equipment could include USEPA-verified or California Air Resources Board (CARB)-verified diesel oxidation catalysts or diesel particulate filters. • Contractors would be encouraged to use cleaner alternatively fueled equipment (natural gas or electric) rather than diesel-fueled equipment where available and feasible. • Contractors would be required to implement measures to protect local residents, visitors, passengers, and passers-by from off-site exposure to dust and debris. Appropriate methods of dust control would be determined according to the surfaces concerned (roadways or disturbed areas) and would 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. Work within roadways would be coordinated with the local municipality, the DCR, and/or MassDOT and the owner of the utility, as appropriate. Upon completion of the valve chambers and piping, the disturbed areas will be restored and affected roadways

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#	Comment	Response
		would be repaved. The final pavement restoration details and any necessary detours would be coordinated with the local municipality, DCR and/or MassDOT as appropriate through their respective permitting processes. As described in the response to Comments C-5 and C-22, and as shown in **SDEIR Chapter 3, Figures 3-3 (pg. 3-37)** to **Figure 3-19 (pg. 3-69)**, U.S. Census block groups containing EJ populations are adjacent to some Study Area intersections and along portions of truck routes that would be utilized during temporary Program-related construction activities. This includes routes along EJ block groups that have existing unfair or inequitable environmental burdens per the Massachusetts Department of Public Health (DPH) vulnerable health criteria data (low birth rate and elevated blood lead prevalence. Construction vehicle routes were established for each Program site location by identifying the most direct route along main state and local roadways to/from the nearest highway. Using the most direct route seeks to minimize construction vehicle travel time and mileage, and the resulting Program-related traffic (and emissions). Any rerouting of construction vehicles would increase travel times and/or mileage, increasing traffic/trips in both EJ and non-EJ communities. Therefore, the least impactful routing to all populations is using the most direct routes to/from the interstate highway and minimizing traffic on local roads. Since no significant Program-related transportation impacts are anticipated, there would be no significant impacts to baseline environmental or health conditions of EJ or non-EJ populations. See **SDEIR Section 3.4.3.3**, **Anticipated Truck Routes Construction Period Impacts (pg. 3-90)**, for more information on measures the MWRA will implement as necessary to minimize traffic disruption during construction. The maximum amount of temporary Program-related traffic would occur at tunnel launching shaft sites when there would be a shift change which was conservatively modeled to take place during the evening peak hour. However, construction worker trips are not expected to occur during the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM. Program launching shaft sites (i.e., Tandem Trailer, Bifurcation, and Highland Avenue sites) are adjacent to highway ramps and are therefore not expected to cause a significant traffic impact to nearby local roadways. As shown on **SDEIR Chapter 3, Figure 3-5 (pg. 3-41), SDEIR Chapter 3, Figure 3-6 (pg. 3-43), SDEIR Chapter 3, Figure 3-10 (pg.3-51)**, and **SDEIR Chapter 3, Figure 3-11 (pg.3-53)**, none of

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#	Comment	Response
		the Program launching shaft sites considered in any of the SDEIR Alternatives are in EJ block groups. Furthermore, given the launching sites' proximity to highway ramps, no construction vehicle routes between these launching shaft sites and the highway travel through EJ block groups. See **SDEIR Chapter 9, Transportation**, for more information on measures the MWRA will implement as necessary to minimize traffic disruption during construction.
C-14	The SDEIR 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. It 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 SDEIR should clearly describe the permits and/or regulatory approvals required for each component of the project.	The permits anticipated to be required for the Program are summarized in **SDEIR Chapter 1, Table 1-1 (pg. 1-3)**, followed by a detailed description of the applicability of federal as described in **SDEIR Section 1.4.2, Regulatory Context – Federal (pg. 1-5)**, state summarized in **SDEIR Section 1.4.3, Regulatory Context – State (pg. 1-5),** and municipal, listed in **SDEIR Section 1.4.4, Regulatory Context – Municipal (pg. 1-5)** standards or requirements for various Program components. **SDEIR Chapter 1, Table 1-1 (pg. 1-3)** includes the status of each permit, approval, or action at the time of the SDEIR.
C-15	The information and analyses identified in this Scope should be addressed within the main body of the SDEIR and not in appendices. In general, appendices should be used only to provide raw data, such as drainage calculations, traffic counts, capacity analyses and energy modelling, that is otherwise adequately summarized with text, tables and figures within the main body of the SDEIR. Information provided in appendices should be indexed with page numbers and separated by tabs, or, if provided in electronic format, include links to individual sections. Any references in the SDEIR to materials provided in an appendix should include specific page numbers to facilitate review.	Noted. The SDEIR is structured in accordance with these requirements. The organizational framework, methodology, analysis, and content contained in the SDEIR have been prepared in accordance with MEPA Regulations set forth in 301 CMR Section 11.00 et seq., including 301 CMR Section 11.07, "EIR Preparation and Filing."
C-16	The DEIR provides a comprehensive analysis of alternatives; however, it relies exclusively on one receiving shaft site for all North Tunnel options (Fernald Property) which appears to be uncertain based on comments from the City of Waltham. In addition, MWRA has preliminarily identified an alternative receiving shaft site location in proximity of the WASM8 [WASM3] in Belmont, which could serve as an alternative to	The MWRA had identified the Fernald Property as a possible end point for the North Tunnel, Segment 1, as early as 2016. There are several areas within the Fernald Property that could support shaft and tunnel construction/permanent facility operations. The portion of the Fernald Property presented in the DEIR for a shaft site (DEIR Fernald Property site) had been evaluated as presented in the DEIR and was previously discussed with the City of Waltham.

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#	Comment	Response
	Fernald Property. The details of this alternative location have not been disclosed.	As described in the Certificate on the DEIR, the Secretary required that the SDEIR identify and analyze alternative sites for the terminus of the proposed North Tunnel alignment in place of the DEIR Fernald Property site. In response to the Secretary's request, and in accordance with the scope outlined in the Certificate on the DEIR, new alternative sites were considered for the terminus of the proposed North Tunnel alignment. See **SDEIR Section 2.2.1, (pg. 2-1)**. The Lower Fernald Property site was suggested by the City of Waltham in February 2023 as a potentially suitable site to serve as a replacement for the portion of the Fernald Property depicted in the DEIR. The revised location is adjacent to the Chapel Road/Waverley Oaks intersection. In addition, the MWRA has evaluated shaft site locations outside the Fernald Property including the UMass Property site for which potential impacts are evaluated in this SDEIR. MWRA performed an initial assessment of sites in Belmont but determined that the sites were not available for use in the Tunnel Program, and therefore not viable alternatives to the DEIR Fernald Property site. As such, these sites were dismissed from further evaluation.
C-17	The SDEIR should confirm MWRA's commitment to use the Fernald Property with demonstrated concurrence from the City of Waltham or disclose the environmental impacts associated with alternative receiving shaft site location(s).	As described in **SDEIR Section 2.8.2 (pg. 2-34)**, MWRA has initiated conversations with representatives of the University of Massachusetts (UMass) regarding use of the UMass Property as proposed in the SDEIR. The discussions have been favorable and UMass has been supportive regarding a potential transfer of the necessary portion of the property to MWRA. The UMass Property site is part of the new preferred alternative and one back up alternative. The Lower Fernald Property site was suggested by the Mayor of Waltham in February 2023 as a potentially suitable site to serve as a replacement for the DEIR Fernald Property receiving shaft site. The revised shaft site is closer to and on the north side of the intersection of Waverley Oaks Road and Chapel Road. The revised Lower Fernald Property shaft site is part of the 2^{nd} back up alternative. The environmental impacts associated with shaft sites at both sites are presented in the SDEIR.
C-18	Specifically, the SDEIR should include a discussion that describes and estimates the environmental impacts associated with any new alternatives presented in the DEIR	As described in **DEIR Chapter 3,** the DEIR Alternatives were evaluated using a thorough and transparent methodology that built on the alternatives analysis conducted prior to and in support of the ENF. The alternatives screening approach to identifying the DEIR

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	including changes in shaft sites. To the extent a change in shaft site location necessitates a new or revised north tunnel alignment, the details of any such revision and associated impacts should be discussed.	Alternatives was an iterative process that used a set of evaluation criteria that were applied in detail as the alternatives' identification and evaluation process proceeded. The DEIR Alternatives screening evaluated and scored each of the DEIR tunnel alignment shaft and connection sites individually, and then cumulatively for the entire tunnel alignment, considering the relative ability of the respective alternatives to achieve the project goals while minimizing environmental impacts. High-level DEIR evaluation criteria included: Engineering/Constructability; Land Availability; Environmental; Social/Community; Operations; Cost; and Schedule. **DEIR Sections 3.3, Tunnel Alignment Elements Considered in DEIR (pg. 3-4),** and **DEIR Section 3.4, DEIR Alternatives Evaluation and Methodology (pg. 3-12),** describe the tunnel alignment elements considered in the DEIR and how the multi-criteria decision tool was used to evaluate and score the alternatives' components and alignments. **SDEIR Section 2.8 (pg. 2-32)**, includes a description of how the previous evaluation methodology was used to evaluate the SDEIR Alternatives, which incorporate the two new alternative sites, the UMass Property site and the Lower Fernald Property site. The potential environmental impacts associated with the Program, by alternative and by site, are quantified in **DEIR Chapter 4** for each respective environmental resource area and updated in the respective sections of this SDEIR.
C-19	The DEIR indicates that the three DEIR Alternatives (preferred and backup) generally traverse the same horizontal alignment and would have comparable potential impacts on wetlands, wells or surface water bodies along the tunnel alignment. However, it does not indicate if any dismissed alternative included less impacts to environmental resources that the preferred or backup alternatives selected. The SDEIR [*should*] clarify if any of the other seven alternatives that were dismissed would include less environmental impacts.	As described in **DEIR Chapter 3**, and **DEIR Appendix C, Alternatives Analysis Supporting Documentation**, the 10 candidate DEIR Alternatives were evaluated against multiple environmental factors within the evaluation criteria of land availability, environmental, social/community. Refer to **DEIR Appendix C, Figure C-1 (pg. C-3)**. As described in **DEIR Section 3.9.3, Environmental Considerations (pg. 3-155)**, each of the 10 candidate DEIR Alternatives were evaluated according to the presence of the following environmental factors: • State and federally listed threatened and endangered species. Refer to **DEIR Section 4.5, Rare Species and Wildlife Habitat (pg. 4.5-1)** • Massachusetts Contingency Plan (MCP) sites. Refer to **DEIR Section 4.8, Hazardous Materials, Materials Handling, and Reuse (pg. 4.8-1)** • Article 97 lands. Refer to **DEIR Section 4.13, Community Resources and Open Space (pg. 4.13-1)** • Wetlands and waterways. Refer to **DEIR Section 4.6, Wetlands and Waterways (pg. 4.6-1)**

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		• Groundwater and water supply infrastructure. Refer to **DEIR Chapter 5, Water Supply and Water Management Act**) As described in **DEIR Section 3.9.2, Land Availability Considerations (pg. 3-155)**, each of the 10 candidate DEIR Alternatives were also evaluated based on the following land availability factors (**DEIR Section 4.9, Land Use (pg. 4.9-1)**, and **DEIR Section 4.13 (pg. 4.13-1)**, informed the evaluation process): • Site availability • Space and right-of-way for construction • Space and right-of-way for permanent facilities • Possibility of precluding other beneficial uses Furthermore, as described in **DEIR Section 3.9.4, Social/Community Considerations (pg. 3-156)**, each alternative was evaluated according to the presence of the following social/community considerations: • Cultural and historic resources (potential adverse effects on National Register of Historic Places). Refer to **DEIR Section 4.7, Cultural and Historic Resources (pg. 4.7-1)** • Community impacts (adverse effects on use of local parks, playgrounds, bus routes, schools, or other community resources). Refer to **DEIR Section 4.13 (pg. 4.13-1)** • Traffic disruption. Refer to **DEIR Section 4.10, Transportation (pg. 4.10-1)** • Air emissions. Refer to **DEIR Section 4.11, Air Quality and Greenhouse Gas Emissions (pg. 4.11-1)** • Noise. Refer to **DEIR Section 4.12, Noise and Vibration (v pg. 4.12-1)** The technical studies, environmental resource impact assessments included in the DEIR, geotechnical investigations, and field surveys described in **DEIR Chapter 4**, informed the evaluation process. The screening of the 10 candidate DEIR Alternatives included an evaluation and scoring of each of the Program sites individually, and then cumulatively for the entire tunnel alignment. Refer to **DEIR Section C.3.1.2, Candidate DEIR Alternatives Evaluation Criteria (pg. C-7)**. **DEIR Appendix C, Table C-4 (pg. C-9)**, provides a summary of the evaluation criteria categories and sub-criteria, and the associated scoring. **DEIR Section 3.6, Candidate DEIR Alignment Alternatives Evaluation and Scoring Findings (pg. 3-28)**, describes the results for each of the 10 candidate DEIR Alternatives.

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		DEIR Chapter 3, Figure 3.7-1, Alternatives Scoring (pg. 3-67), provides a graphical representation of the scoring results of the 10 candidate DEIR Alternatives. This graphic shows that the three shortlisted alternatives were more favorable or neutral compared to the other seven DEIR Alternatives in the environmental and land availability categories. Given that the 10 candidate DEIR Alternatives use the same launching, receiving, and large connection sites but in different configurations, except for DEIR Alternative 8 that included Riverside Park, the potential environmental impacts were generally the same across alternatives. DEIR Alternative 8, which was dismissed, scored lower in the environmental category because it included an active recreational parcel at Riverside Park. DEIR Alternative 8 stands out as being least favorable of the 10 candidate DEIR Alternatives due to potential impacts to Riverside Park. The Park is actively used for recreation and DEIR Alternative 8 could impact planned future use as recreation. Riverside Park is also an Article 97 property within the Charles River Reservation. The site is within the flood zone of the Charles River and access would have to be shared with other entities. In addition, use of Riverside Park would require a connecting pipeline to be built beneath MBTA tracks. These factors led to the elimination of DEIR Alternative 8 elimination from further consideration. In addition, DEIR Alternative 7 includes a double launching site from Highland Avenue Northeast, which could increase the intensity of environmental impacts at that location. The remaining DEIR Alternatives are made up of the same set of sites, in various different combinations and with varying functions, and thus have similar environmental impacts. As described in **DEIR Chapter 4**, the DEIR Alternatives were comparable in terms of potential impacts to state- and federally listed threatened and endangered species, Article 97 lands, and MCP sites. All DEIR Alternatives would have similar potential impacts on wetlands, wells, or surface water bodies along the tunnel alignment. All DEIR Alternatives include the same six connection shaft sites, so environmental considerations for the connection shaft sites were the same across all alternatives. The three shortlisted alternatives were also more favorable or neutral compared to the other seven DEIR Alternatives in the social/community category with the exception of DEIR Alternative 2, which scored more favorably than DEIR Alternatives 3 and 4. As described in **DEIR Section 3.6.2.1, Overall Evaluation (pg. 3-32)**, DEIR Alternative 2 avoids TBM launching and receiving at the Hultman Aqueduct node (in favor of the Highland Avenue sites), thus reducing the possible risk associated with the timing of

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		MassDOT Project No. 606783. However, DEIR Alternative 2 was less favorable than DEIR Alternatives 3 and 4 due to scheduling and engineering/constructability.
C-20	The SDEIR should clearly indicate if the Preferred Alternative is also the most environmentally preferred or provide justification why it was selected over a less environmentally impactful alternative.	The assessments of potential environmental impacts presented comparable findings across the three SDEIR Alternatives. See **SDEIR Chapter 2, Table 2-8 (pg. 2-42)**. SDEIR Alternatives 3A and 4A are anticipated to have fewer potential impacts related to historic resources (i.e., the social/community category discussed in **SDEIR Section 2.8.4 (pg. 2-36**). SDEIR Alternative 10A, given it would include two launching sites compared to three in SDEIR Alternatives 3A and 4A, is more favorable in terms of groundwater management and potential impact on surface water bodies. Potential environmental impacts associated with each of the three alternatives are generally similar, with mitigation measures incorporated where necessary, and were not a determining factor in identifying the Preferred Alternative.
C-21	I expect that the MWRA will continue to actively seek public input and work closely with the Stakeholder Working Group(s) and other stakeholders in developing the SDEIR for this project. The SDEIR should provide an overview of outreach activities that have taken place since the DEIR was submitted.	The MWRA has implemented a robust outreach initiative and continues to seek public input and work closely with stakeholders. **SDEIR Section 3.2, Updated Outreach to Stakeholders (pg. 3-3)**, provides an update to the outreach activities conducted by the MWRA since the filing of the DEIR. As listed in **SDEIR Chapter 3, Table 3-1 (pg. 3-4)**, over 20 meetings were held with landowners, municipalities, and neighborhood groups since the DEIR filing.
C-22	The SDEIR should supplement the EJ analysis presented in the DEIR. While the DEIR identifies certain site locations where the DPH EJ Tool data show indication of an existing "unfair or inequitable burden," it does not specifically assess project impacts on the surrounding EJ populations at those locations, other than to state that impacts, such as traffic and emissions, will be relatively minor and insignificant.	Potential traffic, air quality, and GHG emissions impacts on EJ populations are described below. See the response to Certificate Comment C-23 for details on potential Program-related land alteration, Article 97, wetlands and stormwater, and noise and vibration impacts in proximity to EJ populations. **Traffic:** In response to the Secretary's Certificate, additional EJ analysis was conducted to assess potential traffic and air quality impacts from the anticipated construction vehicle routes between each Program site and the interstate highway. For detailed information See **SDEIR Section 3.4.3.3, Anticipated Truck Routes Construction Period Impacts (pg. 3-90).** Routes were established for each Program site location by identifying the most direct route along main state and local roadways to/from the nearest highway. Using the most direct route seeks to minimize construction vehicle travel time and mileage, and the resulting Program-related traffic and emissions. **SDEIR Chapter 3, Figure 3-3 (pg. 3-37)** to **SDEIR Chapter 3, Figure 3-19 (pg. 3-69)** depict the anticipated

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		construction vehicle routes to be used during temporary Program-related construction activities to/from each Program site and the nearest interstate highway. **SDEIR Chapter 3, Figure 3-20 (pg. 3-75)** through **SDEIR Chapter 3, Figure 3-36 (pg. 3-129)** identify which anticipated construction vehicle routes travel through block groups containing EJ populations. Block groups containing EJ populations within a 0.5-mile distance from the anticipated routes that have existing unfair or inequitable environmental burdens were identified per the DPH vulnerable health criteria data (low birth rate and elevated blood lead prevalence) and are also shown on **SDEIR Chapter 3, Figures 3-3 (pg. 3-37)** to **SDEIR Chapter 3, Figure 3-19 (pg. 3-69)**. Study Area intersections along the anticipated routes are also identified and labeled in **SDEIR Chapter 3, Figure 3-3 (pg. 3-3)** to **SDEIR Chapter 3, Figure 3-19 (pg. 3-69)**. **Table 3-12** in **SDEIR Section 3.4.2.3, Anticipated Truck Routes Existing Conditions (pg. 3-33)**, provides a corresponding list of the census tracts containing populations with existing unfair or inequitable burdens within 0.5-miles of the anticipated truck routes. **SDEIR Chapter 3, Table 3-20 (pg. 3-91)** lists the intersections along the truck routes and the block groups containing EJ populations that are within 0.5-miles of the anticipated truck routes. The DGAs of the sites following sites are within EJ populations adjacent to roadways along construction vehicle routes that could experience potential temporary increases in traffic during Program construction. : • UMass Property site. See **SDEIR Section 3.4.3.1, Alternative 3A/ Alternative 4A Construction Period Impacts (pg. 3-72)** and **SDEIR Chapter 3, Figure 3-20 (pg. 3-75)** • Lower Fernald Property site. See **SDEIR Section 3.4.3.2, Alternative 10A Construction Period Impacts (pg. 3-81)** and **SDEIR Chapter 3, Figure 3-21 (pg. 3-3-83)** • American Legion site. See **SDEIR Chapter 3, Figure 3-29 (pg. 3-115)** • School Street site. See **SDEIR Chapter 3, Figure 3-30 (pg. 3-117)** • St. Mary's Street Pumping Station site. See **SDEIR Chapter 3, Figure 3-33 (pg. 3-123)** • Newton Street Pumping Station site . See **SDEIR Chapter 3, Figure 3-29 (pg. 3-115)**], and Southern Spine Mains site. See **SDEIR Chapter 3, Figure 3-35 (pg. 3-127)**

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		The remaining Program sites have no EJ populations adjacent to the planned construction vehicle routes. Most traffic expected to be generated by construction activities at the proposed shaft sites would be due to construction workers driving to and from the sites at the beginning and end of their workday shifts. The maximum amount of temporary Program-related traffic would occur at launching shaft sites where there is a shift change conservatively modeled to take place during the evening peak hour (construction worker trips are not expected to occur during the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM). Program launching shaft sites (i.e., Tandem Trailer, Bifurcation, and Highland Avenue sites) are adjacent to highway ramps and are therefore not expected to cause a significant traffic impact to nearby local roadways. As shown on **SDEIR Chapter 3, Figure 3-5 (pg. 3-41), SDEIR Chapter 3, Figure 3-6 (pg. 3-43), SDEIR Chapter 3, Figure 3-10 (pg. 3-51)**, and **Figure 3-11 (pg. 3-53)**, none of the Program launching shaft sites considered in either of the SDEIR Alternatives are in EJ block groups. Furthermore, given their proximity to highway ramps, no construction vehicle routes between these launching shaft sites and the highway travel through EJ block groups. **<u>Air Quality and GHG Emissions:</u>** **SDEIR Chapter 3, Table 3-22 (pg. 3-140)**, presents the intersections included in the analysis for each Program site. The traffic study includes local roadway routes to and from construction locations to the nearest highway interchanges, generally with Interstates I-93 and I-95. Air pollutant emissions were calculated along these local routes, which traverse both EJ and non-EJ areas. As described in **SDEIR Chapter 9**, Program-related construction activities are expected to temporarily add approximately 0.1 percent to 2.0 percent additional vehicles to local roadways on the peak day compared to existing conditions. This minor increase would not be expected to materially affect any ambient pollutant concentrations and their comparison to any air quality standards. Program-related traffic (and associated emissions) along highways is anticipated to comprise less than 0.1 percent to 0.7 percent of total daily volumes on the modeled peak day, which conservatively assumes that construction would occur at all shafts simultaneously. See **SDEIR Chapter 9**, for more information. As described in **SDEIR Chapter 8, Air Quality and Greenhouse Gas Emissions**, and as shown in **Table 3-16 (pg. 3-74)**, Program-related construction emissions of nitrogen

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		oxides (NOx), volatile organic compounds (VOC), and greenhouse gas emissions (GHG) are a fraction of the total statewide emissions. As shown in **SDEIR Chapter 3, Table 3-16 (pg. 3-74)**, the total 10-year modeled construction duration emissions calculated for each SDEIR Alternative are not expected to be significantly different from one other (approximately 124 tons of NOx, 9 tons of VOC, and 26,000 tons of GHG) and would occur at a variety of geographically diverse sites, limiting potential health impacts. Temporary Program-related construction emissions of NOx, particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and diesel particulate matter (DPM) are all expected to be below 0.5 tons per year (tpy), and well below the referenced General Conformity *de minimis* thresholds of 100 tpy for NOx, 100 tpy for PM_{10}, and 100 tpy for $PM_{2.5}$ (there are no thresholds for DPM).[4] Lead is no longer used in gasoline and is not used in diesel fuel. Therefore, the Program is expected to have no lead emissions. Thus, no significant construction-period impacts related to air quality and GHG are anticipated from any of the three SDEIR Alternatives. Estimated on-road peak 12-month period emissions of NOx, PM_{10}, $PM_{2.5}$ and DPM in proximity to EJ block groups are presented in **SDEIR Chapter 3,.Table 3-21 (pg. 3-98)**, and **Table 3-22 (pg. 3-140)**. Calculations show that emissions are small, however more pollutants are emitted in EJ areas than in non-EJ areas. This is due to the proximity of EJ neighborhoods to both the construction sites, and to the main state and local thoroughfares used to get to the interstate highways, especially for the American Legion site in Jamaica Plain, and the most direct route along State Road 203 to I-93. Construction vehicle transportation routes between the interstate highways and the Program construction sites are anticipated to take place on local roads, some of which abut EJ communities, assuming that the most direct local routes would be used. Any rerouting of construction vehicles would increase travel times and/or mileage, thus increasing regional emissions totals in both EJ and non-EJ communities. Therefore, the least impactful routing to all populations is using the most direct routes to the interstates and minimizing traffic on local roads. Since no significant air quality or Program-related GHG emissions impacts are anticipated, there would be no impacts to baseline environmental or health conditions of EJ or non-EJ populations. See **SDEIR Chapter 8,** for more information.

4 U.S. Environmental Protection Agency, General Conformity, "*De Minimis* Tables," updated July 20, 2022, https://www.epa.gov/general-conformity/de-minimis-tables (accessed June 13, 2023).

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		As described previously, the maximum amount of temporary Program-related traffic and resulting emissions would occur at launching shaft sites where there is a shift change conservatively modeled to take place during the evening peak hour. Program launching shaft locations are adjacent to highway ramps and are therefore not expected to cause a significant traffic impact to local roadways. As shown on **SDEIR Chapter 3, Figure 3-5 (pg. 3-41), Figure 3-6 (pg. 3-43)**, **Figure 3-10 (pg. 3-51)**, and **Figure 3-11 (pg. 3-53)**, none of the Program launching shaft sites considered are in EJ block groups. Furthermore, given their proximity to highway ramps, no routes between these launching shaft sites and the highway travel through EJ block groups. There are EJ block groups adjacent to intersections along the UMass Property site, Lower Fernald Property site, American Legion site, School Street site, Cedarwood Pumping Station site, Newton Street Pumping Station site, and Southern Spine Mains site anticipated construction truck route that have existing unfair or inequitable environmental burdens for low birth weight rates per the DPH vulnerable health data. See **SDEIR Chapter 3, Figure 3-3 (pg. 3-37)**, **Figure 3-4 (pg. 3-39)**, **Figure 3-12 (pg. 3-55)**, **Figure 3-13 (pg. 3-57)**, **Figure 3-14 (pg. 3-59)**, **Figure 3-17 (pg. 3-65)**, **Figure 3-18 (pg. 3-67),** and **Table 3-12 (pg. 3-55)**, respectively. The remaining sites do not have EJ block groups adjacent to anticipated construction truck routes that have existing unfair or inequitable environmental burdens for low birth weight rates. While emissions from diesel trucks, vehicles, and construction equipment can exacerbate low birth weight health vulnerabilities, and there are existing low birth weight health vulnerabilities, project activities are not anticipated to have an adverse impact. However, the MWRA is dedicated to protecting public health and disadvantaged populations and will work with the DPW and Transportation departments of each municipality if necessary to establish appropriate mitigation to further reduce the risk of exacerbating low birth weight rates. Project activities are not anticipated to exacerbate existing unfair or inequitable environmental burdens. Since no significant Program-related air quality or GHG emissions impacts are anticipated, there would be no impacts to baseline environmental or health conditions of EJ or non-EJ populations.
C-23	The SDEIR should discuss, in greater detail, how the various impacts of the project, including land alteration/Article 97, wetlands/stormwater, traffic, and GHG/air emissions, will	**Land Alteration and Article 97:** Permanent easements and land acquisition would be required to accommodate the Program. As shown in **SDEIR Chapter 3, Table 3-23 (pg. 3-142)**, some of the permanent aboveground easements and land acquisitions would include portions of existing

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	specifically affect the EJ populations that are identified as incurring existing environmental burdens.	community resources and open space, including portions of three Article 97 properties. The proposed easement area or land acquisition area would be small in overall property size (acreage) in relation to the total area and would contain only the critical Program infrastructure needed for operation and maintenance of the tunnel system. Use of the sites for the Program is not anticipated to significantly interfere with or detract from the existing use. Subterranean easements of land that the tunnel runs underneath would also be required but are not anticipated to impact future property use. Ouellet Park (Hegarty Pumping Station) playground infrastructure, fields, and courts are not near the proposed connection site; the 0.1-acre acquisition is not anticipated to impede the existing recreational amenities or public access at Ouellet Park (7.3-acre park). The 0.2-acre portion of Southwest Corridor Park/Arborway I to be used by the Program is not anticipated to interfere with the existing recreational use of the Greenway nor the adjacent community garden. DCR's Morton Street property (American Legion site) does not provide recreational activities. For the UMass Property large connection shaft site (Lawrence Meadow). See **SDEIR Section 3.4.3.1 (pg. 3-82)**, Hegarty Pumping Station connection shaft site (Ouellet Playground), and Southern Spine Mains connection shaft site (Southwest Corridor Park/Arborway I), the proposed acquisition is not anticipated to change the existing recreational amenities or public access. For the Lower Fernald Property receiving shaft site (Walter E. Fernald State School Property) and American Legion site (Morton Street), the property does not have existing public access or recreational amenities. Final conditions at the shaft sites would consist of a fenced-in top of shaft structure that is anticipated to be less than three feet above ground level. The proposed acquisitions and/or easements are not anticipated to exacerbate any existing environmental and health burdens nor limit public access to open space and recreational resources for EJ populations. Therefore, no disproportionate adverse effects would be anticipated. **<u>Wetlands and Stormwater</u>:** Impacts to existing wetlands due to program development would be minimal and primarily would consist of temporary impacts. Permanent impacts would include those to state-regulated Riverfront Areas due to top-of-shaft and/or valve structures and associated pavement at four locations (Fernald Property, Hegarty Pumping Station, Tandem Trailer and Hultman Aqueduct Isolation Valve). In addition to wetlands impacts being minor and primarily temporary. All temporarily impacted areas would be

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		restored and revegetated upon completion of construction. As no adverse impacts would be anticipated, no disproportionate adverse effects due to wetland impacts would be anticipated. Construction period and post-construction development impacts at the project locations may include impacts from erosion control, peak discharge rates, groundwater recharge, total suspended solids (TSS) removal, construction management, and long-term maintenance. As stated in **DEIR Section 4.6.5, Construction Period Impacts (pg. 4.6-127)** and **DEIR Section 4.6.6, Final Conditions (pg. 4.6-153)**, any impacts resulting in changes to existing stormwater characteristics as defined above will be mitigated in accordance with the MassDEP Stormwater Management Standards. Therefore, effects on neighboring EJ communities due to project-related stormwater impacts are not anticipated. Compliance with each of the ten MassDEP Stormwater Management Standards is further described in **DEIR Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards (page 4.6-179)**. **<u>Traffic</u>:** See **Response to Certificate Comment C-22**. **<u>Air Quality and GHG Emissions:</u>** See **Response to Certificate Comment C-22**. **<u>Noise and Vibration:</u>** **SDEIR Chapter 3, Table 3-24 (pg. 3-144)** through **Table 3-26 (pg. 3-148)** identify the noise-sensitive receptors that may be subject to adverse noise impacts during temporary Program-related construction activities. It is important to note that American Community Survey (ACS) Census data utilized by the EJ Maps Viewer and associated data layers do not designate EJ criteria for individual households. Thus, block group EJ criteria designations are used for the assessment of disproportionate adverse effect. As previously described in **DEIR Section 2.4.6, Construction Period Impacts (pg. 2-104)**, and as described in **SDEIR Chapter 11, Noise and Vibration, Section 11.2.4, Noise Avoidance, Minimization, and Mitigation (pg. 11-18),** minimization and mitigation measures would be implemented at all Program sites subject to potential noise impacts, and not just the five sites with DGAs located within EJ communities. Potential adverse impacts are anticipated to be mitigated at all Program sites and therefore no disproportionate adverse noise and vibration effects to EJ populations are anticipated.

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C-24	The SDEIR should discuss whether the anticipated routes of travel for construction period trucks and traffic will extend adjacent to any of those neighborhoods, and whether EJ populations may be disproportionately affected by Article 97 dispositions of parkland and other land takings/easements that may be needed for the project.	See the **Response to Certificate Comment C-22** for details on potential Program-related traffic impacts in proximity to EJ populations. See the **Response to Certificate Comment C-23** for details on potential Program-related Article 97 impacts in proximity to EJ populations.
C-25	The SDEIR should confirm that the project will not generate more than 150 new ADT associated with diesel vehicle trips (Table 4.2-5 appears to indicate the project may produce up to 158 truck trips per day during the construction period).	The analysis estimated the potential for up to 156 average daily trips (ADT) of diesel truck trips at the Highland Avenue Interchange based on a worst-case estimate. The worst-case estimate assumes approximately 70 feet excavation per day by a TBM and that construction would only occur on business days. The average rate for excavation is likely to be less than 60 feet per day, translating to fewer than 150 additional ADT by diesel trucks. Although the excavation on some days may reach or exceed 70 feet a day, the likelihood of exceeding 60 feet a day continuously for over four consecutive quarters (one year) is extremely low. Accordingly, the estimated number of trucks represents a conservative estimate considering the full duration of construction. **The annual average ADT generated by the project would be around 111 ADT per year**. This conclusion is reached by taking the maximum number of daily truck trips (156) and multiplying that by the typical workdays in a year (260) and dividing that amount over a full 365 days to identify the number of annual ADT. Based on the EJ guidance for an impact assessment, the annual ADT 111 is below the 150 ADT threshold and thus a one-mile radius for the EJ assessment is appropriate. The transportation analysis assesses the work week ADT to confirm the roadways will be able to accommodate the anticipated annual traffic, while the air quality/GHG analysis considers trips as an annual average in the region.
C-26	The SDEIR should discuss whether stormwater or other flood impacts, including from extreme storm events that may occur during the construction period, may affect EJ populations due to their proximity to any applicable infrastructure.	Construction period impacts on existing floodplains for all alternatives were evaluated by comparing the flow rates of dewatering discharges at each site to those of the potential receiving water bodies. The USGS Stream Stats: Stream Flow Statistics and Spatial Analysis Tool (web application) was utilized to estimate the flow rates in the existing receiving waterbodies. As documented in **SDEIR Chapter 5, Wetlands and Waterways, Section 5.1.1.1, Summary of Findings (pg. 5-1)** and discussed further below, the proposed discharge volumes would be a small percentage of the projected storm flow volumes from all storm events in all alternatives.

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		At the Lower Fernald Property site, where 300 GPM of dewatering flow would be discharged to Clematis Brook, potential impacts to both Clematis Brook and the downstream Beaver Brook were assessed. Flow estimates for the 100-year flood event (one percent) for Clematis Brook and Beaver Brook were estimated to be approximately 84,381 GPM and 137,343 GPM respectively. Therefore, dewatering discharges made to Clematis Brook from the Lower Fernald Property site are estimated to be only 0.4 percent of the 100-year flood volume for Clematis Brook and 0.2 percent of the 100-year flood volume for Beaver Brook. Based on these estimates, it is anticipated that construction period dewatering discharges from the Lower Fernald Property site would not contribute significantly to existing flood impacts. Additionally, EJ block group BG 1, CT 3689.01, is buffered from Clematis Brook by forested area associated with Forest Street Park. BG 1, CT 3691 is located across the ROW from Beaver Brook. Due to the anticipated 0.4 percent and 0.1 percent respective contributions to the 100-year flood volume, and the physical separation between the 100-year floodplain and the EJ block groups by natural and ROW features, project activities would not exacerbate flood risk to proximal EJ populations or existing environmental and health burdens. **Thus, no disproportionate adverse effects are anticipated due to stormwater or other flood impacts.** At the Tandem Trailer/Park Road East launching and Park Road West receiving sites, where 300 GPM of dewatering flow would be discharged to Seaverns Brook, impacts to both Seaverns Brook and the downstream Charles River were assessed. Flow estimates for the 100-year flood event (1 percent) for Seaverns Brook and Charles River were estimated to be approximately 267,055 GPM and 3,774,682 GPM respectively. Therefore, dewatering discharges made to Seaverns Brook from the Tandem Trailer/Park Road East launching and Park Road West receiving sites are estimated to be only 0.1 percent of the 100-year flood volume for Seaverns Brook and less than 0.01 percent of the 100-year flood volume for Charles River. The maximum cumulative discharge volume that the Charles River may receive from each contributing discharge (inclusive of discharges directly to the Charles as well as to upstream tributaries Clematis Brook/Beaver Brook and Seaverns Brook) is 6,560 GPM associated with SDEIR Alternative 10A discharges. This added volume represents approximately 6.5 percent of the 50 percent duration average flow and 0.17 percent and 0.24 percent of the anticipated 100-year and 25-year flood flows, respectively.

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#	Comment	Response
		Based on these estimates, it is anticipated that construction period dewatering discharges from this site would not contribute significantly to existing flood impacts. Program activities would not exacerbate flood risk to proximal EJ populations or existing environmental and health burdens. **Thus, no disproportionate adverse effects are anticipated due to stormwater or other flood impacts.** The Park Road West large connection site does not have any EJ populations within the DGA, and therefore would not have any adverse impacts, exacerbation of existing environmental and health burdens, or disproportionate adverse effects to EJ populations from stormwater or other flood impacts. At the Highland Avenue Northwest launching and Northeast launching sites, where 6,110 GPM of dewatering flow will be discharged to Charles River, impacts were assessed. Flow estimates for the 100-year flood event (1 percent) for Charles River were estimated to be approximately 3,774,682 GPM respectively. Therefore, dewatering discharges made to Charles River from the Highland Avenue Northwest and Northeast sites are estimated to be 0.2 percent of the 100-year flood volume. The maximum cumulative discharge volume that the Charles River may receive from each contributing discharge (inclusive of discharges directly to the Charles as well as to upstream tributaries Clematis Brook/Beaver Brook and Seaverns Brook) is 6,560 GPM associated with SDEIR Alternative 10A discharges. This added volume represents approximately 6.5 percent of the 50 percent duration average flow and 0.17 percent and 0.24 percent of the anticipated 100-year and 25-year flood flows, respectively. Based on these estimates, it is anticipated that construction period dewatering discharges from this site would not contribute significantly to existing flood impacts. Additionally, EJ block group BG 1, 3740, is distanced away from the Charles River and is not in its floodplain. Project activities would not exacerbate flood risk to proximal EJ populations or existing environmental and health burdens. **Thus, no disproportionate adverse effects are anticipated due to stormwater or other flood impacts.** At the American Legion receiving site, where 300 GPM of dewatering flow will be discharged to Canterbury Brook/Stony Brook, impacts were assessed. Flow estimates for the 100-year flood event (1 percent) for Canterbury Brook/Stony Brook were estimated to be approximately 171,005 GPM respectively. Therefore, dewatering discharges made to Canterbury Brook/Stony Brook from the American Legion receiving site are estimated to be 0.2 percent of the 100-year flood volume. Based on these

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#	Comment	Response
		estimates, it is anticipated that construction period dewatering discharges from this site would not contribute significantly to existing flood impacts. Additionally, the floodplain around Canterbury Brook/Stony Brook is considered a lower risk area than standard the 100-year floodplain (denoted as a one percent drainage area less than one square mile). There is a tree buffer from residential areas, which include EJ populations, mostly from the Boston Nature Center, and a roadway buffer near floodplain areas. Due to the anticipated 0.2 percent contribution to the 100-year flood volume, the lower risk from the FEMA-labeled floodplain, and the physical separation between the 100-year floodplain and the EJ block groups nearby by natural and ROW features, Program activities would not exacerbate flood risk to proximal EJ populations or existing environmental and health burdens. **Thus, no disproportionate adverse effects are anticipated due to stormwater or other flood impacts.** Drilling and excavation of contaminated soil, and construction dewatering of contaminated groundwater or surface water has the potential to exacerbate elevated blood lead health vulnerabilities. In the event that soil or water contaminated with lead is discovered during Program drilling, excavation, or dewatering, the MWRA will work with municipal entities to establish appropriate mitigation. Sites that are not discussed above would not have adverse stormwater impacts, and project activities would not exacerbate flood risk to proximal EJ populations or existing environmental and health burdens. **Thus, no disproportionate adverse effects are anticipated due to stormwater or other flood impacts for the remaining sites**
C-27	The SDEIR should supplement the climate change and GHG/air quality analyses in accordance with the scope below.	**<u>Climate Change:</u>** No disproportionate adverse effects for climate change exposure of EJ communities would be anticipated associated with the three SDEIR Alternatives during construction and in final conditions. For all proposed sites, best management practices and site preparation would be implemented during construction to reduce potential climate-related risks and to build redundancy and resiliency into the Program. No construction period adverse impacts on climate change exposure would be anticipated, and thus no disproportionate adverse effects on EJ populations would be anticipated. The Program would primarily be constructed underground with limited disruption to the surface above. Above-ground infrastructure would primarily consist of the shaft site locations and/or water distribution infrastructure. Within the permanent sites, a fenced-off area would surround valve chambers and tunnel shafts that have an access

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#	Comment	Response
		hatch at or above ground level. It is anticipated that the Program would create up to three acres of new impervious surface compared to existing conditions, including new pavement proposed for vehicle parking and site access roadways. No impacts to baseline environmental or health conditions of EJ or non-EJ populations would be anticipated as a result of final conditions. No disproportionate adverse effects for climate change exposure of EJ communities would be anticipated. See **SDEIR Chapter 7, Climate Change**, and **SDEIR Appendix D, RMAT Tool Output Reports**, for information on climate change-related risks and exposures. **<u>Air Quality and GHG Emissions:</u>** The SDEIR provides the supplemental information requested related to the analyses of air quality and GHG emissions. See **SDEIR Chapter 8**, for the analysis of air quality and GHG emissions-related impacts and the **Response to Certificate Comments C-48, C-49, and C-50** contained therein. Also see **Response to Comment C-22**.
C-28	The SDEIR should provide an update on the project's consistency with the Article 97 Policy.	The MWRA has been closely coordinating with DCR regarding potential construction at DCR-controlled properties, and associated Article 97 requirements. As summarized in **SDEIR Chapter 4, Table 4-1 (pg. 4-5)**, described in **SDEIR Section 4.2.4.2, Community Resources and Open Space (pg. 4-47)**, and as previously assumed in the DEIR. See **DEIR Section 4.13.4.5, Compliance with Article 97 Land Disposition Policy (pg. 4.13-81)**, the Program's proposed use of a portion of the following three sites (common to all SDEIR Alternatives) may require an Article 97 land disposition: • **Ouellet Park** – The Hegarty Pumping Station connection site is within Ouellet Park, which is owned by the Town of Wellesley. Approximately 0.1 acres of land acquisition is anticipated to be required (to be confirmed in final design). Temporary use of approximately 0.3 acres of the site is anticipated during construction. • **Southwest Corridor Park/Arborway I** – The Southern Spine Mains connection site is within Southwest Corridor Park/Arborway I, which is owned by the Commonwealth of Massachusetts under care, custody, and control of DCR. Approximately 0.2 acres of land acquisition is anticipated to be required (to be confirmed in final design). Temporary use of up to 0.5 acres of Southwest Corridor Park/Arborway I is anticipated to be required during construction. • **Morton Street Property** – A portion of the American Legion receiving site is within the Morton Street Property owned by the Commonwealth of Massachusetts under

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#	Comment	Response
		care, custody, and control of DCR. Approximately 1.5 acres of Morton Street Property land acquisition is anticipated to be required for the shaft and valve chamber and up to 2.0 acres of permanent easement would be required for the near-surface pipeline (to be confirmed in final design). Temporary use of up to 3.5 acres of the Morton Street Property is anticipated to be required during construction. See **SDEIR Chapter 4, Table 4-13 (pg. 4-49)** for a summary of how the three sites protected by Article 97 would comply with the conditions outlined in the Article 97 Land Disposition Policy, as applicable. As described in **SDEIR Section 4.2.3.3, Tunnel Alignment (pg. 4-43)** and listed in **SDEIR Chapter 4, Table 4-12 (pg. 4-44)**, properties protected by Article 97 within a 1,000-foot corridor of the preliminary tunnel alignment (500 feet on either side) were identified for each SDEIR Alternative. See **SDEIR Chapter 4, Figure 4-3 (pg. 4-13)**, **Figure 4-4 (pg. 4--23)**, and **Figure 4-5 (pg. 4-27)**. A subterranean easement would be required for properties listed that are directly above the tunnel alignment.
C-29	As requested by DCR, the SDEIR should describe how MWRA will minimize the size and extent of impacts to DCR land. MWRA should work closely with DCR to identify mitigation for the loss of Article 97 conservation lands as the shaft, staging and tunnel locations are finalized. The SDEIR should provide a summary of the outcome of consultations with DCR regarding Article 97 protection and mitigation.	The MWRA has held a number of meetings with DCR to present conceptual plans and to discuss site layout and utilization at the DCR Morton Street Property (American Legion) and the Southern Spine Mains connection to minimize land required by MWRA for construction and long-term operation at the sites. The MWRA will continue to coordinate closely with DCR regarding potential construction at DCR-controlled properties, and associated Article 97 requirements. A list of meetings with DCR since the ENF filing is included in **DEIR Chapter 2, Table 2.2-1 (pg. 2-3)**. The MWRA has continued to coordinate with the DCR to identify replacement land required for the disposition of a portion of Southwest Corridor Park/Arborway I (approximately 0.2 acres) for the proposed Southern Spine Mains connection shaft site and a portion of the DCR Morton Street Property (approximately 1.5 acres of the DCR Morton Street Property (in addition, 2.0 acres would require a permanent easement of the DCR Morton Street Property) for the proposed American Legion receiving shaft site. These acreages are small in relation to the total Article 97 property area and would contain only the critical Program infrastructure needed for operation and maintenance of the tunnel system. See **SDEIR Chapter 4, Table 4-12 (pg. 4-44)** and the Response to Certificate Comment C-6.

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#	Comment	Response
C-30	The SDEIR should provide an update on the borings and geotechnical analysis underway, including presenting the results of any analysis completed by the time of the SDEIR filing.	Eighteen deep test borings were drilled as part of the preliminary design for the Program. The majority of these test borings are located at shaft sites. In addition, surface geophysical surveys have been conducted at 43 locations along the preliminary tunnel alignment. Bedrock outcrop mapping was conducted at 25 locations in the Program Study Area where bedrock is exposed and accessible. This data, along with geotechnical and geologic data collected as part of past projects (e.g., past MWRA projects, MassDOT work, etc.) was analyzed to develop an understanding of both the geologic and hydrological setting for the Program area, understand conditions which influence shaft and tunnel design and construction methods (e.g., top of rock elevation, location and limits of geologic faults, permeability, strength, abrasively, mineralogy, lithology, stability, etc.). This data, along with a number of factors, including hydraulic connections to critical infrastructure, land availability and land use, and environmental impacts was used to select shaft site and the preliminary tunnel alignment. The preliminary tunnel alignment between sites included in the DEIR and SDEIR will be further refined throughout the design phases of the Project. The results of these investigations and analysis are currently being compiled and will be incorporated into the final design and/or included in the construction documents.
C-31	The SDEIR should clearly describe the plans to conduct geotechnical analysis during the course of construction, how such analysis may affect any choice of routing or excavation methods along the chosen tunnel alignment, and what steps MWRA will take to secure easements from landowners along the tunnel alignment route.	The MWRA executed a contract in early 2023 to drill up to 40 additional deep test borings during the next phase of design at the remaining shaft sites and along the preliminary tunnel alignment. These investigations will build on those conducted as part of the preliminary design and will further inform the design including locations of discreet sections of tunnel alignment between shaft sites (e.g., between School Street and the end of the North Tunnel in Waltham), extent and type of initial tunnel support type or final liner (e.g., concrete or steel), etc. This additional data will also help estimate tunnel construction production rates and Program costs. During final design of each tunnel segment, the tunnel alignment (both horizontal and vertical) between shaft sites will be finalized. Subterranean easements along the tunnel alignment will be required. The easements are envisioned to consist of a zone surrounding the tunnel horizon but not extend to, nor affect, land use at the ground surface. Easements will be obtained from each landowner prior to construction. The steps will vary based on the landowner but all will include recording of the easement. It is not expected that geotechnical analysis (if) conducted during construction will change the tunnel alignment.

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#	Comment	Response
C-32	The SDEIR should discuss what contingency plans will be in place in the event of unforeseen circumstances, such as geotechnical conditions or opposition from landowners, that may preclude the project's ability to site the tunnel alignment in the exact location anticipated prior to commencing excavation.	Considering that the majority of the preliminary design phase investigations and significant geotechnical and geologic data collected as part of past projects borings are located at shaft sites, it is not expected that unforeseen geotechnical conditions at a shaft site revealed during late investigation phases would warrant modifications of a shaft site location. In the event that a geologic condition is revealed during later investigations that warrants an adjustment to the tunnel alignment between shaft sites, the tunnel and corresponding subterranean easements will be modified prior to construction. Subterranean easements for the tunnel will not extend to nor impact land use at the surface. However, if landowner opposition to a subterranean easement were to occur an evaluation of the impacts of modifying the tunnel alignment or exercising eminent domain as allowed by MWRA's enabling act will be made.
C-33	The SDEIR should provide an update on temporary and permanent impacts to wetland resource areas. The SDEIR should clarify impacts associated with each wetland resource area as the DEIR includes conflicting estimates (Table 4.2-2 versus Table 7.4-2).	Temporary and permanent impacts to wetland resources areas have been updated and conflicting estimates have been resolved in **SDEIR Chapter 5, Table 5-6 (pg. 5-29)**.
C-34	The SDEIR should address concerns regarding the impacts of increased volume and velocities of dewatering discharges to several waterways associated with construction of the new tunnels (discharge to Clementis Brook on the Fernald Property, discharge to Canterberry Brook at the American Legion site, and discharge to Seaverns Brook for the launching and receiving shafts for the Bifurcation site).	Construction activities would include the installation of riprap splash pads at the outlet of pipes for dewatering discharges at the UMass Property or Lower Fernald Property, Tandem Trailer or Bifurcation, Highland Avenue Northeast/Southeast, and American Legion, depending on the Alternative. A description of wetland and waterway construction period impacts is provided in **DEIR Chapter 4.6, Wetlands and Waterways, Section 4.6.5 , Construction Period Impacts (Page 4.6-127)** for each shaft site. The riprap splash pads were conservatively designed to dissipate higher flow rates than the calculated pipe diameter is expected to convey. Manning's Equation (assuming gravity flow and minimum pipe slope for a given diameter pipe) was used to confirm that pipes were sized conservatively large to convey the expected flow rate from tunnel dewatering activities during construction. Riprap splash pads were then designed conservatively large to be able to dissipate the velocities from a pressure flow condition where flow (Q) and velocity (V) are higher than what is expected from tunnel dewatering rates. These calculations (included in **SDEIR Appendix B, Wetlands and Waterways Supporting Documentation**) show that the outlet pipe diameters and dimensions of riprap splash pads presented in the DEIR were conservatively large and would be adequate to mitigate potential scour impacts to adjacent wetland resources. As the design is refined, both the pipe diameters and

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#	Comment	Response
		the riprap splash pads at the pipe ends likely may be able to be reduced. The calculations and nomograph used for sizing the riprap outlet protection is presented in **SDEIR Appendix B,** demonstrating that the proposed pipes and riprap splash pads have been properly sized to regulate flows and prevent scour. **SDEIR Chapter 5, Table 5-14 (Page 5-46)**, summarizes the cumulative impacts of dewatering discharges to the Charles River for each SDEIR alternative. The maximum cumulative discharge volume that the Charles River may receive from each contributing discharge (inclusive of discharges directly to the Charles as well as to upstream tributaries Clematis Brook/Beaver Brook and Seaverns Brook) is 6,560 GPM associated with Alternative 10A discharges. This added volume represents approximately 6.5% of the 50% duration average flow and 0.17% and 0.24% of the anticipated 100-year and 25-year flood flows, respectively.
C-35	The SDEIR should clarify whether impacts to BVW and Inland Bank will be permanent or temporary due to the installation of splash pads and culvert outlets. As recommended by MassDEP, the SDEIR should examine the possibility of moving these structures farther from the BVW.	As shown in **SDEIR Chapter 5, Table 5-6 (Page 5-29),** impacts to Land Under Waterbodies and Waterways (LUW/WW), Bordering Land Subject to Flooding (BLSF) and Bank due to the construction of discharge pipes and splash pads would include both temporary and permanent impacts. Temporary impacts would result from pipe trenching and excavation and stabilization for construction of the flared end-sections and riprap splash pads. Following completion of construction, vegetation and shorelines would be restored along the pipe trench and around the splash pad. Permanent impacts would include only the flared end-sections and associated riprap splash pads, providing scour protection and erosion control for dewatering discharges within the waterways. The impact to BVW/WW included in **DEIR Section 4.6 (pg. 4.6-1)** due to the discharge structures at the prior Fernald Property site has been eliminated due to inclusion of the alternative sites, which do not require BVW/WW impacts for the discharges. It is not feasible to eliminate the proposed impacts to Bank, LUW and WW because to mitigate potential scour impacts to existing resource areas, the discharge must be in proximity to the associated receiving waterbody. **SDEIR Chapter 5, Table 5-6 (Page 5-29)** includes a summary of temporary and permanent impacts to wetland resource areas at each of the Program sites in SDEIR Alternatives 3A, 4A, and 10A.
C-36	The SDEIR should provide calculations demonstrating that proposed pipes and splash pads, intended to dissipate velocity	See **Comment C-34** that describes the methodology and assumptions used that demonstrate that the proposed pipes and splash pads would be properly sized to regulate flows and prevent scour.

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#	Comment	Response
	to avoid eroding effects on the resource areas, have been properly sized to regulate flows and prevent scour.	
C-37	The SDEIR should provide a plan to monitor the outfalls during dewatering activities to ensure that scour and erosion does not occur, including a contingency plan to address any unexpected negative impacts.	As part of the requirements of the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP), a Stormwater Pollution Prevention Plan (SWPPP) would be prepared by the contractor to document stormwater management during the construction period. Per CGP requirements, the SWPPP would include a description of dewatering practices which are to be installed and maintained in compliance with CGP Part 2.4. Stable, erosion-resistant surfaces would be used to discharge flows from dewatering controls and all dewatering discharges would be in compliance with the velocity dissipation requirements of CGP Part 2.2.11. A dewatering inspection schedule would be developed in accordance with CGP Part 4.3.2 and would include monitoring for scouring and erosion resulting from dewatering practices. Per CGP Part 5, procedures for corrective action would also be included in the SWPPP. Corrective action procedures would include a contingency plan to address any unexpected negative impacts of construction dewatering activities that may be observed during inspection and monitoring. These corrective actions may include splash pad maintenance measures, modifications to pipe sizing, treatment of discharges, or implementation of additional velocity dissipation measures. CGP Parts 7.2.7 and 7.2.8 summarize how the above requirements must be documented as part of the SWPPP: ***"7.2.7 Procedures for Inspection, Maintenance, and Corrective Action.*** *Describe the procedures you will follow for maintaining your stormwater controls, conducting site inspections, and, where necessary, taking corrective actions, in accordance with Part 2.1.4, Part 4, and Part 5 of this permit, accordingly. Also include:* *a. The inspection schedule you will follow, which is based on whether your site is subject to Part 4.2 or Part 4.3, or whether your site qualifies for any of the reduced inspection frequencies in Part 4.4;* *b. If you will be conducting inspections in accordance with the inspection schedule in Part 4.2.2, Part 4.3, or Part 4.4.1b, the location of the rain gauge or the address of the weather station you will be using to obtain rainfall data;*

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		c. If you will be reducing your inspection frequency in accordance with Part 4.4.1b, the beginning and ending dates of the seasonally defined arid period for your area or the valid period of drought; *d. If you will be reducing your inspection frequency in accordance with Part 4.4.3, the beginning and ending dates of frozen conditions on your site; and* *e. Any maintenance or inspection checklists or other forms that will be used.* ***7.2.8 Procedures for Turbidity Benchmark Monitoring from Dewatering Discharges (if applicable).*** *If you are required to comply with the Part 3.3 turbidity benchmark 2022 Construction General Permit (CGP) Page 45 monitoring requirements, describe the procedures you will follow to collect and evaluate samples, report results to EPA and keep records of monitoring information, and take corrective action when necessary. Include the specific type of turbidity meter you will use for monitoring, as well as any manuals or manufacturer instructions on how to operate and calibrate the meter. Describe any coordinating arrangement you may have with any other permitted operators on the same site with respect to compliance with the turbidity monitoring requirements, including which parties are tasked with specific responsibilities. If EPA has approved of an alternate turbidity benchmark pursuant to Part 3.3.2b, include any data and other documentation you relied on to request use of the specific alternative benchmark.*
C-38	The SDEIR should confirm that stormwater runoff as a result of any increase in impervious areas, however small, will be treated in accordance with the SMS.	It is anticipated that the Program would add between 2.3 and 2.7 additional acres of impervious surfaces, depending upon the SDEIR Alternative. As stated in **DEIR Sections 4.6.5, Construction Period Impacts (pg. 4.6-127)** and **Section 4.6.6, Final Conditions (pg. 4.6-153)**, all stormwater runoff would be treated in accordance with the MassDEP Stormwater Management Standards including that associated with any increase in impervious areas. Stormwater management systems would be designed to manage increases in peak discharge rates, infiltrate the required recharge volume, and remove the required post-construction TSS load. Structural stormwater control measures (SCMs) may include surface or subsurface infiltration systems, bioretention, or filtering practices. Specific SCMs to be employed at the site would be refined as part of the final design. Planned Program compliance with each of the 10 MassDEP

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#	Comment	Response
		Stormwater Management Standards is further described in **DEIR Section 4.6, Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards (page pg. 4.6-179)**.
C-39	The SDEIR should include a list or table that specifies all waterways where work will occur in, on, over, or under the waterway, an indication of whether the waterway is jurisdictional pursuant to the regulations at 310 CMR 9.00, and the scope of work that will occur in, on, over, or under any c. 91 jurisdictional area to allow MassDEP WRP to identify all portion of the project that will be located within c.91 jurisdiction.	Project work occurring in, on, over, or under waterways consists of tunnel boring (approximately 200 to 400 feet below grade) and construction of outfalls and associated rip rap splash pads on waterway banks. **Table 5-15** in **SDEIR Chapter 5, Wetlands and Waterways, Section 5.3 (pg. 5-50]**) includes a summary of all impacted waterways, the associated impacts, and a discussion of Chapter 91 applicability and the project's consistency with those regulations. The content included in the table is also summarized below. **<u>Affected Waterways:</u>** As further described in **SDEIR Chapter 5, Table 5-15 (Page 5-50)**, work is expected to occur on, in, over, or under the following waterbodies: • Clematis Brook • Chester Brook • Unnamed Tributary (Stony Brook) *MA72-27* • Seaverns Brook *MA72-44* • Charles River *MA72-07* • Rosemary Brook *MA72-25* • Hurd Brook • Canterbury Brook/Stony Brook **<u>Consistency</u>:** As further described in **Table 5-15** in **SDEIR Chapter 5, Wetlands and Waterways, Section 5.3 (pg. 5-50]**), all work being completed on, in, over, or under waterways would be installed in accordance with 310 CMR 9.05(3)(g), which states: *"(g) placement in a non-tidal river or stream subject to jurisdiction under 310 CMR9.04(1)(e) of fill or structures for which a final Order of Conditions has been issued under M.G.L. c. 131, § 40 and 310 CMR 10.00: Wetlands Protection, and which does not reduce the space available for navigation; such fill or structures are limited to:*

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#	Comment	Response
		1. *overhead wires, conduits, or cables to be attached to an existing bridge, without substantial alteration thereof, or constructed and maintained in accordance with the National Electrical Safety Code;* 2. *fish ladders, fishways, and other devices which allow or assist fish to pass by a dam or other obstruction in the waterway;* 3. *pipelines, cables, conduits, sewers, and aqueducts entirely embedded in the soil beneath such river or stream; and* 4. *bulkheads, revetments, headwalls, storm drainage outfalls, and similar structures which do not extend into such river or stream, except as may be necessary for bank stabilization;"* In accordance with 310 CMR 9.05(3)(g)(3) the tunnel would be entirely embedded in the soil (or bedrock) beneath the waterway. In accordance with 310 CMR 9.05(3)(g)(4), proposed outfalls and splash pads would not extend into the waterway or adjacent wetland. The placement of rip rap splash pads and tunneling of the structure below waterways would not reduce the space available for navigation and therefore may not require Chapter 91 authorization. **Exemptions:** As previously stated and further defined in **SDEIR Chapter 5, Table 5-15 (Page 5-50)**, it is expected that all work occurring on, in, over, or under waterways may be exempt from Chapter 91 authorization as all work would be installed in accordance with 310 CMR 9.05(3)(g)(3) and 310 CMR 9.05(3)(g)(4) and would not reduce the space available for navigation within waterways. Further coordination with MassDEP will be completed during final design to determine applicability of any Chapter 91 exemptions to proposed Program elements and/or requirements to comply with Chapter 91 regulations should the Program not meet exemption criteria.
C-40	The SDEIR should describe the project's consistency with c. 91 regulations.	As described in Response to Certificate Comment C- 39, **Table 5-15** in **SDEIR Chapter 5, Wetlands and Waterways, Section 5.3 (pg. 5-50]** includes a summary of all impacted waterways, the associated impacts, and a discussion of Chapter 91 applicability and the project's consistency with those regulations. Additional details are provided in Comment C-39.
C-41	The SDEIR should describe how tunnels and associated infrastructure installations underneath jurisdictional	As described in Response to Certificate Comment C- 39. See **Table 5-15** in **SDEIR Chapter 5, Wetlands and Waterways, Section 5.4). Response to C-39** includes a

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#	Comment	Response
	waterways will be constructed consistent with all criteria pursuant to 310 CMR 9.05(3)(g)(3) to demonstrate these project elements will be exempt from licensing pursuant.	summary of all impacted waterways, the associated impacts, and a discussion of Chapter 91 applicability and the project's consistency with those regulations. Additional details are provided in Comment C-39. As described in **Table 5-15** in **SDEIR Chapter 5, Wetlands and Waterways, Section 5.3 (pg. 5-50)** includes a summary of all impacted waterways, the associated impacts, and a discussion of Chapter 91 applicability and the project's consistency with those regulations. Additional details are provided in **Comment C-39**.
C-42	The DEIR does not appear to contain the existing capacities of the existing tunnels, and the capacities of the proposed redundant tunnels. The SDEIR should provide these capacities to allow the WRC to determine if there is a possibility of exceeding the present rate of interbasin transfer. The SDEIR should confirm that the transfer of water will be limited to the existing capacity if there is no intent to increase the present rate of interbasin transfer. Specifically, the SDEIR should provide the capacity of the City Tunnel, City Tunnel Extension and Dorchester Tunnel, and also provide the capacity of each of the two new deep rock tunnels.	The intent of the Program is not to increase total capacity of the system, but to ensure redundancy by providing a backup to the existing Metropolitan Tunnel System if it were ever out of service for planned or unplanned reasons. For example, when the North and South Tunnel are completed, the MWRA anticipates it will take segments of the existing City Tunnel system offline for maintenance and repair. During those periods, MWRA would be relying primarily on the North and South Tunnels to provide water to our metro-Boston area communities. Therefore, the new tunnels must be able to provide water supply capacities that are equivalent to the existing tunnel system. The capacity of a pressure tunnel is not measured with a single value because the flow through the tunnel is demand-based and depends on water distribution system parameters, such as attaining acceptable hydraulic grade line at key locations including meters and pump stations, ability to maintain storage tank operating ranges, and proper operation of pressure reducing valves. To respond to the request for existing tunnel capacities, MWRA modeled the water distribution system with 1) existing tunnel system in operation only and 2) the proposed tunnels in operation only under the same flow conditions to see what each system conveys under the same operating conditions. For this comparison, MWRA used the 2060 High Day Demand of 283 million gallons per day (MGD), which is the design flow used when sizing the new tunnels and evaluating ability of the water system to meet required hydraulic conditions. The flows provided below are the maximum through the tunnel in the modeled condition. Existing tunnels only in operation: • City Tunnel = approximately 210 MGD • City Tunnel Extension = approximately 90 MGD • Dorchester Tunnel = approximately 95 MGD

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#	Comment	Response
		Note that the City Tunnel supplies the City Tunnel Extension and the Dorchester Tunnel and as such acts as the limiting factor in supply. New tunnels only in operation: • North Tunnel = approximately 80 MGD • South Tunnel = approximately 125 MGD
C-43	The SDEIR should clearly state if the existing capacity will not be exceeded and what steps will be taken to limit flow to the present rate of interbasin transfer.	As described in the response to Certificate **Comment C-42**, the new deep rock tunnels are not intended to increase MWRA's present capacity to supply water or the rate of Interbasin Transfer. The new tunnels are to ensure redundancy by providing a backup to the existing tunnel system when those tunnels are out of service and must be able to provide the equivalent water supply capacities to the existing tunnel system. The volume of water conveyed through the new deep rock tunnels, as well as the existing tunnels, is limited by the existing aqueducts and tunnels upstream (the Hultman Aqueduct and MetroWest Water Supply Tunnel), which are limited by the Norumbega Reservoir. The Norumbega Reservoir sets the hydraulic gradeline for the metropolitan system and the new tunnels, thereby regulating flows downstream. Additionally, at the downstream end of the tunnels, the surface piping restricts how much water can be conveyed to communities. The addition of a new community to MWRA's service areas requires Water Resource Commission approval under the Interbasin Transfer Act (ITA), in addition to legislative approval as required under MWRA's enabling act, Chapter 372 of the Acts of 1984. All existing and future demands must remain within the safe yield of MWRA's system, which is 300 MGD.
C-44	The SDEIR should confirm that all construction dewatering will take place in the Charles River Basin and not cross a basin boundary.	All proposed construction, including tunnel boring, launching, receiving, large connection, and connection shaft site construction, is proposed to occur only within the Charles River Basin, as shown in **SDEIR Chapter 6, Figure 6-3 (Page 6-21).** No dewatering activities will cross major basin boundaries. For the SDEIR Alternatives, groundwater volumes associated with temporary dewatering are estimated to vary between less than 100,000 gallons per day (GPD) up to an estimated 8 MGD. This range is dependent on shaft function, location, and extent of tunneling incurred. Because all bedrock infiltration will occur from, and be

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		discharged to, the Charles River Basin, and will not cross a basin boundary, the Interbasin Transfer Act (ITA) will not apply to the dewatering portion of the Program.
C-45	Based on the study area and the preferred South and North Alternative, the project may require WMA Permits in more than one river basin (the tunnel may pass through the Charles and Boston Harbor Basins). The DEIR should clarify the need for this Permit and address the permit criteria at 310 CMR 36.00 that incorporate: streamflow criteria (Biological Category, Groundwater Withdrawal Category and Seasonal Groundwater Withdrawal Categories) and potential impacts to coldwater fish resources. MWRA should consult with MassDEP regarding this analysis prior to preparing the DEIR.	MWRA understands that due to estimated withdrawals over 100,000 GPD, a Water Management Act (WMA) permit for construction period withdrawals only will be required. There will be no permanent withdrawals. As previously stated, and as shown in **SDEIR Figure 6-3 (pg. 6-21)**, all proposed construction is to occur within the Charles River Basin, therefore the WMA permit will only pertain to the Charles River Basin. While the tunnel is being constructed, groundwater will infiltrate into the tunnel and will ultimately be discharged at certain locations. See **Response to Certificate Comment C-44**. MWRA understands that due to estimated withdrawals over 100,000 GPD, a Water Management Act (WMA) permit for construction period withdrawals only will be required. There will be no permanent withdrawals. As previously stated, and shown in **SDEIR Chapter 6, Figure 6-3 (Page 6-21)**, all proposed construction is to occur within the Charles River Basin, therefore the WMA permit will only pertain to the Charles River Basin. While the tunnel is being constructed, groundwater will infiltrate into the tunnel and will ultimately be discharged at certain locations. See **Response to C-44**. A key WMA consideration for most projects is demonstrating that withdrawals would be minimized, with mitigation credit given for returning flows to the groundwater. This can be accomplished via groundwater recharge. The MWRA has considered groundwater recharge but has concerns over the unanticipated negative consequences this may cause, such as recharged groundwater migrating back into the tunnel, or potentially flooding residents' basements. Because of the potential challenges surrounding groundwater recharge, the MWRA is proposing discharging to surface waters as the primary means of discharge but will continue to evaluate as design progresses to determine if minor recharge volumes can be handled on site. MWRA will continue coordination with MassDEP to identify other appropriate mitigation measures. The WMA permit incorporates streamflow criteria and potential impacts to coldwater fish resources. Using the WMA Permitting Tool (WMA Tool), impacts to Groundwater Withdrawal Categories and Biologic Categories were evaluated using estimated volumes associated with dewatering. While results of the WMA Tool indicate that some subbasins would fall into a more impacted category, the WMA Tool is not directly applicable to the Program as it assumes all groundwater withdrawals are concentrated at the shaft site rather than distributed along the length of the tunnel. MWRA will

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#	Comment	Response
		continue coordination with MassDEP as the design progress to determine the most appropriate method of determining impacts and the associated mitigation measures. The Tandem Trailer shaft site has been identified as a proposed location for tunnel dewatering, which will discharge to the Seaverns Brook. Seaverns Brook is classified by the Massachusetts Division of Fisheries and Wildlife as a coldwater fishery that originates from Schenck's Pond at the Authority's Norumbega Reservoir Facility. As stated in **DEIR Section 4.5.4.1, Launching and Receiving Sites (pg. 4.5 39)**, a 2007 study conducted by MassDEP in Seaverns Brook noted that the only fish species present was a warmwater species and that the seven-day average of the daily maximum temperature indicated higher temperature than normally found in a coldwater fishery.[5] However, given in Seaverns Brook classification of a coldwater fishery, the MWRA will include language in the contract documents to monitor the ambient temperature of the water in the brook and the temperature of discharge water prior to entering Seaverns Brook. Per 314 CMR 4, Class B waterways, the rise in temperature due to a discharge shall not exceed 3 degrees Fahrenheit for a discharge to a designated coldwater fishery. In the event the groundwater temperature is raised in the course of treatment and exceeds this value, contract provisions would be carried to implement mitigation measures, such as underground storage, to lower the temperature of the water to meet the water quality standards before it is discharged.
C-46	The SDEIR should include a commitment to manage the long-term disposal of rock cuttings excavated in the process of boring the rock tunnels and identify where the long-term deposition of this material will be. Large volumes of this material should not be deposited adjacent to a public water supply because it could increase the total dissolved solids (TDS) content of the water, which would in turn increase the corrosivity of the water.	As described in **DEIR Section 4.8.5**, **Construction Period Impacts (pg. 4.8-51)**, "the construction contractor would be responsible for finding suitable locations for reuse or disposal of excavated material from the tunnel excavation. Protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so that it can be handled appropriately and disposed of at suitable locations. Most of the excavated material from all three DEIR Alternatives is anticipated to be clean, crushed rock, which could be reused beneficially at other locations." The final design and contract documents will have testing requirements for disposed materials to comply with either the reuse of rock cuttings and / or permit requirements for disposal. Approved disposal sites would comply with regulations to protect public water supplies.

5 Massachusetts Department of Environmental Protection, Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle, Appendix 12, November 2021, https://www.mass.gov/doc/20182020-integrated-list-of-waters-appendix-12-charles-river-watershed-assessment-and-listing-decision-summary/download.

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#	Comment	Response
		Excavated material will be tested as needed following removal to determine potential disposal and/or reuse options. Depending on the composition of the excavated material (igneous and metamorphic rocks are generally preferred), the size and shape of the excavated material (how much post-processing is required), and the timing of its removal, some excavated material could be used for embankment, backfill, paving material, or other uses. There is the potential for naturally occurring contaminants such as asbestos-containing rock and arsenic to be present in the rock, and, therefore, excavated material and groundwater generated during the Program would require proper management in accordance with the applicable regulations. Refer to **DEIR Section 4.8.7, Avoidance, Minimization and Mitigation Measures (pg. 4.8-60)**.
C-47	The SDEIR should clarify what infrastructure is proposed to be sited in floodplain, and what measures will be taken to minimize the risk of flooding including through elevation of structures or other wet or dry proofing methods.	Discharge pipes and splash pads would be designed with scour protection and erosion control to minimize impacts to existing waterways. The permanent footprints of all Program sites considered are located outside the limits of the Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas (SFHA) (area subject to inundation by the 100-year flood)[6]. Permanent aboveground infrastructure proposed to be located within the FEMA SFHA would be limited to the dewatering discharge pipe outfalls and associated splash pads associated with three Program sites. These three sites include: • Highland Avenue Northeast/Southeast launching shaft site (SDEIR Alternatives 3A, 4A, and 10A): Permanent dewatering discharge pipe outfall and splash pad would be located within FEMA SFHA (Zone AE)[7] associated with the Charles River. • Bifurcation launching shaft site (SDEIR Alternative 3A): Permanent dewatering discharge pipe outfall and splash pad would be within FEMA SFHA (Zone A)[8] associated with Seaverns Brook.

6 The 1-percent annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1-percent chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1-percent annual chance flood.

7 "Zone AE" is a FEMA Special Flood Hazard Area subject to inundation by the 1% annual chance flood (100-year flood) for which base flood elevations are determined.

8 "Zone A" is a FEMA Special Flood Hazard Area subject to inundation by the 1% annual chance flood (100-year flood) for which base flood elevations are not determined.

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#	Comment	Response
		• Tandem Trailer/Park Road East launching shaft site (SDEIR Alternatives 3A and 4A): Permanent dewatering discharge pipe outfall and splash pad would be located within FEMA SFHA (Zone A) associated with Seaverns Brook. No other permanent aboveground Program infrastructure is proposed to be installed within a FEMA SFHA. The permanent discharge pipes and associated rip rap splash pads are required for dewatering discharge and to enable future tunnel maintenance. Locating the discharge pipes and splash pads adjacent to the respective waterway (within the FEMA SFHA) is intended to reduce the possibility of adverse impacts to the existing bank due to dewatering discharge flows. It is not feasible to locate the structures outside of the SFHA because the SFHA overlaps the areas required to be protected from potential scour. No other permanent aboveground infrastructure is proposed to be installed within FEMA Special Flood Hazard Areas. To minimize the risk of flooding, permanent shaft structures were planned to be sited outside of FEMA SFHA. Discharge pipes and splash pads would be designed with scour protection and erosion control to minimize impacts to existing waterways and would be designed to be resistant to flood flows. See **SDEIR Section 5.3, Technical Analysis to Respond to Certificate Comments (pg. 5-43)** and **SDEIR Section 7.2.5, Climate Change Avoidance, Minimization, and Mitigation Measures, (pg. 7-12)** for additional details.
C-48	The SDEIR should supplement the GHG/air quality analysis presented in the DEIR to clarify how the anticipated emissions associated with the peak construction year compare to Existing and future No Build conditions (both as tpy and % increases/decrease); if the calculated emissions are assumed to increase from Existing/No Build levels of 0 tpy, this should be stated, and the associated percentages calculated.	Should the Program not be built (No-Build conditions), there would be no emissions associated with either construction or operation of the Program, nor emissions associated with transportation or mobilization of any equipment associated with the Program. Both a baseline existing and future No-Build condition assume the Program would not be built, and no Program-related construction activities would take place. Therefore, emissions associated with the No-Build conditions are assumed to be 0 tons for the purpose of comparing against the Program alternatives. Emissions estimates provided for the Program alternatives represent absolute increases from the No-Build conditions (i.e., both a baseline level of 0 tons and a future level of 0 tons are assumed). An estimate of existing emissions on assumed Study Area routes to be used by Program-related construction vehicles and equipment was conducted for emissions of

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#	Comment	Response
		NOx, VOC, and GHG.[9] Emissions were calculated for existing on-road traffic using 2023 emission factors for Middlesex County from the USEPA's MOVES3 model, and existing traffic estimates and distances used in the roadway analysis (see **SDEIR Chapter 9**). For the purposes of the SDEIR, roadway related No-Build conditions are assumed to be the same as existing conditions as described above in **SDEIR Chapter 8, Section 8.3.3**, **Air Quality and GHG Final Conditions (All Alternatives) (pg. 8-24**). However, due to improvements in vehicle technology, the influx of lower- and zero-emission vehicles, and investment in public transportation, baseline future roadway emissions are expected to continue to decrease from existing levels. The results of the analysis were used to identify the peak 12-month period of emissions (the four consecutive quarters with the highest rolling cumulative total emissions). Since peak 12-month period totals are always greater than or equal to the peak calendar year total, they provide a more conservative estimate of emissions. Background information on state-reported GHG emissions levels and ambient air quality has been added **in SDEIR Section 8.2, Air Quality and GHG Emissions Context (pg. 8-3)** to provide context of existing and No-Build conditions. **SDEIR Section 8.3.4, Air Quality and GHG Avoidance, Minimization, and Mitigations Measures (pg. 8-24)** compares the calculated GHG emissions for the Program during the peak 12-month period of construction emissions (6,150 to 6,210 tons, depending on SDEIR Alternative) to the statewide GHG emissions totals (73.5 million tons of CO2e in 2018). Similarly, **SDEIR Section 8.2.2, Statewide Air Pollutant and GHG Emissions (pg. 8-8)** also presents the latest NEI reported data for Massachusetts on- and off-highway emission. See **SDEIR Chapter 8, Table 8-9 (pg. 8-17)** to provide additional context in relation to the emissions associated with Program-related construction activities. Federal NAAQS and MAAQS are described **in SDEIR Section 8.2 (pg. 8-3) and SDEIR Chapter, 8, Table 8-2 (pg. 8-4)** provides the existing ambient air concentrations in the vicinity of the Program using the applicable air monitoring stations operated by MassDEP. Although General Conformity does not apply to the Program, Program-related construction emissions were compared to the de minimis emissions thresholds

9 GHGs include air pollutants such as carbon dioxide (CO_2), methane, hydrofluorocarbons, and perfluorocarbons. The 2010 MEPA GHG Policy focuses on the evaluation of CO_2 emissions because CO_2 is the predominant human-caused contributor to global warming (refer to page 3 of the 2010 MEPA GHG Policy available at https://www.mass.gov/doc/greehouse-gas-emissions-policy-and-protocol/download). Consistent with the GHG Policy and the analysis in the DEIR, the evaluation in the SDEIR uses the terms GHG and CO_2 interchangeably.

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#	Comment	Response
		(for a project in a nonattainment area) for precursors of ozone (100 tpy), NOx (100 tpy), and VOC (50 tpy).[10] Peak 12-month period emissions shown in **SDEIR Chapter 8, Table 8-10 (pg. 8-23)** are all well below the *de minimis* thresholds. Regarding comparison to No-Build traffic conditions, and as described in **SDEIR Chapter 9,** the Program is expected to add approximately 0.1 percent to 2.0 percent additional vehicles to local roadways on the peak day compared to existing conditions. This minor increase would not be expected to materially affect any ambient pollutant concentrations and their comparison to any air quality standards. Regarding existing Program-related traffic outside the study area, which primarily includes traffic along the interstate highways, Program-related traffic (and associated emissions) is anticipated to comprise less than 0.1 percent to 0.7 percent of total daily volumes on the modeled peak day, which conservatively assumes that construction would occur at all shafts simultaneously. See **SDEIR Chapter 9**, for more information.
C-49	The SDEIR should clarify the total number of years that construction related emissions are anticipated from the project, and what the anticipated rate of decline in emissions is as compared to the peak year (e.g., expect to decline by X% each year from the peak year).	Program construction is estimated to take approximately 8 to 12 years to complete and is planned to occur between 2027 and 2040. For emission modeling purposes, construction activities in each of the Program's SDEIR Alternatives were modeled to take place for a total of 10 years (beginning at the start of Year 1 Quarter 1 and ending at the conclusion of Year 10 Quarter 4). Emissions calculated for every quarter of Program construction for the modeled 10-year duration are provided in **SDEIR Appendix E, Air Quality and Greenhouse Gas Emissions Supporting Documentation, Table E-1 (pg. E-1)**. The quarterly emissions totals for each alternative for the modeled 10-year duration of Program construction are illustrated in **SDEIR Chapter 8, Figure 8-1 (pg. 8-19)** (NOx), **SDEIR Chapter 8, Figure 8-2 (pg. 8-20)** (VOC), and **SDEIR Chapter 8, Figure 8-3 (pg. 8-21)** (GHG). The figures show how emissions increase and decrease over the course of construction. **SDEIR Chapter 8, Table 8-11 (pg. 8-28), Table 8-12 (pg. 8-28),** and **Table 8-13 (pg. 8-29)** provide the estimated percent decline in emissions compared to the peak calendar year. As described in **SDEIR Section 8.3.4 (pg. 8-24)** and in the Response to Certificate Comment C-48, the air quality and GHG emissions analysis presented in **SDEIR Chapter 8** focuses on the peak 12-month period of construction emissions (the four

10 U.S. Environmental Protection Agency, General Conformity, "De Minimis Tables," updated July 20, 2022, https://www.epa.gov/general-conformity/de-minimis-tables (accessed June 12, 2023).

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#	Comment	Response
		consecutive quarters with the highest rolling cumulative total emissions). Peak 12-month period totals provide a more conservative estimate of emissions because they are always greater than or equal to the peak calendar year total. However, for the purpose of comparison in Response to Certificate Comment C-49, the results of the analysis are presented by calendar year **SDEIR Chapter 8, Table 8-11 (pg. 8-28), Table 8-12 (pg. 8-28),** and **Table 8-13 (pg. 8-29)** . Emissions calculated for every quarter of Program construction are provided in **SDEIR Appendix E, Table E-1 (pg. E-1)**]. As shown in **SDEIR Chapter 8, Table 8-11 (pg. 8-28)** and **Table 8-12 (pg. 8-28)** the peak calendar year of estimated Program-related NOx and VOC emissions in SDEIR Alternatives 3A and 4A is Year 3. For all SDEIR Alternatives, the estimated peak calendar year for GHG emissions is Year 6. In SDEIR Alternative 3A, NOx emissions decline from the peak year by approximately 17 percent in Year 4, 2 percent in Year 5, 7 percent in Year 6, 79 percent in Year 7, and 100 percent in Years 8, 9, and 10. In SDEIR Alternative 3A, VOC emissions decline from the peak year by approximately 16 percent in Year 4, 1 percent in Year 5, 7 percent in Year 6, 79 percent in Year 7 and 100 percent in Years 8, 9, and 10. See **SDEIR Chapter 8, Table 8-10 (pg. 8-23)**. In SDEIR Alternative 3A, modeled GHG emissions are anticipated to decline from the peak calendar year by approximately 78 percent in Year 7, 99 percent in Year 8, and 100 percent in Year 9 and 10. See **SDEIR Chapter 8, Table 8-10 (pg. 8-23)**. As shown in **SDEIR Chapter 8, Table 8-11**, **(pg. 8-28)** and as in SDEIR Alternative 3A, NOx emissions in SDEIR Alternative 4A decline from the peak year by approximately 17 percent in Year 4, 2 percent in Year 5, 7 percent in Year 6, 79 percent in Year 7 and 100 percent in Years 8, 9, and 10. In SDEIR Alternative 4A, VOC emissions decline from the peak year by approximately 16 percent in Year 4, 1 percent in Year 5, 7 percent in Year 6, 80 percent in Year 7, and 100 percent in Years 8, 9, and 10. See **SDEIR Chapter 8, Table 8-11 (pg. 8-28)**. GHG emissions are anticipated to decline from the peak calendar year by approximately 79 percent in Year 7, 99 percent in Year 8, and 100 percent in Years 9 and 10. As shown in **SDEIR Chapter 8, Table 8-13 (pg. 8-29)**, the peak calendar year of emissions in SDEIR Alternative 10A is estimated to be year 6 of the modeled 10-year construction duration for all three pollutants. In SDEIR Alternative 10A, NOx emissions are anticipated to decline from the peak calendar year by approximately 11 percent in Year 7, 97 percent in Year 8, and 100 percent in Years 9 and 10. VOC emissions are

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#	Comment	Response
		anticipated to decline by approximately 11 percent in Year 7, 98 percent in Year 8, and 100 percent in Years 9 and 10. For SDEIR Alternative 10A, GHG emissions are anticipated to decline from the peak calendar year by approximately 19 percent in Year 7, 91 percent in Year 8, and 100 percent in Years 9 and 10.
C-50	The SDEIR should clarify what traffic study area (including specific intersections) was used to calculate the emissions presented in the mesoscale analysis and indicate whether EJ populations are present near any of the intersections that were studied. To the extent additional EJ populations are identified outside the traffic study area but along routes of travel for construction related traffic, the SDEIR should estimate the anticipated increase in traffic and air emissions at intersections adjacent to those EJ populations. To the extent data is available, the revised air quality analysis should report emissions of PM2.5, PM10, NOx, lead, and DPM at the specified locations above.	See the **Response to Comment C-22**; in addition, the following information is provided. • The traffic study includes local roadway routes to and from construction locations to the nearest highway interchanges, generally with Interstate 93 (I-93) and Interstate 95 (I-95). Air pollutant emissions were calculated along these local routes, which traverse both EJ and non-EJ areas. • On the modeled peak day, the Program is expected to temporarily add 0.1 percent to 2.0 percent additional vehicles to local roadways. This minor increase would not be expected to materially affect any ambient pollutant concentrations and their comparison to any air quality standards. A detailed description of local roadway traffic is provided in **SDEIR Chapter 9**. Program-related traffic outside the Study Area would primarily include construction-related trucks and employee vehicles along the interstate highways. Given the existing volumes of traffic on I-93 and I-95, Program-related traffic (and associated generated emissions) is anticipated to be a comparatively small percentage of the total highway traffic (and emissions) and any increases outside the Study Area attributable to the Program would be minimal. Program-generated traffic on the highways is estimated to temporarily add 0.1 percent to 0.7 percent of total daily volumes on the modeled peak day, which conservatively assumes that construction would occur at all shafts simultaneously. A more detailed description of highway traffic increases is provided in **SDEIR Chapter 9**. The mesoscale analysis is the same as the transportation Study Area and included distances from Program site to the nearest interstate highway. **SDEIR Section 3.4.1, Environmental Justice Impact Methodology (pg. 3-23)** defines the transportation Study Area used to calculate the emissions presented in the mesoscale analysis and identifies the roadway intersections analyzed in both the transportation and air quality analyses (refer also to **SDEIR Chapter 9**). **SDEIR Chapter 3, Table 3-20 (pg. 3-91)** identifies which of the intersections in the analysis include U.S. Census block groups containing potential EJ populations. **SDEIR Chapter 8, Table 8-14 (pg. 8-30)** presents the peak 12-month period of construction emissions of NOx and particulates from Program-related

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		construction vehicles, and identifies how the emissions are distributed on local roads adjacent to block groups identified as containing EJ populations versus non-EJ block groups. As shown in **Table 8-14 (pg. 8-30)**, emissions of NOx, PM_{10}, $PM_{2.5}$, and diesel particulate matter (DPM) are all expected to be below 0.5 tpy, and well below the referenced General Conformity *de minimis* thresholds of 100 tpy for NOx, 100 tpy for PM_{10}, and 100 tpy for $PM_{2.5}$ (there are no thresholds for DPM).[11] Lead is no longer used in gasoline and is not used in diesel fuel. Therefore, the Program is expected to have no lead emissions. Calculations show that emissions are small, however more pollutants are emitted in EJ areas than in non-EJ areas. This is due to the proximity of EJ neighborhoods to both the construction sites, and to the main state and local thoroughfares used to get to the interstate highways, especially for the American Legion site in Jamaica Plain, and the most direct route along State Road 203 to I-93. Construction vehicle transportation routes between the interstate highways and the Program construction sites are anticipated to take place on local roads, some of which abut EJ communities, assuming that the most direct local routes would be used. Any rerouting of construction vehicles would increase travel times and/or mileage, thus increasing regional emissions totals in both EJ and non-EJ communities. Therefore, the least impactful routing to all populations is using the most direct routes to the interstates and minimizing traffic on local roads. The maximum amount of temporary Program-related traffic and resulting emissions would occur at tunnel launching shaft sites where there is a shift change conservatively modeled to take place during the evening peak hour (construction worker trips are not expected to occur during the evening peak hour as shift change is usually at approximately 3:00 PM). Program launching shaft locations (i.e., Tandem Trailer, Bifurcation, and Highland Avenue sites) are adjacent to highway ramps and are therefore not expected to cause a significant traffic impact to nearby local roadways. As shown on **SDEIR Chapter 3, Figure 3-5 (pg. 3-41)**, **Figure 3-6 (pg. 3-43)**, **Figure 3-10 (pg. 3-51)**, and **Figure 3-11 (pg. 3-53)**, none of the Program launching shaft sites considered in either of the SDEIR Alternatives are in EJ block groups. Furthermore,

11 U.S. Environmental Protection Agency, General Conformity, "*De Minimis* Tables," updated July 20, 2022, https://www.epa.gov/general-conformity/de-minimis-tables (accessed June 13, 2023).

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		given their proximity to highway ramps, no construction vehicle routes between these launching shaft sites and the highway travel through EJ block groups. Since no significant Program-related air quality or GHG emissions impacts are anticipated, there would be no impacts to baseline environmental or health conditions of EJ or non-EJ populations. See **SDEIR Chapter 3,** for more information on baseline environmental and health conditions for EJ populations.
C-51	The SDEIR should include a separate chapter summarizing 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 impacts of the project. The SDEIR 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.	Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category are summarized in **SDEIR Chapter 14** . **SDEIR Appendix H** includes draft Section 61 Findings for each permit to be issued by state agencies. **SDEIR Chapter 14, Table 14-2 (pg. 14-4)** summarizes construction period mitigation commitments by environmental category for each of the SDEIR Alternatives. Commitments to implement these mitigation measures are described as well as the parties responsible for implementation, and an estimated schedule for implementation. The Program is in the preliminary design phase, and it is thus difficult to estimate the cost of the mitigation measures. Cost estimates will be developed during the final design phase and included in construction costs.
C-52	The list of commitments should be provided in a tabular format organized by subject matter (traffic, water/wastewater, GHG, EJ, etc.) and identify the Agency Action or Permit associated with each category of impact.	Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category are summarized in **SDEIR Chapter 14. SDEIR Chapter 14** includes tables documenting mitigation commitments by environmental category, with mitigation commitments summarized in **SDEIR Chapter 14, Table 14-2 (pg. 14-4)**. Potential impacts are identified by SDEIR Alternative and Program site where applicable. **SDEIR Chapter 14, Table 14-1 (pg. 14-2)** outlines the anticipated permits, by agency, for the Program.
C-53	Draft Section 61 Findings should be separately included for each Agency Action to be taken on the project.	**SDEIR Appendix H**, includes separate draft Section 61 Findings for each of the agencies for which an agency action is required. Environmental Impacts and associated mitigation measures identified in this Chapter have been restated in **SDEIR Appendix H** where applicable.
C-54	The SDEIR should contain a copy of this Certificate and a copy of each comment letter received. It should include a comprehensive response to comments on the DEIR that specifically address each issue raised in the comment letter; references to a chapter or sections of the SDEIR alone are not	A copy of the DEIR Certificate and each of the seven comment letters received is included herein in **SDEIR Chapter 15, Responses to Comments**. A copy of the Certificate and the comment letters are provided in the following **SDEIR Sections** (refer also to **SDEIR Chapter 15, Table 15-1 (pg. 15-1)** for a list of the Certificate and comment letters received on the DEIR):

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	adequate and should only be used, with reference to specific page numbers, to support a direct response. This directive is not intended to, and shall not be construed to, enlarge the Scope of the SDEIR beyond what has been expressly identified in this certificate.	• **SDEIR Section 15.2**, Secretary's Certificate on the SDEIR, December 16, 2022
		  ○ Responses to Certificate comments are included in this table, **Table 15-2**.
		• **SDEIR Section 15.4**, Letter 1: Massachusetts Water Resources Commission, November 22, 2022.
		  ○ Responses to Letter 1 comments are included in **Table 15-3**.
		• **SDEIR Section 15.6**, Letter 2: MassDEP Waterways Regulation Program
		  ○ Responses to Letter 2 comments are included in **Table 15-4**.
		• **SDEIR Section 15.8**, Letter 3: MassDEP Northeast Regional Office
		  ○ Responses to Letter 3 comments are included in **Table 15-5**.
		• **SDEIR Section 15.10**, Letter 4: Massachusetts DCR
		  ○ Responses to Letter 4 comments are included in **Table 15-6**.
		• **SDEIR Section 15.12**, Letter 5: Boston Water and Sewer Commission
		  ○ Responses to Letter 5 comments are included in **Table 15-7**.
		• **SDEIR Section 15.14**, Letter 6: City of Waltham
		  ○ Responses to Letter 6 comments are included in **Table 15-8**.
		• **SDEIR Section 15.16**, Letter 7: Town of Needham
		  ○ Responses to Letter 7 comments are included in **Table 15-9**.

C-55	The Proponent should circulate the SDEIR to the same distribution list the ENF and DEIR were sent to, including all community contacts identified for the Study Area; any additional stakeholders identified during MWRA's public outreach program; to any Agencies from which MWRA will seek Permits, Land Transfers or Financial Assistance; and to any parties specified in Section 11.16 of the MEPA regulations. Pursuant to 301 CMR 11.16(5), the Proponent may circulate copies of the SDEIR to commenters in a digital format (e.g., CD-ROM, USB drive) or post to an online website. However, the Proponent must 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. The Proponent should send correspondence accompanying the digital copy or identifying the web address of the online version of the SDEIR indicating that hard copies	The distribution list for this SDEIR includes all parties within the DEIR and ENF distribution lists, state agencies that permits or approvals are required from, as well as additional stakeholders identified during the development of the DEIR and in the Secretary's Certificate on the DEIR. A copy of the SDEIR distribution list is included in **SDEIR Chapter 16, Circulation, Table 16-1 (pg. 16-1)**.

Table 15-2 Responses to Comments Received in the EEA Secretary's Certificate on the DEIR

#	Comment	Response
	are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. A copy of the SDEIR should be made available for review at public libraries of the Study Area communities.	

THE COMMONWEALTH OF MASSACHUSETTS
WATER RESOURCES COMMISSION
100 CAMBRIDGE STREET, BOSTON MA 02114

November 22, 2022

Bethany Card, Secretary
Executive Office of Energy and Environmental Affairs
Attention: Purvi Patel, MEPA Office
EOEEA #16355
100 Cambridge Street
Boston, MA 02114

Dear Secretary Card:

The Water Resources Commission (WRC) staff has reviewed the Draft Environmental Impact Report (DEIR) for the Massachusetts Water Resources Authority (MWRA) Metropolitan Water Tunnel Program (Program). The Program is proposed by MWRA to provide redundancy for the existing Metropolitan Tunnel System, which includes the City Tunnel, City Tunnel Extension, and Dorchester Tunnel. Construction will consist of two new deep rock water supply tunnels originating at the westernmost portion of the existing Metropolitan Tunnel System, with one tunnel extending north towards Waltham and the other extending south towards Boston/Dorchester. Work for this proposed project is slated to take place in the following municipalities: Waltham, Watertown, Newton, Belmont, Weston, Brookline, Boston, Dedham, Needham, and Wellesley. MWRA's water supply sources are in the Chicopee River Basin and the Nashua River Basin. The current transfer of water supply from these basins to communities in eastern Massachusetts in different basins would be considered an existing interbasin transfer and includes transfers that occurred prior to 1984 and any subsequent transfers that received interbasin transfer approval by the WRC. The Interbasin Transfer Act (ITA; regulations at 313 CMR 4.00) regulates the transfer of water supply or wastewater across major basin boundaries.

The DEIR asserts that the intent of the Program is to ensure redundancy by providing a backup to the existing Metropolitan Tunnel System, and not to increase the capacity of the MWRA water supply system. The ITA regulations, specifically 313 CMR 4.05 (5), exempt projects whose "sole purpose is to provide redundancy, provided that any increase in capacity cannot be used to increase the ability to transfer water out of the Donor Basin and provided further that streamflow in the Donor Basin is not adversely affected".

The Metrowest Water Supply Tunnel (formerly known as the Sudbury Tunnel) was completed in 2003 and created a redundant water transmission system for approximately 25 miles from the Wachusett Reservoir to the beginning of the existing Metropolitan Water Tunnel System. In 1991, the WRC found that this redundancy project was not subject to the ITA and did not require WRC approval, provided that there was no increase in the present rate of interbasin transfer. The WRC did require MWRA to submit on an annual basis a report of the volume transferred through this section of the water transmission system to ensure that the existing capacity is not exceeded. The 1991 precedent would indicate that the ITA may also not apply to this proposed Metropolitan Water Tunnel Program project. 1-1

However, the DEIR does not appear to contain the existing capacities of the existing tunnels, and the capacities of the proposed redundant tunnels. The WRC will need to know these capacities to determine if there is a possibility of exceeding the present rate of interbasin transfer. If there is no intent to increase the present rate of interbasin transfer, the transfer of water will need to be limited to the existing capacity. 1-2
WRC staff request that MWRA provide the capacity of the City Tunnel, City Tunnel Extension and Dorchester Tunnel, and also provide the capacity of each of the two new deep rock tunnels. WRC staff also request that MWRA clearly state if the existing capacity will not be exceeded and what steps will be taken to limit flow to the present rate of interbasin transfer.

Additionally, in 1995, the WRC reviewed a Request for Determination of Insignificance for the Metrowest Tunnel Dewatering project. During the excavation of the Charles River Basin portion of the Metrowest Tunnel, 0.75 million gallons per day (MGD) or less of bedrock infiltration was proposed to be transferred to what is now known as the SuAsCo Basin during tunnel construction. This was determined to be an insignificant transfer as it was less than 1 MGD and also met the following criterion of the ITA regulations, which are now found at 313 CMR 4.08 (3)(b): "For temporary transfers, that the increase would be of short duration and conducted to facilitate the construction, maintenance or repair of a public utility, for flood control purposes, for public safety purposes or other similar purposes not related to water supply or wastewater service". For the current proposed project, groundwater volumes associated with dewatering are estimated to vary between less than 100,000 gallons per day (GPD) up to an estimated 8 MGD. No transfers over 1 MGD may be considered insignificant under the ITA. However, it is stated on 1-3
page 5-3 of the DEIR that all construction dewatering activities will take place in the Charles River Basin. As long as all bedrock infiltration will occur from and be discharged to the Charles River Basin and will not cross a basin boundary, then the ITA will not apply to the dewatering portion of the project.

In conclusion, WRC staff needs some additional information to determine if the project is jurisdictional under the ITA. We request that the MWRA provide the above requested information on tunnel capacities in a Final EIR, if one is required, or directly to WRC staff if a FEIR is not required. Please contact Vanessa.Curran@mass.gov if you have any questions.

Thank you for the opportunity to comment.

Vandana Rao, PhD
Executive Director, MA Water Resources Commission

cc: Anne Carroll, DCR
Vanessa Curran, DCR
Erin Graham, DCR
Rebecca Weidman, MWRA
Kathy Murtagh, MWRA
Water Resources Commission

15.5 Responses to Letter 1: Massachusetts Water Resources Commission

Table 15-3 Responses to Comments from the Massachusetts Water Resources Commission

#	Comment	Response
1-1	The ITA [Interbasin Transfer Act] regulations, specifically 313 CMR 4.05 (5), exempt projects whose "sole purpose is to provide redundancy, provided that any increase in capacity cannot be used to increase the ability to transfer water out of the Donor Basin and provided further that streamflow in the Donor Basin is not adversely affected." The Metrowest Water Supply Tunnel (formerly known as the Sudbury Tunnel) was completed in 2003 and created a redundant water transmission system for approximately 25 miles from the Wachusett Reservoir to the beginning of the existing Metropolitan Water Tunnel System. In 1991, the WRC found that this redundancy project was not subject to the ITA and did not require WRC approval, provided that there was no increase in the present rate of interbasin transfer. The WRC did require MWRA to submit on an annual basis a report of the volume transferred through this section of the water transmission system to ensure that the existing capacity is not exceeded. The 1991 precedent would indicate that the ITA may also not apply to this proposed Metropolitan Water Tunnel Program project.	The intent of the Program is not to increase total capacity of the system, but to ensure redundancy by providing a backup to the existing Metropolitan Tunnel System if it were ever out of service for planned or unplanned reasons. For example, when the North and South Tunnel are completed, we anticipate we will take segments of the existing City Tunnel system offline for maintenance and repair. During those periods, MWRA would be relying primarily on the North and South Tunnels to provide water to our metro-Boston area communities. Therefore, the new tunnels must be able to provide water supply capacities that are equivalent to the existing tunnel system. The capacity of a pressure tunnel is not measured with a single value because the flow through the tunnel is demand-based and depends on water distribution system parameters, such as attaining acceptable hydraulic grade line at key locations including meters and pump stations, ability to maintain storage tank operating ranges, and proper operation of pressure reducing valves. To respond to the request for capacities, MWRA modeled the water distribution system with 1) existing tunnel system in operation only and 2) the proposed tunnels in operation only under the same flow conditions to see what each system conveys under the same operating conditions. For this comparison, MWRA used the 2060 High Day Demand of 283 million gallons per day (MGD), which is the design flow used when sizing the new tunnels and evaluating ability of the water system to meet required hydraulic conditions. The flows provided below are the maximum through the tunnel in the modeled condition.

Table 15-3 Responses to Comments from the Massachusetts Water Resources Commission

#	Comment	Response
		Existing tunnels only in operation: • City Tunnel = approximately 210 MGD • City Tunnel Extension = approximately 90 MGD • Dorchester Tunnel = approximately 95 MGD Note that the City Tunnel supplies the City Tunnel Extension and the Dorchester Tunnel and as such acts as the limiting factor in supply. New tunnels only in operation: • North Tunnel = approximately 80 MGD • South Tunnel = approximately 125 MGD
1-2	However, the DEIR does not appear to contain the existing capacities of the existing tunnels, and the capacities of the proposed redundant tunnels. The WRC will need to know these capacities to determine if there is a possibility of exceeding the present rate of interbasin transfer. If there is no intent to increase the present rate of interbasin transfer, the transfer of water will need to be limited to the existing capacity. WRC staff request that MWRA provide the capacity of the City Tunnel, City Tunnel Extension and Dorchester Tunnel, and also provide the capacity of each of the two new deep rock tunnels. WRC staff also request that MWRA clearly state if the existing capacity will not be exceeded and what steps will be taken to limit flow to the present rate of interbasin transfer.	The volume of water conveyed through the new deep rock tunnels is limited by the existing aqueducts and tunnels upstream (the Hultman Aqueduct and MetroWest Water Supply Tunnel), which are limited by the Norumbega Reservoir. The Norumbega Reservoir sets the hydraulic gradeline for the metropolitan system, thereby regulating flows downstream. Additionally, at the downstream end of the tunnels, the surface piping restricts how much water can be conveyed to communities. The addition of a new community to MWRA's service areas requires Water Resource Commission approval under the Interbasin Transfer Act, in addition to legislative approval as required under MWRA's enabling act, Chapter 372 of the Acts of 1984. All existing and future demands must remain within the safe yield of MWRA's system, which is 300 MGD. See **Response to Comment 1-1** for additional information.

Table 15-3 Responses to Comments from the Massachusetts Water Resources Commission

#	Comment	Response
1-3	For the current proposed project, groundwater volumes associated with dewatering are estimated to vary between less than 100,000 gallons per day (GPD) up to an estimated 8 MGD. No transfers over 1 MGD may be considered insignificant under the ITA. However, it is stated on page 5-3 of the DEIR that all construction dewatering activities will take place in the Charles River Basin. As long as all bedrock infiltration will occur from and be discharged to the Charles River Basin and will not cross a basin boundary, then the ITA will not apply to the dewatering portion of the project.	All proposed construction, including tunnel boring, launching, and receiving shaft site construction, large connection shaft site construction, and connection shaft site construction, is proposed to occur only within the Charles River Basin, as shown in **SDEIR Chapter 6, Water Supply and Water Management Act, Figure 6-3 (pg. 6-21).** No dewatering activities will cross major basin boundaries. For the SDEIR Alternatives, groundwater volumes associated with temporary dewatering are estimated to vary between less than 100,000 gallons per day (GPD) up to an estimated 8 million gallons per day (MGD). This range is dependent on shaft function, location, and extent of tunneling incurred. Because all bedrock infiltration will occur from, and be discharged to, the Charles River Basin, and will not cross a basin boundary, the Interbasin Transfer Act (ITA) will not apply to the dewatering portion of the Program.

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MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Letter 2

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Bethany A. Card
Secretary

Martin Suuberg
Commissioner

Memorandum

To: Purvi Patel, Environmental Analyst, MEPA

From: Alice Doyle, Waterways Regulation Program, MassDEP

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

Re: Comments from the Chapter 91 Waterways Regulation Program
EEA #16355 – Draft Environmental Impact Report
MWRA Metropolitan Water Tunnel Program

Date: November 23, 2022

The Department of Environmental Protection Waterways Regulation Program (the "Department") has reviewed the above referenced Draft Environmental Impact Report (DEIR), EEA #16355 submitted by CDM Smith in association with VHB and Jacobs on behalf of the Massachusetts Water Resources Authority (MWRA) for the Metropolitan Water Tunnel Program. The project proposes to construct approximately 14 miles of two new water supply deep-rock tunnels and connections to existing water supply infrastructure, providing redundancy for MWRA's existing Metropolitan Tunnel System. The project area includes Waltham, Belmont, Watertown, Weston, Newton, Wellesley, Needham, Brookline, Boston, and Dedham.

Chapter 91 Jurisdiction

The DEIR has identified a preferred tunnel alignment and two backup alternatives, all of which will 'intersect' waterways in several locations. There will also be several dewatering discharge locations within waterways that are subject to Chapter 91 jurisdiction pursuant to 310 CMR 9.04. In order for the Department to identify all portions of the project that will be located within Chapter 91 jurisdiction, the FEIR should include a list or table that specifies all waterways where work will occur in, on, over, or under the waterway, an indication of whether the waterway is jurisdictional pursuant to the regulations at 310 CMR 9.00, and the scope of work that will occur in, on, over, or under any Chapter 91 jurisdictional area. 2-1

Regulatory Review

The dewatering sites will include the placement of structures and fill consisting of outlet pipes with riprap splash pads to mitigate potential scour. All structures and fill and any associated dredging that will be located waterward of the ordinary high water mark will require a Chapter 91 authorization. The tunnels and associated infrastructure installations underneath jurisdictional waterways are potentially exempt from licensing pursuant to 310 CMR 9.05(3)(g)3. "pipelines, cables, conduits, sewers, and aqueducts entirely embedded in the soil beneath such river or stream", provided that they are consistent with all criteria in the referenced section of the regulations. 2-2

The Department has previously met with MWRA and is available to have subsequent discussions and/or meetings upon request. If you have any questions regarding the Department's comments, please contact Alice Doyle at alice.doyle@mass.gov.

15.7 Responses to Letter 2: MassDEP Waterways Regulation Program

Table 15-4 Response to Comments from the MassDEP Waterways Regulation Program

#	Comment	Response
2-1	In order for the Department to identify all portions of the project that will be located within Chapter 91 jurisdiction, the FEIR should include a list or table that specifies all waterways where work will occur in, on, over, or under the waterway, an indication of whether the waterway is jurisdictional pursuant to the regulations at 310 CMR 9.00, and the scope of work that will occur in, on, over, or under any Chapter 91 jurisdictional area.	Project work occurring in, on, over, or under waterways consists of tunnel boring (approximately 200 to 400 feet below grade) and construction of outfalls and associated rip rap splash pads on waterway banks. **SDEIR Chapter 5, Wetlands and Waterways, Table 5-15 (pg. 5-50)** includes a summary of all impacted waterways, the associated impacts, and a discussion of Chapter 91 applicability and the project's consistency with those regulations. The content included in the table is also summarized below. **<u>Affected Waterways:</u>** As further described in **SDEIR Chapter 5, Table 5-15 (pg. 5-50)**, work is expected to occur on, in, over, or under the following waterbodies: • Clematis Brook • Chester Brook • Unnamed Tributary (Stony Brook) *MA72-27* • Seaverns Brook *MA72-44* • Charles River *MA72-07* • Rosemary Brook *MA72-25* • Hurd Brook • Canterbury Brook/Stony Brook **<u>Consistency</u>:** As further described in **SDEIR Chapter 5, Table 5-15 (pg. 5-50)** all work being completed on, in, over, or under waterways would be installed in accordance with 310 CMR 9.05(3)(g), which states: *"(g) placement in a non-tidal river or stream subject to jurisdiction under 310 CMR9.04(1)(e) of fill or structures for which a final Order of Conditions has been issued under M.G.L. c. 131, § 40 and 310 CMR 10.00: Wetlands Protection, and which does not reduce the space available for navigation; such fill or structures are limited to:*

Table 15-4 Response to Comments from the MassDEP Waterways Regulation Program

#	Comment	Response
		5. *overhead wires, conduits, or cables to be attached to an existing bridge, without substantial alteration thereof, or constructed and maintained in accordance with the National Electrical Safety Code;* 6. *fish ladders, fishways, and other devices which allow or assist fish to pass by a dam or other obstruction in the waterway;* 7. *pipelines, cables, conduits, sewers, and aqueducts entirely embedded in the soil beneath such river or stream; and* 8. *bulkheads, revetments, headwalls, storm drainage outfalls, and similar structures which do not extend into such river or stream, except as may be necessary for bank stabilization;"* In accordance with 310 CMR 9.05(3)(g)(3) the tunnel would be entirely embedded in the soil (or bedrock) beneath the waterway. In accordance with 310 CMR 9.05(3)(g)(4), proposed outfalls and splash pads would not extend into the waterway or adjacent wetland. The placement of rip rap splash pads and tunneling of the structure below waterways would not reduce the space available for navigation and therefore may not require Chapter 91 authorization. **Exemptions:** As previously stated and further defined in **SDEIR Chapter 5, Table 5-15 (pg. 5-50)**, it is expected that all work occurring on, in, over, or under waterways may be exempt from Chapter 91 authorization as all work would be installed in accordance with 310 CMR 9.05(3)(g)(3) and 310 CMR 9.05(3)(g)(4) and would not reduce the space available for navigation within waterways. Further coordination with MassDEP will be completed during final design to determine applicability of any Chapter 91 exemptions to proposed Program elements and/or requirements to comply with Chapter 91 regulations should the Program not meet exemption criteria.

Table 15-4 Response to Comments from the MassDEP Waterways Regulation Program

#	Comment	Response
2-2	The dewatering sites will include the placement of structures and fill consisting of outlet pipes with riprap splash pads to mitigate potential scour. All structures and fill and any associated dredging that will be located waterward of the ordinary high water mark will require a Chapter 91 authorization. The tunnels and associated infrastructure installations underneath jurisdictional waterways are potentially exempt from licensing pursuant to 310 CMR 9.05(3)(g)3. "pipelines, cables, conduits, sewers, and aqueducts entirely embedded in the soil beneath such river or stream", provided that they are consistent with all criteria in the referenced section of the regulations.	**Response to Comment 2-1**, describes the possible exemption from Chapter 91 requirements for work occurring on, in, over, or under waterways.

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MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Bethany A. Card
Secretary

Martin Suuberg
Commissioner

December 9, 2022

Bethany A. Card, Secretary
Executive Office of
Energy & Environmental Affairs
100 Cambridge Street
Boston MA, 02114

RE: Boston and multiple communities
Metropolitan Water Tunnel Program
EEA # 16355

Attn: MEPA Unit

Dear Secretary Card:

The Massachusetts Department of Environmental Protection Northeast Regional Office (MassDEP-NERO) has reviewed the Draft Environmental Impact Review ("DEIR") of the Metropolitan Water Tunnel Program for Boston and other communities and provides the following comments.

Wetlands

Construction of the new tunnels will result in dewatering discharges to several waterways, which raises concerns about the impacts of increased volume and velocities of the discharges. On the Fernald property, there will be a discharge to Clementis Brook, and at the American Legion site there will be a discharge to Canterberry Brook. The launching and receiving shafts for the Bifurcation will discharge to Seaverns Brook. Permanent alterations to BVW and inland Bank will occur due to the installation of splash pads and culvert outlets. MassDEP recommends that the applicant examine the possibility of moving these structures farther from the BVW if possible. 3-1

The DEIR discusses impacts from the increased volume of dischargea to the waterways, but appears to assume that the splash pads will be adequate to dissipate velocity in order to avoid eroding effects on the resource areas. The applicant should provide calculations demonstrating that the pipes and splash pads have been properly sized to regulate flows and prevent scour. 3-2 In addition, MassDEP recommends that the applicant develop a plan to monitor the outfalls during dewatering activities to ensure that scour and erosion does not occur, including a contingency plan to address any unexpected negative impacts. 3-3

The project will entail the addition of impervious surfaces, such as access roads and parking areas, in many of the sites. The DEIR describes the increase in impervious areas as “neglible.” The 3-4
applicant is reminded that stormwater runoff from these surfaces must be treated in accordance with the Stormwater Regulations.

Drinking Water

The MWRA provided redundancy for the Hultman Aqueduct when it constructed the MetroWest Tunnel, which went on-line in 2003; however, it presently does not have any redundancy for the older “Metropolitan Tunnel System” to the east of Route I-95. Some of the tunnels, valves, associated surface piping, and equipment that have been in use for more than 60 years are now in need of regular inspections, and possibly repairs, but cannot be shut down for inspection or repair because there is no way to provide the necessary water throughout the system while these are shut down. Some valves are not exercised because there would be an interruption in the water supply if one got stuck in the closed position. The need for redundancy was highlighted when a break in a pipe connection in May 2010 resulted in an interruption in service and subsequent Boil Water Order for much of the Boston metropolitan area.

In the ENF, MWRA evaluated 28 alternatives to provide redundancy via construction of deep rock tunnels, near-surface mains, and improvements to the existing infrastructure. All of these alternatives began in the vicinity of Shaft 5 and 5A in Weston, near the Route I-90 and I-95 intersection. Of these alternatives, there were 13 “north” alternatives that extended to the northeast from Weston, providing improvements or redundancy for Weston Aqueduct Supply Main 3 (WASM 3). There were 15 “south” alternatives that extended to the east-southeast from Weston to the Dorchester Tunnel. MWRA’s evaluation sought a combination of a north and south alternative that would work together.

The alternatives that MWRA determined were preferable were north Alternative 8N and south Alternative 20S. Alternative 8N would involve construction of a 10 to 12-foot diameter rock tunnel 4.5 miles long, from the Shaft 5/5A area in an alignment roughly parallel to WASM 3, and ending in Waltham near the Belmont town line. Alternative 20S would involve construction of a 10-foot diameter rock tunnel extending from the Hultman Aqueduct near Shaft 5/5A, to first the end of the Section 80 main in Needham, then to the Newton Street Pumping Station in Brookline, and ending near Shaft 7C of the Dorchester Tunnel. For improved redundancy, MWRA intended to connect the tunnels to some additional existing pump stations near the planned routes for the tunnels.

In the DEIR, MWRA went on to evaluate 10 alternative ways to construct the deep tunnels along the routes of Alternatives 8N/20S. These alternatives primarily involved where the launching (entry) and receiving (exit) points would be sited for the tunnel boring machine(s), and whether the tunnels would be constructed in two or three segments. The preferred alternative among these was Alternative 4, in which three tunnel segments would be constructed. Two of these would be launched to the northwest and east from the Highland Road property in Needham, and one launched to the northeast from a location in Weston referred to as the Tandem Trailer site. Each of the three tunnel segments would have connections to the MWRA water system at two additional tunnel shafts along their courses. Section 1.1 of the DEIR states that construction of the tunnels is expected to take 8 to 12 years, during the period of 2027 to 2040.

The tunnels will be concrete-lined in most areas. In locations where the ground conditions necessitate that the tunnels have greater structural strength, a mortar-coated steel lining will be installed.

As noted in Section 1.4.3.6, the project will require a Distribution System Modification permit
(MassDEP Permit Category BRPWS32) from the MassDEP Drinking Water Program. However, this 3-5
permit was not included in the list of required permits/approvals in Table 1.4-1.

The DEIR states that the groundwater withdrawal volumes associated with dewatering are expected to vary from less than 100,000 gallons per day to about 8 million gallons per day. Therefore, in accordance with the Water Management Act, a Water Withdrawal Permit (MassDEP Permit Category WM03) will be required.

Dewatering at the launch sites and tunnel shafts should not affect any public water supply. These locations are all downstream of the Dedham-Westwood Water District's Bridge Street Wells, which are adjacent to the Charles River. The Bridge Street Wells are the farthest downstream of any public water supply sources along the Charles River. The City of Cambridge's Stony Brook Reservoir is just upstream of Stony Brook's confluence with the Charles River, so the discharges to the Charles River and Seaverns Brook will not affect the reservoir.

Section 4.4.7.1 of the DEIR states that the volume of the proposed tunnels will be about 66 million gallons (MG) of water. Following initial disinfection of the tunnels, up to four volumes of water will be used to flush the tunnels; i.e., up to 264 MG. For comparison, the amount of water that MWRA provides to the Boston metropolitan area tends to average just under 200 MG per day. Therefore, the disinfection/flushing process may have to take place during a time of the year when water demand is low.

Table 5.4-1 refers to certain launching and receiving sites being within the Zone I protective
radius and/or Zone II wellhead protection area for the Town of Weston's Fitzgerald and Nickerson
Wells. On May 20, 2022, MassDEP approved an application by the Weston Department of Public
Works to formally abandon these wells. The wells never had a Zone II, but had an Interim Wellhead 3-6
Protection Area (IWPA) with a half-mile radius as a default instead. Upon abandonment, the wells
are no longer considered to be public water supply sources, and the Zone Is and IWPAs for the two
wells are no longer protected water supply areas.

The DEIR is incorrect in stating in Section 5.4.3 that Rosemary Brook is a surface water 3-7
source for the Town of Wellesley. Wellesley has a municipal well called the Rosemary Brook Well,
but the brook itself is not a public water supply source.

The DEIR identifies the volumes of rock cuttings that will be excavated in the process of
boring the rock tunnels, but does not identify where the long-term deposition of this material will be. 3-8
During construction of the MetroWest Tunnel, this material was referred to as "tunnel muck" for how
fine the cuttings were. The boring process creates a great deal of freshly-cut surface area that is

subject to leaching. Long-term disposal of these cuttings near a water supply could increase the total dissolved solids (TDS) content of the water, which would in turn increase the corrosivity of the water. Therefore, large volumes of this material should not be deposited adjacent to a public water supply. 3-8 *(cont'd)*

MassDEP looks forward to working with the Town on implementation of the CWMP/SEIR, and more generally on the Town's interest in protecting and preserving the Town's water resources. MassDEP appreciates the opportunity to comment on this proposed project. Please contact Rachel Freed at Rachel.Freed@mass.gov or (978) 694-3258, or Susy King at susannah.king@mass.gov or (857) 300-3294 for further information on wastewater issues. If you have any general questions regarding these comments, please contact me at john.d.viola@mass.gov or (978) 694-3304.

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, Rachel Freed, Susy King, MassDEP-NERO

15.9 Responses to Letter 3: MassDEP Northeast Regional Office

Table 15-5 Responses to Comments from the MassDEP Northeast Regional Office

#	Comment	Response
3-1	Construction of the new tunnels will result in dewatering discharges to several waterways, which raises concerns about the impacts of increased volume and velocities of the discharges. On the Fernald property, there will be a discharge to Clementis Brook, and at the American Legion site there will be a discharge to Canterberry Brook. The launching and receiving shafts for the Bifurcation will discharge to Seaverns Brook. Permanent alterations to BVW and inland Bank will occur due to the installation of splash pads and culvert outlets. MassDEP recommends that the applicant examine the possibility of moving these structures farther from the BVW if possible.	Construction activities would include the installation of riprap splash pads at the outlet of pipes for dewatering discharges at the UMass Property or Lower Fernald Property, Tandem Trailer or Bifurcation, Highland Avenue Northeast/Southeast, and American Legion, depending on the Alternative. A description of wetland and waterway construction period impacts is provided in **DEIR Chapter 4.6, Wetlands and Waterways, Section 4.6.5 Construction Period Impacts (Page 4.6-127)** for each shaft site. The riprap splash pads were conservatively designed to dissipate higher flow rates than the calculated pipe diameter is expected to convey. Manning's Equation (assuming gravity flow and minimum pipe slope for a given diameter pipe) was used to confirm that pipes were sized conservatively large to convey the expected flow rate from tunnel dewatering activities during construction. Riprap splash pads were then designed conservatively large to be able to dissipate the velocities from a pressure flow condition where flow (Q) and velocity (V) are higher than what is expected from tunnel dewatering rates. These calculations (included in **SDEIR Appendix B, Wetlands and Waterways Supporting Documentation**) show that the outlet pipe diameters and dimensions of riprap splash pads presented in the DEIR were conservatively large and would be adequate to mitigate potential scour impacts to adjacent wetland resources. As the design is refined, both the pipe diameters and the riprap splash pads at the pipe ends likely may be able to be reduced. The calculations and nomograph used for sizing the riprap outlet protection is presented in **SDEIR Appendix B,** demonstrating that the proposed pipes and riprap splash pads have been properly sized to regulate flows and prevent scour. **SDEIR Chapter 5, Wetlands and Waterways, Table 5-14 (pg. 5-46)**, summarizes the cumulative impacts of dewatering discharges to the Charles River for each SDEIR alternative. The maximum cumulative discharge volume that the Charles River may receive from each contributing discharge (inclusive of discharges directly to the Charles as well as to upstream tributaries Clematis Brook/Beaver Brook and Seaverns Brook) is 6,560 GPM associated with Alternative 10A discharges. This added volume represents approximately 6.5% of the 50% duration average flow and 0.17% and 0.24% of the anticipated 100-year and 25-year flood flows, respectively.

Table 15-5 Responses to Comments from the MassDEP Northeast Regional Office

#	Comment	Response
3-2	The DEIR discusses impacts from the increased volume of discharges to the waterways, but appears to assume that the splash pads will be adequate to dissipate velocity in order to avoid eroding effects on the resource areas. The applicant should provide calculations demonstrating that the pipes and splash pads have been properly sized to regulate flows and prevent scour.	As shown in **SDEIR Chapter 5, Table 5-6 (pg. 5-29),** impacts to Land Under Waterbodies and Waterways (LUW/WW), Bordering Land Subject to Flooding (BLSF) and Bank due to the construction of discharge pipes and splash pads would include both temporary and permanent impacts. Temporary impacts would result from pipe trenching and excavation and stabilization for construction of the flared end-sections and riprap splash pads. Following completion of construction, vegetation and shorelines would be restored along the pipe trench and around the splash pad. Permanent impacts would include only the flared end-sections and associated riprap splash pads, providing scour protection and erosion control for dewatering discharges within the waterways. The impact to BVW/WW included in **DEIR Chapter 4.6** due to the discharge structures at the prior Fernald Property site has been eliminated due to inclusion of the alternative sites, which do not require BVW/WW impacts for the discharges. It is not feasible to eliminate the proposed impacts to Bank, LUW and WW because to mitigate potential scour impacts to existing resource areas, the discharge must be in proximity to the associated receiving waterbody. **SDEIR Chapter 5, Table 5-6 (pg. 5-29)** includes a summary of temporary and permanent impacts to wetland resource areas at each of the Program sites in SDEIR Alternatives 3A, 4A, and 10A.

Table 15-5 Responses to Comments from the MassDEP Northeast Regional Office

#	Comment	Response
3-3	MassDEP recommends that the applicant develop a plan to monitor the outfalls during dewatering activities to ensure that scour and erosion does not occur, including a contingency plan to address any unexpected negative impacts.	As part of the requirements of the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP), a Stormwater Pollution Prevention Plan (SWPPP) would be prepared by the contractor to document stormwater management during the construction period. Per CGP requirements, the SWPPP would include a description of dewatering practices which are to be installed and maintained in compliance with CGP Part 2.4. Stable, erosion-resistant surfaces would be used to discharge flows from dewatering controls and all dewatering discharges would be in compliance with the velocity dissipation requirements of CGP Part 2.2.11. A dewatering inspection schedule would be developed in accordance with CGP Part 4.3.2 and would include monitoring for scouring and erosion resulting from dewatering practices. Per CGP Part 5, procedures for corrective action would also be included in the SWPPP. Corrective action procedures would include a contingency plan to address any unexpected negative impacts of construction dewatering activities that may be observed during inspection and monitoring. These corrective actions may include splash pad maintenance measures, modifications to pipe sizing, treatment of discharges, or implementation of additional velocity dissipation measures. CGP Parts 7.2.7 and 7.2.8 summarize how the above requirements must be documented as part of the SWPPP:

Table 15-5 Responses to Comments from the MassDEP Northeast Regional Office

#	Comment	Response
3-3	MassDEP recommends that the applicant develop a plan to monitor the outfalls during dewatering activities to ensure that scour and erosion does not occur, including a contingency plan to address any unexpected negative impacts.	***"7.2.7 Procedures for Inspection, Maintenance, and Corrective Action.*** *Describe the procedures you will follow for maintaining your stormwater controls, conducting site inspections, and, where necessary, taking corrective actions, in accordance with Part 2.1.4, Part 4, and Part 5 of this permit, accordingly. Also include:* *a. The inspection schedule you will follow, which is based on whether your site is subject to Part 4.2 or Part 4.3, or whether your site qualifies for any of the reduced inspection frequencies in Part 4.4;* *b. If you will be conducting inspections in accordance with the inspection schedule in Part 4.2.2, Part 4.3, or Part 4.4.1b, the location of the rain gauge or the address of the weather station you will be using to obtain rainfall data;* *c. If you will be reducing your inspection frequency in accordance with Part 4.4.1b, the beginning and ending dates of the seasonally defined arid period for your area or the valid period of drought;* *d. If you will be reducing your inspection frequency in accordance with Part 4.4.3, the beginning and ending dates of frozen conditions on your site; and* *e. Any maintenance or inspection checklists or other forms that will be used.* ***7.2.8 Procedures for Turbidity Benchmark Monitoring from Dewatering Discharges (if applicable).*** *If you are required to comply with the Part 3.3 turbidity benchmark 2022 Construction General Permit (CGP) Page 45 monitoring requirements, describe the procedures you will follow to collect and evaluate samples, report results to EPA and keep records of monitoring information, and take corrective action when necessary. Include the specific type of turbidity meter you will use for monitoring, as well as any manuals or manufacturer instructions on how to operate and calibrate the meter. Describe any coordinating arrangement you may have with any other permitted operators on the same site with respect to compliance with the turbidity monitoring requirements, including which parties are tasked with specific responsibilities. If EPA has approved of an alternate turbidity benchmark pursuant to Part 3.3.2b, include any data and other documentation you relied on to request use of the specific alternative benchmark.*

Table 15-5 Responses to Comments from the MassDEP Northeast Regional Office

#	Comment	Response
3-4	The project will entail the addition of impervious surfaces, such as access roads and parking areas, in many of the sites. The DEIR describes the increase in impervious areas as "negligible." The applicant is reminded that stormwater runoff from these surfaces must be treated in accordance with the Stormwater Regulations.	It is anticipated that the Program would add between 2.3 and 2.7 additional acres of impervious surfaces, depending upon the SDEIR Alternative. As stated in **DEIR Sections 4.6.5 (pg. 4.6-127)** and **Section 4.6.6, Final Conditions (pg. 4.6-153)**, all stormwater runoff would be treated in accordance with the MassDEP Stormwater Management Standards including that associated with any increase in impervious areas. Stormwater management systems would be designed to manage increases in peak discharge rates, infiltrate the required recharge volume, and remove the required post-construction TSS load. Structural stormwater control measures (SCMs) may include surface or subsurface infiltration systems, bioretention, or filtering practices. Specific SCMs to be employed at the site would be refined as part of the final design. Planned Program compliance with each of the 10 MassDEP Stormwater Management Standards is further described in **DEIR Chapter 4.6, Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards (pg. 4.6-179)**.
3-5	As noted in Section 1.4.3.6, the project will require a Distribution System Modification permit (MassDEP Permit Category BRPWS32) from the MassDEP Drinking Water Program. However, this permit was not included in the list of required permits/approvals in Table 1.4-1.	**SDEIR Chapter 1, Program Description and Permitting, Table 1-1 (pg. 1-11)** has been updated to include a Distribution System Modification permit from the Massachusetts Department of Environmental Protection (MassDEP) Drinking Water Program.
3-6	Table 5.4-1 refers to certain launching and receiving sites being within the Zone I protective radius and/or Zone II wellhead protection area for the Town of Weston's Fitzgerald and Nickerson Wells. On May 20, 2022, MassDEP approved an application by the Weston Department of Public Works to formally abandon these wells. The wells never had a Zone II, but had an Interim Wellhead Protection Area (IWPA) with a half-mile radius as a default instead. Upon abandonment, the wells are no longer considered to be public water supply sources, and the Zone Is and IWPAs for the two wells are no longer protected water supply areas.	**DEIR Section 5.4.1, Launching and Receiving Sites, Table 5.4-1 (pg. 5-4),** lists public water supply wells and their protection areas at launching and receiving sites. The table lists the Nickerson Field G.P. Well and Route 128 G.P. well, and notes that they are both abandoned. On May 20, 2022, MassDEP approved an application by the Weston Department of Public Works to formally abandon these wells. The wells never had a Zone II but had an Interim Wellhead Protection Area (IWPA) with a half-mile radius as a default instead. Upon abandonment, the wells are no longer considered to be public water supply sources, and the Zone I and IWPAs for these two wells are no longer protected water supply areas. Therefore, there are no public water supply wells or protection areas at any of the launching and receiving sites. See updated text and figures in **SDEIR Chapter 6, Water Supply and Water Management Act, Section 6.2.3, Water Supply Final Conditions,** and **SDEIR Chapter 6, Table 6-2 (pg. 6-5), Table 6-3 (pg. 6-6)** and **Table 6-4 (pg. 6-7)**.

Table 15-5 Responses to Comments from the MassDEP Northeast Regional Office

#	Comment	Response
3-7	The DEIR is incorrect in stating in Section 5.4.3 that Rosemary Brook is a surface water source for the Town of Wellesley. Wellesley has a municipal well called the Rosemary Brook Well, but the brook itself is not a public water supply source.	The **DEIR Section 5.4.3, Tunnel Alignments (pg. 5-55)** incorrectly refers to the Rosemary Brook as a surface water source for the Town of Wellesley. Wellesley has a municipal well called the Rosemary Brook Well, but the brook itself is not a public water supply source. **SDEIR Appendix C, Updated Draft Water Supply Contingency Plan** has been updated to reflect this. See text in **Appendix C.4**, and **Appendix C.4, Table C.4-1 (pg. C-5)**.
3-8	The DEIR identifies the volumes of rock cuttings that will be excavated in the process of boring the rock tunnels, but does not identify where the long-term deposition of this material will be. During construction of the MetroWest Tunnel, this material was referred to as “tunnel muck” for how fine the cuttings were. The boring process creates a great deal of freshly cut surface area that is subject to leaching. Long-term disposal of these cuttings near a water supply could increase the total dissolved solids (TDS) content of the water, which would in turn increase the corrosivity of the water. Therefore, large volumes of this material should not be deposited adjacent to a public water supply.	As described in **DEIR Section 4.8.5**, **Construction Period Impacts (pg. 4.8-51)**, “the construction contractor would be responsible for finding suitable locations for reuse or disposal of excavated material from the tunnel excavation. Protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so that it can be handled appropriately and disposed of at suitable locations. Most of the excavated material from all three DEIR Alternatives is anticipated to be clean, crushed rock, which could be reused beneficially at other locations.” The final design and contract documents will have testing requirements for disposed materials to comply with either the reuse of rock cuttings and / or permit requirements for disposal. Approved disposal sites would comply with regulations to protect public water supplies. Excavated material will be tested as needed following removal to determine potential disposal and/or reuse options. Depending on the composition of the excavated material (igneous and metamorphic rocks are generally preferred), the size and shape of the excavated material (how much post-processing is required), and the timing of its removal, some excavated material could be used for embankment, backfill, paving material, or other uses. There is the potential for naturally occurring contaminants such as asbestos-containing rock and arsenic to be present in the rock, and, therefore, excavated material and groundwater generated during the Program would require proper management in accordance with the applicable regulations . Refer to **DEIR Section 4.8.7, Avoidance, Minimization and Mitigation Measures (pg. 4.8-60).**

dcr
Massachusetts

Letter 4

December 12, 2022

Secretary Bethany A. Card
Executive Office of Energy and Environmental Affairs
Attn: Purvi Patel, MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: EOEEA #16355 Metropolitan Water Tunnel Program DEIR

Dear Secretary Card:

The Department of Conservation and Recreation ("DCR" or "Department") is pleased to submit the following comments in response to the Draft Environmental Impact Report ("DEIR") submitted by the Massachusetts Water Resources Authority (the "Proponent") for the Metropolitan Water Tunnel Program (the "Project").

As described in the DEIR, the Proponent will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for the MWRA's Metropolitan Tunnel System. Sites on DCR land that require permanent easements will trigger Article 97 of the Amendments to the Massachusetts Constitution. Based on a consult meeting provided by the Proponent, it appears that up to 5 acres of DCR property may be needed as staging locations for tunnel construction over several years; such temporary use of DCR property will require a DCR Construction and Access Permit.

Article 97 Land Disposition

Transfers of interests in state conservation property must meet the requirements set forth in the Executive Office of Energy and Environmental Affairs ("EEA") Article 97 Land Disposition Policy (the "Policy"). The Policy has the stated goal of ensuring no net loss of Article 97 lands under the ownership and control of the Commonwealth, and states as a general premise that EEA and its agencies shall not sell, transfer or otherwise dispose of any right or interest in Article 97 lands. Transfer of ownership or interests therein only may occur 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. DCR also notes that with the recent passage of St. 2022, c. 274 – commonly known as the Public Lands Preservation Act – additional requirements may apply to a transfer of Article 97 property. 4-1

The DEIR describes two sites that may require disposition of DCR land that is protected under Article 97: the American Legion receiving site within the Morton Street property; the Southern Spine Mains connection site within the Southwest Corridor Park. The DEIR also describes locations where tunnel construction is proposed beneath DCR properties, including the Leo J. Martin Golf Course in Weston and portions of the Charles River Reservation. Tunnel construction beneath DCR property will require permanent easements triggering Article 97. DCR requests that the Proponent minimize the size and extent of impacts to DCR 4-2

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Lt. Governor

Bethany A. Card, Secretary
Executive Office of Energy & Environmental Affairs

Douglas J. Rice, Commissioner
Department of Conservation & Recreation

land, and work closely with DCR to identify mitigation for the loss of Article 97 conservation lands as the shaft, staging and tunnel locations are finalized. 4-2 (*cont'd*)

DCR supports the granting of a Construction and Access Permit for temporary tunnel staging sites and permanent easements on and under DCR land, and DCR will continue to work with the Proponent to ensure that the process is compliant with EEA's Article 97 Policy. Construction and Access Permits for this Project, required for work activities on DCR property, will not be issued until MEPA review is complete and Article 97 legislation has been enacted. 4-3

Thank you for the opportunity to comment on the DEIR. Please contact the Director of Construction & Access Permitting, Sean Casey at sean.casey@mass.gov regarding DCR Construction and Access Permits. Questions related to Article 97 can be directed to Jennifer Howard at jennifer.howard@mass.gov.

Sincerely,

Douglas Rice

Douglas J. Rice
Commissioner

cc: Jennifer Howard, Sean Casey, Priscilla Geigis, Patrice Kish, Tom LaRosa (DCR)

15.11 Responses to Letter 4: Massachusetts Department of Conservation and Recreation

Table 15-6 Responses to Comments from the Massachusetts DCR

#	Comment	Response
4-1	DCR also notes that with the recent passage of St. 2022, c. 274 – commonly known as the Public Lands Preservation Act – additional requirements may apply to a transfer of Article 97 property.	The MWRA has reviewed the enactment of *An Act Preserving Open Space in the Commonwealth* (Chapter 274 of the Acts of 2022),[12] also known as the Public Lands Preservation Act (PLPA) and is committed to working with the DCR and other agencies to meet the additional requirements for the transfer of Article 97 property. Approved in November 2022, the PLPA complements the existing Article 97 policy by establishing a process for notifying the Secretary of the EEA and the public of a proponent's plans to perform a take of Article 97 protected lands before the proponent approaches the legislature for the disposition. The PLPA applies to Program sites requiring Article 97 disposition and the MWRA will be subject to the requirements of the 2022 PLPA. In accordance with the requirements of the PLPA, the MWRA will notify the Secretary and public by submitting the proposed disposition request within the PLPA portal (forthcoming as of July 2023[13]) and perform additional notification as required by the EEA as part of the Massachusetts Environmental Policy Act (MEPA) process. Prior to the submission, the MWRA will coordinate with the current owner/maintainer of the parcel of interest, as required by the PLPA. As outlined in the PLPA, the MWRA will need to prepare a brief alternatives analysis in the EEA portal submission for site use and select an acceptable replacement parcel or request a waiver from the Secretary to modify or eliminate the replacement land requirement. Alternatively, the MWRA may request to provide in-lieu funding for part or all of the replacement land. The MWRA will seek to comply with applicable requirements specified in the 2022 PLPA in association with the Commonwealth's "Guidance on Public Lands Preservation Act Implementation."[14] The MWRA will continue to work with the appropriate agencies regarding the most appropriate option for each applicable site subject to the PLPA and the Article 97 policy.

12 Commonwealth of Massachusetts, Chapter 274, An Act Preserving Open Space in the Commonwealth, https://malegislature.gov/Laws/SessionLaws/Acts/2022/Chapter274#:~:text=Acts%20%282022%29%20Chapter%20274%20AN%20ACT,PRESERVING%20OPEN%20SPACE%20IN%20THE%20COMMONWEALTH (accessed March 24, 2023).

Table 15-6 Responses to Comments from the Massachusetts DCR

#	Comment	Response
4-2	DCR requests that the Proponent minimize the size and extent of impacts to DCR land and work closely with DCR to identify mitigation for the loss of Article 97 conservation lands as the shaft, staging and tunnel locations are finalized.	The MWRA has held a number of meetings with DCR to present conceptual plans and to discuss site layout and utilization at the DCR Morton Street Property (American Legion) and the Southern Spine Mains connection to minimize land required by MWRA for construction and long-term operation at the sites. The MWRA will continue to coordinate closely with DCR regarding potential construction at DCR-controlled properties, and associated Article 97 requirements. A list of meetings with DCR since the ENF filing is included in **DEIR Chapter 2, Outreach and Environmental Justice, Table 2.2-1 (pg. 2-3)**. The MWRA has continued to coordinate with the DCR to identify replacement land required for the disposition of a portion of Southwest Corridor Park/Arborway I (approximately 0.2 acres) for the proposed Southern Spine Mains connection shaft site and a portion of the DCR Morton Street Property (approximately 1.5 acres of the DCR Morton Street Property (in addition, 2.0 acres would require a permanent easement of the DCR Morton Street Property) for the proposed American Legion receiving shaft site. These acreages are small in relation to the total Article 97 property area and would contain only the critical Program infrastructure needed for operation and maintenance of the tunnel system. See **SDEIR Chapter 4, Land Alteration and Article 97, Table 4-12 (pg. 4-44)** and the Response to Certificate Comment 4-1.
4-3	DCR supports the granting of a Construction and Access Permit for temporary tunnel staging sites and permanent easements on and under DCR land, and DCR will continue to work with the Proponent to ensure that the process is compliant with EEA's Article 97 Policy. Construction and Access Permits for this Project, required for work activities on DCR property, will not be issued until MEPA review is complete and Article 97 legislation has been enacted.	The MWRA understands that temporary use of DCR property will require a DCR Construction and Access Permit for temporary use of up to five acres total of DCR property for staging locations for construction activities at the American Legion site Refer to **DEIR Chapter 3, Alternatives, Figure 3.8-15 (pg. 3-115)** and the Southern Spine Mains site. Refer to **DEIR Chapter 3, Figure 3.8-27 (pg. 3-145**). Through coordination with DCR and comment letters on the ENF and DEIR, DCR has expressed its support in granting Construction and Access Permits for temporary tunnel staging sites and permanent easements on and under DCR land which is reflected in **SDEIR Chapter 1, Program Description and Permitting, Section 1.4.3.6 (pg. 1-14)**. The MWRA will continue to work with the DCR and will seek to comply with the EEA's Article 97 Policy as discussed in **SDEIR Chapter 4, Land Alteration and Article 97.**

13 Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, "Article 97 & The Public Lands Preservation Act," https://www.mass.gov/info-details/article-97-the-public-lands-preservation-act (accessed July 15, 2023).

14 Commonwealth of Massachusetts, "Guidance on Public Lands Preservation Act Implementation," February 2023, https://www.mass.gov/doc/guidance-on-public-lands-preservation-act-implementation-january-2023/download (accessed May 9, 2023).

Boston Water and Sewer Commission

980 Harrison Avenue
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November 17, 2022

Secretary Bethany A. Card
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Purvi Patel, EEA#16355
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Metropolitan Water Tunnel Program
Draft Environmental Impact Report

Dear Secretary Card:

The Boston Water and Sewer Commission (Commission) has reviewed the Draft Environmental Impact Report (DEIR) for the proposed Metropolitan Water Tunnel Program in the Metropolitan Boston area. This letter provides the Commission's comments on the DEIR.

The proposed project involves construction of approximately 14 miles of deep rock tunnel and open cut connections to the existing MWRA water distribution network. The new tunnel will provide redundancy for the Massachusetts Water Resources Authority's (MWRA) existing tunnel system in the Metropolitan Boston area. The DEIR presents a comprehensive evaluation of 10 alternatives and recommended a preferred alternative and two backup alternatives. The 10 alternatives have similar courses. Differences include the locations of the tunnel boring machine's launch and receiving shafts, direction of tunneling and locations of connections to the existing MWRA water transmission network. The southern branch extends off-road from Shaft 5/5A in Weston to existing MWRA water mains at two locations in the Dorchester neighborhood of Boston, Shaft 7C on the Dorchester Tunnel and the intersection of Morton Street at Canterbury Way. The northern branch starts at Shaft 5/5A and extends off-road to the existing MWRA water main at the intersection of Waverley Oaks Road, Route 60, and Chapel Road in Waltham.

The Commission has the following comments regarding the DEIR:

1. Prior to the initial phase of the construction drawing development, the MWRA should meet with the Commission's Design and Engineering Customer Services Departments to review Commission infrastructure that may be affected by the proposed construction. 5-1

2. All relocated water mains, sewers and storm drains must be designed and constructed at MWRA's, expense. They must be designed and constructed in conformance with the 5-2

Commission's design standards, Water Distribution System and Sewer Use regulations, and Requirements for Site Plans. The plan should include the locations of new, relocated, and existing water mains, sewers and drains which may be impacted by the construction. 5-2 (cont'd)

3. MWRA is advised that any plans to build over Commission facilities are subject to review and approval by the Commission. The project must be designed so that access to the Commission's water and sewer lines for the purpose of operation and maintenance is not inhibited. 5-3

4. The Commission will require MWRA to undertake all necessary precautions to prevent damage or disruption of the existing active water, sewer and drain lines during construction. The Commission will require MWRA to inspect the existing sewer and drain lines by CCTV after site construction is complete, to confirm that the lines were not damaged from construction activity. 5-4

5. MWRA is required to obtain a Hydrant Permit for use of any hydrant during the construction phase of this project. The water used from the hydrant must be metered. MWRA should contact the Commission's Meter Department for information on and to obtain a Hydrant Permit. 5-5

6. In conjunction with the Site Plan MWRA will be required to submit a Stormwater Pollution Prevention Plan. The plan must:

   - Identify specific best management measures for controlling erosion and preventing the discharge of sediment, contaminated stormwater, or construction debris to the Commission's drainage system when construction is underway.

   - Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control structures or treatment structures to be utilized during the construction.

   - Specifically identify how the project will comply with the Department of Environmental Protection's Performance Standards for Stormwater Management both during construction and after construction is complete.

5-6

7. Developers of projects involving disturbances of land of one acre or more will be required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. MWRA is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required, it is required that a copy of the permit and any pollution prevention plan prepared pursuant to the permit be provided to the 5-7

Commission's Engineering Customer Services Department, prior to the commencement of construction. The pollution prevention plan submitted pursuant to a NPDES Permit may be submitted in place of the pollution prevention plan required by the Commission provided the Plan addresses the same components identified in item 6 above. 5-7 *(cont'd)*

8. The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. MWRA is advised that the discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products, MWRA will be required to obtain a Remediation General Permit from the Environmental Protection Agency (EPA) for the discharge. 5-8

9. The Commission is not a member of Dig Safe. The applications for mark-out of Commission water, sewer, and storm drains, are filed on the Commission's website at https://www.bwsc.org/mark-out-request-form. 5-9

Thank you for the opportunity to comment on this project.

Yours truly,

John P. Sullivan, P.E.
Chief Engineer

JPS/ac

cc: K. Ronan, MWRA via e-mail
M. Zlody, BED via e-mail
P. Larocque, BWSC via e-mail
P. Salvatore, BWSC via e-mail

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15.13 Responses to Letter 5: Boston Water and Sewer Commission

Table 15-7 Responses to Comments from the Boston Water and Sewer Commission

#	Comment	*Response*
5-1	Prior to the initial phase of the construction drawing development, the MWRA should meet with the Boston Water and Sewer Commission's (Commission's) Design and Engineering Customer Services Departments to review Commission infrastructure that may be affected by the proposed construction.	Construction drawings will be developed and finalized by the Final Design Engineer, who will be retained in mid-2024. This consultant and the Massachusetts Water Resources Authority (MWRA) will meet with the Boston Water and Sewer Commission's (BWSC's) Design and Engineering Customer Services Department to review and discuss Commission-owned infrastructure that may be impacted and other concerns BWSC may have for the shaft sites located within City limits.
5-2	All relocated water mains, sewers and storm drains must be designed and constructed at MWRA's expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use regulations, and Requirements for Site Plans. The plan should include the locations of new, relocated, and existing water mains, sewers and drains which may be impacted by the construction.	The construction drawings, to be developed by the Final Design Engineer and reviewed by the BWSC, will clearly identify Commission-owned infrastructure that would be installed or relocated. Such work will adhere to the Commission's design standards Water Distribution System and Sewer Use regulations. Current preliminary designs do not have any permanent connections to BWSC infrastructure.
5-3	The project must be designed so that access to the Commission's water and sewer lines for the purpose of operation and maintenance is not inhibited.	Access to the Commission's infrastructure will not be inhibited in the Program's permanent conditions. Any access concerns during construction will be discussed with the BWSC's Design and Engineering Customer Services Department.
5-4	The Commission will require MWRA to undertake all necessary precautions to prevent damage or disruption of the existing active water, sewer and drain lines during construction. The Commission will require MWRA to inspect the existing sewer and drain lines by CCTV after site construction is complete, to confirm that the lines were not damaged from construction activity.	Disruptions to existing active water, sewer and drain lines will be reviewed with the BWSC's Design and Engineering Customer Services Department. The MWRA and its contractor will coordinate planned disruptions with the BWSC during construction. The MWRA will work with BWSC to ensure closed-circuit television (CCTV) requirements are met.

Table 15-7 Responses to Comments from the Boston Water and Sewer Commission

#	Comment	*Response*
5-5	MWRA is required to obtain a Hydrant Permit for use of any hydrant during the construction phase of this project. The water used from the hydrant must be metered. MWRA should contact the Commission's Meter Department for information on and to obtain a Hydrant Permit.	As described in **SDEIR Chapter 1, Program Description and Permitting, Section 1.4.3**, **Regulatory Context – State (pg. 1-5)** the MWRA's contractor will have to obtain a Hydrant Permit from the Boston Water and Sewer Commission's Meter Department for use of any hydrant during the construction phase of the Program. The water used from the hydrant will have to be metered. At the appropriate juncture in the permitting and construction process, the MWRA will contact the Commission's Meter Department for information on and to obtain a Hydrant Permit. If water from a BWSC hydrant is needed for geotechnical investigations during design, MWRA's consultants/subcontractors will obtain necessary hydrant permits.
5-6	In conjunction with the Site Plan, MWRA will be required to submit a Stormwater Pollution Prevention Plan. The plan must: • Identify specific best management measures for controlling erosion and preventing the discharge of sediment, contaminated stormwater, or construction debris to the Commission's drainage system when construction is underway • Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control structures or treatment structures to be utilized during the construction. Specifically identify how the project will comply with the Department of Environmental Protection's Performance Standards for Stormwater Management both during construction and after construction is complete.	As described in **SDEIR Chapter 1, Section 1.4.2.1**, **USEPA NPDES Construction General Permit (pg. 1-12)**, the Program will require the completion and submittal of a Notice of Intent (NOI) to the U.S. Environmental Protection Agency (USEPA) for coverage under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) for stormwater discharge from construction activities. As part of the NOI, a Stormwater Pollution Prevention Plan (SWPPP) will be prepared by the contractor to document stormwater management during the construction period. The NOI submitted for the NPDES CGP will contain information about the contents and stipulations of the SWPPP. This permit will be needed to cover all launching, receiving, large connection, and connection sites for the Program. **SDEIR Chapter 5, Wetlands and Waterways, Section 5.2.2, Wetlands and Waterways Construction Period Impacts (pg. 5-21)**, discusses the requirements needed for the NPDES CGP and SWPPP.

Table 15-7 Responses to Comments from the Boston Water and Sewer Commission

#	Comment	*Response*
		As described in **DEIR Chapter 4.6, Section 4.6.5, Construction Period Impacts (pg. 4.6-127),** Program sites would be covered by a SWPPP, to be developed by the contractor prior to construction, that specifies proper erosion and sedimentation control for disturbed areas at each site and outlines procedures aimed at minimizing the transport of sediment into nearby waters, including temporary stormwater management, dust control, and winter stabilization measures. The SWPPP would be adhered to at all sites and throughout all phases of the project and would be adapted to fit the contractor's equipment, weather conditions, and construction activity for each site. The SWPPP will include identification of specific best management measures for controlling erosion and maintaining stormwater quality during construction, site maps showing existing site drainage patterns, storage and treatment areas for contaminated soils and water, and the location of major control and treatment structures to be used during construction. The SWPPP will be submitted to all required agencies, including the BWSC for work completed within the City of Boston. Identification of methods for compliance with MassDEP's Stormwater Management Standards for construction and post-development conditions will also be submitted to MassDEP and local Conservation Commissions per 310 CMR 10.00 Massachusetts Wetlands Protection Act during final design.

Table 15-7 Responses to Comments from the Boston Water and Sewer Commission

#	Comment	Response
5-7	Developers of projects involving disturbances of land of one acre or more will be required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. MWRA is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required, it is required that a copy of the permit and any pollution prevention plan prepared pursuant to the permit be provided to the Commission's Engineering Customer Services Department, prior to the commencement of construction. The pollution prevention plan submitted pursuant to a NPDES Permit may be submitted in place of the pollution prevention plan required by the Commission provided the Plan addresses the same components identified in item 6 above [Comment 5-6].	Construction activities will disturb more than one acre of land. A NPDES CGP will be completed and submitted. The SWPP will be prepared by the contractor to document stormwater management during the construction period. The SWPPP would be adhered to at all sites and throughout all phases of the project and would be adapted to fit the contractor's equipment, weather conditions, and construction activity for each site. Additional information is provided in response to Comment 5-6.
5-8	The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. MWRA is advised that the discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products, MWRA will be required to obtain a Remediation General Permit from the Environmental Protection Agency (EPA) for the discharge.	No discharge of dewatering drainage will be allowed in the sanitary sewer. Dewatering activities will be in accordance with the NPDES CGP and NDPES DRGP, and a Drainage Discharge Permit form the Commission if applicable. Additional discussion regarding permit requirements and construction dewatering can be found in **SDEIR Section 1.4 Regulatory Context (pg. 1-5)** and **DEIR Chapter 5, Wetlands and Waterways**.
5-9	The Commission is not a member of Dig Safe. The applications for mark-out of Commission water, sewer, and storm drains are filed on the Commission's website at https://www.bwsc.org/mark-out-request-form.	The MWRA's consultants and contractors will submit a mark-out application at the URL provided and provide adequate notice in accordance with BWSC's requirements prior to any proposed excavation work.

City of Waltham
MASSACHUSETTS

LAW DEPARTMENT

City Solicitor
JOHN B. CERVONE

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December 7, 2022

Bethany Card, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114
Attn.: MEPA analysts Purvi Patel and Erin Flaherty

RE: MWRA Metropolitan Water Tunnel Program – EEA # 16355

Dear Secretary Card:

I write on behalf of the City of Waltham to express concerns with the Draft Environmental Impact Report (DEIR) submitted by the MWRA relative to the tunnel program proposed to go through Waltham. As you know, the purpose of a DEIR is to provide detailed information regarding a project's environmental effects, an analysis of ways to minimize or eliminate those impacts, and provide reasonable alternatives. The DEIR submitted by the MWRA, however, fails to do so. When the state issued its Certificate of the Secretary on the Environmental Notice, the text of the certificate included the following language: " . . .due to the project preliminary design phase, specific locations of temporary and permanent impacts are not known and the full scope of the project's environmental impacts cannot be understood and assessed until the DEIR is submitted." The City believes that the project is still at such a preliminary stage that its impacts continue to be unable to be understood and assessed and that the DEIR submitted does not meet the objectives and requirements of such a report. The comments below identify some of the issues still not properly addressed by the MWRA, and which prevent the City from being able to fully respond.

It is the City's position that the DEIR is premature as the MWRA has not yet completed test borings which would enable it to determine whether the project may be constructed in any of the public or private locations identified in Waltham as possible locations therefor. As the MWRA has itself noted, geologic conditions in Waltham are particularly complex and complete identification of the location of the Northern Boundary Fault, which runs through Waltham, requires extensive deep borings. Such test borings produce noise and vibrations that will impact nearby residential areas and the impacts on those areas must be fully identified and addressed. 6-1

The MWRA had been asked to provide the City with a certified list of City-owned Waltham locations to be impacted and the MWRA has not provided same – it has only generally identified certain City-owned properties but not the locations thereon proposed for use. This may, as noted above, be attributable to 6-2
the lack of completed test borings in Waltham. But said lack of test borings make the DEIR too speculative in its review of possible environmental impacts. The MWRA has indicated that the test boring results will drive selection of locations and that final locations will not be set until the 60% or possibly even the 90% design phase. Since final design is not scheduled to commence until 2024, it is 6-3
not possible for the MWRA to assess, even preliminarily, the possible environmental impacts of its proposed project on City-owned properties.

The MWRA has indicated that it proposes long-term usage of the City-owned former Fernald State 6-4
School (Fernald property). The MWRA, however, has neither addressed with the Mayor nor identified what such possible long-term usage would entail. The Mayor has advised the MWRA that the City will not allow anything outside of the roadways located on the Fernald property. The work proposed, 6-5
however, goes well beyond those roadways. Furthermore, the MWRA was advised that the land south of the Fernald incinerator is highly contaminated and not appropriate for a water project. There is state- 6-6
owned land to the south of the Fernald site, some of which is contaminated and some of which is not, 6-7
yet it is not proposed for the placement of the project.

The Fernald property has been in a process within the City to identify possible City uses, whether for housing, recreation, or other uses and is currently poised for bidding for open space, recreation, the arts, nature and athletic areas. Without information as to the MWRA's proposed usage and the areas within which such long-term usage is to be proposed, the Fernald property re-use is adversely impacted. 6-8
The MWRA should be required to identify its proposed long-term use so that the City will be able to determine whether it will allow such use and whether the use proposed will harm the City's long-term plans for the Fernald.

The City reserves its rights with respect to use of municipal property - the Fernald as well as all other City-owned property – to review, accept or reject the MWRA's plans for such City-owned land once the 6-9
MWRA has finished its testing. While the MWRA, by filing this DEIR, is trying to advance the permitting of its project, it has only provided the City with schematic summaries and it is not and should not be at 6-10
the permitting stage.

The MWRA also proposes to locate one of its tunnel shafts on the Fernald property and traffic disruption is expected to extend into the adjacent public ways. The MWRA should be required to identify the 6-11
expected traffic disruption to be caused thereby and its proposed methods of mitigating same.

The MWRA has indicated that it plans to locate a portion of the project within School Street. The MWRA has indicated that it estimates this portion of the work to take approximately 3 months to complete. School Street is a major street within the City of Waltham, running parallel to Main Street and adjacent to the City's central downtown area. A disruption of traffic on this street for the period contemplated 6-12
by the MWRA must be fully analyzed and specific methods of addressing traffic issues should be detailed to minimize, to the greatest extent possible, the impact on the City's downtown traffic.

The MWRA has indicated that it is proposing haul routes based upon shortest distances to highways, but wants to work with the City on this. As currently proposed, the MWRA has stated that mitigation of impacts of the haul routes consists of proposals to adjust traffic signal timing at two intersections on Main Street. The MWRA must further identify the impacts of use of Main Street as a haul route, including potential traffic delays for regular users of that street, and alternative haul routes with their attendant traffic impacts must be identified. A determination of the actual route to be used is necessary before the City can fully comment. 6-13

On an important note, the City has worked with the MWRA and a private property owner to facilitate the MWRA's acquisition of private property on School Street for its tunnel project, but the MWRA still is not providing sufficient information to the City for it to make informed comments. 6-14

The above comments provide only a brief overview of the concerns of the City of Waltham and the City is unable to comment further based upon the current state of the MWRA's plans.

At this time, therefore, the City requests that the DEIR submitted by the MWRA be rejected and that the MWRA prepare a more complete DEIR once it has completed its test boring work. Once a more substantial DEIR is provided, the City will then be able to review same and provide appropriate and complete comments Only after a more complete DEIR has been presented and comments received should any consideration be given to allowing the MWRA to advance to the EIR stage.

Thank you for your consideration.

Regards,

Jeannette A. McCarthy

Jeannette A. McCarthy, Mayor

Patricia A. Azadi

Patricia A. Azadi, First Assi

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15.15 Responses to Letter 6: City of Waltham

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
6-1	It is the City's position that the DEIR is premature as the MWRA has not yet completed test borings which would enable it to determine whether the project may be constructed in any of the public or private locations identified in Waltham as possible locations therefor. As the MWRA has itself noted, geologic conditions in Waltham are particularly complex and complete identification of the location of the Northern Boundary Fault, which runs through Waltham, requires extensive deep borings. Such test borings produce noise and vibrations that will impact nearby residential areas and the impacts on those areas must be fully identified and addressed.	Shaft site locations (connection points) have been identified based on a number of factors, including hydraulic connections to critical infrastructure, land availability and land use, environmental impacts, among others, and would not be changed based on the results of the geotechnical borings. Borings have been drilled as part of the preliminary design or previous test boring data was available at/near all shaft sites and is sufficient for shaft site selection. Only the subsurface (underground) tunnel alignment between shaft sites would be influenced by future test borings. As noted in **DEIR Chapter 3, Alternatives, Chapter 3, Alternatives, Section 3.3.1, Nodes, Segments and Routes (pg. 3-5)** "at this stage in the alternatives development and evaluation process, the specific subsurface (underground) alignment that a tunnel segment may take would be refined throughout the design phases of the Program based on additional geotechnical data." Required Connection Points (hydraulic connection points where the tunnel facilities must connect to existing surface infrastructure to achieve the redundancy goals) were identified in **DEIR Section 3.3.5.1, Required Connection Points (pg. 3-8)** and Secondary Connection Points (connection points identified to facilitate tunnel construction or to provide benefit to its customers and reinforcement to its transmission network) were identified in the **DEIR Section 3.3.5.2, Secondary Connection Points (pg. 3-10).** These connection points (shaft sites) will not change based on the results of future geotechnical borings. In response to the DEIR Certificate, the Metropolitan Water Resources Authority (MWRA) evaluated additional shaft site locations, which are identified in **SDEIR Chapter 2, Alternatives, Section 2.2.1, Revised North Tunnel Terminus Site (pg. 2-1)**, and **SDEIR Section 2.3, Alternative Sites for the North Tunnel Terminus (pg. 2-7)**. As the shaft sites have been identified, the impacts associated with the work have been detailed in the DEIR and the SDEIR so the impacts can be reviewed. MWRA has coordinated with City personnel since early 2021 regarding test borings in Waltham, including notifications to nearby residents and businesses to address any concerns, and will continue to do so through future phases of test borings. MWRA has performed a number of borings throughout multiple communities within the Program study area and the noise/vibration associated with these borings is minimal to none.

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
6-2	The MWRA had been asked to provide the City with a certified list of City-owned Waltham locations to be impacted and the MWRA has not provided same - it has only generally identified certain City-owned properties but not the locations thereon proposed for use. This may, as noted above, be attributable to the lack of completed test borings in Waltham. But said lack of test borings make the DEIR too speculative in its review of possible environmental impacts.	A list of City-owned properties was first requested via email by the City of Waltham's Assistant Solicitor Patricia A. Azadi on November 17, 2022, to the MWRA after the submittal of the DEIR on October 17, 2022. MWRA compiled this list and sent it to Patricia A. Azadi via memorandum dated December 16, 2022. City-owned properties within a tunnel alignment study area (1,000-foot-wide corridor along the preliminary tunnel alignments) were included in the list. In addition, the shaft site locations are also clearly presented in the DEIR and SDEIR with their associated impacts. The City-owned shaft site locations include Fernald Property (DEIR)/Lower Fernald Property (SDEIR) and Cedarwood Pumping Station.
6-3	The MWRA has indicated that the test boring results will drive selection of locations and that final locations will not be set until the 60% or possibly even the 90% design phase. Since final design is not scheduled to commence until 2024, it is not possible for the MWRA to assess, even preliminarily, the possible environmental impacts of its proposed project on City-owned properties.	The connection points (shaft sites) will not change based on the results of future geotechnical borings. Only the subsurface (underground) tunnel alignment between shaft sites would be influenced by future test borings. As noted in **DEIR Section 3.3.1 (pg. 3-73-5)**, "at this stage in the alternatives development and evaluation process, the specific subsurface (underground) alignment that a tunnel segment may take would be refined throughout the design phases of the Program based on additional geotechnical data."

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
6-4	The MWRA has indicated that it proposes long-term usage of the City-owned former Fernald State School (Fernald property). The MWRA, however, has neither addressed with the Mayor nor identified what such possible long-term usage would entail.	Short-term and long-term uses of the Fernald Property are shown on the **DEIR Chapter 3, Figure 3.8-1 (pg. 3-77),** and **DEIR Chapter 3, Figure 3.8-2 (pg. 3-79)** with additional detail provided in the discipline-specific sections of the DEIR as noted below. **DEIR Chapter 4.5, Rare Species and Wildlife Habitat, Section 4.5.6.1 Alternative 3, (pg. 4.5-51):** "Final conditions for the Fernald Property would include a paved access drive, stormwater management area, valve chamber, and top-of-shaft structure in the western portion of the site, and a paved access drive, stormwater management area, and valve chamber adjacent to the site entrance at Waverly Oaks Road. Tree planting and landscaping will be coordinated with the City of Waltham and community stakeholders during final design. Trees and plantings native to the area will be planted to mitigate the impact of the tree removal required during construction." Note: Fernald Property **DEIR Chapter 3, Figure 3.8-1 (pg. 3-77),** and **DEIR Chapter 3, Figure 3.8-2 (pg. 3-79)** are based on and have the same extents as were presented to the City Council in June 2021 and the Mayor of Waltham as recently as Summer 2022. Both temporary and permanent easements or takings were presented at that time. As described in the Certificate on the DEIR, the Secretary required that the SDEIR identify and analyze alternative sites for the terminus of the proposed North Tunnel alignment in place of the DEIR Fernald Property site. In response to the Secretary's request, and in accordance with the scope outlined in the Certificate on the DEIR, new alternative sites were considered for the terminus of the proposed North Tunnel alignment (See **SDEIR Chapter 2, Alternatives**). The Lower Fernald Property was suggested by the City of Waltham in February 2023 as a potentially suitable site to serve as a replacement for the portion of the Fernald Property depicted in the DEIR. The revised location is adjacent to the Chapel Road/Waverley Oaks intersection. The extent of potential temporary and permanent impacts to the Lower Fernald Property were sent to the City of Waltham in March 2023. The SDEIR includes an evaluation of impacts. **SDEIR Chapter 2, Figure 2-3 (pg. 2-6) and Figure 2-4 (pg. 2-12)** show the temporary and permanent conditions in this area.

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
6-5	The Mayor has advised the MWRA that the City will not allow anything outside of the roadways located on the Fernald property. The work proposed, however, goes well beyond those roadways.	DEIR Fernald Property **DEIR Chapter 3, Figure 3.8-1 (pg. 3-77),** and **DEIR Chapter 3, Figure 3.8-2 (pg. 3-79)** are based on and have the same extents as were presented to the City Council in June 2021 and the Mayor of Waltham as recently as Summer 2022. Both temporary and permanent easements or takings were presented at that time. In response to the scope of the DEIR Certificate, MWRA evaluated additional sites for the terminus of the northern tunnel. Site Schematic and Final Conditions figures for these new sites, the UMass Property and the Lower Fernald Property, can be found in the SDEIR. See **SDEIR Chapter 2, Figure 2-1 (pg. 2-4), Figure 2-2 (pg. 2-6), Figure 2-3 (pg. 2-10),** and **Figure 2-4 (pg. 2-12)**.
6-6	Furthermore, the MWRA was advised that the land south of the Fernald incinerator is highly contaminated and not appropriate for a water project.	The proposed water system facilities at the Fernald property are not located within the limit of the activity use limitation (AUL) associated with the Fernald Center Power Plant located on the south side of Chapel Road. However, the DEIR addresses the potential for encountered contamination should any be encountered in the following sections: • **DEIR Section 4.8 Hazardous Materials, Materials Handling, and Reuse, Section 4.8.5, Construction Period Impacts (pg. 4.8-51)**: - “The approximately 8,000 cubic yards of soil generated during the construction of the receiving shaft at the Fernald Property would likely contain measurable concentrations of Oil and Hazardous Material (OHM) requiring proper management during construction.” - “Mitigation measures would need to be implemented during the discharge to these wetlands to avoid exacerbating the contaminated sediments.” - “Due to the potential to encounter impacted groundwater during construction, dewatering effluent treatment and a USEPA NPDES Dewatering and Remediation General Permit (DRGP) would likely be required.” • **DEIR Section 4.8, Section 4.8.7, Avoidance, Minimization, and Mitigation Measures (pg. 4.8-60)**: - “A Program-wide Soils and Materials Management Plan (SMMP) would be developed during final design to manage contaminated materials encountered during construction.” - “Properties with confirmed OHM impacts would be managed in accordance with the MCP, 310 CMR 40.0000, the Program-wide SMMP, and associated policies or guidance issued by MassDEP. Depending on the type and

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
		concentrations of OHM present at a property, other federal regulations implemented by the USEPA may apply (e.g., Comprehensive Environmental Response, Compensation, and Liability Act of 1980)." - "If these hazardous materials were found to be present in the structures, they would be removed in accordance with state regulations by a licensed contractor and disposed of at a licensed receiving facility." - "Based on the existing conditions assessment, a DRGP would likely be required for overburden excavations at the Fernald School." - "In all cases, contract documents would require that groundwater collected at each construction site be treated prior to discharge to meet applicable regulatory requirements. Depending on site-specific conditions such as the existing groundwater quality and the dewatering methods selected by the contractor, groundwater management protocols would include siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary, to meet discharge state and federal permits requirements." The SDEIR includes evaluation of two additional sites for the terminus of the northern tunnel, the UMass Property and the Lower Fernald Property. **SDEIR Chapter 13, Hazardous Materials, Materials Handling, and Recycling, Section 13.2.2, Construction Period Impacts (pg. 13-13)** and **SDEIR Section 13.2.4, Avoidance, Minimization, and Mitigation Measures (pg. 13-17)** provide information regarding handling of hazardous material should any be encountered at these sites, as summarized below: - Approximately 5,000 cubic yards of soil generated during the construction of the receiving shaft at the Lower Fernald Property would likely contain measurable concentrations of OHM requiring proper management during construction. - Approximately 12,300 cubic yards of soil generated during the construction of the large connection shaft at the UMass Property, a portion of which would likely contain measurable concentrations of OHM requiring proper management during construction. - Based on the existing conditions assessment, a DRGP would likely be required for at both the Lower Fernald and UMass Properties.

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
		- A Program-wide SMMP would be developed during final design to manage contaminated materials encountered during construction. - Properties with confirmed OHM impacts would be managed in accordance with the MCP, 310 CMR 40.0000, the Program-wide SMMP, and associated policies or guidance issued by MassDEP. Depending on the type and concentrations of OHM present at a property, other federal regulations implemented by the USEPA may apply (e.g., Comprehensive Environmental Response, Compensation, and Liability Act of 1980). - In all cases, contract documents would require that groundwater collected at each construction site be treated prior to discharge to meet applicable regulatory requirements. Depending on site specific conditions such as the existing groundwater quality and the dewatering methods selected by the contractor, groundwater management protocols would include siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary, to meet discharge state and federal permits requirements. In addition to the mitigation measures outlined in the DEIR and this SDEIR, the dewatering discharge points for all three locations (i.e., Fernald, Lower Fernald, and UMass Properties) are located downgradient from the identified limits of the ash contamination and would be unlikely to exacerbate the levels of contamination. Furthermore, the new deep rock tunnels will be a closed system and the source of the public water is from the Quabbin Reservoir. Overburden groundwater, whether contaminated or not, from launching and receiving sites, such as what is proposed at the Fernald Property, the Lower Fernald Property, and the UMass Property, will not be able to migrate into and affect the quality of water conveyed within the rock tunnel system.

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
6-7	There is state-owned land to the south of the Fernald site, some of which is contaminated and some of which is not, yet it is not proposed for the placement of the project.	As described in the Certificate on the DEIR, the Secretary required that the SDEIR identify and analyze alternative sites for the terminus of the proposed North Tunnel alignment in place of the DEIR Fernald Property site. In response to the Secretary's request, and in accordance with the scope outlined in the Certificate on the DEIR, new alternative sites were considered for the terminus of the proposed North Tunnel alignment (See **SDEIR Chapter 2, Alternatives**). There is state-owned land under the care and control of the University of Massachusetts located to the south of the Fernald Property. MWRA evaluated this UMass Property Site as a large connection in the SDEIR. This site is included two alternatives, including the Preferred Alternative. See **SDEIR Section 2, Alternatives Analysis** for an overview of this site. The environmental resources in the study area associated with the UMass Property site and the Lower Fernald Property site are depicted for each environmental resource category in each respective technical resource chapter of the SDEIR as listed below. • **Chapter 1 – Program Description and Permitting** • **Chapter 2 – Alternatives Analysis** • **Chapter 3 – Environmental Justice and Outreach** • **Chapter 4 – Land Alteration and Article 97** • **Chapter 5 – Wetlands and Waterway/appendix** • **Chapter 6 – Water Supply and Water Management Act/appendix** • **Chapter 7 – Climate Change/appendix** • **Chapter 8 – Air Quality and GHGs/appendix** • **Chapter 9 – Transportation/appendix** • **Chapter 10 – Rare Species** • **Chapter 11 – Noise and Vibration** • **Chapter 12 – Cultural Resources/appendix** • **Chapter 13 – Hazardous Materials** • **Chapter 14 – Mitigation**

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
6-8	The Fernald property has been in a process within the City to identify possible City uses, whether for housing, recreation, or other uses and is currently poised for bidding for open space, recreation, the arts, nature and athletic areas. Without information as to the MWRA's proposed usage and the areas within which such long-term usage is to be proposed, the Fernald property re-use is adversely impacted. The MWRA should be required to identify its proposed long-term use so that the City will be able to determine whether it will allow such use and whether the use proposed will harm the City's long-term plans for the Fernald.	Short-term and long-term uses of the Fernald Property are shown on **DEIR Chapter 3, Figure 3.8-1 (pg. 3-77),** and **Figure 3.8-2 (pg. 3-79)**, with additional detail provided in the discipline-specific sections of the DEIR. These figures are based on and have the same extents as were presented to the City Council in June 2021 and the Mayor of Waltham as recently as Summer 2022. The DEIR Fernald Property was evaluated as a receiving site for the North Tunnel, Segment 1, in DEIR Alternatives 3, 4, and 10. As described in **DEIR Section 4.5.6.1, Alternative 3 (pg. 4.5-51)**, final conditions for the DEIR Fernald Property site were anticipated to include a paved access drive, stormwater management area, valve chamber, and top-of-shaft structure in the western portion of the site, and a paved access drive, stormwater management area, and valve chamber adjacent to the site entrance at Waverley Oaks Road As described in the Certificate on the DEIR, the Secretary required that the SDEIR identify and analyze alternative sites for the terminus of the proposed North Tunnel alignment in place of the DEIR Fernald Property site. In response to the Secretary's request, and in accordance with the scope outlined in the Certificate on the DEIR, new alternative sites were considered for the terminus of the proposed North Tunnel alignment (See **SDEIR Chapter 2, Alternatives**). The Lower Fernald Property was suggested by the City of Waltham in February 2023 as a potentially suitable site to serve as a replacement for the portion of the Fernald Property depicted in the DEIR. The revised location is adjacent to the Chapel Road/Waverley Oaks intersection. The extent of potential temporary and permanent impacts to the Lower Fernald Property were sent to the City of Waltham in March 2023. The SDEIR includes an evaluation of impacts **SDEIR Chapter 2, Figure 2-3 (pg. 2-10)** and **Figure 2-4 (pg. 2-12)** how the temporary and permanent conditions in this area.

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
		Temporary construction facilities on the Lower Fernald Property site are anticipated to include trailers, parking areas, on-site temporary excavated material storage area, additional staging area for working adjacent to shaft construction, a temporary groundwater discharge pipe and a water treatment facility. As shown on **SDEIR Chapter 2, Figure 2-4 (pg. 2-12)** and as described in **SDEIR Chapter 2,** the Lower Fernald Property in its final condition would include a fenced in area surrounding the proposed receiving shaft, a paved driveway and parking area, bollards, an access gate, a stormwater basin, and landscaping. The permanent facilities would be contained within an approximately 1.4-acre area surrounded by a chain link fence. The concrete top of shaft structure would extend not more than 3 feet above ground surface. A buried pipeline approximately 100 feet long would exist underground from the valve chamber out to Waverley Oaks Road to connect to the existing WASM3. Permanent access to the site would be provided via a new paved driveway from Chapel Road.
6-9	The City reserves its rights with respect to use of municipal property - the Fernald as well as all other City-owned property- to review, accept or reject the MWRA's plans for such City-owned land once the MWRA has finished its testing.	Comment noted. The MWRA will continue to work with the City to determine plans acceptable to both parties.
6-10	While the MWRA, by filing this DEIR, is trying to advance the permitting of its project, it has only provided the City with schematic summaries and it is not and should not be at the permitting stage.	MWRA believes that the Program is at the environmental review and permitting stage. The DEIR identified the extents for both temporary and final conditions for all sites. These sites would not be impacted by results of the geotechnical investigation and are therefore not subject to change, so are at an appropriate stage to be evaluated for permitting. Over the last several years, the MWRA has met with the City of Waltham to discuss aspects of the Program that may impact the City. These meetings will continue in the future in order to advance this significant Program.
6-11	The MWRA also proposes to locate one of its tunnel shafts on the Fernald property and traffic disruption is expected to extend into the adjacent public ways. The MWRA should be required to identify the expected traffic disruption to be caused thereby and its proposed methods of mitigating same.	The DEIR addressed overall traffic impacts and potential mitigation measures at the Fernald Property. The SDEIR further addresses and updates, where needed, overall traffic impacts and potential mitigation measures at the Lower Fernald Property as noted below. As design evolves, it's anticipated that MWRA and the City will have more detailed discussions about lane closures, timing, traffic management plans through the Street Opening Permit process.

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
		• • **SDEIR Appendix E.1, Updated Transportation Impact Assessment:** Traffic volumes and durations during construction were estimated and are presented. • • **SDEIR Chapter 9, Transportation, Section 9.2.1, Transportation Existing Conditions (pg. 9-4),** and **Section 9.2.2 Transportation Construction Period Impacts (pg. 9-17):** Several intersections in Waltham were studied to evaluate the potential impact of the Tunnel Program construction. • • **SDEIR Section 9.2.2.7 Alternative 10A Surface Piping Construction Period Traffic Impacts (pg. 9-48)**: "A surface pipe is proposed between the proposed valve chamber at Lower Fernald Property and the existing MWRA pipeline along Waverley Oaks Road. This connection may require a short-term detour along Waverley Oaks Road, which is functionally classified as an urban principal arterial. Work would be performed during off-peak hours to minimize the disturbance to traffic operations." • • **SDEIR Section 9.2.4, Transportation Avoidance, Minimization, and Mitigation Measures (pg. 9-51)** and **Chapter 9, Table 9-9 (pg. 9-38):** Transportation impacts and potential mitigations are presented.

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
6-12	The MWRA has indicated that it plans to locate a portion of the project within School Street. The MWRA has indicated that it estimates this portion of the work to take approximately 3 months to complete. School Street is a major street within the City of Waltham, running parallel to Main Street and adjacent to the City's central downtown area. A disruption of traffic on this street for the period contemplated by the MWRA must be fully analyzed and specific methods of addressing traffic issues should be detailed to minimize, to the greatest extent possible, the impact on the City's downtown traffic.	The DEIR addressed overall traffic impacts and potential mitigation measures along School Street as noted below. As design evolves, it's anticipated that MWRA and the City will have more detailed discussions about lane closures, timing, traffic management plans through the Street Opening Permit process. • **DEIR Section 4.10.3.5, Surface Piping Construction Impacts (pg. 4.10-52):** "School Street - A surface pipe is proposed between the proposed valve chamber and the existing MWRA pipeline along School Street. Installation of this pipe may require a short-term detour along School Street, which is functionally classified as an urban collector. Construction would be expected to generate an average of 14 truck trips per day and take place for approximately 12 weeks. The duration of detours would be much shorter as they would not be needed for the entirety of work at this location." • **DEIR Section 4.10.4, Avoidance, Minimization, and Mitigation Measures (pg. 4.10-117):** "To minimize disturbance to traffic, the surface pipe along School Street would be installed largely during off-peak hours. Traffic would be maintained in at least one direction whenever possible."
6-13	The MWRA has indicated that it is proposing haul routes based upon shortest distances to highways but wants to work with the City on this. As currently proposed, the MWRA has stated that mitigation of impacts of the haul routes consists of proposals to adjust traffic signal timing at two intersections on Main Street. The MWRA must further identify the impacts of use of Main Street as a haul route, including potential traffic delays for regular users of that street, and alternative haul routes with their attendant traffic impacts must be identified. A determination of the actual route to be used is necessary before the City can fully comment.	MWRA's proposed haul routes presented in the DEIR and SDEIR are conceptual and will serve as the basis of ongoing discussion with the City of Waltham. These conceptual haul routes were based on routing along the most direct routes to the interstates and minimizing traffic on local roads. Alternative haul routes to Main Street would require directing traffic to smaller, unsignalized streets, with more potential for disruption to adjacent residents and businesses. Haul Routes are detailed in: • **DEIR Figures 4.10-8 (pg. 4.10-21)** and **4.10-9 (pg. 4.10-23)** in **Chapter 4.10** • **SDEIR Table 9-1 (pg. 9-3)** and **Figure 9-2 (pg. 9-9)** and **Figure 9-3 (pg. 9-11)** in **Chapter 9** Traffic impacts along these haul routes are detailed in:

Table 15-8 Response to Comments from the City of Waltham

#	Comment	Response
		• **Program-Generated Construction Vehicle Trips: DEIR Chapter 4, Figure 4.10-20 (4.10-54), Figure 4.10-26 (pg. 4.10-65),** and **Figure 4.10-32 (pg. 4.10-78),** and **SDEIR Chapter 9, Figure 9-4 (pg. 9-19)** and **Figure 9-5 (pg. 9-21)** • **SDEIR Chapter 9, Table 9-6 (pg. 9-25):** Intersection Operational Analysis Results: Morning Peak Hour • **SDEIR Chapter 9, Table 9-7 (pg. 9-27):** Intersection Operational Analysis Results: Evening Peak Hour • **SDEIR Section 9.2.2 Transportation Construction Period Impacts (pg. 9-17):** Includes discussion of the expected increase in delay at both Main Street intersections for SDEIR Alternatives 3A/Alternative 4A (**SDEIR pg. 9-16**), and 10A (**SDEIR pg. 9-21**) Operational analysis results with adjusted traffic signal timing for Alternatives 3A, 4A, and 10A (SDEIR Table E.2-1 and E.2-2). As shown, after adjusting traffic signal timings, delays are generally reduced compared to the unadjusted Build conditions.
6-14	On an important note, the City has worked with the MWRA and a private property owner to facilitate the MWRA's acquisition of private property on School Street for its tunnel project, but the MWRA still is not providing sufficient information to the City for it to make informed comments.	MWRA appreciates the City of Waltham's continued ongoing coordination. The MWRA will continue to provide Waltham with Program information and is always willing to meet with the City Officials and personnel to answer any questions regarding the Program and MWRA's land use plans.

TOWN OF NEEDHAM
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December 9, 2022

Attn: MEPA Office
Project No. 16355
Metropolitan Water Tunnel Program

Ms. Bethany A. Card
Secretary of Energy and Environmental Affairs
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Ms. Tori Kim
Director
Massachusetts Environmental Policy Act Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: Project No. 16355
Metropolitan Water Tunnel Program

Dear Secretary Card, Director Kim, et. al.,

The Town of Needham respectfully submits these comments on the Massachusetts Water Resources Authority (MWRA)'s Draft Environmental Impact Report (DEIR) for the Metropolitan Tunnel System Program (the "Project"). As outlined in the DEIR, the MWRA proposes to construct approximately 14 miles of two new deep rock tunnels that will provide redundancy for the MWRA's existing Metropolitan Tunnel System. The Preferred Alternative (Alternative 4) for the Project calls for the construction of a secondary shaft and pump station in Needham at St. Mary Street. The MWRA also proposes two launching sites and receiving area near the Highland Avenue and I-95 Interchange in Needham.

The Town's comments are as follows:

General Project Design

The Town seeks further clarity on why the MWRA proposes two launching sites within the Town of Needham. The Town is inquiring as to whether the MWRA could reduce the number of launching sites and still achieve its overall objective of the Project. 7-1

The DEIR indicates that work will be conducted in the southwestern portion of the 1-95 cloverleaf in Needham. However, it is unclear whether trees or vegetation will need to be removed to perform work within this area and, if so, whether MWRA has a plan for restoration. 7-2

Security at the construction sites is critical. The DEIR does not address what measures, if any, the MWRA will employ. The Town requests that at a minimum cameras and fencing be erected to protect the public. 7-3

The Town is also concerned on how this proposed tunnel construction activity will impact our Public Safety Departments (Fire and Police Departments). Tunnel construction is a specialized construction activity with deep 300 vertical foot shafts and limited access points. A detailed plan of what is expected or may be required from our first responders is necessary for evaluation should an emergency rescue or other situation arise within the proposed tunnel. 7-4

General Construction

The DEIR does not provide sufficient information relative to the construction schedule. The St. Mary Street Pumping Station is located within a residential neighborhood. The Town requests that the MWRA provide a detailed construction management plan outlining the hours of proposed work relative to site setup, vehicle and employee mobilization, construction activities, equipment-laydown, and decommissioning at the St, Mary Street and I-95/Highland Ave cloverleaf sites. 7-5

It is unclear from the materials whether drilling and blasting is necessary at all shafts in the Project. To the extent that the St. Mary Street Pumping Station necessitates this construction method, the MWRA should clarify when (hours and frequency) the construction work will occur. 7-6

The DEIR does not provide information relative to the procurement of additional power from Eversource. While more power will be needed, no data is provided relative to the manner in which the power will be routed to the I-95/Highland Ave cloverleaf and the St. Mary construction site. A map showing the location of any temporary power lines or underground construction should be included. The MWRA should also provide information relative to the construction of these additional energy facilities (timing, traffic impacts, hours, etc.). 7-7

The Town requests that the MWRA specify whether the laydown and storage area for the tailings has been determined and, if so, where it will be located at all areas for excavation in Needham. Information relative to the storage, delivery, and removal methods should also be provided. 7-8

The DEIR recognizes the presence of hazardous materials in certain portions of the
Project area (Section 4.2.4). However, the DEIR does not adequately outline its process to 7-9
address and manage storage of, contamination from, or discovery ofhazardous materials that may
be encountered during the construction phase in either the soil or the groundwater. A plan should
be developed prior to construction to ensure safe handling of contaminants. A pest control plan 7-10
should also be incorporated into the Project.

Existing and Known Infrastructure Impacts

The DEIR lacks sufficient information to ascertain the impact of the Project on the
Town's existing infrastructure (road/pipelines/structures). The DEIR does not specify whether
pre-construction and pre-blast surveys will be performed on all structures and if so, at what 7-11
radius from the site. The Town requests that the MWRA identify who will be performing this
survey work and whether the company performing the work will be independent of the
contractors for the underlying Project. The DEIR should also clarify what measures will be
implemented to ensure that the Town's infrastructure will be protected during the pendency of 7-12
the Project.

Finally, a large development project is planned at 557 Highland Avenue. The DEIR is
silent as to the impacts of the tunneling on this site, which will be undergoing significant 7-13
construction anticipated for 2023 – 2025.

Noise Impacts

The Town requests additional information relative to the planned noise studies. The
MWRA should clarify when it intends to obtain the baseline data (time of day and year), who 7-14
will perform those readings, the methodology for collecting baseline, and the locations of the
baseline monitors. The Town is also interested in better understanding the anticipated radius of 7-15
noise impacts and if the Eliot Elementary School on Central Avenue falls within that area.

Dewatering Pipe

The proposed project includes the siting of a 36-inch diameter dewatering pipeline
between the tunnel boring machine insertion location on I-95 to the discharge point at the
Charles River. The DEIR does not elaborate on whether the MWRA considered alternatives to
this route, including a potential shorter route for this pipeline segment. The DEIR does not 7-16
provide sufficient detail on how the pipe will be installed and how the Town's existing utilities
and infrastructure will be protected throughout this process. Additional details relative to this
pipeline segment is requested.

Water Supply

The DEIR should define the pipeline, shaft, and tunnel diameters in area around the St. 7-17
Mary Street Pumping Station. The Town requests clarification on whether a redundant
connection to the Town of Needham's public water supply facility will be performed as part of 7-18
this water supply improvement or whether that connection will be tied-in directly to the

MWRA's existing Section 80 water main. The Town is also interested in understanding whether the new tunnel line will provide enough flow and volume for a potential future connection between Needham and Dover. 7-19

Additionally, the DEIR does not explain the tunnel's impact on groundwater elevation in Needham. As part of this Project, the MWRA should monitor groundwater levels to ensure that Needham's public water supply is not negatively impacted by the proposed work. Impacts to the Town's public water supply, capacity, volume, and quality should be fully explored as part of this environmental review. 7-20

__Traffic__

The MWRA proposes to direct traffic from the St. Mary Street Pumping Station down Central Avenue and up Cedar Street through Wellesley to connect to I-95. There are three elementary schools located along Central Avenue between Cedar Street and High Rock Street in Needham, including Eliot Elementary School located at 135 Wellesley Avenue off Cedar Street. While each of the schools has staggered start and finish times the areas around each school experience increased pedestrian (student walkers/bikers) and automobile traffic during school drop off and pick up (8:30 am - 3:10 pm). Couple this with commuter traffic, the Town does not recommend that Central Avenue be used as a designated haul route during the periods when the school year is in session. 7-21

Additionally, the DEIR does not provide sufficient detail on the hours of truck traffic through the Town. This information is important to fully understand the impacts to the local roadways and the residential neighborhood surrounding the St. Mary Street Pumping Station. 7-22

The traffic analysis does not consider the planned large-scale development of 557 Highland Avenue. It is unclear from the MWRA's DEIR whether the traffic from a fully developed 557 Highland Avenue has been factored into the Authority's analysis for the Project. 7-23

__Environmental Justice Issues__

The Town is concerned about the Project's impacts on the environmental justice communities near the St. Mary Street Pumping Station and the residents of the Needham Housing Authority. The DEIR should expand on what actions the MWRA plans to utilize to protect those residing in this area. 7-24

__Communication Plan__

The Town requests that the MWRA develop a clear communication plan to ensure that all individuals living within a half mile of St. Mary Street and the Highland Avenue and I-95 Interchange launching and receiving area, along with abutters to the haul routes, are kept fully apprised of all project developments. Individuals should be able to obtain the materials in their requested language. 7-25

****

The Town appreciates MEPA and the MWRA taking the time to review these comments and looks forward to working collaborative with the Authority as this Project progresses.

Sincerely,

Kate Fitzpatrick

Kate Fitzpatrick
Town Manager

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15.17 Responses to Letter 7: Town of Needham

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-1	The Town seeks further clarity on why the MWRA proposes two launching sites within the Town of Needham. The Town is inquiring as to whether the MWRA could reduce the number of launching sites and still achieve its overall objective of the Project.	The preferred alternative and both back up alternatives include launching tunnel boring machines (TBMs) in two directions from two separate launching shaft sites at the Highland Ave interchange. Separation of launching shaft sites for the two distinct tunneling directions allows the most flexibility with regard to contract packaging and corresponding construction sequence. The DEIR and SDEIR impact assessments are based on conservative construction packaging and construction sequencing. Selection of construction packaging and phasing (by the MWRA during later stages of design) and construction sequence (by the selected contractor) could result in a reduction (i.e., consolidation) of launching shaft sites at the Highland Ave interchange. These selections require careful consideration of several factors including but not limited to construction interfaces, schedule impacts, costs, and land availability. The MWRA will incorporate the Town of Needham in the decision-making process.
7-2	The DEIR indicates that work will be conducted in the southwestern portion of the I-95 cloverleaf in Needham. However, it is unclear whether trees or vegetation will need to be removed to perform work within this area and, if so, whether MWRA has a plan for restoration.	Temporary construction work associated with the Highland Avenue Northwest/Southwest launching site in SDEIR Alternatives 4A and 10A (DEIR Alternatives 4 and 10) would include tree and vegetation removal in the southwest cloverleaf of the interchange between I-95 and Needham Highland Avenue. Work at the southwest portion of the Highland Ave/I-95 cloverleaf is currently planned as part of the shaft construction work at the northwest cloverleaf. No shaft or permanent infrastructure will be constructed at the southwest cloverleaf. Use of the southwest cloverleaf is envisioned for construction trailers, parking, material stockpiles, etc. Depending on the extent of the area used some tree and vegetation removal will be needed. The MWRA would implement tree impact avoidance and protection strategies where feasible. The area will be restored after construction, including landscaping, in accordance with MassDOT and/or Town requirements.
7-3	Security at the construction sites is critical. The DEIR does not address what measures, if any, the MWRA will employ. The Town requests that at a minimum cameras and fencing be erected to protect the public.	Construction staging areas will be fenced with lockable gates during construction. Permanent facilities, where constructed, will be fenced with lockable gates and secured in accordance with MWRA security practices. Security cameras during construction can be installed. Cameras will be installed on permanent facilities in accordance with MWRA security practices.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-4	The Town is also concerned on how this proposed tunnel construction activity will impact our Public Safety Departments (Fire and Police Departments). Tunnel construction is a specialized construction activity with deep 300 vertical foot shafts and limited access points. A detailed plan of what is expected or may be required from our first responders is necessary for evaluation should an emergency rescue or other situation arise within the proposed tunnel.	The MWRA met (virtually) with Fire and Emergency personnel from four communities in January 2023 to begin coordination of Public Safety for the tunnel program. The Town of Needham Fire Department was in attendance. It was discussed that coordinated emergency response plans will be needed in the event of an emergency within the tunnels or shafts given the unique safety requirements for the work. The MWRA intends to support Public Safety, Fire and Emergency personnel with the resources, equipment, and training necessary to respond in coordination with the selected contractor to such an emergency. Additional meetings and coordination with all applicable municipal Public Safety departments are planned and will continue through design and into construction.
7-5	The DEIR does not provide sufficient information relative to the construction schedule. The St. Mary Street Pumping Station is located within a residential neighborhood. The Town requests that the MWRA provide a detailed construction management plan outlining the hours of proposed work relative to site setup, vehicle and employee mobilization, construction activities, equipment-laydown, and decommissioning at the St. Mary Street and I-95/Highland Ave cloverleaf sites.	Construction on the first tunnel segment is anticipated to begin in 2027 with construction of all segments complete and the new tunnel system in service by 2040. Refer to **DEIR Chapter 1, Program Description and Permitting, Section 1.3, Program Schedule and Phasing (pg. 1-12)** and **SDEIR Chapter 1, Program Description and Permitting, Section 1.3, Program Schedule and Phasing (pg. 1-5)**. The shaft at the St. Mary Street site is envisioned to be constructed using the raised bore method, which is predominantly daytime work. Exact hours will be determined through the local permitting process for this site. While the Highland Avenue/I-95 site would include periods of 24-hour work, the overnight shift would generally be for maintenance with mostly on-site activities. Work hour restrictions will be determined through the MassDOT permitting process and in coordination with the Town. 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 included in the contract documents and serve as the basis for a Construction Management Plan (CMP) to be prepared by the Contractor. The CMP will further detail construction and contractor measures to avoid, minimize, and mitigate potential traffic disruptions, and potential air quality and noise impacts. The CMP will document requirements for the contractors to accept and follow prior to construction activities beginning.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-6	It is unclear from the materials whether drilling and blasting is necessary at all shafts in the Project. To the extent that the St. Mary Street Pumping Station necessitates this construction method, the MWRA should clarify when (hours and frequency) the construction work will occur.	Drilling and blasting is not anticipated at the St. Mary Street Pumping Station site for shaft construction. It is envisioned that drilling upwards from the tunnel with a raised bore method (bottom-up) will be used at this site for shaft construction through rock. Limited controlled blasting or non-blasting rock removal methods may be required to reach the bottom of excavation for the valve chamber or connection piping. Construction at the St. Mary Street Pumping Station site will occur during normal daytime hours and in accordance with Town requirements.
7-7	The DEIR does not provide information relative to the procurement of additional power from Eversource. While more power will be needed, no data is provided relative to the manner in which the power will be routed to the I-95/Highland Ave. cloverleaf and the St. Mary construction site. A map showing the location of any temporary power lines or underground construction should be included. The MWRA should also provide information relative to the construction of these additional energy facilities (timing, traffic impacts, hours, etc.).	MWRA has been coordinating closely with Eversource regarding power needs for launching TBMs at the Highland Avenue interchange. It is MWRA's understanding that Eversource is planning to install new infrastructure from existing substations, while utilizing as much existing infrastructure as possible to minimize disruption. The exact location of the power source substation has not been identified at the time of this SDEIR, nor the routing of the power cables to the launch shaft locations at the Highland Avenue site. The information will be available when Eversource completes its analysis and will be provided to the Town of Needham for review and approval through the normal permitting process for their street work. MWRA will continue coordination with both Eversource and the Town of Needham as design progresses.
7-8	The Town requests that the MWRA specify whether the laydown and storage area for the tailings has been determined and, if so, where it will be located at all areas for excavation in Needham. Information relative to the storage, delivery, and removal methods should also be provided.	Limited temporary storage of excavated rock material (or tailings) will be provided at each launching or receiving shaft site including those at the Highland Ave interchange in Needham in order to accommodate the difference between individual daily shaft and tunnel excavation rates and daily hauling rates. Excavated material will be hauled from the shaft sites approximately daily during excavation phases and taken to an off-site, not yet determined, final disposal site. At this time the final disposal site(s) are not anticipated to be in Needham. No storage of excavated rock material from shaft construction is needed at the St. Mary Street Pumping Station site since the raised bore method (bottom-up) will be used at this site for shaft construction through rock.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-9	The DEIR recognizes the presence of hazardous materials in certain portions of the Project area (Section 4.2.4). However, the DEIR does not adequately outline its process to address and manage storage of, contamination from, or discovery of hazardous materials that may be encountered during the construction phase in either the soil or the groundwater. A plan should be developed prior to construction to ensure safe handling of contaminants.	A plan will be developed prior to construction to ensure safe handling of any contaminants encountered as part of the work. It is envisioned that the plan will include provisions to identify and stockpile excavated material based on visual, olfactory, or testing criteria. In the event contaminated excavate is encountered, the material will be segregated, secured, and tested for disposal in accordance with state and local regulations. Groundwater collected as part of construction dewatering activities will be treated in accordance with applicable permits prior to discharge. As described in **DEIR Chapter 4, Section 4.8, Hazardous Materials, Materials Handling, and Reuse, Section 4.8.5, Construction Period Impacts (pg. 4.8-51),** "The contractor would be responsible for finding suitable locations for reuse or disposal of excavated material from the tunnel excavation. Protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so that it can be handled appropriately and disposed of at suitable locations. Most of the excavated material from all three DEIR Alternatives is anticipated to be clean, crushed rock, which could be reused beneficially at other locations." The same would be applicable under the SDEIR alternatives.
7-10	A pest control plan should also be incorporated into the Project.	A pest control plan will be part of the Program and implemented at all construction sites.
7-11	The DEIR lacks sufficient information to ascertain the impact of the Project on the Town's existing infrastructure (road/pipelines/structures). The DEIR does not specify whether pre-construction and pre-blast surveys will be performed on all structures and if so, at what radius from the site. The Town requests that the MWRA identify who will be performing this survey work and whether the company performing the work will be independent of the contractors for the underlying Project.	Existing infrastructure (roads/pipelines/structures) near each shaft site will be evaluated for potential impact from construction. Instrumentation, including seismographs and settlement monitoring points, and monitoring of select infrastructure will be implemented. Monitoring plans including alert/action and maximum limits for various monitoring devices will be developed during final design. Pre-construction and pre-blast surveys will be offered to owners of structures near the shaft sites. The radius of these surveys will be determined in consultation with the respective Fire Department but typically are not less than 500 ft. These surveys will be performed by a qualified consultant contracted directly to the MWRA or through a Construction Manager who will be directly contracted to the MWRA.
7-12	The DEIR should also clarify what measures will be implemented to ensure that the Town's infrastructure will be protected during the pendency of the Project.	MWRA will implement limit vibration, perform pre-construction and pre-blast surveys within a defined radius (to be determined in consultation with the respective Fire Departments). Additional information is provided in **Response to Comment 7-11**.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-13	A large development project is planned at 557 Highland Avenue. The DEIR is silent as to the impacts of the tunneling on this site, which will be undergoing significant construction anticipated for 2023 – 2025.	MWRA is aware of the planned development at 557 Highland Avenue, located west of the Highland Avenue and I-95 interchange, and will continue to follow the development to understand any potential impacts that Program tunneling may have on the site. As described in **DEIR Chapter 3, Alternatives, Sections 3.8.4.6, Highland Avenue Northwest Receiving (pg. 3-97)** and Section **3.8.4.7, Highland Avenue Northwest/Southwest Launching (pg. 3-105),** the MWRA proposes to use the northwest cloverleaf of the Highland Avenue and I-95 interchange for a receiving shaft site in SDEIR Alternative 3A and proposes to use both the northwest and southwest cloverleafs for a launching shaft site in SDEIR Alternatives 4A and 10A (the northwest cloverleaf would be used for the launching shaft site while the southwest cloverleaf would be used for temporary construction staging). The Program site is separated from the planned development at 557 Highland Avenue by the on-ramp connecting Highland Avenue westbound traffic to I-95 South and by the off-ramp connecting I-95 South to Highland Avenue (westbound). Based on information available on the project's website (https://557highland.com/), the development, known as the Highland Innovation Center, is planned to include roughly 500,000 square feet of combined office, laboratory, research and development, and retail and/or restaurant uses. The site is also proposed to include below-grade parking, a stand-alone parking garage structure, and a multi-use fitness/access walkway around the site. Construction of the Highland Innovation Center is planned to be complete in 2025, prior to the commencement of MWRA's proposed work (2027). The proposed location of the shaft site is more than 300 feet east of a planned building at 557 Highland Avenue that may contain laboratory equipment per design drawings dated August 2022 on the project's website. The laboratory building is assumed to include typical laboratory equipment that has a sensitivity to vibration consistent with the General Vibration Criteria VC-A curve (0.002 inches per second root-mean square (RMS)). To assess the potential for impact inside the building, vibration levels from Program-related construction activities were estimated. A potential impact to a laboratory (VC-A curve) within a large masonry/steel building would be present when impact pile driving takes place within 216 feet.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
		Since the proposed shaft location would be more than 300 feet from the Highland Innovation Center development, exterior vibration levels would be below the threshold for potential structural damage; therefore, no potential vibration impact would be anticipated. To assess the potential for impact inside the building, vibration levels from Program-related construction activities were estimated. A potential impact to a laboratory (VC-A curve) within a large masonry/steel building would be present when impact pile driving takes place within 216 feet. Since the proposed shaft location would be more than 300 feet from the Highland Innovation Center development, exterior vibration levels would be below the threshold for potential structural damage; therefore, no potential vibration impact would be anticipated. As described in **DEIR Chapter 4, Noise and Vibration, Section 4.12.1.8, Noise Measurements (pg. 4.12-11),** monitoring at locations S12 and S13, as shown in **DEIR Chapter 4, Figure 4.12-7 (pg. 4.12-25)** to **Figure 4.12-9 (pg. 4.12-29)**, was conducted to determine ambient noise conditions near the Highland Avenue sites. Existing noise sources in the area include traffic on I-95, Highland Avenue, and 1st Avenue. The ambient daytime sound levels ranged from 54 to 62 dBA (Leq) and 51 to 56 dBA (L90) and nighttime sound levels ranged from 48 to 51 dBA (Leq) and 41 to 44 (L90) in the vicinity of the Highland Avenue sites. The day-night average noise level ranged from 56 to 61 dBA (Ldn). Interior noise conditions of the Highland Innovation Center buildings are anticipated to be at least 35 dBA quieter than the exterior noise levels. Therefore, noise generated by temporary Program-related construction activities is not anticipated to result in potential impacts. Construction noise avoidance, minimization, and mitigation measures would be implemented as practicable to minimize the potential for impacts to noise-sensitive receptors (see **SDEIR Chapter 11, Noise and Vibration, Section 11.2.4, Noise Avoidance Minimization, and Mitigation (pg. 11-180)**). As described in **DEIR Chapter 4, Section 4.11, Air Quality and Greenhouse Gas Emissions (pg. 4.11-1)**, no significant construction-related or final conditions impacts related to air quality or climate change exposure are anticipated as a result of construction-period activities or Program-related greenhouse gas (GHG) emissions at the Highland Avenue shaft site.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
		As described in the Response to Comment 7-24, vehicle trips associated with the planned development at 557 Highland Avenue have been added to the Updated Transportation Impact Assessment included in **SDEIR Appendix F.1, Updated Transportation Impact Assessment**. The estimated traffic volumes from this development have been incorporated into the future traffic volumes at the intersection of Central Avenue and Cedar Street in Needham. **SDEIR Appendix F.2, Table F.2-1 (pg. F.2-1)** and **Table F.2-2 (pg. F.2-5)** show the updated operational analysis for the future scenarios for the morning and afternoon peak hours, respectively
7-14	The Town requests additional information relative to the planned noise studies. The MWRA should clarify when it intends to obtain the baseline data (time of day and year), who will perform those readings, the methodology for collecting baseline, and the locations of the baseline monitors.	As described in **SDEIR Chapter 11, Section 11.2.4, Noise Avoidance, Minimization, and Mitigation (pg. 11-18)**, MWRA would require that the contractor develop and follow an Noise Control Plan (NCP) for the duration of the Program, and this SDEIR section includes an outline of key components of a NCP. The NCP would include noise level criteria that the contractor would have to meet, as well as a construction noise monitoring program. Prior to the start of work, the contractor would submit the NCP to the MWRA. The NCP would include preconstruction noise monitoring to help establish construction noise limits, estimates of construction noise levels during each phase of construction, alternative noise mitigation measures to be implemented by the contractor, procedures for noise measurements to confirm equipment noise emission levels, public outreach requirements, and an outline of a complaint resolution process. While the Draft NCP Outline does not specify what methods the contractor would need to deploy to meet the noise level criteria, the following are construction noise control methods and best practices that could be implemented at construction sites, as feasible and reasonable, where there would be potential construction noise impact: • Outfit construction equipment with noise-control features such as mufflers to avoid unnecessary noise. • Deploy properly functioning equipment and schedule maintenance to avoid louder operation associated with mechanical issues. • Locate especially noisy construction equipment, such as pumps and air compressors, away from sensitive receptor locations, as feasible. • Use quieter equipment and methods, as feasible, such as smaller backhoes and excavators, predrilling in lieu of or prior to pile driving during support of

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
		excavation, electric power instead of diesel-generators, and concrete saws to breakup pavement prior to excavation rather than hoe rams or jackhammers. • Where possible, perform certain construction activities during periods of the day that are less sensitive to noise (e.g., mid-day periods near residences or evening periods near schools). • Install temporary noise barriers around the perimeter of the equipment at the construction site or along the sides of the construction site that are adjacent to noise-sensitive receptors. Temporary noise barriers are often constructed using 3 to 4-foot-tall concrete highway barriers with plywood (3/4-inch or thicker) installed on top or chain-linked fencing with acoustical curtains. Noise barriers up to approximately 12 or 15 feet tall can be constructed using these materials. When noise barriers break the line-of-sight between the construction equipment and the receptors, they can reduce noise by 10 dBA or more. • Place smaller stationary equipment such as air compressors, generators, and pumps in portable acoustic enclosures. Enclosures around the shaft/tunnel pump system would be indicated when no other construction activities are slated to occur during the evening/nighttime hours to mitigate impacts to nearby receptors. • Maintain strong communication with the public regarding the Program and continue Program-specific public outreach to keep the public informed of the schedule of construction activities and to respond to potential concerns. • Provide site-specific information about the time and nature of construction activities to adjacent neighbors.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
		The above construction noise avoidance, minimization, and mitigation measures would be implemented as practicable to minimize the potential for impacts to noise-sensitive receptors. These measures are anticipated to be effective in keeping temporary construction-related noise to acceptable levels and minimizing the potential for adverse impacts. In particular, the installation of temporary noise barriers around equipment at Program construction sites that are adjacent to noise-sensitive receptors subject to adverse impacts, is anticipated to reduce noise by 10 dBA or more.[15] As part of the NCP, the MWRA would work the contractor to identify and implement site-specific mitigation measures where appropriate and as necessary to minimize potential adverse impacts to noise-sensitive receptors. **DEIR Chapter 4, Section 4.12, Noise and Vibration** includes preliminary noise analysis at sensitive receptors to the Highland Avenue interchange and to the St. Mary Street Pumping Station site (Refer to **DEIR Chapter 4, Figure 4.12-7 (pg. 4.12-25)** through **Figure 4.12-9 (pg. 4.12-29)** and **Figure 4.12-14 (pg. 4.12-41)** for locations). Ambient noise levels were measured during daytime and nighttime hours in February and March 2022 as the baseline. Exact locations and timing of additional baseline data will be established in final design to best correlate to planned activities. MWRA will work with the Town of Needham to identify additional receptors as needed.

15 The potential noise level reduction benefit provided by these mitigation measures at specific receptor locations would be based on the specific mitigation measure or best practice, the distance from the construction site, elevation and height of the source and receptor, and other considerations.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-15	The Town is also interested in better understanding the anticipated radius of noise impacts and if the Eliot Elementary School on Central Avenue falls within that area.	Eliot Elementary School, located at 135 Wellesley Avenue in Needham, is more than 2,500 feet (approximately 0.5-mile) southwest of the proposed St. Mary Street Pumping Station connection site and more than 3,500 feet (approximately 0.7-mile) northwest of the proposed Highland Avenue Northwest site. Given the distance between Eliot Elementary School and the Program sites, no potential noise impacts are anticipated. As described in **DEIR Section 4.12.1.6, Construction Noise Levels Methodology (pg. 4.12-7)**, the Federal Highway Administration's Roadway Construction Noise Model (RCNM)[16] includes a 7.5 dB reduction for each doubling of distance from the center of the construction site to account for sound levels reducing with distance over acoustically soft ground conditions. For example, if the construction noise emissions at a site was 90 dBA (Leq) at a distance of 50 feet, the construction noise levels at a receptor 200 feet away would be 75 dBA (Leq). For receptors where intervening objects such as buildings, terrain, or existing highway noise barriers would reduce noise from construction activities, a noise reduction of 5 to 10 dBA is included in the construction noise predictions, based on the geometry of the intervening objects.
7-16	The proposed project includes the siting of a 36-inch diameter dewatering pipeline between the tunnel boring machine insertion location on I-95 to the discharge point at the Charles River. The DEIR does not elaborate on whether the MWRA considered alternatives to this route, including a potential shorter route for this pipeline segment. The DEIR does not provide sufficient detail on how the pipe will be installed and how the Town's existing utilities and infrastructure will be protected throughout this process. Additional details relative to this pipeline segment is requested.	The MWRA considered routes for the dewatering pipeline that traversed the public way as well as private property. Although a shorter/more direct route could be taken, it would require construction across, and permanent easements on, private property, which would restrict future development/construction over the pipe and was deemed less desirable. The new dewatering pipeline will be constructed mostly using conventional trenching methods. Trenchless construction methods (e.g., pipe jacking or jack and bore) will be used where the pipeline crosses the highway ramp. Where the pipeline construction will cross or extend alongside existing utilities and infrastructure, a protection plan including monitoring will be developed.

16 Federal Highway Administration, "Roadway Construction Noise Model User's Guide", Report FHWA-HEP-05-054, January 2006.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-17	The DEIR should define the pipeline, shaft, and tunnel diameters in area around the St. Mary Street Pumping Station.	In the area of St. Mary Street Pumping Station, the excavated diameter of the tunnel will be no more than 15 ft and the final inside diameter of the tunnel will be not smaller than 10 ft. The shaft will be 9 ft diameter in rock with a 6 ft steel lined finish diameter. A 48-inch connection pipe with a tee to the existing Section 80 pipeline and existing Sudbury aqueduct is planned. Refer to **DEIR Section 3.8.5.4**, **St. Mary Street Pumping Station Connection (pg. 3-133)**.
7-18	The Town requests clarification on whether a redundant connection to the Town of Needham's public water supply facility will be performed as part of this water supply improvement or whether that connection will be tied-in directly to the MWRA's existing Section 80 water main.	The new shaft near the St. Mary Street Pumping Station will include a new 48-inch pipeline connecting to the existing Section 80 pipeline which supplies the Town's Pumping Station. Although this configuration does not provide a redundant connection directly to the Town's public water supply, it does provide a redundant source in that water can be supplied from the existing Metropolitan Tunnel System via approximately 15,000 ft of Section 80 or from the new MWTP South Tunnel and shaft near St. Mary Street Pumping Station via a very short section of Section 80. Refer to **DEIR Section 3.8.5.4**, **St. Mary Street Pumping Station Connection (pg. 3-133)**.
7-19	The Town is also interested in understanding whether the new tunnel line will provide enough flow and volume for a potential future connection between Needham and Dover.	The Town of Dover's water demand is small relative to the design capacity of the tunnel. It's likely that the tunnel can provide the necessary capacity, however the surface piping/distribution system would need to be evaluated to determine an acceptable route to convey water. Should Dover decide to seek Admission to MWRA, MWRA Operating Policy 10 would apply, including an approval from the Water Resource Commission for a new Interbasin Transfer.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-20	The DEIR does not explain the tunnel's impact on groundwater elevation in Needham. As part of this Project, the MWRA should monitor groundwater levels to ensure that Needham's public water supply is not negatively impacted by the proposed work. Impacts to the Town's public water supply, capacity, volume, and quality should be fully explored as part of this environmental review.	Groundwater inflow into the new tunnels and shafts will occur during construction. This groundwater inflow may temporarily affect water supply wells along the tunnel route during construction. Once constructed and in service, no permanent impacts to groundwater resources will occur from the new tunnel system. Public water supply wells located within 0.5 miles offset of each shaft site and the preliminary tunnel alignment were identified. The half mile offset was used to be conservative since geotechnical investigations are ongoing. No public water supply wells were identified within the 0.5 mile offset in Needham. Refer to **DEIR Chapter 4, Figure 5.4-13 (pg. 5-31)**. In addition, the construction documents will require probing and pre-excavation grouting from the tunnel heading in advance of tunnel excavation in areas of concern to reduce the volume of groundwater inflow into the tunnel which will help mitigate any potential impacts to water supply wells. Refer to **DEIR Chapter 5, Water Supply and Water Management Act, Section 5.5, Construction Period Impacts (pg. 5-55)** Regardless, a Water Supply Contingency Plan (**DEIR Appendix J, Draft Water Supply Contingency Plan**) details the process of identifying the location and pertinent information of nearby water supply wells, inspection prior to and monitoring during construction, as well as action levels, implementation timelines, and description of mitigation measures should construction impact a water supply well.
7-21	The MWRA proposes to direct traffic from the St. Mary Street Pumping Station down Central Avenue and up Cedar Street through Wellesley to connect to I-95. There are three elementary schools located along Central Avenue between Cedar Street and High Rock Street in Needham, including Eliot Elementary School located at 135 Wellesley Avenue off Cedar Street. While each of the schools has staggered start and finish times the areas around each school experience increased pedestrian (student walkers/bikers) and automobile traffic during school drop off and pick up (8:30 am - 3:10 pm). Couple this with commuter traffic, the Town does not recommend that Central Avenue be used as a designated haul route during the periods when the school year is in session.	MWRA's proposed haul routes presented in the DEIR and SDEIR are conceptual and will serve as the basis of ongoing discussion with the Town of Needham. These conceptual haul routes were based on routing from Program sites along the most direct routes to the interstates and minimizing traffic on local roads. MWRA appreciates the input from the Town and will continue to coordinate with the Town of Needham regarding alternate routes or to determine constraints relative to timing. The results of this coordination would be documented and included in the Construction Management Plan provided to the Contractor.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-22	The DEIR does not provide sufficient detail on the hours of truck traffic through the Town. This information is important to fully understand the impacts to the local roadways and the residential neighborhood surrounding the St. Mary Street Pumping Station.	Truck routes are made up of primarily arterial roadways. Truck traffic is not anticipated to affect local nor residential roadways. 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 included in the contract documents and serve as the basis for a Construction Management Plan to be prepared by the Contractor. The CMP will further detail construction and contractor measures to avoid, minimize, and mitigate potential traffic disruptions, and potential air quality and noise impacts. The CMP will document requirements for the contractors to accept and follow prior to construction activities beginning. MWRA will continue to coordinate with the Town of Needham and MassDOT regarding constraints relative to timing as needed.
7-23	The traffic analysis does not consider the planned large-scale development of 557 Highland Avenue. It is unclear from the MWRA's DEIR whether the traffic from a fully developed 557 Highland Avenue has been factored into the Authority's analysis for the Project.	Trips associated with the development at 557 Highland Avenue have been added to the updated Transportation Impact Assessment (TIA) included with the SDEIR (See **SDEIR Appendix E**). The estimated traffic volumes from this development have been added to the future traffic volumes at the intersection of Central Avenue and Cedar Street in Needham. **SDEIR Chapter 9, Table 9-10 (pg. 9-50)** shows the revised operational analysis for the future scenarios and demonstrates that the intersection is expected to operate at Level of Service (LOS) F in all future conditions regardless of Program-related trips being added.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-24	The Town is concerned about the Project's impacts on the environmental justice communities near the St. Mary Street Pumping Station and the residents of the Needham Housing Authority. The DEIR should expand on what actions the MWRA plans to utilize to protect those residing in this area.	**SDEIR Chapter 3, Outreach and Environmental Justice**, details the EJ impact assessment methodology and results of the analysis at all Program sites, including those in the Town of Needham. The MWRA is committed to protecting residents and minimizing impacts on communities near work areas. No adverse impacts associated with wetlands, waterways, water supply, climate change exposure, air quality and GHG emissions, or community and open space resources to EJ populations are anticipated. Therefore, no adverse impacts to the EJ block group within the DGA or the residents of the property managed by the Needham Housing Authority are anticipated. Potential adverse noise impacts are anticipated to be mitigated at all Program sites and therefore no disproportionate adverse impacts to EJ populations are anticipated following mitigation. Two Town of Needham Housing Authority properties are within the Study areas of the St. Mary Street Pumping Station connection site. The Captain Robert Cook Drive federal family housing property and the Seabeds Way property are located off St. Mary Street. Neither housing development falls within EJ block groups. Sensitive noise receptors adjacent to the St. Mary Street Pumping Station that are subject to potential temporary noise impacts are not within an EJ block group nor are they associated with the Needham Housing Authority properties. 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 included in the contract documents and serve as the basis for a Construction Management Plan to be prepared by the Contractor. The CMP will further detail construction and contractor measures to avoid, minimize, and mitigate potential traffic disruptions, and potential air quality and noise impacts. The CMP will document requirements for the contractors to accept and follow prior to construction activities beginning. Consideration will be given to the community including EJ populations and public housing residents.

Table 15-9 Responses to Comments from the Town of Needham

#	Comment	Response
7-25	The Town requests that the MWRA develop a clear communication plan to ensure that all individuals living within a half mile of St. Mary Street and the Highland Avenue and I-95 Interchange launching and receiving area, along with abutters to the haul routes, are kept fully apprised of all project developments. Individuals should be able to obtain the materials in their requested language.	As noted in **SDEIR Chapter 3, Section 3.3, Updated Environmental Justice Outreach Plan (pg. 3-7),** the MWRA has initiated an outreach and communications plan for the Program that includes a Program working group, website, fact sheets translated into multiple languages, and numerous stakeholder and community meetings. This communication plan will be expanded as the Program evolves and will continue to be tailored to EJ communities throughout the Program planning, design and construction to facilitate their involvement in the environmental review process. The MWRA is committed to: • Holding community meetings upon request by anyone contacted through advance notification provided, or upon further dissemination of a written project summary • Wide dissemination of a written project summary (with translation into relevant languages) with basic project details • Wide dissemination of fact sheets (with translation into relevant languages) for key topics such as traffic, noise and vibration, shaft site selection process, and natural and cultural resource impacts • Hosting a project website and making project information available through other similar electronic means on local town/city websites • Ensuring outreach to the public is communicated in clear, understandable language and in a user-friendly format • Use of non-English and/or community-specific media outlets to publicize the project, including local newspapers

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16 Circulation

16.1 Distribution List

The Metropolitan Water Tunnel Program Supplemental Draft Environmental Impact Report (SDEIR) has been distributed to federal, state, and municipalities listed in **Table 16-1**. The Massachusetts Environmental Policy Act (MEPA) office only accepts electronic filings for state agency and public distribution. Notices of Availability have been mailed, or emails have been sent, to all parties indicating the filing location on MWRA's website. Printed copies of the SDEIR have been mailed to the libraries, and Massachusetts Historical Commission, and may be requested by contacting Gabrielle Marrese, Project Engineer, at Gabrielle.Marrese@mwra.com or 617-570-5469.

Table 16-1 Distribution List

Libraries		
Belmont Public Library 336 Concord Ave Belmont, MA 02478	Boston Public Library- Main Branch 700 Boylston Street Boston, MA 02116	Dedham Public Library 43 Church Street Dedham, MA 02026
Needham Free Public Library 1139 Highland Ave Needham Heights, MA 02494	Newton Free Library 330 Homer Street Newton, MA 02459	The Public Library of Brookline-Brookline Village 361 Washington Street Brookline, MA 02445
Waltham Public Library 735 Main Street Waltham, MA 02451	Watertown Free Public Library 123 Main Street Watertown, MA 02472	Wellesley Free Library 530 Washington Street Wellesley, MA 02482
Weston Public Library 87 School Street Weston, MA 02493		
Federal Government		
Environmental Protection Agency, Region 1 Jane Downing, Chief Drinking Water Branch 5 Post Office Square - Suite 100 Boston, MA 02109-3912	United States Army Corps of Engineers Attn: Colonel John A. Atilano II, Commander and District Engineer New England District 696 Virginia Road Concord, MA 01742	United States Fish and Wildlife Service David Simmons, Supervisor New England Field Office 70 Commercial St., Suite 300 Concord, NH 03301
State Agencies		
MEPA Office 100 Cambridge Street, Suite 900 Boston, MA 02144 MEPA@mass.gov	MEPA Office Attn: EEA EJ Director 100 Cambridge Street, Suite 900 Boston, MA 02144 MEPA-EJ@mass.gov	Commonwealth of Massachusetts Water Resource Commission Attn: Vandana Rao 100 Cambridge Street Boston MA 02114

Table 16-1 Distribution List

State Agencies (Cont.)		
Department of Agricultural Resources Attn: MEPA Coordinator 138 Memorial Avenue, Suite 42 West Springfield, MA 01089 barbara.hopson@mass.gov	Department of Environmental Protection, Boston Office Commissioner's Office One Winter Street Boston, MA 02108 helena.boccadoro@mass.gov	Department of Environmental Protection, Northeast Regional Office Attn: MEPA Coordinator 205B Lowell Street Wilmington, MA 01887 john.d.viola@mass.gov
Department of Environmental Protection, Waterways Program Attn: Alice Doyle One Winter Street Boston, MA 02108 alice.doyle@mass.gov daniel.padien@mass.gov	Massachusetts Bay Transportation Authority Attn: MEPA Coordinator10 Park Plaza, 6th Floor Boston, MA 02116-3966 MEPAcoordinator@mbta.com	Massachusetts Department of Conservation and Recreation Attn: MEPA Coordinator 251 Causeway Street, Suite 600 Boston, MA 02114 andy.backman@mass.gov
Massachusetts Department of Correction Boston Pre-Release Center Attn: Thomas Neville430 Canterbury Street Roslindale, MA 02131	Massachusetts Department of Public Health Director of Environmental Health 250 Washington Street Boston, MA 02108 dphtoxicology@massmail.state.ma.us	Massachusetts Department of Transportation, District 4 Office Attn: MEPA Coordinator 519 Appleton Street Arlington, MA 02476 timothy.paris@dot.state.ma.us
Massachusetts Department of Transportation, District 6 Office Attn: MEPA Coordinator 185 Kneeland Street Boston, MA 02111 michael.garrity@dot.state.ma.us	Massachusetts Department of Transportation Public/Private Development Unit10 Park Plaza, Suite #4150 Boston, MA 02116 MassDOTPPDU@dot.state.ma.us	Massachusetts Department of Youth Services Attn: Eugene J. Deutsch 600 Washington Street Boston, MA 02114-1704
Massachusetts Historical Commission The MA Archives Building 220 Morrissey Boulevard Boston, MA 02125	Massachusetts Office of Coastal Zone Management 251 Causeway Street #800 Boston, MA 02114 robert.boeri@mass.gov patrice.bordonaro@mass.gov	Natural Heritage and Endangered Species Program Attn: Lauren Glorioso, Endangered Species Review Biologist Division of Fisheries & Wildlife 1 Rabbit Hill Road Westboro, MA 01581 melany.cheeseman@mass.gov emily.holt@mass.gov

Table 16-1 Distribution List

Study Area Community Leaders		
Belmont	**Boston**	**Brookline**
Patrice Garvin, Town Administrator Town Hall 455 Concord Avenue, 1st Floor Belmont, MA 02478	The Honorable Michelle Wu, Mayor 1 City Hall Square, Suite 500 Boston, MA 02201	Charles Carey, Town Administrator 333 Washington Street 6th Floor Brookline, MA 02445
Dedham	**Needham**	**Newton**
Leon Goodwin, Town Manager 450 Washington Street Dedham, MA 02026	Kate Fitzpatrick, Town Manager 1471 Highland Avenue Needham, MA 02492	The Honorable Ruthanne Fuller, Mayor 1000 Commonwealth Avenue Newton Centre, MA 02459
Waltham	**Watertown**	**Wellesley**
The Honorable Jeannette McCarthy, Mayor City Hall Second Floor 610 Main Street Waltham, MA 02452	George Proakis, City Manager Town Hall 149 Main Street Watertown, MA 02472	Meghan Jop, Executive Director of General Gov't Services Selectmen's Office 888 Worcester Street Wellesley, MA 02482
Weston		
Leon A. Gaumond, Jr., Town Manager P.O Box 378 Weston, MA 02493		
Municipalities		
Conservation Commissions		
Belmont Conservation Commission Attn: Chair 19 Moore Street, 2nd Floor Belmont, MA 02478	Boston Conservation Commission Attn: Executive Director 1 City Hall Square, Room 709 Boston, MA 02201	Brookline Conservation Commission Attn: Chair 333 Washington Street Brookline, MA 02445
Dedham Conservation Commission Attn: Chair Dedham Town Hall 450 Washington Street Dedham, MA 02026	Needham Conservation Commission Attn: Chair Needham Town Hall 1471 Highland Avenue Needham, MA 02492	Weston Conservation Commission Attn: Chair Weston Town Hall 11 Town House Road P.O. Box 378 Weston, MA 02493
Waltham Conservation Commission Attn: Chair 119 School Street, Top Floor Waltham, MA 02451	Newton Conservation Commission Planning and Development Department Attn: Chair 1000 Commonwealth Ave Newton, MA 02459	Watertown Conservation Commission Attn: Chair Conservation Office, 3rd Floor 149 Main Street Watertown, MA 02472
Wellesley Wetlands Protection Committee Attn: Chair 888 Worcester Street, Suite 160		

Table 16-1 Distribution List

Wellesley, MA 02482		
Departments of Public Works		
Belmont Department of Public Works Homer Municipal Building 19 Moore Street, 1st Floor Belmont, MA 02478	Boston Department of Public Works 1 City Hall Square, Room 714 Boston, MA 02201	Boston Water and Sewer Commission Attn: John P. Sullivan 980 Harrison Avenue Boston, MA 02119
Brookline Department of Public Works 870 Hammond Street Chestnut Hill, MA 02467	Cambridge Department of Public Works 147 Hampshire Street Cambridge, MA 02139	Dedham Department of Public Works 55 River Street Dedham, MA 02026
Needham Department of Public Works Public Service Administration Building 500 Dedham Avenue Needham, MA 02492	Newton Department of Public Works City Hall 1000 Commonwealth Avenue Newton Centre, MA 02459	Waltham Department of Consolidated Public Works 610 Main Street Waltham, MA 02452
Watertown Department of Public Works 124 Orchard Street Watertown, MA 02472	Wellesley Department of Public Works 20 Municipal Way Wellesley, MA 02481	Weston Public Works 190 Boston Post Road By-pass Weston, MA 02493
Planning Offices		
Belmont Office of Community Development Homer Municipal Building 19 Moore Street, 2nd Floor Belmont, MA 02478	Boston Planning & Development Agency One City Hall Square, 9th Floor Boston, MA 02201	Brookline Planning and Community Development Department 333 Washington Street, 3rd Floor Brookline, MA 02445
Dedham Planning and Zoning Department 450 Washington Street Dedham, MA 02026	Needham Planning Department 500 Dedham Avenue, Suite 118 Public Services Administration Building Needham, MA 02492	Newton Department of Planning and Development 1000 Commonwealth Avenue Newton Centre, MA 02459
Waltham Planning Department Government Center 119 School Street, Top Floor Waltham, MA 02451	Watertown Department of Community Development and Planning 149 Main Street Watertown, MA 02472	Wellesley Planning Department 888 Worcester Street, Suite 160 Wellesley, MA 02482
Weston Town Planner P.O. Box 378 Weston, MA 02493		
Boards of Health		
Belmont Health Department Homer Building 19 Moore Street, 2nd Floor P.O. Box 56 Belmont, MA 02478	Boston Public Health Commission 1010 Massachusetts Avenue 6th Floor Boston, MA 02118	Brookline Health Department 11 Pierce Street Brookline, MA 02445

Table 16-1 Distribution List

Boards of Health (cont.)		
Dedham Health Department 450 Washington Street Dedham, MA 02026	Needham Board of Health Town Hall 1471 Highland Avenue Needham, MA 02492	Newton Health and Human Services Department City Hall Room 107A 1000 Commonwealth Avenue Newton, MA 02459
Waltham Health Department 119 School Street Waltham, MA 02451	Watertown Health Department 149 Main Street Watertown, MA 02472	Wellesley Health Department 90 Washington Street, 2nd Floor Wellesley, MA 02481
Weston Board of Health P.O. Box 378 Weston, MA 02493		
Community Groups and Interested Parties		
Alternatives for Community and Environment Dwaign Tyndal, Executive Director 2201 Washington Street, #302 Roxbury, MA 02119	Boston Region Metropolitan Planning Organization 10 Park Plaza, Suite 2150 Boston, MA 02116	Charles River Watershed Association Emily Norton, Executive Director 190 Park Road Weston, MA 02493
Conservation Law Foundation Bradley Campbell, President 62 Summer St Boston, MA 02110	Inner Core Committee Attn: Karina Milchman 60 Temple Place Boston, MA 02111	Massachusetts Rivers Alliance Julia Blatt, Executive Director 2343 Massachusetts Avenue Cambridge, MA 02140
Metropolitan Area Planning Council 60 Temple Place, 6th floor Boston, MA 02111 mpillsbury@mapc.org afelix@mapc.org	MetroWest Regional Collaborative Attn: Leah Robins 60 Temple Place Boston, MA 02111	MWRA Advisory Board Joseph Favaloro, Executive Director 100 First Avenue, 4th Floor Boston, MA 02129
Mystic River Watershed Association Patrick Herron, Executive Director P. O. Box 390 Arlington, MA 02476	Neponset River Watershed Association Ian Cooke, Executive Director 2173 Washington Street Canton, MA 02021	Three Rivers Interlocal Council Attn: Josh Eichen 60 Temple Place Boston, MA 02111
Water Supply Citizens Advisory Committee to the MWRA (WSCAC) Lexi Dewey, Executive Director 485 Ware Road Belchertown, MA 01007		
Environmental Justice Reference List		
Statewide Environmental Justice Community Based Organizations		
Appalachian Mountain Club Heather Clish, Director of Conservation & Recreation Policy hclish@outdoors.org	Browning the Green Space Kerry Bowie, Board President kerry@msaadapartners.com	Clean Water Action Cindy Luppi, New England Director cluppi@cleanwater.org
Community Action Works Sylvia Broude Executive Director, sylvia@communityactionworks.org	Environment Massachusetts Ben Hellerstein, MA State Director ben@environmentmassachusetts.org	Environmental League of MA Nancy Goodman, Vice President for Policy ngoodman@environmentalleague.org

Table 16-1 Distribution List

Statewide Environmental Justice Community Based Organizations (cont.)		
Mass Audubon Heidi Ricci, Director of Policy hricci@massaudubon.org	Mass Land Trust Coalition Robb Johnson, Executive Director robb@massland.org	Mass Rivers Alliance Julia Blatt, Executive Director juliablatt@massriversalliance.org
Neighbor to Neighbor Elvis Mendez, Associate Director elvis@n2nma.org	Ocean River Institute Rob Moir, Executive Director rob@oceanriver.org	Sierra Club MA Deb Pasternak, Director, MA Chapter deb.pasternak@sierraclub.org
The Trust for Public Land Kelly Boling, MA & RI State Director kelly.boling@tpl.org	Unitarian Universalist Mass Action Network Claire B.W. Muller, Movement Building Director claire@uumassaction.org	
Indigenous Organizations		
Chappaquiddick Tribe of the Wampanoag Nation Alma Gordon, President tribalcouncil@chappaquiddickwampanoag.org	Chappaquiddick Tribe of the Wampanoag Nation, Whale Clan Patricia D. Rocker, Council Chair rockerpatriciad@verizon.net	Chaubunagungamaug Nipmuck Indian Council Kenneth White, Council Chairman acw1213@verizon.net
Herring Pond Wampanoag Tribe Melissa Ferretti, Chair melissa@herringpondtribe.org	Massachusetts Commission on Indian Affairs (MCIA) John Peters, Jr., Executive Director john.peters@mass.gov	Massachusetts Tribe at Ponkapoag Elizabeth Soloman Solomon.Elizabeth@gmail.com
Nipmuc Nation (Hassanamisco Nipmucs) Cheryll Toney Holley, Chair crwritings@aol.com	North American Indian Center of Boston Raquel Halsey, Executive Director rhalsey@naicob.org	Pocassett Wampanoag Tribe Cora Pierce Coradot@yahoo.com
Federally Recognized Tribes		
Mashpee Wampanoag Tribe Brian Weeden, Chair Brian.Weeden@mwtribe-nsn.gov	Wampanoag Tribe of Gay Head (Aquinnah) Bettina Washington, Tribal Historic Preservation Officer thpo@wampanoagtribe-nsn.gov	
Organizations in Proximity		
Air, Inc. Chris Marchi, Vice President cbmarchi@gmail.com	Asian Community Development Corporation May Lui, Community Outreach Coordinator may.lui@asiancdc.org	Boston Farms Community Land Trust Joy Gary, Executive Director joy@bostonfarms.org
Boston Harbor Now Alice Brown, Chief of Planning and Policy abrown@bostonharbornow.org	Boston Harbor Now Kelly Sherman, Manager of Waterfront Design Ksherman@BostonHarborNow.org	Charles River Conservancy Laura Jasinki, Executive Director ljasinski@thecharles.org
Charles River Watershed Association Heather Miller hmiller@crwa.org	Chinatown Community Land Trust Lydia Lowe, Executive Director lydia@chinatownclt.org	Chinatown Resident Association Hin Sang Yu, Co-Chair chinatownresidents@gmail.com

Table 16-1 Distribution List

Organizations in Proximity (cont.)		
Chinese Progressive Association Karen Chen, Executive Director karen@cpaboston.org	Coalition for Social Justice Deb Fastino, Executive Director dfastino@aol.com	GreenRoots, Inc. Eugene Benson, Former City Planning & Urban Affairs Professor eugene.b.benson@gmail.com
Mass Community Land United Lee Matsueda, Executive Director lee@massclu.org	Neponset River Watershed Association Andres Ripley, Natural Resource Specialist ripley@neponset.org	New England United for Justice Neomi Mimi Ramos, Executive Director mimi.neunited4justice@gmail.com
Save the Harbor/Save the Bay Bruce Berman Bruce@bostonharbor.com	Southwest Boston Community Development Corporation Patricia Alvarez palvarez@swbcdc.org	

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Appendices

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Appendix A: Environmental Justice Supporting Documentation

- Existing Conditions by Community
- Existing Conditions by Site

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Existing Conditions by Community

Table A-1 Populations with Health Vulnerabilities in Belmont (UMass Property, Lower Fernald Property)

Year Range	Health Topic	Statistical Significance	Stability	Case Count	Rate per 1,000	Statewide Rate per 1,000	110% Statewide Rate per 1,000	>110% Statewide Rate? [2]
2016 - 2020	Elevated Blood Lead Prevalence[1]	Statistically significantly lower	Stable	4	7.4	14.985	16.484	**No**
2011 - 2015	Low Birth Weight	Statistically significantly lower	Unstable	3	121.1	216.8	238.5	**No**
Year Range	**Health Topic**	**Statistical Significance**	**Stability**	**Case Count**	**Rate per 10,000 Label**	**Statewide Rate per 10,000**	**110% Statewide Rate per 10,000**	**>110% Statewide Rate? [2]**
2013 - 2017	Heart Attack	Statistically significantly lower	Stable	29	16.5	26	29	**No**
2013 - 2017	Pediatric Asthma Emergency Department Visits	Statistically significantly lower	Unstable	11	30.4	83.1	91.4	**No**

Source: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023.

1 For determining prevalence, children can be counted only once per year, but can appear in multiple years. Prevalence is the number of tests in a given blood lead level category out of all the children screened in that year within specific age ranges, per 1,000 children.

2 The determination of greater than 110% statewide rate was made by comparing the rate per 1,000 or 10,000 to the 110% statewide rate per 1,000 or 10,000.

Table A-2 Populations with Health Vulnerabilities in Waltham (UMass Property, Lower Fernald Property)

Year Range	Health Topic	Statistical Significance	Stability	Case Count	Rate per 1,000	Statewide Rate per 1,000	110% Statewide Rate per 1,000	>110% Statewide Rate? [2]
2015 - 2019	Elevated Blood Lead Prevalence [1]	Not statistically different	Stable	19	12.7	14.985	16.484	**No**
2011 - 2015	Low Birth Weight	Not statistically significantly different	Stable	16	216.2	216.8	238.5	**No**
Year Range	**Health Topic**	**Statistical Significance**	**Stability**	**Case Count**	**Rate per 10,000 Label**	**Statewide Rate per 10,000**	**110% Statewide Rate per 10,000**	**>110% Statewide Rate?[2]**
2013 - 2017	Heart Attack	Not statistically significantly different	Stable	84	24.4	26	29	**No**
2013 - 2017	Pediatric Asthma Emergency Department Visits	Statistically significantly lower	Stable	32	66.1	83.1	91.4	**No**

Source: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023.

1 For determining prevalence, children can be counted only once per year, but can appear in multiple years. Prevalence is the number of tests in a given blood lead level category out of all the children screened in that year within specific age ranges, per 1,000 children.

2 The determination of greater than 110% statewide rate was made by comparing the rate per 1,000 or 10,000 to the 110% statewide rate per 1,000 or 10,000.

Table A-3 Populations with Health Vulnerabilities in Watertown (UMass Property, Lower Fernald Property)

Year Range	Health Topic	Statistical Significance	Stability	Case Count	Rate per 1,000	Statewide Rate per 1,000	110% Statewide Rate per 1,000	>110% Statewide Rate? [2]
2015 - 2019	Elevated Blood Lead Prevalence [1]	Statistically significantly lower	Stable	9	11	14.985	16.484	**No**
2011 - 2015	Low Birth Weight	Not statistically significantly different	Unstable	8	175.1	216.8	238.5	**No**
Year Range	**Health Topic**	**Statistical Significance**	**Stability**	**Case Count**	**Rate per 10,000 Label**	**Statewide Rate per 10,000**	**110% Statewide Rate per 10,000**	**>110% Statewide Rate? [2]**
2013 - 2017	Heart Attack	Not statistically significantly different	Stable	52	24.2	26	29	**No**
2013 - 2017	Pediatric Asthma Emergency Department Visits	Statistically significantly lower	Unstable	9	36.9	83.1	91.4	**No**

Source: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023.

1 For determining prevalence, children can be counted only once per year, but can appear in multiple years. Prevalence is the number of tests in a given blood lead level category out of all the children screened in that year within specific age ranges, per 1,000 children.

2 The determination of greater than 110% statewide rate was made by comparing the rate per 1,000 or 10,000 to the 110% statewide rate per 1,000 or 10,000.

Existing Conditions by Site

Table A-4 Elevated Blood Lead Prevalence by Census Tract Within 1-Mile of UMass Property

Census Tract	Municipality	Statistical Significance	Stability	Case Count	Rate per 1,000	Statewide Rate Per 1,000	110% Statewide Rate per 1,000	>110% Statewide Rate? [2]
3576	Belmont	Not statistically different	Unstable	1	17.1	16.1	17.7	No
3577	Belmont	Statistically significantly lower	Unstable	0	0	16.1	17.7	No
3688 [1]	Waltham	Not statistically different	Stable	4	27.3	16.1	17.7	**Yes**
3689.02 [1]	Waltham	Not statistically different	Unstable	1	14.6	16.1	17.7	No
3701.01 [1]	Watertown	Statistically significantly lower	Unstable	1	9	16.1	17.7	No

Sources: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023; Commonwealth of Massachusetts, Massachusetts Environmental Public Health Tracking, Childhood Lead Poisoning, 2023, https://matracking.ehs.state.ma.us/Health-Data/Childhood_Blood_Lead_Levels.html.

Notes: Year Range 2015-2019.

For determining prevalence, children can be counted only once per year, but can appear in multiple years. Prevalence is the number of tests in a given blood lead level category out of all the children screened in that year within specific age ranges, per 1,000 children.

1 EJ block group present within.

2 The determination of greater than 110% statewide rate was made by comparing the rate per 1,000 to the 110% statewide rate per 1,000.

Table A-5 Low Birth Weight Rate per 1,000 by Census Tract Within 1-Mile of UMass Property

Census Tract	Community	Statistical Significance	Stability	Case Count	Rate per 1,000	Statewide Rate Per 1,000	110% Statewide Rate per 1,000	>110% Statewide Rate? [2]
3576	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**
3577	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**
3688 [1]	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**
3689.02 [1]	Waltham	Not statistically significantly different	Unstable	2	268.7	216.8	238.5	**Yes**
3701.01 [1]	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**

Sources: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023; Commonwealth of Massachusetts, Massachusetts Environmental Public Health Tracking, Low Birth Weight, 2023, https://matracking.ehs.state.ma.us/Health-Data/Reproductive-Outcomes/Low_Birth_Weight.html.

Notes: Year Range 2011-2015.

For determining prevalence, low birth weight is measured among singleton births only. Prevalence is the number of babies born weighing less than 5.5 pounds per 1,000 singleton births.

1 EJ block group present within.

2 The determination of greater than 110% statewide rate was made by comparing the rate per 1,000 to the 110% statewide rate per 1,000.

Table A-6 Sources of Pollution Within 1 Mile of UMass Property

DPH Source	Number of Areas within 1 Mile
MassDEP Major Air and Waste Facilities	
Air Operating Permits	0
Hazardous Waste Treatment, storage/disposal	0
Hazardous waste recycler	0
Large quantity generators	4 (Duffy Bros Construction Inc., Lockheed Martin Advance Energy Storage, CVS 0148, Beaver Visitec International Inc.)
Large Quantity Toxic Users	1 (Light Metal Platers LLC)
MassDEP Tier Classified 21E Sites	1 (Waverly Oaks Wooded Area)
MassDEP Tier II Facilities	6 (Frederick C Murphy Federal Center, Light Metal Platers LLC, Lockheed Martin Advanced Energy Storage, Beaver Visitec International, Bentley University, Repligen Corporation)
MassDEP Sites with Activity and Use Limitations (AUL)	12 (110 Beaver Street [two occurrences], Murphy Federal Ctr Boiler Plant, 15-21 Main Street, Shell Product Dist Plant FMR, Duffy Brothers Construction, Power Plant Near Waverly Oaks Entrance, Murphy Federal Center – Boiler Plant UST, Standard Thomson Co., George More Facility FMR, FMR Heating Plant, Dana Athletic CTR Off Field Road)
MassDEP Groundwater Discharge Permits	0
MassDEP Public Water Suppliers	0
Wastewater Treatment Plants	0
Underground Storage Tanks	5 (Sycamore Auto Repair, Shell Service Station, Ellison Park Property Holding LLC, Shell Service Station 137873, AAA Auto Clinic)
EPA Facilities	
Toxic Release Inventory sites 2017	0
Superfund Site Boundaries	0

Source: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023.

Table A-7 Elevated Blood Lead Prevalence by Census Tract Within 1-Mile of Lower Fernald Property

Census Tract	Municipality	Statistical Significance	Stability	Case Count	Rate per 1,000	Statewide Rate Per 1,000	110% Statewide Rate per 1,000	>110% Statewide Rate? [2]
3576 [1]	Belmont	Not statistically different	Unstable	1.0	17.1	16.1	17.7	No
3577	Belmont	Statistically significantly lower	Unstable	0	0	16.1	17.7	No
3688[1]	Waltham	Not statistically different	Stable	4.0	27.3	16.1	17.7	**Yes**
3689.02 [1]	Waltham	Not statistically different	Unstable	1.0	14.6	16.1	17.7	No
3701.01 [1]	Watertown	Statistically significantly lower	Unstable	1.0	9.0	16.1	17.7	No
3702.02	Watertown	Not statistically different	Stable	3.0	30.1	16.1	17.7	**Yes**

Sources: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023; Commonwealth of Massachusetts, Massachusetts Environmental Public Health Tracking, Childhood Lead Poisoning, 2023, https://matracking.ehs.state.ma.us/Health-Data/Childhood_Blood_Lead_Levels.html.

Notes: Year Range 2015-2019.

For determining prevalence, children can be counted only once per year, but can appear in multiple years. Prevalence is the number of tests in a given blood lead level category out of all the children screened in that year within specific age ranges, per 1,000 children.

1 EJ block group present within.

2 The determination of greater than 110% statewide rate was made by comparing the rate per 1,000 to the 110% statewide rate per 1,000.

Table A-8 Low Birth Weight Rate per 1,000 by Census Tract Within 1-Mile of Lower Fernald Property

Census Tract	Community	Statistical Significance	Stability	Case Count	Rate per 1,000	Statewide Rate Per 1,000	110% Statewide Rate per 1,000	>110% Statewide Rate? [2]
3576 [1]	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**
3577	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**
3688[1]	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**
3689.02 [1]	Waltham	Not statistically significantly different	Unstable	2	268.7	216.8	238.5	**Yes**
3701.01 [1]	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**
3702.02	Watertown	Not statistically significantly different	Unstable	2	243.3	216.8	238.5	**Yes**

Sources: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023; Commonwealth of Massachusetts, Massachusetts Environmental Public Health Tracking, Low Birth Weight, 2023, https://matracking.ehs.state.ma.us/Health-Data/Reproductive-Outcomes/Low_Birth_Weight.html.

Notes: Year Range 2011-2015.

For determining prevalence, low birth weight is measured among singleton births only. Prevalence is the number of babies born weighing less than 5.5 pounds per 1,000 singleton births.

1 EJ block group present within.

2 The determination of greater than 110% statewide rate was made by comparing the rate per 1,000 to the 110% statewide rate per 1,000.

Table A-9 Sources of Pollution Within 1 Mile of Lower Fernald Property

DPH Source	Number of Areas within 1 Mile
MassDEP Major Air and Waste Facilities	
Air Operating Permits	0
Hazardous Waste Treatment, storage/disposal	0
Hazardous waste recycler	0
Large quantity generators	3 (Duffy Bros Construction Inc., Lockheed Martin Advance Energy Storage, Beaver Visitec International Inc.)
Large Quantity Toxic Users	1 (Light Metal Platers LLC)
MassDEP Tier Classified 21E Sites	1 (Waverly Oaks Wooded Area)
MassDEP Tier II Facilities	6 (Frederick C Murphy Federal Center, McClean Hospital, Light Metal Platers LLC, Lockheed Martin Advanced Energy Storage, Beaver Visitec International, Bentley University)
MassDEP Sites with Activity and Use Limitations (AUL)	12 (110 Beaver Street [two occurrences], Murphy Federal Ctr Boiler Plant, 15-21 Main Street, Shell Product Dist Plant FMR, Duffy Brothers Construction, Power Plant Near Waverly Oaks Entrance, Murphy Federal Center – Boiler Plant UST, George More Facility FMR, FMR Heating Plant, Watertown Elderly Housing Building A, Dana Athletic CTR Off Field Road)
MassDEP Groundwater Discharge Permits	0
MassDEP Public Water Suppliers	0
Wastewater Treatment Plants	0
Underground Storage Tanks	6 (Sycamore Auto Repair, Shell Service Station, Getty Petroleum Marketing Inc., Waverly Square Service Inc., Shell Service Station 137873, AAA Auto Clinic)
USEPA Facilities	
Toxic Release Inventory sites 2017	0
Superfund Site Boundaries	0

Source: Commonwealth of Massachusetts, Department of Public Health, Environmental Justice Tool, 2023.

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Appendix B: Wetlands and Waterways Supporting Documentation

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Stone Pipe End Sizing for Outfall from Dewatering Pipes

Created by: N. Vigneault
Date: 4/6/2023

Checked by: VAR
Date: 4/12/2023

Site	Approximate Pipe Diameter as presented in DEIR based on conveying design flow in a pipe at min. slope	Receiving Water	Stone Pipe End Dimensions in DEIR - Oct. 2022		
			L	W1	W2
American Legion	6 to 12 inch	Canterbury Brook	10 ft	11 ft	3 ft
UMass and Lower Fernald Property	6 to 12 inch	Clematis Brook	10 ft	11 ft	3 ft
Tandem Trailer	24 to 30 inch	Seaverns Brook	20 ft	26 ft	6 ft
Park Road East	6 to 12 inch	Seaverns Brook	10 ft	11 ft	3 ft
Park Road West	6 to 12 inch	Seaverns Brook	10 ft	11 ft	3 ft
Bifurcation	27 inch	Seaverns Brook	20 ft	26 ft	6 ft
Highland Avenue Alternative 4	27 inch	Charles River	20 ft	26 ft	6 ft
Highland Avenue Alternative 10	36 inch	Charles River	30 ft	36 ft	8 ft

Stone Pipe End Sizing for Outfall from Dewatering Pipes

Site	Design Flow Rate (as presented in Oct. 2022 DEIR)			Pipe Capacity (Q) - full pipe, gravity flow, Manning's Eqn. at minimum slope, n=0.013 $Q=1.49AR^{2/3}S^{1/2}/n$			Pipe Capacity (Q) - pressure flow assume velocity (V) = 10 ft/sec Q=VA		
	GPM	MGD	CFS	Pipe diameter (inches)	Slope (ft/ft)	Full pipe flow at given diameter at min. slope (cfs)	Velocity (V) fps	Cross sectional Pipe Area (A) sq. ft.	Flow (Q) cfs
American Legion	300	0.4	0.7	12	0.0022	1.7	10	0.79	7.9
UMass and Lower Fernald Property	300	0.4	0.7	12	0.0022	1.7	10	0.79	7.9
Tandem Trailer	1860	2.7	4.1	24	0.0008	6.4	10	3.14	31.4
Park Road East	150	0.2	0.3	12	0.0022	1.7	10	0.79	7.9
Park Road West	150	0.2	0.3	12	0.0022	1.7	10	0.79	7.9
Bifurcation	1340	1.9	3.0	27	0.0007	8.2	10	3.97	39.7
Highland Avenue Alternative 4	4130	5.9	9.2	27	0.0007	8.2	10	3.97	39.7
Highland Avenue Alternative 10	6110	8.8	13.6	36	0.0005	14.6	10	7.07	70.7

*This table presents pipe sizing based on expected discharge rate from groundwater pumping during tunnel construction to a pipe laid at a minimum slope. As design progresses, actual design slope of pipe may increase and thus a smaller pipe diameter may be used to convey the same flow rate. For riprap splash pads/stone pipe ends, design for higher flow rates that the given diameter pipe could convey, say at 10 fps (pressure flow rather than gravity flow).

Stone Pipe End Sizing for Outfall from Dewatering Pipes

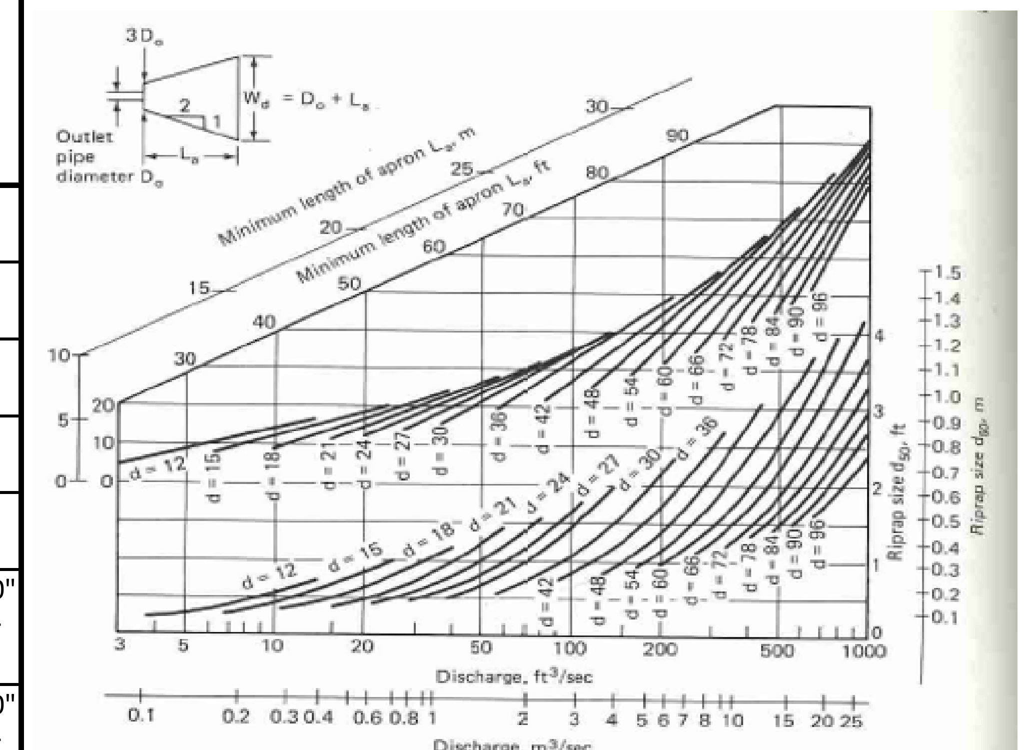

Fig. 7.45 Design of riprap outlet protection from a round pipe flowing full; minimum tailwater conditions. (6, 14)

Site	Stone Pipe End Dimensions From Nomograph using Q from pressure flow at 10 fps velocity				Notes	
	Riprap size D50	L (ft)	W1 (L+ pipe diam) ft	W2 (3 x pipe dia) ft		
American Legion	6"	10	11	3	6" pipe is sufficient for removal of groundwater from shaft during construction.	
UMass and Lower Fernald Property	6"	10	11	3	6" pipe is sufficient for removal of groundwater from shaft during construction.	
Tandem Trailer	9"	18	20	6	Based on anticipated slope of 0.007, a 12" to 18" pipe will be sufficient.	
Park Road East	6"	10	11	3	6" pipe is sufficient for removal of groundwater from shaft during construction.	
Park Road West	6"	10	11	3	6" pipe is sufficient for removal of groundwater from shaft during construction.	
Bifurcation	9"	20	22.25	6.75	As design progresses, consider using 24" or 30" Based on anticipated slope of 0.006, an 18" or 24" pipe will be sufficient.	
Highland Avenue Alternative 4	9"	20	22.25	6.75	As design progresses, consider using 24" or 30" Based on anticipated slope of 0.006, an 18" or 24" pipe will be sufficient.	
Highland Avenue Alternative 10	9"	25	28	9	Based on anticipated slope of 0.006, a 24" pipe will be sufficient.	
	*Note that larger W1 and L dimensions were used in the DEIR to estimate a larger area of impact for purposes of a conservative estimate for the environmental analysis in the DEIR since design is preliminary. This will provide flexibility as design is advanced if there are increases in estimated flows or pipe diameters.				See Fig. 7.45, "Design of riprap outlet protection from a round pipe flowing full; minimum tailwater conditions" for nomograph used to size the length, D50 riprap, and width of riprap apron.	Source: Erosion and Sediment Control Handbook Steven J. Goldman (Author), Katherine Jackson (Author), Taras A. Bursztynsky (Author) Publication date: January 1, 1986

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Appendix C: Updated Draft Water Supply Contingency Plan

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Tables

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C.1 Introduction

This appendix presents a **Draft Water Supply Contingency Plan** as part of the Massachusetts Water Resources Authority (MWRA) Metropolitan Water Tunnel Program (Program), Draft Environmental Impact Report (DEIR). The Draft Water Supply Contingency Plan has been updated for the Supplemental Draft Environmental Impact Report (SDEIR) to incorporate the two new alternative sites for the terminus of the North Tunnel, Segment 1: the UMass Property large connection shaft site in SDEIR Alternatives 3A and 4A, and the Lower Fernald Property receiving shaft site in SDEIR Alternative 10A. This section summarizes the project background and water supply contingency plan objectives. **SDEIR Section C.2** describes the data collection for private wells. **SDEIR Section C.3** lists water supply alternatives. **SDEIR Section C.4** summarizes the determination of the order of implementation.

This appendix includes updated analysis for the two new alternative sites, and addresses comments received on the DEIR in the Secretary's Certificate.

C.1.1 Program Background

MWRA's existing Metropolitan Tunnel System, comprised of the City Tunnel, Dorchester Tunnel and City Tunnel Extension needs to be taken out-of-service so that these existing facilities, including isolation valves, can be refurbished and maintained in the future. To make this possible, additional (redundant) water transmission capacity is needed to provide continued service while the existing tunnels are offline. The purpose of the Program is to provide redundancy for the Metropolitan Tunnel System east of Shaft 5/5A.

Construction of the new deep rock tunnel system would include use of a tunnel boring machine (TBM) along the proposed alignment. Although this construction method minimizes disruption at the surface as compared to open trench construction, there is the potential to temporarily affect water supplies (wells and surface waters) along the tunnel route by lowering the groundwater level during construction. In areas of concern, drilling and pre-grouting ahead of the TBM would be required. This approach would reduce the likelihood of groundwater inflow into the tunnel, which would help to mitigate potential impacts to water supply wells and waterbodies.

C.1.1.1 Drawdown of Groundwater or Levels of Local Water Bodies

Groundwater drawdown during tunnel construction, and to a lesser extent during shaft construction, may impact the production of groundwater wells. The Program is unlikely to impact local surface water body levels with planned requirements for probing and grouting. Probing from the tunnel heading is done in advance of the excavation to assess water inflows. If the water inflow rate observed during probing exceeds a certain threshold, the contract documents will dictate the contractor must grout. See **DEIR Chapter 4.6, Wetlands and Waterways, Section 4.6.5.3, Tunnel Alignments – All Alternatives (pg. 4.6-149)** for more information on probing and grouting. Groundwater drawdown is typically caused by interconnectivity of discontinuities within an otherwise impermeable rock mass, which in turn is hydraulically connected to the groundwater well or water body.

The **primary mitigation** to reduce the potential for groundwater drawdown during construction is probing from the tunnel heading in advance of the excavation, followed by pre-excavation grouting (also from the tunnel heading) in the event water-bearing features are encountered by the probing. The probing could be made mandatory before the tunnel proceeds beneath important areas of groundwater well production or beneath local water bodies; the determination for mandatory probing and grouting (both where this may be required as well as the number and relative position of probe holes or grouting criteria) would be a risk-based assessment during the Final Design phase of the Program. The specification of mandatory probing and the setting of limits that trigger grouting must be judiciously applied, as performing these activities would require TBM stoppages, which may reduce overall TBM production rate and lead to a longer construction schedule.

A **secondary mitigation** to reduce groundwater inflow into the tunnel is drilling and grouting of water bearing features in the rock through the walls of the unlined tunnel after the TBM has passed. The intent of this type of grouting, referred to as cut-off grouting, is to cut off, or minimize, groundwater flowing into the tunnel after the TBM has passed. It is not as effective as (and not proposed as a replacement for) the pre-excavation probing and grouting described earlier in this section, mainly because post-excavation cut-off grouting must be performed at lower pressures than pre-excavation grouting (due to the lower confining pressures that exist after tunnel excavation), and therefore is not as effective at penetrating water-bearing features in the rock.

A **tertiary mitigation** for disruption of water supply from groundwater wells or surface waters is to provide users with an alternative water supply until groundwater levels can be restored. This mitigation is described in this appendix in **SDEIR Section C.3**.

C.1.1.2 Water Supply Contingency Plan Objectives

The Water Supply Contingency Plan provides alternatives to address water supply issues if wells and surface waters are impacted during construction. The following are the objectives for the water supply contingency plan:

1. Provide the location of water supplies (wells and surface waters) within half a mile (2,640 feet) of the proposed tunnel alignment.
2. Provide information pertaining to the well's geologic and hydrological data, when available.
3. Provide information pertaining to the use of the water supply well, including wells for non-potable uses.
4. Develop recommended mitigation strategies for the contractor to implement should the water supply well be impacted during construction.

C.2 Water Supply Well Data Collection

Data pertaining to the water supply wells was reviewed from several sources. These sources include:

- Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA) (Mass Well Database)

- Massachusetts Department of Environmental Protections (MassDEP)'s Public Water Supplies by Massachusetts geographic information system (MassGIS)
- MassDEP Wellhead Protection Areas (Zone II, Zone I, Interim Wellhead Protection Areas (IWPAs)) by MassGIS
- City of Waltham Engineering Department
- Town of Wellesley Geographic Information System Department

The communities of Needham, Newton, Brookline, Boston, and Weston were also contacted for any available information on wells, but no additional City or Town specific data was available.

The various data sources were compiled and included in a GIS geodatabase. Using the location data, maps showing the locations and types of wells within 0.5 mile (2,640 feet) of the proposed tunnel alignment were developed and are included in **DEIR Chapter 5, Water Supply and Water Management Act, Figure 5.1-1** through **Figure 5.1-24**. For this SDEIR submittal, two new figures were developed to demonstrate water supply impacts within a 0.5-mile radius of the two new sites. See **SDEIR Chapter 6, Water Supply and Water Management Act, Figure 6-1** and **Figure 6-2** for wells within a 0.5-mile radius of the tunnel alignment between the School Street site and the UMass Property site, and the School Street site and the Lower Fernald Property site, respectively. It should be noted that the proposed tunnel alignments and the offset are all within the Charles River watershed. This is the only watershed expected to be impacted during construction. The following information pertaining to the wells are stored in the geodatabase:

- Well ID
- Location information including street address, longitude and latitude information, and northing and easting
- Date of construction
- Well type
- Well depth
- Depth to bedrock
- Water level
- Elevation

The contract documents will require a preconstruction survey to be conducted by the contractor to verify the locations and well characteristics prior to construction.

The wells within the 0.5-mile radius of the tunnel alignment in SDEIR Alternatives 3A, 4A, and 10A are generally the same as those presented in the DEIR. Omissions are noted in strikethrough text and one additional irrigation well is highlighted for SDEIR Alternative 10A. The updated wells are shown in **Table C-1** through **Table C-3**, along with the key information included in the geodatabase, such as well characteristics and addresses.

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Table C-1

List of Wells within 0.5 Mile of the SDEIR Alternative 3A Tunnel Alignment

MWRA Contract No. 7159

WellID	Town	Street Number	Street Name	Latitude	Longitude	spcNorthing_usft_Y	spcEasting_usft_X	Date Complete	Well Type	Work Performed	Total Depth	Depth to Bedrock	Water Level	Dates	Ground Elev_BCB	Z	Ground Elev_Ft	Hit Bedrock	Bedrock Elev_BCB
266340	BOSTON	125	Arborway	42.30746	-71.120906	2937294.292	758710.498	2/24/1993	Irrigation	New Well	1005	49	22	2/24/1993	65.6481926	59.1981926	59.1981926	Yes	16.6481926
266339	BOSTON	7	Louders Lane	42.306007	-71.125431	2936759.387	757488.832	2/17/1993	Irrigation	New Well	255	60	50	2/17/1993	148.9375183	142.4875183	142.4875183	Yes	88.93751831
123519	BOSTON		St. Joseph Cemetery	42.301312	-71.104536	2935073.967	763148.892	9/7/2004	Irrigation	New Well	500	10	27	8/16/2004	78.86679382	72.41679382	72.41679382	Yes	68.86679382
105422	BOSTON[1]	Lot 49	Country Club Road	42.307069	-71.193309	2937073.073	739126.303	11/28/2001	Domestic	New Well	510	8	50	12/5/2001	157.1465942	150.6965942	150.6965942	Yes	149.1465942
2318	BOSTON	5	Woodlawn Avenue	42.299243	-71.113476	2934308.904	760733.847	3/14/2000	Domestic	New Well	105	0	1	3/16/2000	48.02450867	41.57450867	41.57450867		
282434	BROOKLINE	191	Newton Street	42.310554	-71.142905	2938396.119	752755.148	5/11/1989	Irrigation	New Well	0	74	35	5/17/1989	211.3908264	204.9408264	204.9408264	Yes	137.3908264
282375	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	4/1/1998	Irrigation	New Well	1000	3	52	4/1/1998	234.3170044	227.8670044	227.8670044	Yes	231.3170044
257944	BROOKLINE	186	Newton Street	42.30945	-71.141633	2937995.245	753100.892	8/20/2008	GeoThermal Open Loop	New Well	1000	30	18	8/20/2008	219.9852478	213.5352478	213.5352478	Yes	189.9852478
100863	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	6/5/2001	Irrigation	New Well	1300	0	15	6/5/2001	234.3170044	227.8670044	227.8670044		
2900	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	7/13/1999	Irrigation	New Well	1000	0	30	7/27/1999	234.3170044	227.8670044	227.8670044		
663558	NEWTON	530	DUDLEY ROAD	42.30641	-71.17603	2936850.201	743801.147	7/9/2019	Irrigation	New Well	500	6	7	7/2/2019	195.2411987	188.7911987	188.7911987	Yes	189.2411987
659148	NEWTON	181	WINDSOR ROAD	42.3317	-71.25741	2945993.265	721761.565	10/17/2017	Irrigation	New Well	1000	85	54.7	10/17/2017	69.90000076	63.45000076	63.45000076	Yes	-15.09999924
656616	NEWTON	179	LAGRANGE STREET	42.30421	-71.1672	2936057.679	746192.794	2/24/2017	Irrigation	New Well	705	11	0		193.899173	187.449173	187.449173	Yes	182.899173
655572	NEWTON	380	DEDHAM STREET	42.30885	-71.1992	2937716.427	737530.51	7/12/2016	Irrigation	New Well	500	38	40	7/7/2016	183.0266144	176.5766144	176.5766144	Yes	145.0266144
304378	NEWTON		Grove Street and Route 16	42.32577	-71.25632	2943833.092	722062.467	12/1/1980	Domestic	New Well	405	44	0		73.30900879	66.85900879	66.85900879	Yes	29.30900879
304367	NEWTON	400	Dedham Street	42.308428	-71.19821	2937563.589	737798.84	10/12/1989	Irrigation	New Well	450	23	25	10/12/1989	185.9413025	179.4913025	179.4913025	Yes	162.9413025
304353	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/3/1991	Irrigation	New Well	330	30	7	4/3/1991	120.8999969	114.4499969	114.4499969	Yes	90.89999695
304350	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	3/22/1991	Irrigation	New Well	500	9	28	3/22/1991	120.8999969	114.4499969	114.4499969	Yes	111.8999969
304349	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	3/26/1991	Irrigation	New Well	350	10	34	3/26/1991	120.8999969	114.4499969	114.4499969	Yes	110.8999969
304348	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/5/1991	Irrigation	New Well	500	7	40	4/5/1991	120.8999969	114.4499969	114.4499969	Yes	113.8999969
304347	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/14/1991	Irrigation	New Well	405	8	30	4/14/1991	120.8999969	114.4499969	114.4499969	Yes	112.8999969
304346	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/30/1991	Irrigation	New Well	500	10	12	4/30/1991	120.8999969	114.4499969	114.4499969	Yes	110.8999969
304344	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	5/17/1991	Irrigation	New Well	480	10	30	5/17/1991	120.8999969	114.4499969	114.4499969	Yes	110.8999969
304335	NEWTON	29	Charles Street	42.344068	-71.256131	2950501.411	722094.511	6/3/1991	Domestic	New Well	260	55	20	6/3/1991	59.90000076	53.45000076	53.45000076	Yes	4.900000763
304321	NEWTON	21	Placid Road	42.311998	-71.198113	2938864.655	737820.473	10/25/1991	Irrigation	New Well	305	32	16	10/25/1991	125.340831	118.890831	118.890831	Yes	93.34083099
304288	NEWTON	275	Brookline Street	42.300822	-71.177481	2934812.35	743416.35	8/9/1993	Irrigation	New Well	625	13	35	8/9/1993	187.6864197	181.2364197	181.2364197	Yes	174.6864197
304287	NEWTON	85	Kingswood Road	42.354185	-71.253941	2954189.969	722675.921	8/1/1993	Irrigation	New Well	27	0	20	8/1/1993	71.89095612	65.44095612	65.44095612		
304278	NEWTON	185	Christina Street	42.304348	-71.209367	2936066.283	734786.024	4/15/1994	Irrigation	New Well	345	42	25	4/15/1994	114.8999969	108.4499969	108.4499969	Yes	72.89999695
304268	NEWTON	605	Grove Street	42.328369	-71.258656	2944778.424	721428.089	6/17/1994	Irrigation	New Well	500	90	80	6/17/1994	87.41557617	80.96557617	80.96557617	Yes	-2.584423828
304265	NEWTON	130	Wheeler Road	42.310092	-71.191544	2938176.43	739599.748	8/4/1994	Irrigation	New Well	1000	50	10	8/4/1994	135.8999969	129.4499969	129.4499969	Yes	85.89999695
~~304263~~	~~NEWTON~~	~~471~~	~~Nahanton Street~~	~~42.297404~~	~~-71.207079~~	~~2933537.884~~	~~735413.641~~	~~8/11/1994~~	~~Irrigation~~	~~New Well~~	~~820~~	~~18~~	~~40~~	~~8/11/1994~~	~~116.285495~~	~~109.835495~~	~~109.835495~~	~~Yes~~	~~98.285495~~
304243	NEWTON	7	Melina Road	42.31081	-71.196701	2938433.081	738203.926	12/27/1994	Irrigation	New Well	175	10	14	12/27/1994	146.0838806	139.6338806	139.6338806	Yes	136.0838806
304214	NEWTON	123	Baldpate Hill Road	42.30506	-71.180194	2936353.987	742676.627	7/9/1996	Irrigation	New Well	325	80	60	7/9/1996	261.6592133	255.2092133	255.2092133	Yes	181.6592133
304210	NEWTON		Cornell Street	42.329787	-71.259677	2945294.393	721150.547	8/24/1996	Irrigation	New Well	1000	90	15	8/24/1996	80.25924988	73.80924988	73.80924988	Yes	-9.740750122
304209	NEWTON		Wheeler Road	42.310384	-71.193965	2938280.482	738944.522	9/29/1996	Domestic	Hydrofracture	1000	25	7	9/29/1996	127.8999969	121.4499969	121.4499969	Yes	102.8999969
~~304177~~	~~NEWTON~~	~~74~~	~~Oak Hill Street~~	~~42.298672~~	~~-71.179113~~	~~2934027.188~~	~~742977.802~~	~~4/9/1998~~	~~Domestic~~	~~New Well~~	~~500~~	~~5~~	~~20~~	~~4/9/1998~~	~~135.8999969~~	~~129.4499969~~	~~129.4499969~~	~~Yes~~	~~130.8999969~~
304170	NEWTON[1]	24	Bryon Road	42.301863	-71.166924	2935202.683	746270.794	8/8/1998	Irrigation	New Well	500	45	20	8/8/1998	156.8999969	150.4499969	150.4499969	Yes	111.8999969
304165	NEWTON	142	Neshobe Road	42.326972	-71.244996	2944280.077	725123.378	9/1/1998	Irrigation	Hydrofracture	820	65	30	9/1/1998	168.8999969	162.4499969	162.4499969	Yes	103.8999969
304161	NEWTON[1]	24	Bryon Road	42.301863	-71.166924	2935202.683	746270.794	12/5/1998	Irrigation	New Well	505	4	20	12/5/1998	156.8999969	150.4499969	150.4499969	Yes	152.8999969
258804	NEWTON	17	Racheal Rd.	42.30915	-71.202	2937823.094	736772.755	3/10/2009	GeoThermal Closed Loop	New Well	360	22	41	3/10/2009	182.3013031	175.8513031	175.8513031	Yes	160.3013031
257132	NEWTON	354	dudley road	42.30935	-71.181567	2937915.949	742299.385	5/12/2008	Irrigation	New Well	500	15	22	5/12/2008	152.8999969	146.4499969	146.4499969	Yes	137.8999969
~~158209~~	~~NEWTON~~	~~2253~~	~~Commonwealth Avenue~~	~~42.347217~~	~~-71.254883~~	~~2951649.942~~	~~722428.599~~	~~6/12/2009~~	~~Irrigation~~	~~New Well~~	~~520~~	~~40~~	~~19.6~~	~~4/15/2009~~	~~67.90000076~~	~~61.45000076~~	~~61.45000076~~	~~Yes~~	~~27.90000076~~
155281	NEWTON	369	Dudley Road	42.308333	-71.182517	2937544.379	742043.801	11/13/2007	Irrigation	New Well	425	22	40	11/13/2007	161.0908844	154.6408844	154.6408844	Yes	139.0908844
150099	NEWTON	11	Placid Road	42.307033	-71.192617	2937060.628	739313.534	11/10/2006	Irrigation	New Well	160	25	10	11/11/2006	154.7581055	148.3081055	148.3081055	Yes	129.7581055
~~146978~~	~~NEWTON~~	~~21~~	~~Columbine Road~~	~~42.29903~~	~~-71.178494~~	~~2934158.28~~	~~743144.77~~	~~9/11/2006~~	~~Irrigation~~	~~New Well~~	~~220~~	~~26~~	~~20~~	~~8/3/2006~~	~~131.5530731~~	~~125.1030731~~	~~125.1030731~~	~~Yes~~	~~105.5530731~~
~~139646~~	~~NEWTON~~	~~303~~	~~Nahanten Street~~	~~42.297823~~	~~-71.200698~~	~~2933696.568~~	~~737139.416~~	~~4/12/2006~~	~~Irrigation~~	~~New Well~~	~~27~~	~~0~~	~~4~~	~~4/12/2006~~	~~112.7166473~~	~~106.2666473~~	~~106.2666473~~		
135288	NEWTON	554	Grove Street	42.330087	-71.257671	2945405.254	721692.662	4/25/2005	Irrigation	New Well	1005	30	20	4/26/2005	83.89999695	77.44999695	77.44999695	Yes	53.89999695
~~123535~~	~~NEWTON~~	~~41~~	~~Old Farm Road~~	~~42.299198~~	~~-71.185172~~	~~2934212.763~~	~~741337.931~~	~~5/8/2006~~	~~Irrigation~~	~~New Well~~	~~23~~	~~0~~	~~18.75~~	~~4/18/2006~~	~~168.0910675~~	~~161.6410675~~	~~161.6410675~~		
~~106072~~	~~NEWTON~~	~~12~~	~~Laurus Lane~~	~~42.300441~~	~~-71.182577~~	~~2934668.335~~	~~742038.274~~	~~3/11/2002~~	~~Irrigation~~	~~New Well~~	~~325~~	~~40~~	~~21.9~~	~~3/18/2002~~	~~155.8012573~~	~~149.3512573~~	~~149.3512573~~	~~Yes~~	~~115.8012573~~
106054	NEWTON	46	Varick Road	42.32792	-71.245823	2944624.879	724898.717	10/10/2002	Irrigation	New Well	116	115	95	10/9/2002	172.8999969	166.4499969	166.4499969	Yes	57.89999695
~~103608~~	~~NEWTON~~	~~27~~	~~Pudding Stone Lane~~	~~42.299993~~	~~-71.177456~~	~~2934510.274~~	~~743424.256~~	~~6/6/2001~~	~~Irrigation~~	~~New Well~~	~~600~~	~~10~~	~~20~~	~~6/6/2001~~	~~161.6835663~~	~~155.2335663~~	~~155.2335663~~	~~Yes~~	~~151.6835663~~
304789	WALTHAM	24	Sagamore Way	42.359708	-71.260258	2956197.813	720962.796	11/1/1981	Domestic	New Well	79	67	1	11/1/1981	94.92100067	88.47100067	88.47100067	Yes	27.92100067
304772	WALTHAM	215	Waverley Oaks Road	42.383245	-71.209767	2964817.637	734579.988	5/19/1989	Irrigation	New Well	300	65	10	5/19/1989	73.94291992	67.49291992	67.49291992	Yes	8.942919922
304759	WALTHAM	10	Prospect Hill Road	42.376608	-71.252061	2962362.903	723160.327	6/12/1990	Irrigation	New Well	1000	8	30	6/12/1990	83.11716766	76.66716766	76.66716766	Yes	75.11716766
304716	WALTHAM	601	Beaver Street	42.385188	-71.228649	2965508.92	729476.333	12/11/1992	Irrigation	New Well	225	6	25	12/11/1992	101.2899124	94.83991241	94.83991241	Yes	95.28991241
112825	WALTHAM	213	Beaver Street	42.38417	-71.210531	2965154.028	734372.432	8/27/2002	Irrigation	New Well	180	0	10	8/28/2002	73.59553833	67.14553833	67.14553833		
112667	WALTHAM		Beaver Street	42.385444	-71.223709	2965606.497	730810.644	1/2/2003	Irrigation	New Well	0	120	10	1/4/2003	87.1364624	80.6864624	80.6864624	Yes	-32.8635376
112664	WALTHAM	175	Forest Street	42.387918	-71.218891	2966512.336	732109.32	11/25/2002	Irrigation	New Well	600	120	10	11/26/2002	214.6716644	208.2216644	208.2216644	Yes	94.67166443

Table C-1

List of Wells within 0.5 Mile of the SDEIR Alternative 3A Tunnel Alignment

MWRA Contract No. 7159

WellID	Town	Street Number	Street Name	Latitude	Longitude	spcNorthing_usft_Y	spcEasting_usft_X	Date Complete	Well Type	Work Performed	Total Depth	Depth to Bedrock	Water Level	Dates	Ground Elev_BCB	Z	Ground Elev_Ft	Hit Bedrock	Bedrock Elev_BCB
112654	WALTHAM	175	Forest Street	42.387918	-71.218891	2966512.336	732109.32	10/9/2002	Irrigation	New Well	900	95	7.8	10/30/2002	214.6716644	208.2216644	208.2216644	Yes	119.6716644
112651	WALTHAM		Beaver Street	42.385444	-71.223709	2965606.497	730810.644	9/20/2002	Irrigation	New Well	400	100	5	9/21/2002	87.1364624	80.6864624	80.6864624	Yes	-12.8635376
668958	WELLESLEY	40	WILLIAM STREET	42.31805	-71.23175	2941039.712	728715.499	6/11/2021	Irrigation	New Well	1005	16	60	5/4/2021	91.6236908	85.1736908	85.1736908	Yes	75.6236908
309600	WELLESLEY	7	Ashmont Road	42.312337	-71.24152	2938949.626	726079.497	12/5/1997	Irrigation	New Well	220	70	20	12/5/1997	99.89999695	93.44999695	93.44999695	Yes	29.89999695
308617	WELLESLEY	83	Walnut Street	42.324077	-71.253577	2943218.26	722806.008	5/10/1989	Domestic	New Well	625	50	40	5/10/1989	129.8999969	123.4499969	123.4499969	Yes	79.89999695
135983	WELLESLEY[1]	65	Mill Hill Road	42.29889	-71.229703	2934059.201	729291.239	4/15/2005	Domestic	Replacement	50	0	33	4/15/2005	162.9268677	156.4768677	156.4768677		
669062	WESTON	18	GATE HOUSE LANE	42.3543	-71.26556	2954223.031	719535.222	7/14/2021	Domestic	New Well	1005	16	14	6/23/2021	84.21760864	77.76760864	77.76760864	Yes	68.21760864
660151	WESTON	7	CUTTERS BLUFF LANE	42.344	-71.26725	2950468.232	719088.663	3/28/2018	Irrigation	New Well	465	8	182	3/28/2018	161.3444702	154.8944702	154.8944702	Yes	153.3444702
650969	WESTON	24	MEADOWBROOK RD	42.34916	-71.27023	2952346.465	718277.981	10/31/2014	Irrigation	New Well	800	10	36	10/30/2014	179.8658783	173.4158783	173.4158783	Yes	169.8658783
617861	WESTON	44	MEADOWBROOK ROAD	42.3497	-71.26996	2952543.45	718350.437	11/21/2012	Irrigation	New Well	940	4	0		176.7796967	170.3296967	170.3296967	Yes	172.7796967
305070	WESTON	72	River Road	42.348696	-71.26396	2952182.001	719973.348	1/29/1993	Domestic	Deepen	785	0	100	1/29/1993	88.57319183	82.12319183	82.12319183		
305047	WESTON	9	Newton Street	42.341779	-71.275886	2949652.599	716756.125	9/10/1997	Domestic	Hydrofracture	525	20	32	9/10/1997	129.8999969	123.4499969	123.4499969	Yes	109.8999969
305032	WESTON	93	South Avenue	42.341906	-71.267946	2949704.621	718902.581	9/4/1998	Irrigation	New Well	600	70	12	9/4/1998	110.1142609	103.6642609	103.6642609	Yes	40.11426086
163620	WESTON	20	Tamarack Road	42.336517	-71.2701	2947739.177	718325.541	12/15/2010	GeoThermal Open Loop	New Well	1205	45	45	12/15/2010	132.6488525	126.1988525	126.1988525	Yes	87.64885254
122634	WESTON	71	Meadow Beach Road	42.351856	-71.272657	2953327.19	717619.299	5/2/2003	Domestic	New Well	725	3	18	5/2/2003	197.5386841	191.0886841	191.0886841	Yes	194.5386841
117062	WESTON	80	Orchard Avenue	42.33462	-71.272199	2947046.347	717759.875	9/12/2002	Irrigation	New Well	900	80	20	9/12/2002	169.7197754	163.2697754	163.2697754	Yes	89.71977539
114591	WESTON	70	Meadowbrook Road	42.350817	-71.273218	2952948.151	717468.663	6/13/2002	Irrigation	New Well	600	1	14	6/19/2002	239.2779572	232.8279572	232.8279572	Yes	238.2779572
114511	WESTON	45	Young Road	42.344178	-71.275781	2950526.921	716782.214	7/1/2002	Irrigation	New Well	700	29	10	7/12/2002	168.7977173	162.3477173	162.3477173	Yes	139.7977173
112922	WESTON	71	Meadowbrook Road	42.351856	-71.272657	2953327.19	717619.299	1/6/2003	Irrigation	New Well	705	8	16	1/6/2003	197.5386841	191.0886841	191.0886841	Yes	189.5386841
107473	WESTON[1]	167	South Street (rte 30)	42.370125	-71.250359	2960001.684	723627.125	11/12/2001	Irrigation	New Well	700	30	30	11/13/2001	87.51864929	81.06864929	81.06864929	Yes	57.51864929
106117	WESTON	46	River Road	42.34682	-71.264341	2951498.061	719872.245	12/8/2001	Irrigation	New Well	600	6	10	1/4/2001	98.20183868	91.75183868	91.75183868	Yes	92.20183868
105624	WESTON	31	Farm Raod	42.355538	-71.272193	2954669.328	717741.138	9/15/2001	GeoThermal Open Loop	New Well	1507	11	50	9/15/2001	155.0550568	148.6050568	148.6050568	Yes	144.0550568
310539	WESTWOOD[1]		Grove Street	42.331134	-71.257524	2945786.915	721731.326	5/21/1985	Domestic	New Well	600	3	0		71.89999695	65.44999695	65.44999695	Yes	68.89999695
310380	WESTWOOD[1]		Grove Street	42.331134	-71.257524	2945786.915	721731.326	2/19/1982	Domestic	New Well	250	6	12	2/19/1982	71.89999695	65.44999695	65.44999695	Yes	65.89999695
3333000-03G	WESTON		NICKERSON FIELD G.P. WELL	42.340324	-71.263817														MassGIS
3333000-04G	WESTON		RTE. 128 G.P. WELL	42.341896	-71.263733														MassGIS
3317000-05G	WELLESLEY			42.314106	-71.253868														MassGIS

Note:

1. Recorded latitude/longitude of well is causing the plotting of well in GIS to show as being in a different City/Town. Exact well location should be field verified.
2. Strikethrough text indicate wells that are no longer in the half mile radius from DEIR alternative.

Table C-2

List of Wells within 0.5 Mile of the SDEIR Alternative 4A Tunnel Alignment

Well ID	Town	Street Number	Street Name	Latitude	Longitude	spcNorthing_usft_Y	spcEasting_usft_X	Date Complete	Well Type	Work Performed	Total Depth	Depth to Bedrock	Water Level	Dates	Z	Elev_ NAD83Ft	Top Of Rock Elev
266340	BOSTON	125	Arborway	42.30746	-71.120906	2937294.292	758710.498	2/24/1993	Irrigation	New Well	1005	49	22	2/24/1993			
266339	BOSTON	7	Louders Lane	42.306007	-71.125431	2936759.387	757488.832	2/17/1993	Irrigation	New Well	255	60	50	2/17/1993	53.91604614	53.91604614	53.91604614
123519	BOSTON		St. Joseph Cemetery	42.301312	-71.104536	2935073.967	763148.892	9/7/2004	Irrigation	New Well	500	10	27	8/16/2004			
105422	BOSTON[1]		Country Club Road	42.307069	-71.193309	2937073.073	739126.303	11/28/2001	Domestic	New Well	510	8	50	12/5/2001	143.6488953	143.6488953	143.6488953
2318	BOSTON	5	Woodlawn Avenue	42.299243	-71.113476	2934308.904	760733.847	3/14/2000	Domestic	New Well	105	0	1	3/16/2000	35.21578598	35.21578598	
282434	BROOKLINE	191	Newton Street	42.310554	-71.142905	2938396.119	752755.148	5/11/1989	Irrigation	New Well	0	74	35	5/17/1989	264.8783569	264.8783569	264.8783569
282375	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	4/1/1998	Irrigation	New Well	1000	3	52	4/1/1998	190.9111176	190.9111176	190.9111176
257944	BROOKLINE	186	Newton Street	42.30945	-71.141633	2937995.245	753100.892	8/20/2008	GeoThermal Open Loop	New Well	1000	30	18	8/20/2008	265.6067505	265.6067505	265.6067505
100863	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	6/5/2001	Irrigation	New Well	1300	0	15	6/5/2001	190.9111176	190.9111176	
2900	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	7/13/1999	Irrigation	New Well	1000	0	30	7/27/1999	190.9111176	190.9111176	
663558	NEWTON	530	DUDLEY ROAD	42.30641	-71.17603	2936850.201	743801.147	7/9/2019	Irrigation	New Well	500	6	7	7/2/2019	182.3028412	182.3028412	182.3028412
659148	NEWTON	181	WINDSOR ROAD	42.3317	-71.25741	2945993.265	721761.565	10/17/2017	Irrigation	New Well	1000	85	-2E+09	10/17/2017	57.00632858	57.00632858	57.00632858
656616	NEWTON	179	LAGRANGE STREET	42.30421	-71.1672	2936057.679	746192.794	2/24/2017	Irrigation	New Well	705	11	0		130.837616	130.837616	130.837616
655572	NEWTON	380	DEDHAM STREET	42.30885	-71.1992	2937716.427	737530.51	7/12/2016	Irrigation	New Well	500	38	40	7/7/2016	188.9265289	188.9265289	188.9265289
653868	NEWTON	373	DEDHAM ST	42.308703	-71.199853	2937662.236	737354.069	4/30/2016	Irrigation	New Well	250	12	10	4/30/2016	189.9477997	189.9477997	189.9477997
304378	NEWTON		Grove Street and Route 16	42.32577	-71.25632	2943833.092	722062.467	12/1/1980	Domestic	New Well	405	44	0				
304367	NEWTON	400	Dedham Street	42.308428	-71.19821	2937563.589	737798.84	10/12/1989	Irrigation	New Well	450	23	25	10/12/1989	185.7204132	185.7204132	185.7204132
304353	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/3/1991	Irrigation	New Well	330	30	7	4/3/1991	98.40291595	98.40291595	98.40291595
304350	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	3/22/1991	Irrigation	New Well	500	9	28	3/22/1991	98.40291595	98.40291595	98.40291595
304349	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	3/26/1991	Irrigation	New Well	350	10	34	3/26/1991	98.40291595	98.40291595	98.40291595
304348	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/5/1991	Irrigation	New Well	500	7	40	4/5/1991	98.40291595	98.40291595	98.40291595
304347	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/14/1991	Irrigation	New Well	405	8	30	4/14/1991	98.40291595	98.40291595	98.40291595
304346	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/30/1991	Irrigation	New Well	500	10	12	4/30/1991	98.40291595	98.40291595	98.40291595
304344	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	5/17/1991	Irrigation	New Well	480	10	30	5/17/1991	98.40291595	98.40291595	98.40291595
304335	NEWTON	29	Charles Street	42.344068	-71.256131	2950501.411	722094.511	6/3/1991	Domestic	New Well	260	55	20	6/3/1991	53.14040756	53.14040756	53.14040756
304321	NEWTON	21	Placid Road	42.311998	-71.198113	2938864.655	737820.473	10/25/1991	Irrigation	New Well	305	32	16	10/25/1991	149.79776	149.79776	149.79776
304288	NEWTON	275	Brookline Street	42.300822	-71.177481	2934812.35	743416.35	8/9/1993	Irrigation	New Well	625	13	35	8/9/1993	155.1386414	155.1386414	155.1386414
304287	NEWTON	85	Kingswood Road	42.354185	-71.253941	2954189.969	722675.921	8/1/1993	Irrigation	New Well	27	0	20	8/1/1993	38.45722198	38.45722198	
304278	NEWTON	185	Christina Street	42.304348	-71.209367	2936066.283	734786.024	4/15/1994	Irrigation	New Well	345	42	25	4/15/1994	102	102	102
304268	NEWTON	605	Grove Street	42.328369	-71.258656	2944778.424	721428.089	6/17/1994	Irrigation	New Well	500	90	80	6/17/1994			
304265	NEWTON	130	Wheeler Road	42.310092	-71.191544	2938176.43	739599.748	8/4/1994	Irrigation	New Well	1000	50	10	8/4/1994	140.0252991	140.0252991	140.0252991
~~304263~~	~~NEWTON~~	~~471~~	~~Nahanton Street~~	~~42.297404~~	~~-71.207079~~	~~2933537.884~~	~~735413.641~~	~~8/11/1994~~	~~Irrigation~~	~~New Well~~	~~820~~	~~18~~	~~40~~	~~8/11/1994~~			
304243	NEWTON	7	Melina Road	42.31081	-71.196701	2938433.081	738203.926	12/27/1994	Irrigation	New Well	175	10	14	12/27/1994	145.6761169	145.6761169	145.6761169
304214	NEWTON	123	Baldpate Hill Road	42.30506	-71.180194	2936353.987	742676.627	7/9/1996	Irrigation	New Well	325	80	60	7/9/1996	248.3180695	248.3180695	248.3180695
304210	NEWTON		Cornell Street	42.329787	-71.259677	2945294.393	721150.547	8/24/1996	Irrigation	New Well	1000	90	15	8/24/1996			
304209	NEWTON		Wheeler Road	42.310384	-71.193965	2938280.482	738944.522	9/29/1996	Domestic	Hydrofracture	1000	25	7	9/29/1996	125.9862518	125.9862518	125.9862518
~~304177~~	~~NEWTON~~	~~74~~	~~Oak Hill Street~~	~~42.298672~~	~~-71.179113~~	~~2934027.188~~	~~742977.802~~	~~4/9/1998~~	~~Domestic~~	~~New Well~~	~~500~~	~~5~~	~~20~~	~~4/9/1998~~	~~110.7127533~~	~~110.7127533~~	~~110.7127533~~
304170	NEWTON[1]	24	Bryon Road	42.301863	-71.166924	2935202.683	746270.794	8/8/1998	Irrigation	New Well	500	45	20	8/8/1998	140.2731323	140.2731323	140.2731323
304165	NEWTON	142	Neshobe Road	42.326972	-71.244996	2944280.077	725123.378	9/1/1998	Irrigation	Hydrofracture	820	65	30	9/1/1998	72.26209259	72.26209259	72.26209259
304161	NEWTON[1]	24	Bryon Road	42.301863	-71.166924	2935202.683	746270.794	12/5/1998	Irrigation	New Well	505	4	20	12/5/1998	140.2731323	140.2731323	140.2731323
258804	NEWTON	17	Racheal Rd.	42.30915	-71.202	2937823.094	736772.755	3/10/2009	GeoThermal Closed Loop	New Well	360	22	41	3/10/2009	182.9972076	182.9972076	182.9972076
257132	NEWTON	354	dudley road	42.30935	-71.181567	2937915.949	742299.385	5/12/2008	Irrigation	New Well	500	15	22	5/12/2008	170.7354126	170.7354126	170.7354126
~~158209~~	~~NEWTON~~	~~2253~~	~~Commonwealth Avenue~~	~~42.347217~~	~~-71.254883~~	~~2951649.942~~	~~722428.599~~	~~6/12/2009~~	~~Irrigation~~	~~New Well~~	~~520~~	~~40~~	~~-2E+09~~	~~4/15/2009~~	~~50.79621887~~	~~50.79621887~~	~~50.79621887~~
155281	NEWTON	369	Dudley Road	42.308333	-71.182517	2937544.379	742043.801	11/13/2007	Irrigation	New Well	425	22	40	11/13/2007	153.3340912	153.3340912	153.3340912
150099	NEWTON	11	Placid Road	42.307033	-71.192617	2937060.628	739313.534	11/10/2006	Irrigation	New Well	160	25	10	11/11/2006	140.8580322	140.8580322	140.8580322
~~146978~~	~~NEWTON~~	~~21~~	~~Columbine Road~~	~~42.29903~~	~~-71.178494~~	~~2934158.28~~	~~743144.77~~	~~9/11/2006~~	~~Irrigation~~	~~New Well~~	~~220~~	~~26~~	~~20~~	~~8/3/2006~~	~~116.1653366~~	~~116.1653366~~	~~116.1653366~~
~~139646~~	~~NEWTON~~	~~303~~	~~Nahanten Street~~	~~42.297823~~	~~-71.200698~~	~~2933696.568~~	~~737139.416~~	~~4/12/2006~~	~~Irrigation~~	~~New Well~~	~~27~~	~~0~~	~~4~~	~~4/12/2006~~			
135288	NEWTON	554	Grove Street	42.330087	-71.257671	2945405.254	721692.662	4/25/2005	Irrigation	New Well	1005	30	20	4/26/2005	71	71	71
~~123535~~	~~NEWTON~~	~~41~~	~~Old Farm Road~~	~~42.299198~~	~~-71.185172~~	~~2934212.763~~	~~741337.931~~	~~5/8/2006~~	~~Irrigation~~	~~New Well~~	~~23~~	~~0~~	~~0~~	~~4/18/2006~~	~~112.5763855~~	~~112.5763855~~	
106072	NEWTON	12	Laurus Lane	42.300441	-71.182577	2934668.335	742038.274	3/11/2002	Irrigation	New Well	325	40	2E+09	3/18/2002	133.5980988	133.5980988	133.5980988
106054	NEWTON	46	Varick Road	42.32792	-71.245823	2944624.879	724898.717	10/10/2002	Irrigation	New Well	116	115	95	10/9/2002	73.18985748	73.18985748	73.18985748
~~103608~~	~~NEWTON~~	~~27~~	~~Pudding Stone Lane~~	~~42.299993~~	~~-71.177456~~	~~2934510.274~~	~~743424.256~~	~~6/6/2001~~	~~Irrigation~~	~~New Well~~	~~600~~	~~10~~	~~20~~	~~6/6/2001~~	~~145.0875702~~	~~145.0875702~~	~~145.0875702~~

Table C-2

List of Wells within 0.5 Mile of the SDEIR Alternative 4A Tunnel Alignment

MWRA Contract No. 7159

Well ID	Town	Street Number	Street Name	Latitude	Longitude	spcNorthing_usft_Y	spcEasting_usft_X	Date Complete	Well Type	Work Performed	Total Depth	Depth to Bedrock	Water Level	Dates	Z	Elev_ NAD83Ft	Top Of Rock Elev
304789	WALTHAM	24	Sagamore Way	42.359708	-71.260258	2956197.813	720962.796	11/1/1981	Domestic	New Well	79	67	1	11/1/1981	25.00705454	82.04414481	82.04414481
304772	WALTHAM	215	Waverley Oaks Road	42.383245	-71.209767	2964817.637	734579.988	5/19/1989	Irrigation	New Well	300	65	10	5/19/1989			
304759	WALTHAM	10	Prospect Hill Road	42.376608	-71.252061	2962362.903	723160.327	6/12/1990	Irrigation	New Well	1000	8	30	6/12/1990			
304716	WALTHAM	601	Beaver Street	42.385188	-71.228649	2965508.92	729476.333	12/11/1992	Irrigation	New Well	225	6	25	12/11/1992	26.77721172	87.85174731	87.85174731
112825	WALTHAM	213	Beaver Street	42.38417	-71.210531	2965154.028	734372.432	8/27/2002	Irrigation	New Well	180	0	10	8/28/2002			
112667	WALTHAM		Beaver Street	42.385444	-71.223709	2965606.497	730810.644	1/2/2003	Irrigation	New Well	0	120	10	1/4/2003	22.63574352	74.26425277	74.26425277
112664	WALTHAM	175	Forest Street	42.387918	-71.218891	2966512.336	732109.32	11/25/2002	Irrigation	New Well	600	120	10	11/26/2002	61.48029454	201.7070095	201.7070095
112654	WALTHAM	175	Forest Street	42.387918	-71.218891	2966512.336	732109.32	10/9/2002	Irrigation	New Well	900	95	9E+08	10/30/2002	61.48029454	201.7070095	201.7070095
112651	WALTHAM		Beaver Street	42.385444	-71.223709	2965606.497	730810.644	9/20/2002	Irrigation	New Well	400	100	5	9/21/2002	22.63574352	74.26425277	74.26425277
668958	WELLESLEY	40	WILLIAM STREET	42.31805	-71.23175	2941039.712	728715.499	6/11/2021	Irrigation	New Well	1005	16	60	5/4/2021	80.72761536	80.72761536	80.72761536
309600	WELLESLEY	7	Ashmont Road	42.312337	-71.24152	2938949.626	726079.497	12/5/1997	Irrigation	New Well	220	70	20	12/5/1997			
308617	WELLESLEY	83	Walnut Street	42.324077	-71.253577	2943218.26	722806.008	5/10/1989	Domestic	New Well	625	50	40	5/10/1989			
135983	WELLESLEY[1]	65	Mill Hill Road	42.29889	-71.229703	2934059.201	729291.239	4/15/2005	Domestic	Replacement	50	0	33	4/15/2005			
669062	WESTON	18	GATE HOUSE LANE	42.3543	-71.26556	2954223.031	719535.222	7/14/2021	Domestic	New Well	1005	16	14	6/23/2021	21.7169054	71.24969192	71.24969192
660882	WESTON	100	RIDGEWAY RD	42.33487	-71.27732	2947133.796	716375.016	6/13/2018	Irrigation	New Well	700	9	21	6/13/2018			
660151	WESTON	7	CUTTERS BLUFF LANE	42.344	-71.26725	2950468.232	719088.663	3/28/2018	Irrigation	New Well	465	8	182	3/28/2018			
657690	WESTON	55	RIDGEWAY ROAD	42.33673	-71.27901	2947810.431	715916.317	6/6/2017	Irrigation	New Well	1400	32	-9E+08	6/6/2017			
650969	WESTON	24	MEADOWBROOK RD	42.34916	-71.27023	2952346.465	718277.981	10/31/2014	Irrigation	New Well	800	10	36	10/30/2014	50.91780932	167.0531855	167.0531855
617861	WESTON	44	MEADOWBROOK ROAD	42.3497	-71.26996	2952543.45	718350.437	11/21/2012	Irrigation	New Well	940	4	0		50.17807065	164.6262213	164.6262213
305153	WESTON	115	Orchard Avenue	42.33424	-71.275682	2946905.371	716818.502	2/15/1980	Domestic	New Well	320	25	20	2/15/1980			
305124	WESTON	48	Ridgeway Road	42.33667	-71.27793	2947789.324	716208.376	8/3/1989	Domestic	New Well	480	10	35	8/3/1989			
305070	WESTON	72	River Road	42.348696	-71.26396	2952182.001	719973.348	1/29/1993	Domestic	Deepen	785	0	100	1/29/1993	75.74117279	75.74117279	
305047	WESTON	9	Newton Street	42.341779	-71.275886	2949652.599	716756.125	9/10/1997	Domestic	Hydrofracture	525	20	32	9/10/1997			
305032	WESTON	93	South Avenue	42.341906	-71.267946	2949704.621	718902.581	9/4/1998	Irrigation	New Well	600	70	12	9/4/1998			
163620	WESTON	20	Tamarack Road	42.336517	-71.2701	2947739.177	718325.541	12/15/2010	GeoThermal Open Loop	New Well	1205	45	45	12/15/2010			
122634	WESTON	71	Meadow Beach Road	42.351856	-71.272657	2953327.19	717619.299	5/2/2003	Domestic	New Well	725	3	18	5/2/2003	56.30302601	184.7212198	184.7212198
117062	WESTON	80	Orchard Avenue	42.33462	-71.272199	2947046.347	717759.875	9/12/2002	Irrigation	New Well	900	80	20	9/12/2002			
114591	WESTON	70	Meadowbrook Road	42.350817	-71.273218	2952948.151	717468.663	6/13/2002	Irrigation	New Well	600	1	14	6/19/2002	69.1055701	226.7243186	226.7243186
114511	WESTON	45	Young Road	42.344178	-71.275781	2950526.921	716782.214	7/1/2002	Irrigation	New Well	700	29	10	7/12/2002			
112922	WESTON	71	Meadowbrook Road	42.351856	-71.272657	2953327.19	717619.299	1/6/2003	Irrigation	New Well	705	8	16	1/6/2003	56.30302601	184.7212198	184.7212198
107473	WESTON[1]	167	South Street (rte 30)	42.370125	-71.250359	2960001.684	723627.125	11/12/2001	Irrigation	New Well	700	30	30	11/13/2001	22.82396148	74.88176577	74.88176577
106117	WESTON	46	River Road	42.34682	-71.264341	2951498.061	719872.245	12/8/2001	Irrigation	New Well	600	6	10	1/4/2001	26.15982801	85.82621013	85.82621013
105624	WESTON	31	Farm Raod	42.355538	-71.272193	2954669.328	717741.138	9/15/2001	GeoThermal Open Loop	New Well	1507	11	50	9/15/2001	43.19941404	141.7303656	141.7303656
310539	WESTWOOD[1]		Grove Street	42.331134	-71.257524	2945786.915	721731.326	5/21/1985	Domestic	New Well	600	3	0		59	59	59
310380	WESTWOOD[1]		Grove Street	42.331134	-71.257524	2945786.915	721731.326	2/19/1982	Domestic	New Well	250	6	12	2/19/1982	59	59	59
3333000-04G	WESTON		RTE. 128 G.P. WELL	42.341896	-71.263733												
3333000-03G	WESTON		NICKERSON FIELD G.P. WELL	42.340324	-71.263817												

Note:

1. Recorded latitude/longitude of well is causing the plotting of well in GIS to show as being in a different City/Town. Exact well location should be field verified.
2. Strikethrough text indicate wells that are no longer in the half mile radius from DEIR alternative.

Table C-3

List of Wells within 0.5 Mile of the SDEIR Alternative 10A Tunnel Alignment

WellID	Town	Street Number	Street Name	Latitude	Longitude	spcNorthing_usft_Y	spcEasting_usft_X	Date Complete	Well Type	Work Performed	Total Depth	Depth to Bedrock	Water Level	Dates	GroundElev_BCB	Z	Ground Elev_Ft	Hit Bedrock	Bedrock Elev_BCB
266340	BOSTON	125	Arborway	42.30746	-71.120906	2937294.292	758710.498	2/24/1993	Irrigation	New Well	1005	49	22	2/24/1993	65.6481926	59.1981926	59.1981926	Yes	16.6481926
266339	BOSTON	7	Louders Lane	42.306007	-71.125431	2936759.387	757488.832	2/17/1993	Irrigation	New Well	255	60	50	2/17/1993	148.9375183	142.4875183	142.4875183	Yes	88.93751831
123519	BOSTON		St. Joseph Cemetery	42.301312	-71.104536	2935073.967	763148.892	9/7/2004	Irrigation	New Well	500	10	27	8/16/2004	78.86679382	72.41679382	72.41679382	Yes	68.86679382
105422	BOSTON[1]	Lot 49	Country Club Road	42.307069	-71.193309	2937073.073	739126.303	11/28/2001	Domestic	New Well	510	8	50	12/5/2001	157.1465942	150.6965942	150.6965942	Yes	149.1465942
2318	BOSTON	5	Woodlawn Avenue	42.299243	-71.113476	2934308.904	760733.847	3/14/2000	Domestic	New Well	105	0	1	3/16/2000	48.02450867	41.57450867	41.57450867		
282434	BROOKLINE	191	Newton Street	42.310554	-71.142905	2938396.119	752755.148	5/11/1989	Irrigation	New Well	0	74	35	5/17/1989	211.3908264	204.9408264	204.9408264	Yes	137.3908264
282375	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	4/1/1998	Irrigation	New Well	1000	3	52	4/1/1998	234.3170044	227.8670044	227.8670044	Yes	231.3170044
257944	BROOKLINE	186	Newton Street	42.30945	-71.141633	2937995.245	753100.892	8/20/2008	GeoThermal Open Loop	New Well	1000	30	18	8/20/2008	219.9852478	213.5352478	213.5352478	Yes	189.9852478
100863	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	6/5/2001	Irrigation	New Well	1300	0	15	6/5/2001	234.3170044	227.8670044	227.8670044		
2900	BROOKLINE	150	Woodland Road	42.314477	-71.15786	2939809.149	748704.347	7/13/1999	Irrigation	New Well	1000	0	30	7/27/1999	234.3170044	227.8670044	227.8670044		
663558	NEWTON	530	DUDLEY ROAD	42.30641	-71.17603	2936850.201	743801.147	7/9/2019	Irrigation	New Well	500	6	7	7/2/2019	195.2411987	188.7911987	188.7911987	Yes	189.2411987
659148	NEWTON	181	WINDSOR ROAD	42.3317	-71.25741	2945993.265	721761.565	10/17/2017	Irrigation	New Well	1000	85	54.7	10/17/2017	69.90000076	63.45000076	63.45000076	Yes	-15.09999924
656616	NEWTON	179	LAGRANGE STREET	42.30421	-71.1672	2936057.679	746192.794	2/24/2017	Irrigation	New Well	705	11	0		193.899173	187.449173	187.449173	Yes	182.899173
655572	NEWTON	380	DEDHAM STREET	42.30885	-71.1992	2937716.427	737530.51	7/12/2016	Irrigation	New Well	500	38	40	7/7/2016	183.0266144	176.5766144	176.5766144	Yes	145.0266144
304378	NEWTON		Grove Street and Route 16	42.32577	-71.25632	2943833.092	722062.467	12/1/1980	Domestic	New Well	405	44	0		73.30900879	66.85900879	66.85900879	Yes	29.30900879
304367	NEWTON	400	Dedham Street	42.308428	-71.19821	2937563.589	737798.84	10/12/1989	Irrigation	New Well	450	23	25	10/12/1989	185.9413025	179.4913025	179.4913025	Yes	162.9413025
304353	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/3/1991	Irrigation	New Well	330	30	7	4/3/1991	120.8999969	114.4499969	114.4499969	Yes	90.89999695
304350	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	3/22/1991	Irrigation	New Well	500	9	28	3/22/1991	120.8999969	114.4499969	114.4499969	Yes	111.8999969
304349	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	3/26/1991	Irrigation	New Well	350	10	34	3/26/1991	120.8999969	114.4499969	114.4499969	Yes	110.8999969
304348	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/5/1991	Irrigation	New Well	500	7	40	4/5/1991	120.8999969	114.4499969	114.4499969	Yes	113.8999969
304347	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/14/1991	Irrigation	New Well	405	8	30	4/14/1991	120.8999969	114.4499969	114.4499969	Yes	112.8999969
304346	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	4/30/1991	Irrigation	New Well	500	10	12	4/30/1991	120.8999969	114.4499969	114.4499969	Yes	110.8999969
304344	NEWTON		Nahanton Street	42.298969	-71.198264	2934116.51	737796.427	5/17/1991	Irrigation	New Well	480	10	30	5/17/1991	120.8999969	114.4499969	114.4499969	Yes	110.8999969
304321	NEWTON	21	Placid Road	42.311998	-71.198113	2938864.655	737820.473	10/25/1991	Irrigation	New Well	305	32	16	10/25/1991	125.340831	118.890831	118.890831	Yes	93.34083099
304288	NEWTON	275	Brookline Street	42.300822	-71.177481	2934812.35	743416.35	8/9/1993	Irrigation	New Well	625	13	35	8/9/1993	187.6864197	181.2364197	181.2364197	Yes	174.6864197
304287	NEWTON	85	Kingswood Road	42.354185	-71.253941	2954189.969	722675.921	8/1/1993	Irrigation	New Well	27	0	20	8/1/1993	71.89095612	65.44095612	65.44095612		
304278	NEWTON	185	Christina Street	42.304348	-71.209367	2936066.283	734786.024	4/15/1994	Irrigation	New Well	345	42	25	4/15/1994	114.8999969	108.4499969	108.4499969	Yes	72.89999695
304268	NEWTON	605	Grove Street	42.328369	-71.258656	2944778.424	721428.089	6/17/1994	Irrigation	New Well	500	90	80	6/17/1994	87.41557617	80.96557617	80.96557617	Yes	-2.584423828
304265	NEWTON	130	Wheeler Road	42.310092	-71.191544	2938176.43	739599.748	8/4/1994	Irrigation	New Well	1000	50	10	8/4/1994	135.8999969	129.4499969	129.4499969	Yes	85.89999695
304263	~~NEWTON~~	~~471~~	~~Nahanton Street~~	~~42.297404~~	~~-71.207079~~	~~2933537.884~~	~~735413.641~~	~~8/11/1994~~	~~Irrigation~~	~~New Well~~	~~820~~	~~18~~	~~40~~	~~8/11/1994~~	~~116.285495~~	~~109.835495~~	~~109.835495~~	~~Yes~~	~~98.285495~~
304243	NEWTON	7	Melina Road	42.31081	-71.196701	2938433.081	738203.926	12/27/1994	Irrigation	New Well	175	10	14	12/27/1994	146.0838806	139.6338806	139.6338806	Yes	136.0838806
304214	NEWTON	123	Baldpate Hill Road	42.30506	-71.180194	2936353.987	742676.627	7/9/1996	Irrigation	New Well	325	80	60	7/9/1996	261.6592133	255.2092133	255.2092133	Yes	181.6592133
304210	NEWTON		Cornell Street	42.329787	-71.259677	2945294.393	721150.547	8/24/1996	Irrigation	New Well	1000	90	15	8/24/1996	80.25924988	73.80924988	73.80924988	Yes	-9.740750122
304209	NEWTON		Wheeler Road	42.310384	-71.193965	2938280.482	738944.522	9/29/1996	Domestic	Hydrofracture	1000	25	7	9/29/1996	127.8999969	121.4499969	121.4499969	Yes	102.8999969
304177	~~NEWTON~~	~~74~~	~~Oak Hill Street~~	~~42.298672~~	~~-71.179113~~	~~2934027.188~~	~~742977.802~~	~~4/9/1998~~	~~Domestic~~	~~New Well~~	~~500~~	~~5~~	~~20~~	~~4/9/1998~~	~~135.8999969~~	~~129.4499969~~	~~129.4499969~~	~~Yes~~	~~130.8999969~~
304170	NEWTON1	24	Bryon Road	42.301863	-71.166924	2935202.683	746270.794	8/8/1998	Irrigation	New Well	500	45	20	8/8/1998	156.8999969	150.4499969	150.4499969	Yes	111.8999969
304165	NEWTON	142	Neshobe Road	42.326972	-71.244996	2944280.077	725123.378	9/1/1998	Irrigation	Hydrofracture	820	65	30	9/1/1998	168.8999969	162.4499969	162.4499969	Yes	103.8999969
304161	NEWTON[1]	24	Bryon Road	42.301863	-71.166924	2935202.683	746270.794	12/5/1998	Irrigation	New Well	505	4	20	12/5/1998	156.8999969	150.4499969	150.4499969	Yes	152.8999969
258804	NEWTON	17	Racheal Rd.	42.30915	-71.202	2937823.094	736772.755	3/10/2009	GeoThermal Closed Loop	New Well	360	22	41	3/10/2009	182.3013031	175.8513031	175.8513031	Yes	160.3013031
257132	NEWTON	354	dudley road	42.30935	-71.181567	2937915.949	742299.385	5/12/2008	Irrigation	New Well	500	15	22	5/12/2008	152.8999969	146.4499969	146.4499969	Yes	137.8999969
155281	NEWTON	369	Dudley Road	42.308333	-71.182517	2937544.379	742043.801	11/13/2007	Irrigation	New Well	425	22	40	11/13/2007	161.0908844	154.6408844	154.6408844	Yes	139.0908844
150099	NEWTON	11	Placid Road	42.307033	-71.192617	2937060.628	739313.534	11/10/2006	Irrigation	New Well	160	25	10	11/11/2006	154.7581055	148.3081055	148.3081055	Yes	129.7581055
146978	~~NEWTON~~	~~21~~	~~Columbine Road~~	~~42.29903~~	~~-71.178494~~	~~2934158.28~~	~~743144.77~~	~~9/11/2006~~	~~Irrigation~~	~~New Well~~	~~220~~	~~26~~	~~20~~	~~8/3/2006~~	~~131.5530731~~	~~125.1030731~~	~~125.1030731~~	~~Yes~~	~~105.5530731~~
139646	~~NEWTON~~	~~303~~	~~Nahanton Street~~	~~42.297823~~	~~-71.200698~~	~~2933696.568~~	~~737139.416~~	~~4/12/2006~~	~~Irrigation~~	~~New Well~~	~~27~~	~~0~~	4	~~4/12/2006~~	~~112.7166473~~	~~106.2666473~~	~~106.2666473~~		
135288	NEWTON	554	Grove Street	42.330087	-71.257671	2945405.254	721692.662	4/25/2005	Irrigation	New Well	1005	30	20	4/26/2005	83.89999695	77.44999695	77.44999695	Yes	53.89999695
~~123535~~	~~NEWTON~~	~~41~~	~~Old Farm Road~~	~~42.299198~~	~~-71.185172~~	~~2934212.763~~	~~741337.931~~	~~5/8/2006~~	~~Irrigation~~	~~New Well~~	~~23~~	~~0~~	~~18.75~~	~~4/18/2006~~	~~168.0910675~~	~~161.6410675~~	~~161.6410675~~		
106072	NEWTON	12	Laurus Lane	42.300441	-71.182577	2934668.335	742038.274	3/11/2002	Irrigation	New Well	325	40	21.9	3/18/2002	155.8012573	149.3512573	149.3512573	Yes	115.8012573
106054	NEWTON	46	Varick Road	42.32792	-71.245823	2944624.879	724898.717	10/10/2002	Irrigation	New Well	116	115	95	10/9/2002	172.8999969	166.4499969	166.4499969	Yes	57.89999695
~~103608~~	~~NEWTON~~	~~27~~	~~Pudding Stone Lane~~	~~42.299993~~	~~-71.177456~~	~~2934510.274~~	~~743424.256~~	~~6/6/2001~~	~~Irrigation~~	~~New Well~~	~~600~~	~~10~~	~~20~~	~~6/6/2001~~	~~161.6835663~~	~~155.2335663~~	~~155.2335663~~	~~Yes~~	~~151.6835663~~
304789	WALTHAM	24	Sagamore Way	42.359708	-71.260258	2956197.813	720962.796	11/1/1981	Domestic	New Well	79	67	1	11/1/1981	94.92100067	88.47100067	88.47100067	Yes	27.92100067
304772	WALTHAM	215	Waverley Oaks Road	42.383245	-71.209767	2964817.637	734579.988	5/19/1989	Irrigation	New Well	300	65	10	5/19/1989	73.94291992	67.49291992	67.49291992	Yes	8.942919922
304769	WALTHAM	45	Azalea Road	42.391878	-71.226474	2967948.799	730056.123	6/21/1989	Irrigation	New Well	605	10	10	6/21/1989	197.679294	191.229294	191.229294	Yes	187.679294
304759	WALTHAM	10	Prospect Hill Road	42.376608	-71.252061	2962362.903	723160.327	6/12/1990	Irrigation	New Well	1000	8	30	6/12/1990	83.11716766	76.66716766	76.66716766	Yes	75.11716766
304716	WALTHAM	601	Beaver Street	42.385188	-71.228649	2965508.92	729476.333	12/11/1992	Irrigation	New Well	225	6	25	12/11/1992	101.2899124	94.83991241	94.83991241	Yes	95.28991241
112825	WALTHAM	213	Beaver Street	42.38417	-71.210531	2965154.028	734372.432	8/27/2002	Irrigation	New Well	180	0	10	8/28/2002	73.59553833	67.14553833	67.14553833		
112667	WALTHAM		Beaver Street	42.385444	-71.223709	2965606.497	730810.644	1/2/2003	Irrigation	New Well	0	120	10	1/4/2003	87.1364624	80.6864624	80.6864624	Yes	-32.8635376
112664	WALTHAM	175	Forest Street	42.387918	-71.218891	2966512.336	732109.32	11/25/2002	Irrigation	New Well	600	120	10	11/26/2002	214.6716644	208.2216644	208.2216644	Yes	94.67166443
112654	WALTHAM	175	Forest Street	42.387918	-71.218891	2966512.336	732109.32	10/9/2002	Irrigation	New Well	900	95	7.8	10/30/2002	214.6716644	208.2216644	208.2216644	Yes	119.6716644
112651	WALTHAM		Beaver Street	42.385444	-71.223709	2965606.497	730810.644	9/20/2002	Irrigation	New Well	400	100	5	9/21/2002	87.1364624	80.6864624	80.6864624	Yes	-12.8635376

Table C-3

List of Wells within 0.5 Mile of the SDEIR Alternative 10A Tunnel Alignment

WellID	Town	Street Number	Street Name	Latitude	Longitude	spcNorthing_usft_Y	spcEasting_usft_X	Date Complete	Well Type	Work Performed	Total Depth	Depth to Bedrock	Water Level	Dates	GroundElev_BCB	Z	Ground Elev_Ft	Hit Bedrock	Bedrock Elev_BCB
668958	WELLESLEY	40	WILLIAM STREET	42.31805	-71.23175	2941039.712	728715.499	6/11/2021	Irrigation	New Well	1005	16	60	5/4/2021	91.6236908	85.1736908	85.1736908	Yes	75.6236908
309600	WELLESLEY	7	Ashmont Road	42.312337	-71.24152	2938949.626	726079.497	12/5/1997	Irrigation	New Well	220	70	20	12/5/1997	99.89999695	93.44999695	93.44999695	Yes	29.89999695
308617	WELLESLEY	83	Walnut Street	42.324077	-71.253577	2943218.26	722806.008	5/10/1989	Domestic	New Well	625	50	40	5/10/1989	129.8999969	123.4499969	123.4499969	Yes	79.89999695
135983	WELLESLEY[1]	65	Mill Hill Road	42.29889	-71.229703	2934059.201	729291.239	4/15/2005	Domestic	Replacement	50	0	33	4/15/2005	162.9268677	156.4768677	156.4768677		
669062	WESTON	18	GATE HOUSE LANE	42.3543	-71.26556	2954223.031	719535.222	7/14/2021	Domestic	New Well	1005	16	14	6/23/2021	84.21760864	77.76760864	77.76760864	Yes	68.21760864
660882	WESTON	100	RIDGEWAY RD	42.33487	-71.27732	2947133.796	716375.016	6/13/2018	Irrigation	New Well	700	9	21	6/13/2018	179.4576752	173.0076752	173.0076752	Yes	170.4576752
660151	WESTON	7	CUTTERS BLUFF LANE	42.344	-71.26725	2950468.232	719088.663	3/28/2018	Irrigation	New Well	465	8	182	3/28/2018	161.3444702	154.8944702	154.8944702	Yes	153.3444702
657690	WESTON	55	RIDGEWAY ROAD	42.33673	-71.27901	2947810.431	715916.317	6/6/2017	Irrigation	New Well	1400	32	18.3	6/6/2017	180.5790894	174.1290894	174.1290894	Yes	148.5790894
650969	WESTON	24	MEADOWBROOK RD	42.34916	-71.27023	2952346.465	718277.981	10/31/2014	Irrigation	New Well	800	10	36	10/30/2014	179.8658783	173.4158783	173.4158783	Yes	169.8658783
617861	WESTON	44	MEADOWBROOK ROAD	42.3497	-71.26996	2952543.45	718350.437	11/21/2012	Irrigation	New Well	940	4	0		176.7796967	170.3296967	170.3296967	Yes	172.7796967
305153	WESTON	115	Orchard Avenue	42.33424	-71.275682	2946905.371	716818.502	2/15/1980	Domestic	New Well	320	25	20	2/15/1980	174.8999969	168.4499969	168.4499969	Yes	149.8999969
305124	WESTON	48	Ridgeway Road	42.33667	-71.27793	2947789.324	716208.376	8/3/1989	Domestic	New Well	480	10	35	8/3/1989	174.090625	167.640625	167.640625	Yes	164.090625
305070	WESTON	72	River Road	42.348696	-71.26396	2952182.001	719973.348	1/29/1993	Domestic	Deepen	785	0	100	1/29/1993	88.57319183	82.12319183	82.12319183		
305047	WESTON	9	Newton Street	42.341779	-71.275886	2949652.599	716756.125	9/10/1997	Domestic	Hydrofracture	525	20	32	9/10/1997	129.8999969	123.4499969	123.4499969	Yes	109.8999969
305044	WESTON	75	Doublet Hill Road	42.348869	-71.275925	2952236.323	716738.794	2/14/1998	Irrigation	New Well	1660	4	1000	2/14/1998	364.4698975	358.0198975	358.0198975	Yes	360.4698975
305043	WESTON	75	Doublet Hill Road	42.348869	-71.275925	2952236.323	716738.794	2/21/1998	Irrigation	New Well	1140	10	1000	2/21/1998	364.4698975	358.0198975	358.0198975	Yes	354.4698975
305032	WESTON	93	South Avenue	42.341906	-71.267946	2949704.621	718902.581	9/4/1998	Irrigation	New Well	600	70	12	9/4/1998	110.1142609	103.6642609	103.6642609	Yes	40.11426086
163620	WESTON	20	Tamarack Road	42.336517	-71.2701	2947739.177	718325.541	12/15/2010	GeoThermal Open Loop	New Well	1205	45	45	12/15/2010	132.6488525	126.1988525	126.1988525	Yes	87.64885254
122634	WESTON	71	Meadow Beach Road	42.351856	-71.272657	2953327.19	717619.299	5/2/2003	Domestic	New Well	725	3	18	5/2/2003	197.5386841	191.0886841	191.0886841	Yes	194.5386841
117062	WESTON	80	Orchard Avenue	42.33462	-71.272199	2947046.347	717759.875	9/12/2002	Irrigation	New Well	900	80	20	9/12/2002	169.7197754	163.2697754	163.2697754	Yes	89.71977539
114591	WESTON	70	Meadowbrook Road	42.350817	-71.273218	2952948.151	717468.663	6/13/2002	Irrigation	New Well	600	1	14	6/19/2002	239.2779572	232.8279572	232.8279572	Yes	238.2779572
114511	WESTON	45	Young Road	42.344178	-71.275781	2950526.921	716782.214	7/1/2002	Irrigation	New Well	700	29	10	7/12/2002	168.7977173	162.3477173	162.3477173	Yes	139.7977173
112922	WESTON	71	Meadowbrook Road	42.351856	-71.272657	2953327.19	717619.299	1/6/2003	Irrigation	New Well	705	8	16	1/6/2003	197.5386841	191.0886841	191.0886841	Yes	189.5386841
107473	WESTON[1]	167	South Street (rte 30)	42.370125	-71.250359	2960001.684	723627.125	11/12/2001	Irrigation	New Well	700	30	30	11/13/2001	87.51864929	81.06864929	81.06864929	Yes	57.51864929
106117	WESTON	46	River Road	42.34682	-71.264341	2951498.061	719872.245	12/8/2001	Irrigation	New Well	600	6	10	1/4/2001	98.20183868	91.75183868	91.75183868	Yes	92.20183868
105624	WESTON	31	Farm Raod	42.355538	-71.272193	2954669.328	717741.138	9/15/2001	GeoThermal Open Loop	New Well	1507	11	50	9/15/2001	155.0550568	148.6050568	148.6050568	Yes	144.0550568
310539	WESTWOOD[1]		Grove Street	42.331134	-71.257524	2945786.915	721731.326	5/21/1985	Domestic	New Well	600	3	0		71.89999695	65.44999695	65.44999695	Yes	68.89999695
310380	WESTWOOD[1]		Grove Street	42.331134	-71.257524	2945786.915	721731.326	2/19/1982	Domestic	New Well	250	6	12	2/19/1982	71.89999695	65.44999695	65.44999695	Yes	65.89999695
3333000-03G	WESTON		NICKERSON FIELD G.P. WELL	42.340324	-71.263817														
3333000-04G	WESTON		RTE. 128 G.P. WELL	42.341896	-71.263733														

Note:
1. Recorded latitude/longitude of well is causing the plotting of well in GIS to show as being in a different City/Town. Exact well location should be field verified.
2. Strikethrough text indicate wells that are no longer in the half mile radius from DEIR alternative.
3. Highlighted cells indicate wells that have been added in the half mile radius since the DEIR alternative.

C.3 Water Supply Alternatives and Determination of the Order of Implementation

It is recommended that the contractor follow the same protocols previously implemented on tunnel construction projects, such as the MetroWest Water Supply Tunnel, should a private well be impacted during construction. There are three levels to be considered: emergency (24 hours after the incident), interim (48 hours after the incident), and permanent (after construction). These levels are detailed in **Table C-4**.

Table C-4 Water Supply Levels

Level	Implementation Timeline	Description
Emergency	24 hours after incident	Provide water for at least drinking and cooking purposes for the duration of construction, including: Contact pre-approved bottled water supplier to deliver and install a refrigeration unit and provide an adequate volume of bottled water for drinking and cooking. Contact the City or Town's Water Department and Dig Safe to mark out utilities in the vicinity of the well owner's address.
Interim	48 hours after incident	Provide water for domestic and/or irrigation purposes for the duration of construction or until the groundwater level returns to normal, including: Provide reliable water supply for domestic uses such as showering and dishwashing through a temporary or long-term system. Water supply process and materials should be submitted through the shop drawing review process prior to the start of construction. Stockpile materials required for the temporary water supply system prior to construction. Water supply systems will vary depending on the location of the property served by the impacted well in relation to properties served by public water supply. A description of different water supply alternatives is included in **Table C-5**.
Permanent	After construction	Evaluate the affected wells after construction is complete to determine whether water supply quality and quantity has returned to pre-construction conditions. If the well has been determined to be damaged beyond repair, the contractor will be directed to replace the well with one of an equivalent size and water quality or provide an alternative water supply.

Alternatives for providing potable water supply are described in **Table C-5**, along with the corresponding order in which the supply alternative is recommended to be implemented. This order corresponds to the complexity of establishing a water supply during construction with 1 being the least complex and most desirable alternative and 7 being the most complex and least desirable. The first alternative, supplying bottled water, is to provide water immediately after the incident because the remaining alternatives require completion of the 48-hour Dig Safe waiting period before implementation.

For any potentially impacted residential irrigation wells, the contractor could arrange for a landscaping service to provide watering of lawns and other outdoor uses. For any potentially impacted commercial irrigation wells, like a golf course, water could be provided by MWRA through its existing interconnection. Although most geothermal wells today are closed circuit systems that would not be affected by tunnel construction, if there are impacted geothermal wells that are non-closed systems, other heating sources, such as use of space heaters or existing oil, electric, or natural gas services could be utilized until the well has returned to pre-construction conditions and the geothermal well can be operated again.

Table C-5 Alternative Potable Water Supply Levels

Order of Implementation	Alternative Name	Description
1	Bottled Water	Provide bottled water for drinking and cooking purposes within 24 hours of water supply emergency until the well owner puts in writing that they no longer require the bottled water.
2	Use of an existing water service	If the property has an existing connection to a municipal water system, the contractor can hire a licensed plumber to re-plumb the interior piping of the property to utilize the water service. This work may include upsizing the existing service or installation of an in-line booster pump if required to provide a minimum service pressure of 35 pounds per square inch.
3	Use of an outdoor spigot	If the property is within 200 feet of a property that receives municipal water service, the contractor could utilize the outdoor spigots of the two properties with proper backflow prevention. In this case, the property with the municipal service would supply water to the property with the well via a hose with a meter. Note that this alternative may not be feasible during cold weather months. During the design phase, the cost of water for one homeowner to supply another should be considered.
4	Construction of a new water service	If the property has a municipal water main in front of the residence, the contractor could tap the existing main and install a service connecting to the existing plumbing.
5	Use of a Hydrant	If the property is within 500 feet of a hydrant, a connection to the municipal water system could be made via the 2.5-inch port with proper backflow prevention and installation of appropriately sized temporary water main to extend to the property and then connect the new temporary water main to the existing plumbing with a new water service or via an outdoor spigot. Note that this alternative could only be utilized seasonally if the temporary piping is above ground, as it could freeze in the winter.
6	Construction of New Water Main and Service	If the property is within 1,000 feet of an existing municipal water main, the contractor could extend the water main to the property. In this alternative, a gate valve at the connection point and a hydrant at the end of the new main are recommended and an in-line booster pump may be required to provide a minimum service pressure of 35 pounds per square inch. A water service would be installed from the new main to the existing plumbing.
7	Use of an Above-Ground Tank System	If there are no ways to provide municipal water service to the property, installation of an above-ground tank system would be required to supply water. This system can be installed in a garage or basement and includes a plastic tank, disinfection system, and pump. The tank would need to be filled on an as-needed basis until a permanent water supply solution is constructed.

Note: The term “water main” refers to a larger diameter pipe that provides service to multiple buildings and fire protection. The term “water service” refers to a smaller diameter pipe that provides service to a single building.

C.4 Surface Water Impacts

In addition to groundwater impacts, there may be potential impacts to surface waters during construction. **Table C-6** summarizes the surface waters within a 0.5 mile of the proposed tunnel alignment and potential mitigation strategies should the surface water be disrupted during construction. No new surface waters were identified along the SDEIR Alternatives as compared to the DEIR. The use of four of the waterbodies are unknown and thus, coordination with the landowner is recommended to understand the use and corresponding mitigation strategy, if required. Water Management Act (WMA) registrations and permits were checked, but these waterbodies with unknown use were not listed. If less than 100,000 gpd is used, a WMA permit or registration would not likely be required, so there is still a possibility that some of waterbodies with unknown uses could be used for irrigation water. It should be noted that in **Table C-6**, Rosemary Brook was listed as a Public Water Supply. Per Comment 3-7, from the Town of Wellesley, this is incorrect. Wellesley has a municipal well called the Rosemary Brook Well, but the Brook itself is not a public water supply source. In **Table C-6**, the “Use” for Rosemary Brook has been changed to Recreation; the Mitigation Strategy Needed has also been updated.

Table C-6 Water Supply Resources

Name	Attachment Map Location [1]	Communities	Use	Mitigation Strategy Needed
Charles River	All	Waltham, Weston, Newton, Wellesley, Needham, Brookline, Boston	Recreation	No
Clematis Brook	2 of 8 [2]	Waltham	Recreation	No
Chester Brook/Lyman Pond	2 of 8 [2]	Waltham	Recreation	No
Stony Brook Reservoir	3 of 8	Waltham, Weston, Cambridge	Public Water Supply	Yes, this is a water source for City of Cambridge but the City has an emergency connection with MWRA that could be utilized.
Rosemary Brook	5 of 8	Wellesley	Recreation	No
Charles River Country Club Ponds	6 of 8	Newton	Unknown	While it is expected that this might be an irrigation pond, coordination with the golf course is recommended to confirm use of waterbodies and whether mitigation is required. A WMA registration # 32020701 exists for this golf course for 0.29 million gallons per day (MGD) for 136 days/year from the Charles River.
Robert T. Lynch Municipal Golf Course Ponds	6 of 8	Brookline	Unknown	While it is expected that this might be an irrigation pond, coordination with the golf course is recommended to confirm use of waterbodies and whether mitigation is required.
Pond at Larz Anderson Park	7 of 8	Brookline	Unknown	Coordination with Town of Brookline is recommended to confirm whether mitigation would be required.
Pond at Apple Orchard School	7 of 8	Brookline	Unknown	Coordination with the school is recommended to determine the use of the waterbody and whether mitigation Is required.
Scarboro Pond	7 of 8	Boston	Recreation	No
Lake Hibiscus	8 of 8	Boston	Recreation	No

1 *Attachment Map Reference Figures are included in* ***DEIR Chapter 5, Water Supply and Water Management Act, Figures 5.1-1*** *through* ***5.1-8****.*

2 *See* ***SDEIR Figures 6-1*** *and* ***6-2****.*

Appendix D: RMAT Tool Output Reports

- University of Massachusetts Property (Alternatives 3A and 4A)
- Lower Fernald Property (Alternative 10A)
- Tandem Trailer (Alternatives 3A and 4A)
- Park Road East (Alternatives 3A and 4A)
- Bifurcation (Alternative 3A)
- Park Road West (Alternatives 4A and 10A)
- Highland Avenue Northwest (All Alternatives)
- Highland Avenue Northeast (All Alternatives)
- American Legion (All Alternatives)
- School Street (All Alternatives)
- Cedarwood Pumping Station (All Alternatives)
- Hegarty Pumping Station (All Alternatives)
- St. Mary Street Pumping Station (All Alternatives)
- Newton Street Pumping Station (All Alternatives)
- Southern Spine Mains (All Alternatives)
- Hultman Aqueduct Isolation Valve (All Alternatives)

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Climate Resilience Design Standards Tool Project Report

UMass Property

Date Created: 3/10/2023 4:02:16 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 3:46:04 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
UMass Property	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
UMass Property					
Extreme Precipitation					
UMass Property	2070			100-yr (1%)	Tier 3
Extreme Heat					
UMass Property	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 500ft of a waterbody and less than 20ft above the waterbody
- 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 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover

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 - UMass Property
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: UMass Property — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
UMass Property	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	UMass Property
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)?	2127
Location of Project:	Waltham
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: UMass Property
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Lower Fernald
Date Created: 3/10/2023 3:50:03 PM Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 3:45:31 PM Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
Lower Fernald Property	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Lower Fernald Property					
Extreme Precipitation					
Lower Fernald Property	2070			100-yr (1%)	Tier 3
Extreme Heat					
Lower Fernald Property	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

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

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 500ft of a waterbody and less than 20ft above the waterbody
- 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 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is between 10% and 50%

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 - Lower Fernald Property
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Lower Fernald Property — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Lower Fernald Property	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Lower Fernald
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)?	2127
Location of Project:	Waltham
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Lower Fernald Property
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Tandem Trailer

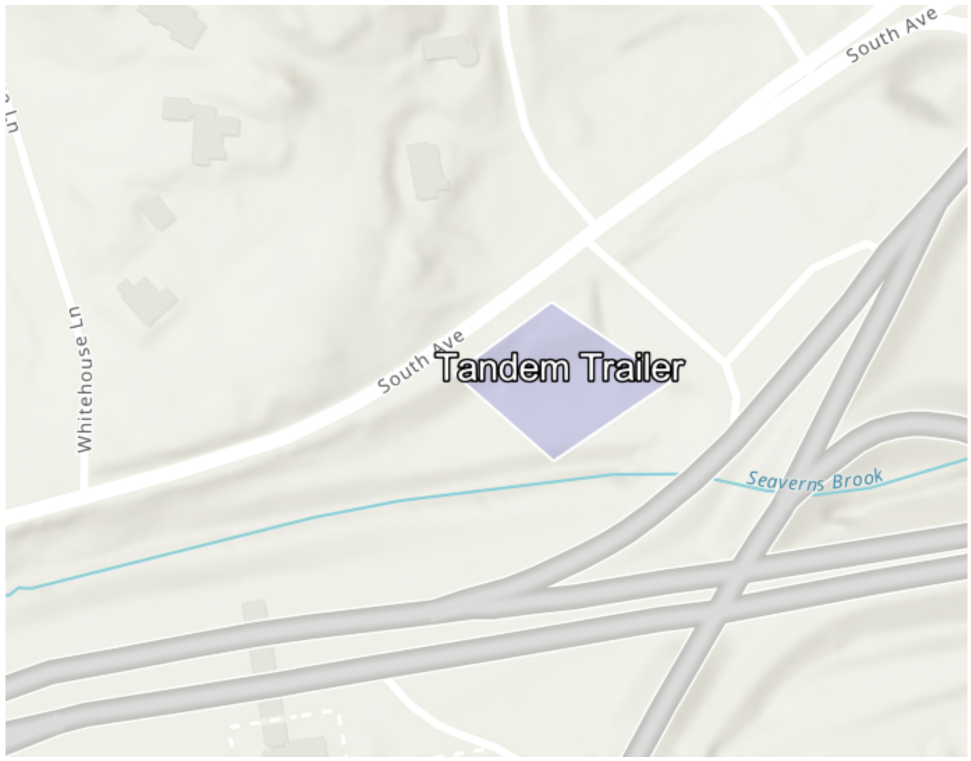
Date Created: 4/28/2022 4:37:53 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 4:38:12 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	High Exposure
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
Tandem Trailer	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Tandem Trailer					
Extreme Precipitation					
Tandem Trailer	2070			100-yr (1%)	Tier 3
Extreme Heat					
Tandem Trailer	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within a mapped FEMA floodplain, outside of the Massachusetts Coast Flood Risk Model (MC-FRM)
- Part of the project is within 100ft of a waterbody
- No historic riverine flooding at project site
- 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is less than 10%

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 - Tandem Trailer
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Tandem Trailer — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Tandem Trailer	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Tandem Trailer
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)?	2127
Location of Project:	Weston
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Tandem Trailer
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.

Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.

Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?

Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?

Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?

Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Park Road East

Date Created: 4/28/2022 4:40:30 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/5/2023 5:44:00 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
Park Road East	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Park Road East					
Extreme Precipitation					
Park Road East	2070			100-yr (1%)	Tier 3
Extreme Heat					
Park Road East	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 100ft of a waterbody
- 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 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Between 10% and 40% of the existing project site has canopy cover

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 - Park Road East
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Park Road East — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Park Road East	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Park Road East
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)?	2127
Location of Project:	Weston
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Park Road East
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Bifurcation

Date Created: 4/28/2022 4:46:05 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/5/2023 5:44:30 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

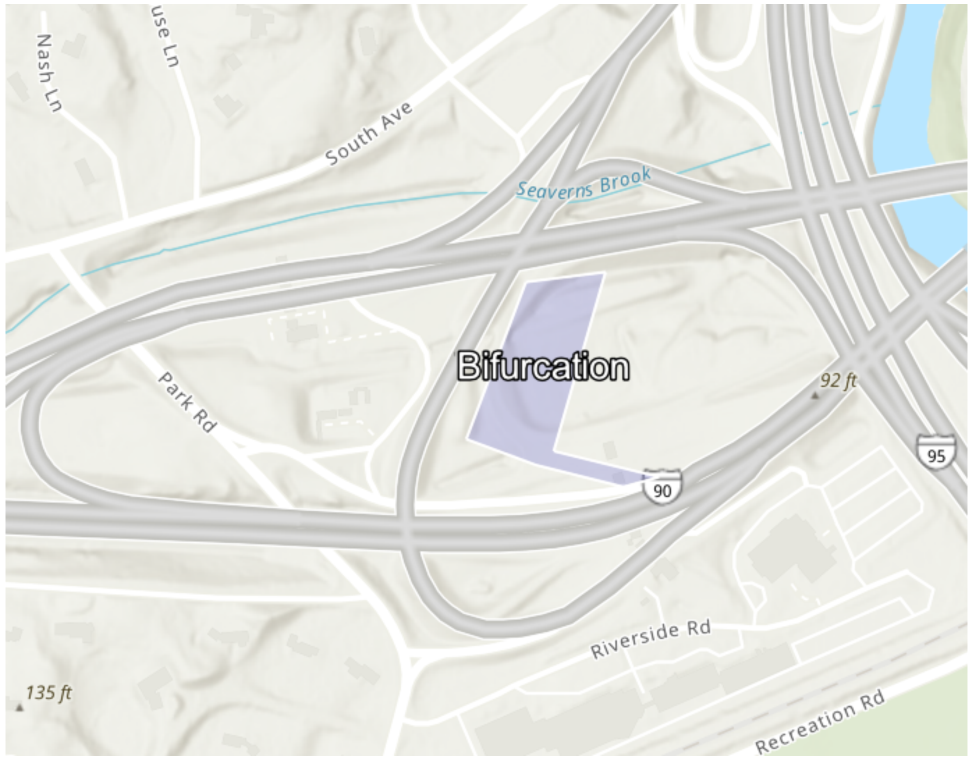
Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
Bifurcation	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Bifurcation					
Extreme Precipitation					
Bifurcation	2070			100-yr (1%)	Tier 3
Extreme Heat					
Bifurcation	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

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

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 100ft of a waterbody
- 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 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover

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 - Bifurcation
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Bifurcation Infrastructure

Sea Level Rise/Storm Surge Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Bifurcation	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Bifurcation
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)?	2127
Location of Project:	Weston
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Bifurcation
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.
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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate
If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist
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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Park Road West

Date Created: 4/28/2022 4:44:35 PM
Created By: ofisher@vhb.com

Date Report Generated: 6/5/2023 5:50:56 PM
Tool Version: Version 1.3

Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

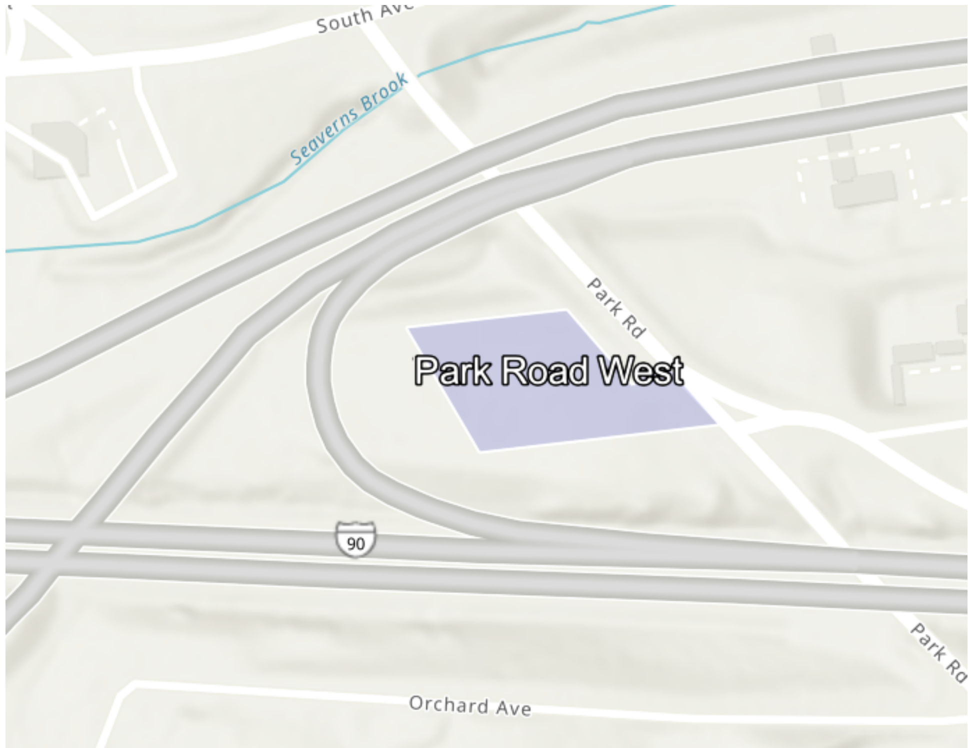
Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
Park Road West	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Park Road West					
Extreme Precipitation					
Park Road West	2070			100-yr (1%)	Tier 3
Extreme Heat					
Park Road West	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 100ft of a waterbody
- 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 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover

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 - Park Road West
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Park Road West — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Park Road West	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Park Road West
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)?	2127
Location of Project:	Weston
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Park Road West
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Highland Ave Northwest
Date Created: 4/28/2022 4:53:35 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 2:35:56 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

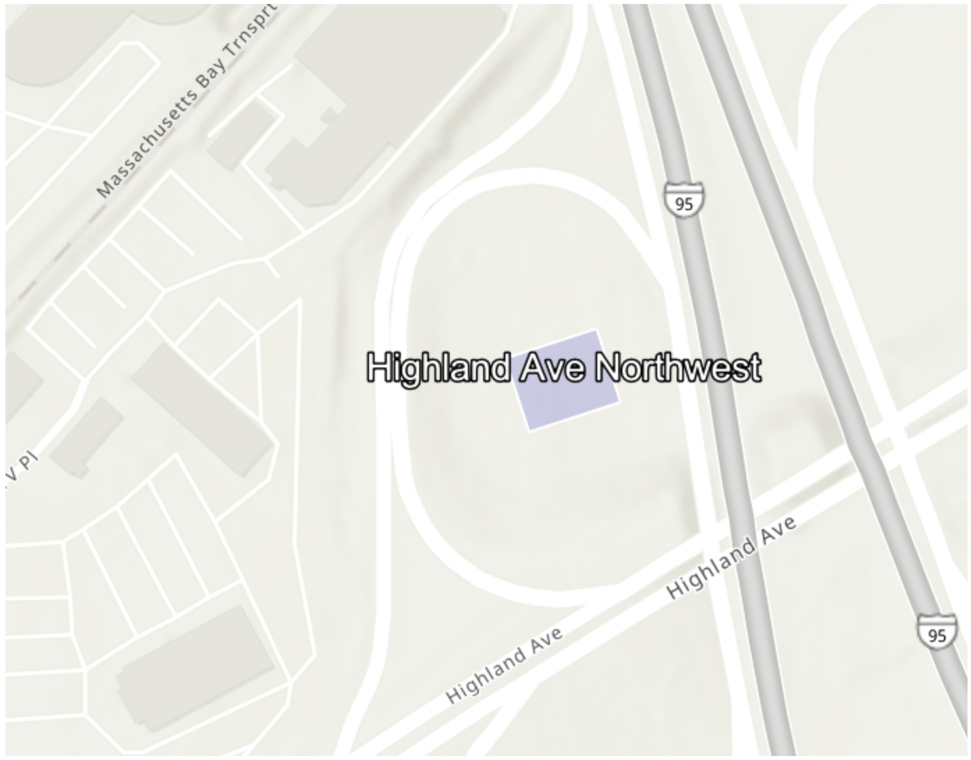
Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
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
Highland Ave Northwest	Low 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					
Highland Ave Northwest					
Extreme Precipitation					
Highland Ave Northwest	2070			100-yr (1%)	Tier 3
Extreme Heat					
Highland Ave Northwest	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover

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 - Highland Ave Northwest
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Highland Ave Northwest — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Highland Ave Northwest	2070	100-Year (1%)	11.1	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat — High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Highland Ave Northwest
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)?	2127
Location of Project:	Needham
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Highland Ave Northwest
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.
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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate
If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist
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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Highland Ave Northeast
Date Created: 4/28/2022 4:50:26 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/5/2023 5:51:17 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

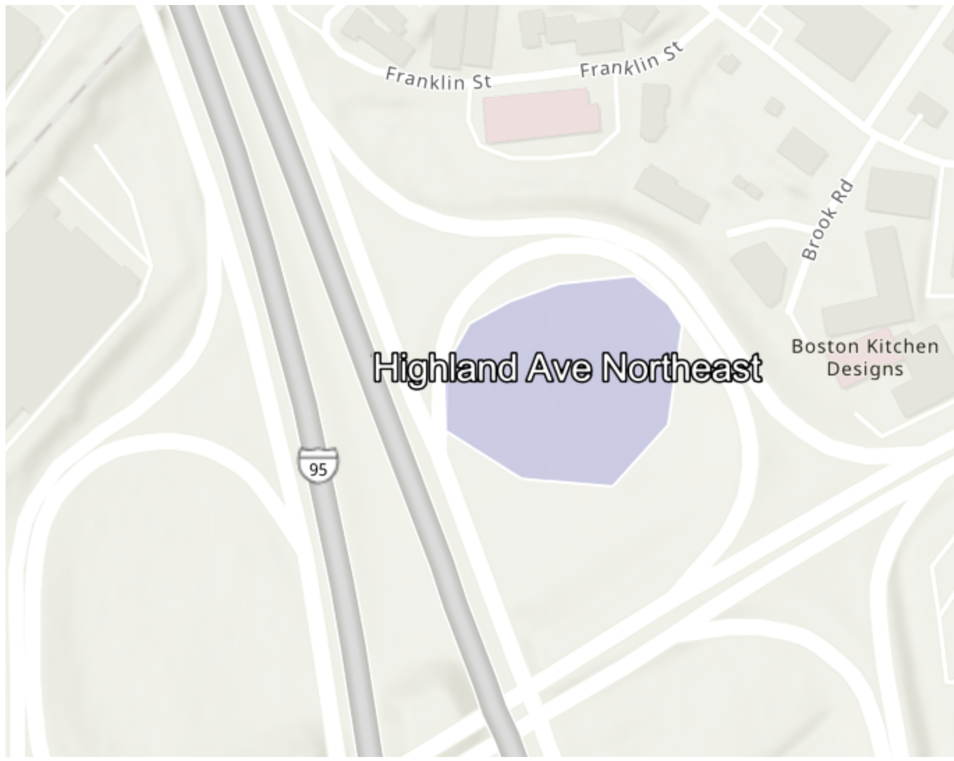
Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
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
Highland Ave Northeast	Low 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					
Highland Ave Northeast					
Extreme Precipitation					
Highland Ave Northeast	2070			100-yr (1%)	Tier 3
Extreme Heat					
Highland Ave Northeast	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover

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 - Highland Ave Northeast
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Highland Ave Northeast | Infrastructure

Sea Level Rise/Storm Surge | Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation | High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Highland Ave Northeast	2070	100-Year (1%)	11.1	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat | High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Highland Ave Northeast
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)?	2127
Location of Project:	Needham
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Highland Ave Northeast
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

American Legion

Date Created: 4/28/2022 5:02:07 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 2:13:37 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

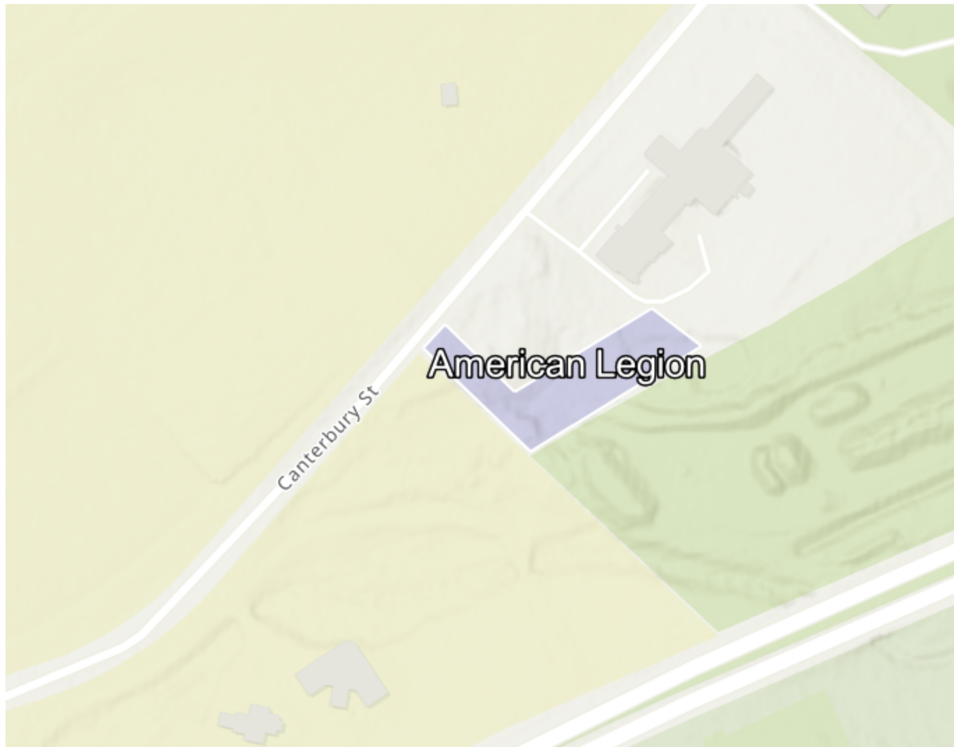
Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
American Legion Site	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
American Legion Site					
Extreme Precipitation					
American Legion Site	2070			100-yr (1%)	Tier 3
Extreme Heat					
American Legion Site	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 500ft of a waterbody and less than 20ft above the waterbody
- 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 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is less than 10%

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 - American Legion Site
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: American Legion Site — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
American Legion Site	2070	100-Year (1%)	11.2	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	American Legion
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)?	2127
Location of Project:	Boston
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: American Legion Site
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.
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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate
If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist
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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

School Street

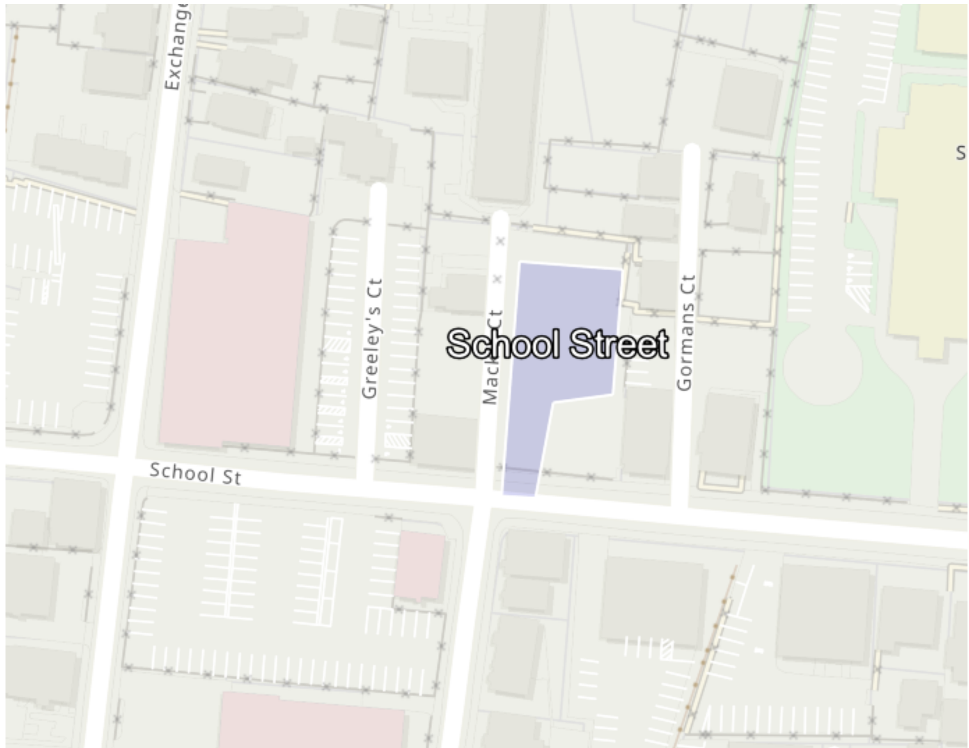
Date Created: 4/28/2022 4:30:52 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 2:36:56 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
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
School Street Site	Low 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					
School Street Site					
Extreme Precipitation					
School Street Site	2070			100-yr (1%)	Tier 3
Extreme Heat					
School Street Site	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

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
- Existing impervious area of the project site is greater than 50%
- No historic flooding at project site
- No increase to impervious area

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
- Not located within 100 ft of existing water body
- Existing impervious area of the project site is greater than 50%
- 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 - School Street Site
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: School Street Site — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
School Street Site	2070	100-Year (1%)	10.9	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat — High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	School Street
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)?	2127
Location of Project:	Waltham
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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: School Street Site
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Cedarwood Pumping Station

Date Created: 4/28/2022 4:36:15 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 3:08:46 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
Cedarwood Pumping Station	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Cedarwood Pumping Station					
Extreme Precipitation					
Cedarwood Pumping Station	2070			100-yr (1%)	Tier 3
Extreme Heat					
Cedarwood Pumping Station	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 500ft of a waterbody and less than 20ft above the waterbody
- 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 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
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Between 10% and 40% of the existing project site has canopy cover
- Located within 100 ft of existing water body

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 - Cedarwood Pumping Station
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Cedarwood Pumping Station — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Cedarwood Pumping Station	2070	100-Year (1%)	10.9	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Cedarwood Pumping Station
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)?	2127
Location of Project:	Waltham
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Cedarwood Pumping Station
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.

Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.

Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?

Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?

Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?

Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Hegarty Pumping Station

Date Created: 4/28/2022 4:47:29 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 3:12:06 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
Hegarty Pumping Station	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Hegarty Pumping Station					
Extreme Precipitation					
Hegarty Pumping Station	2070			100-yr (1%)	Tier 3
Extreme Heat					
Hegarty Pumping Station	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 200ft of a waterbody and less than 30ft above the waterbody
- 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 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is less than 10%

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 - Hegarty Pumping Station
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Hegarty Pumping Station — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Hegarty Pumping Station	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Hegarty Pumping Station
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)?	2127
Location of Project:	Wellesley
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Hegarty Pumping Station
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

St.Mary Street Pumping Station

Date Created: 4/28/2022 4:48:48 PM | Created By: ofisher@vhb.com

Date Report Generated: 6/2/2023 3:12:34 PM | Tool Version: Version 1.3

Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00

End of Useful Life Year: 2127

Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
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
St.Mary Street Pumping Station	Low 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					
St.Mary Street Pumping Station					
Extreme Precipitation					
St.Mary Street Pumping Station	2070			100-yr (1%)	Tier 3
Extreme Heat					
St.Mary Street Pumping Station	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover

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 - St.Mary Street Pumping Station
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: St.Mary Street Pumping Station — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
St.Mary Street Pumping Station	2070	100-Year (1%)	9.3	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat — High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	St.Mary Street Pumping Station
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)?	2127
Location of Project:	Needham
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: St.Mary Street Pumping Station
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.
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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate
If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist
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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Newton Street Pumping Station
Date Created: 4/28/2022 4:59:52 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 3:22:14 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
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
Newton Street Pumping Station	Low 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					
Newton Street Pumping Station					
Extreme Precipitation					
Newton Street Pumping Station	2070			100-yr (1%)	Tier 3
Extreme Heat					
Newton Street Pumping Station	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is between 10% and 50%

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 - Newton Street Pumping Station
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Newton Street Pumping Station — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Newton Street Pumping Station	2070	100-Year (1%)	11.1	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat — High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Newton Street Pumping Station
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)?	2127
Location of Project:	Brookline
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Newton Street Pumping Station
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

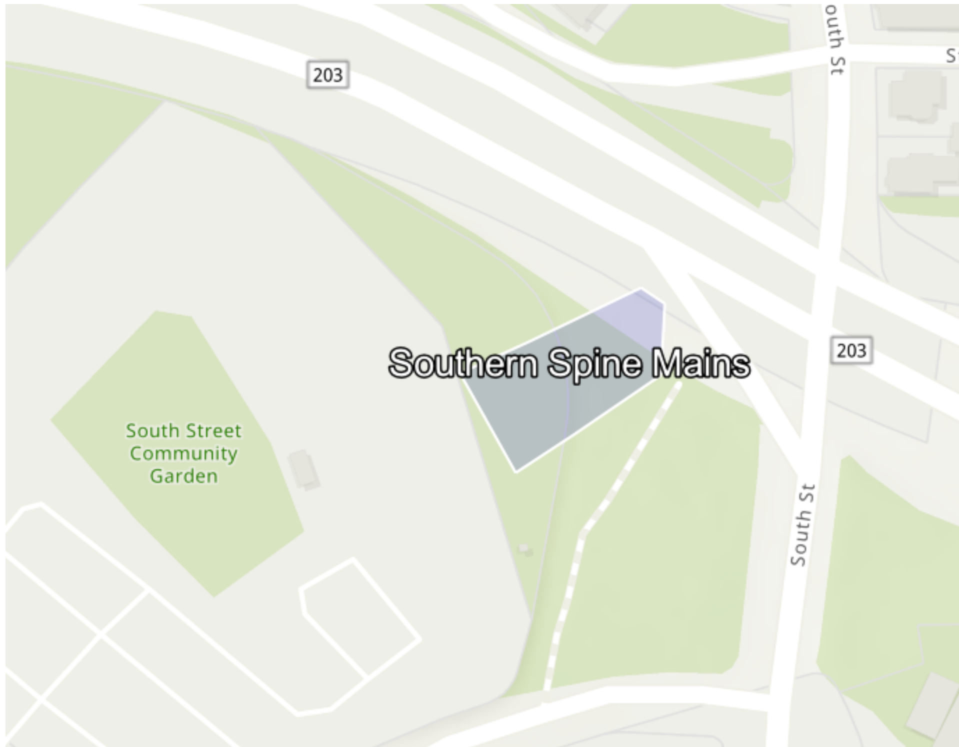
Southern Spine Mains
Date Created: 4/28/2022 5:01:00 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/5/2023 5:52:56 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
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
Southern Spine Mains	Low 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					
Southern Spine Mains					
Extreme Precipitation					
Southern Spine Mains	2070			100-yr (1%)	Tier 3
Extreme Heat					
Southern Spine Mains	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- 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
- Not located within 100 ft of existing water body
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is between 10% and 50%

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 - Southern Spine Mains
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Southern Spine Mains — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Southern Spine Mains	2070	100-Year (1%)	11.2	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat — High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Southern Spine Mains
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)?	2127
Location of Project:	Boston
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Southern Spine Mains
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.

Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.

Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?

Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?

Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?

Loss of confidence in government agency

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Hultman Aqueduct Isolation Valve

Date Created: 5/5/2022 12:24:57 PM
Created By: ofisher@vhb.com
Date Report Generated: 6/2/2023 3:43:36 PM
Tool Version: Version 1.3
Project Contact Information: Colleen Rizzi (Colleen.Rizzi@mwra.com)

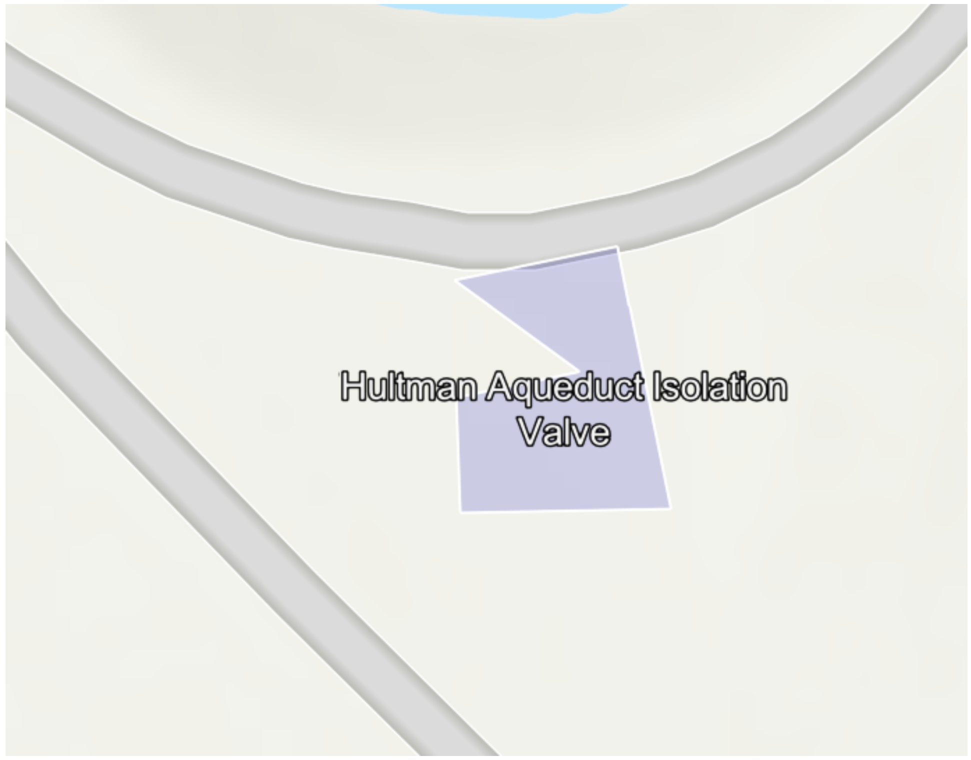
Project Summary

Link to Project

Estimated Capital Cost: $1500000000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
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
Hultman Aqueduct Isolation Valve	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Hultman Aqueduct Isolation Valve					
Extreme Precipitation					
Hultman Aqueduct Isolation Valve	2070			100-yr (1%)	Tier 3
Extreme Heat					
Hultman Aqueduct Isolation Valve	2070		90th		Tier 3

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 "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

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

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

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

- Part of the project is within 200ft of a waterbody and less than 30ft above the waterbody
- 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 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
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover
- Located within 100 ft of existing water body

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 - Hultman Aqueduct Isolation Valve
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Greater than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
- Cost to replace is greater than $100 million
- 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: Hultman Aqueduct Isolation Valve | Infrastructure

Sea Level Rise/Storm Surge | Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation | High Risk

Target Planning Horizon: 2070
Return Period: 100-yr (1%)

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 3

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
Hultman Aqueduct Isolation Valve	2070	100-Year (1%)	11.0	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

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

Project Inputs

Core Project Information

Name:	Hultman Aqueduct Isolation Valve
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)?	2127
Location of Project:	Weston
Estimated Capital Cost:	$1,500,000,000
Who is the Submitting Entity?	Private Other Massachusetts Water Resource Authority Colleen Rizzi (Colleen.Rizzi@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?	Planning
Is climate resiliency a core objective of this project?	No
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:	Through the Metropolitan Water Tunnel Program (the Program), the Authority will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (1950), City Tunnel Extension (1963) and Dorchester Tunnel (1976) serving 2.5 million people. The Program will also allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Tunnel construction is planned to occur from approximately 2026-2027 through 2037. The project is subject to MEPA review.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

✓ Project protects public water supply

Factors to Improve Output

✓ Incorporate green infrastructure to filter stormwater

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	Maybe
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
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?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
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?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Hultman Aqueduct Isolation Valve
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

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.
Greater than 100,000 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 result in moderate or severe injuries or moderate or severe impacts to chronic illnesses

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?
Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Greater than or equal to $100 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 infrasturcture may reduce the ability to maintain most government services, while some sevices will still exist

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)?
Loss of confidence in government agency

Report Comments

N/A

Appendix E: Air Quality and Greenhouse Gas Emissions Supporting Documentation

- Table E-1: Program-Related Construction Emissions over the Modeled 10-Year Duration
- Table E-2: Study Area Truck Routes - Existing (2023) Volumes and Estimated Emissions

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Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 3A

NOx Emissions (tons)

Off-Road Emissions	**Year 1**				**Year 2**				**Year 3**				**Year 4**				**Year 5**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northeast Launching	0.0	0.0	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	1.2	0.0	0.0	0.0	1.3	3.8	3.8	3.8
American Legion Receiving	0.0	0.0	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bifurcation Launching	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.3	0.3	3.7	3.7	3.7	2.5	0.0	1.3	3.8	3.8	1.3	0.0	0.1
Highland Avenue Northwest Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.2	0.1	0.0	0.0	0.1	0.0	1.2	1.2	0.0	1.3	0.0	0.2
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.3	3.7	3.7	3.7	3.7	3.7	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																				
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Road Total	**0.0**	**0.0**	**0.7**	**0.5**	**0.4**	**4.1**	**4.3**	**4.3**	**4.2**	**7.5**	**8.2**	**7.4**	**4.1**	**3.7**	**6.2**	**8.7**	**8.7**	**10.0**	**3.8**	**4.1**

Off-Road Emissions	**Year 6**				**Year 7**				**Year 8**				**Year 9**				**Year 10**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northeast Launching	3.8	3.8	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	1.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bifurcation Launching	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Receiving	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.4	2.5	5.0	5.0	3.8	1.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																				
Cedarwood Pumping Station Connection	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.3	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Road Total	**6.5**	**7.9**	**5.4**	**5.4**	**3.9**	**1.3**	**0.2**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

On-Road Emissions	**Year 1**				**Year 2**				**Year 3**				**Year 4**				**Year 5**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Bifurcation Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																				
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Total	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**

On-Road Emissions	**Year 6**				**Year 7**				**Year 8**				**Year 9**				**Year 10**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bifurcation Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																				
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Total	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Total Emissions	**Year 1**				**Year 2**				**Year 3**				**Year 4**				**Year 5**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northeast Launching	0.0	0.0	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	1.2	0.0	0.0	0.0	1.3	3.8	3.8	3.8
American Legion Receiving	0.0	0.0	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Bifurcation Launching	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.3	0.3	3.7	3.7	3.7	2.5	0.0	1.3	3.8	3.8	1.3	0.0	0.1
Highland Avenue Northwest Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.2	0.1	0.0	0.0	0.1	0.0	1.2	1.2	0.0	1.3	0.0	0.2
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.3	3.7	3.7	3.7	3.7	3.7	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																				
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Total	**0.0**	**0.0**	**0.8**	**0.6**	**0.4**	**4.1**	**4.3**	**4.3**	**4.2**	**7.5**	**8.2**	**7.5**	**4.2**	**3.7**	**6.2**	**8.7**	**8.8**	**10.0**	**3.9**	**4.2**

Total Emissions	**Year 6**				**Year 7**				**Year 8**				**Year 9**				**Year 10**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northeast Launching	3.8	3.8	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	1.3	0.0	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bifurcation Launching	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Receiving	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.4	2.5	5.0	5.0	3.8	1.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																				
Cedarwood Pumping Station Connection	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.3	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Total	**6.6**	**8.0**	**5.5**	**5.5**	**4.0**	**1.4**	**0.2**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

	Y1 Q1	**Y1 Q2**	**Y1 Q3**	**Y1 Q4**	**Y2 Q1**	**Y2 Q2**	**Y2 Q3**	**Y2 Q4**	**Y3 Q1**	**Y3 Q2**	**Y3 Q3**	**Y3 Q4**	**Y4 Q1**	**Y4 Q2**	**Y4 Q3**	**Y4 Q4**	**Y5 Q1**	**Y5 Q2**	**Y5 Q3**	**Y5 Q4**
Trailing 4 Quarter Off-Road Total	**0.0**	**0.0**	**0.7**	**1.3**	**1.7**	**5.8**	**9.3**	**13.1**	**16.8**	**20.2**	**24.1**	**27.3**	**27.2**	**23.5**	**21.5**	**22.8**	**27.4**	**33.7**	**31.2**	**26.6**
Trailing 4 Quarter On-Road Total	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.2**	**0.3**
Trailing 4 Quarter Total	**0.0**	**0.0**	**0.8**	**1.4**	**1.8**	**5.9**	**9.4**	**13.1**	**16.9**	**20.3**	**24.1**	**27.4**	**27.3**	**23.5**	**21.6**	**22.8**	**27.4**	**33.7**	**31.4**	**26.9**

	Y6 Q1	**Y6 Q2**	**Y6 Q3**	**Y6 Q4**	**Y7 Q1**	**Y7 Q2**	**Y7 Q3**	**Y7 Q4**	**Y8 Q1**	**Y8 Q2**	**Y8 Q3**	**Y8 Q4**	**Y9 Q1**	**Y9 Q2**	**Y9 Q3**	**Y9 Q4**	**Y10 Q1**	**Y10 Q2**	**Y10 Q3**	**Y10 Q4**
Trailing 4 Quarter Off-Road Total	**24.3**	**22.3**	**23.9**	**25.3**	**22.7**	**16.1**	**10.9**	**5.5**	**1.5**	**0.2**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Trailing 4 Quarter On-Road Total	**0.3**	**0.4**	**0.2**	**0.2**	**0.2**	**0.2**	**0.3**	**0.3**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Trailing 4 Quarter Total	**24.7**	**22.6**	**24.2**	**25.5**	**22.9**	**16.3**	**11.1**	**5.7**	**1.7**	**0.4**	**0.2**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 3A

VOC Emissions (tons)

Off-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bifurcation Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.2	0.0	0.1	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.2	0.4	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Road Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.3**	**0.3**	**0.3**	**0.6**	**0.6**	**0.6**	**0.3**	**0.3**	**0.5**	**0.6**	**0.7**	**0.7**	**0.3**	**0.3**	**0.5**	**0.6**	**0.4**	**0.4**	**0.3**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

On-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bifurcation Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Total Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bifurcation Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.2	0.0	0.1	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.2	0.4	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Total	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.3**	**0.3**	**0.3**	**0.3**	**0.6**	**0.6**	**0.6**	**0.3**	**0.3**	**0.5**	**0.6**	**0.7**	**0.7**	**0.3**	**0.3**	**0.5**	**0.6**	**0.4**	**0.4**	**0.3**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Trailing 4 Quarter Off-Road Total	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.4**	**0.7**	**1.0**	**1.2**	**1.5**	**1.8**	**2.0**	**2.0**	**1.7**	**1.6**	**1.7**	**2.0**	**2.5**	**2.3**	**2.0**	**1.8**	**1.6**	**1.8**	**1.9**	**1.7**	**1.2**	**0.8**	**0.4**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Trailing 4 Quarter On-Road Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Trailing 4 Quarter Total	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.4**	**0.7**	**1.0**	**1.2**	**1.5**	**1.8**	**2.0**	**2.0**	**1.7**	**1.6**	**1.7**	**2.0**	**2.5**	**2.3**	**2.0**	**1.8**	**1.7**	**1.8**	**1.9**	**1.7**	**1.2**	**0.8**	**0.4**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 3A

GHG (CO2) Emissions (tons)

Off-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0	0	129	117	232	665	665	665	665	665	665	665	222	0	0	0	224	672	672	672	672	672	45	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Legion Receiving	0	0	129	117	101	0	0	0	0	0	0	0	66	0	0	0	0	0	0	0	0	224	0	119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bifurcation Launching	0	0	0	0	0	129	86	117	232	665	665	665	443	0	224	672	672	224	0	45	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue Northwest Receiving	0	0	0	0	0	0	129	117	106	67	0	0	66	0	309	309	0	224	0	119	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tandem Trailer Launching	0	0	0	0	0	0	0	0	0	0	259	12	232	665	665	665	665	665	0	0	104	536	985	985	672	224	136	45	0	0	0	0	0	0	0	0	0	0	0	0
UMass Property Large Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	95	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Park Road East Large Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	95	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
School Street Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	65	144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Mary Street Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hegarty Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newton Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hultman Aqueduct Isolation Valve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Spine Mains Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	198	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Road Total	**0**	**0**	**259**	**235**	**333**	**794**	**880**	**899**	**1003**	**1396**	**1588**	**1341**	**1029**	**665**	**1198**	**1646**	**1561**	**1785**	**672**	**837**	**1861**	**1586**	**1174**	**1274**	**767**	**267**	**136**	**45**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

On-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0	0	0	1	1	3	3	3	3	3	3	3	2	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Legion Receiving	0	0	13	24	11	0	0	0	0	0	0	0	11	0	0	0	0	0	56	56	0	11	0	18	18	18	18	18	0	0	0	0	0	0	0	0	0	0	0	0
Bifurcation Launching	0	0	0	0	0	0	0	1	1	3	3	3	2	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue Northwest Receiving	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tandem Trailer Launching	0	0	0	0	0	0	0	0	0	0	1	1	1	3	3	3	3	3	0	0	0	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
UMass Property Large Connection	0	0	0	0	0	0	0	0	0	0	4	8	6	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	5	10	10	10	0	0	0	0	0	0	0	0
Park Road East Large Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
School Street Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Mary Street Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hegarty Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newton Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hultman Aqueduct Isolation Valve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Spine Mains Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	3	10	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
On-Road Total	**0**	**0**	**13**	**25**	**12**	**3**	**3**	**5**	**4**	**6**	**11**	**15**	**22**	**3**	**4**	**5**	**5**	**5**	**57**	**58**	**51**	**35**	**16**	**32**	**20**	**22**	**19**	**21**	**5**	**10**	**10**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Total Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0	0	130	118	233	667	667	667	667	667	667	667	223	0	0	0	225	674	674	674	674	673	46	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Legion Receiving	0	0	142	141	112	0	0	0	0	0	0	0	77	0	0	0	0	0	56	56	0	235	0	137	18	18	18	18	0	0	0	0	0	0	0	0	0	0	0	0
Bifurcation Launching	0	0	0	0	0	130	86	118	233	667	667	667	445	0	225	674	674	225	0	46	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue Northwest Receiving	0	0	0	0	0	0	130	118	107	67	0	0	66	0	310	310	0	224	0	120	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tandem Trailer Launching	0	0	0	0	0	0	0	0	0	0	259	13	233	667	667	667	667	667	0	0	105	538	986	986	674	225	136	46	0	0	0	0	0	0	0	0	0	0	0	0
UMass Property Large Connection	0	0	0	0	0	0	0	0	0	0	4	8	6	0	0	0	0	0	0	0	95	23	0	0	0	2	0	2	5	10	10	10	0	0	0	0	0	0	0	0
Park Road East Large Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	95	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
School Street Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	66	148	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Mary Street Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hegarty Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newton Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hultman Aqueduct Isolation Valve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Spine Mains Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	68	10	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Total	**0**	**0**	**272**	**259**	**345**	**797**	**884**	**904**	**1007**	**1402**	**1599**	**1356**	**1052**	**667**	**1202**	**1651**	**1567**	**1791**	**729**	**895**	**1912**	**1620**	**1190**	**1307**	**787**	**289**	**155**	**66**	**5**	**10**	**10**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Trailing 4 Quarter Off-Road Total	**0**	**0**	**259**	**493**	**826**	**1,620**	**2,242**	**2,906**	**3,576**	**4,179**	**4,887**	**5,329**	**5,355**	**4,623**	**4,233**	**4,538**	**5,070**	**6,191**	**5,665**	**4,856**	**5,156**	**4,956**	**5,458**	**5,895**	**4,801**	**3,482**	**2,444**	**1,215**	**448**	**181**	**45**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Trailing 4 Quarter On-Road Total	**0**	**0**	**13**	**38**	**50**	**53**	**43**	**23**	**15**	**18**	**25**	**36**	**54**	**51**	**45**	**34**	**17**	**20**	**72**	**125**	**171**	**201**	**160**	**135**	**103**	**90**	**93**	**82**	**67**	**55**	**45**	**34**	**29**	**20**	**10**	**0**	**0**	**0**	**0**	**0**
Trailing 4 Quarter Total	**0**	**0**	**272**	**531**	**876**	**1,673**	**2,285**	**2,929**	**3,592**	**4,197**	**4,912**	**5,364**	**5,409**	**4,674**	**4,277**	**4,572**	**5,087**	**6,210**	**5,737**	**4,981**	**5,327**	**5,157**	**5,618**	**6,030**	**4,904**	**3,573**	**2,537**	**1,297**	**514**	**236**	**90**	**34**	**29**	**20**	**10**	**0**	**0**	**0**	**0**	**0**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 4A

NOx Emissions (tons)

Off-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	1.2	0.0	1.2	1.2	1.3	3.8	3.8	3.8	3.8	3.8	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.3	3.7	3.7	3.7	2.5	0.0	1.3	3.8	3.8	1.3	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road West Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	1.3	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.3	3.7	3.7	3.7	3.7	3.7	0.0	0.0	0.4	2.5	5.0	5.0	3.8	1.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Road Total	**0.0**	**0.0**	**0.7**	**0.5**	**0.4**	**3.7**	**4.4**	**4.3**	**4.2**	**7.5**	**8.2**	**7.4**	**4.1**	**3.7**	**6.2**	**8.7**	**8.7**	**10.0**	**3.8**	**4.1**	**6.5**	**7.9**	**5.4**	**5.5**	**3.9**	**1.3**	**0.2**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

On-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road West Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Total	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Total Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	-	-	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	1.2	-	1.2	1.2	1.3	3.8	3.8	3.8	3.8	3.8	0.1	0.2	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	0.4	0.3	0.1	-	-	-	-	-	-	-	0.1	-	-	-	-	-	0.1	0.1	-	1.3	-	0.2	0.1	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Highland Avenue Northwest Launching	-	-	-	-	-	-	0.4	0.3	0.3	3.7	3.7	3.7	2.5	0.0	1.3	3.8	3.8	1.3	-	0.1	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Park Road West Receiving	-	-	-	-	-	-	0.4	0.3	0.2	0.1	-	-	0.1	-	-	-	-	1.3	-	0.2	0.1	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tandem Trailer Launching	-	-	-	-	-	-	-	-	-	-	0.7	0.0	0.3	3.7	3.7	3.7	3.7	3.7	-	-	0.4	2.5	5.0	5.0	3.8	1.3	0.2	0.1	0.0	-	-	-	-	-	-	-	-	-	-	-
UMass Property Large Connection	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-	-	-	-	0.1	0.2	0.0	-	-	-	0.0	-	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
Park Road East Large Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.2	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	0.4	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	0.2	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All Total	**-**	**-**	**0.8**	**0.6**	**0.4**	**3.7**	**4.5**	**4.3**	**4.2**	**7.5**	**8.2**	**7.5**	**4.2**	**3.7**	**6.2**	**8.7**	**8.8**	**10.0**	**3.9**	**4.2**	**6.6**	**8.0**	**5.5**	**5.5**	**4.0**	**1.4**	**0.2**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Trailing 4 Quarter Off-Road Total	**-**	**-**	**0.7**	**1.3**	**1.7**	**5.4**	**9.1**	**12.8**	**16.6**	**20.4**	**24.1**	**27.3**	**27.2**	**23.5**	**21.5**	**22.8**	**27.4**	**33.7**	**31.2**	**26.6**	**24.3**	**22.3**	**23.9**	**25.3**	**22.8**	**16.1**	**10.9**	**5.5**	**1.5**	**0.2**	**0.1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Trailing 4 Quarter On-Road Total	**-**	**-**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.2**	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.3**	**0.3**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**-**	**-**	**-**	**-**	**-**
Trailing 4 Quarter Total	**-**	**-**	**0.8**	**1.4**	**1.8**	**5.5**	**9.2**	**12.9**	**16.6**	**20.4**	**24.1**	**27.4**	**27.3**	**23.5**	**21.6**	**22.8**	**27.4**	**33.7**	**31.4**	**26.8**	**24.6**	**22.6**	**24.2**	**25.5**	**22.9**	**16.4**	**11.1**	**5.7**	**1.7**	**0.4**	**0.2**	**0.1**	**0.1**	**0.1**	**0.0**	**-**	**-**	**-**	**-**	**-**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 4A

VOC Emissions (tons)

Off-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.2	0.0	0.1	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road West Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.2	0.4	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Road Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.3**	**0.3**	**0.3**	**0.6**	**0.6**	**0.6**	**0.3**	**0.3**	**0.5**	**0.6**	**0.7**	**0.7**	**0.3**	**0.3**	**0.5**	**0.6**	**0.4**	**0.4**	**0.3**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

On-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road West Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Total Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northwest Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.2	0.0	0.1	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road West Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tandem Trailer Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.2	0.4	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UMass Property Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road East Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Total	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.3**	**0.3**	**0.3**	**0.3**	**0.6**	**0.6**	**0.6**	**0.3**	**0.3**	**0.5**	**0.6**	**0.7**	**0.7**	**0.3**	**0.3**	**0.5**	**0.6**	**0.4**	**0.4**	**0.3**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Trailing 4 Quarter Off-Road Total	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.4**	**0.7**	**0.9**	**1.2**	**1.5**	**1.8**	**2.0**	**2.0**	**1.7**	**1.6**	**1.7**	**2.0**	**2.5**	**2.3**	**2.0**	**1.8**	**1.6**	**1.8**	**1.9**	**1.7**	**1.2**	**0.8**	**0.4**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Trailing 4 Quarter On-Road Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Trailing 4 Quarter Total	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.4**	**0.7**	**0.9**	**1.2**	**1.5**	**1.8**	**2.0**	**2.0**	**1.7**	**1.6**	**1.7**	**2.0**	**2.5**	**2.3**	**2.0**	**1.8**	**1.7**	**1.8**	**1.9**	**1.7**	**1.2**	**0.8**	**0.4**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 4A

GHG (CO2) Emissions (tons)

Off-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	-	-	129	117	232	665	665	665	665	665	665	665	222	-	309	309	224	672	672	672	672	672	45	136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	129	117	101	-	-	-	-	-	-	-	66	-	-	-	-	-	-	-	-	224	-	119	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Highland Avenue Northwest Launching	-	-	-	-	-	-	129	117	232	665	665	665	443	-	224	672	672	224	-	45	136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Park Road West Receiving	-	-	-	-	-	-	129	117	106	67	-	-	66	-	-	-	-	224	-	119	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tandem Trailer Launching	-	-	-	-	-	-	-	-	-	-	259	12	232	665	665	665	665	665	-	-	104	536	985	985	672	224	136	45	-	-	-	-	-	-	-	-	-	-	-	-
UMass Property Large Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	95	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Park Road East Large Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	95	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97	65	144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	198	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-Road Total	**-**	**-**	**259**	**235**	**333**	**665**	**923**	**899**	**1,003**	**1,396**	**1,588**	**1,341**	**1,029**	**665**	**1,198**	**1,646**	**1,561**	**1,785**	**672**	**872**	**1,861**	**1,586**	**1,174**	**1,279**	**767**	**267**	**136**	**45**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

On-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	0	0	0	1	1	3	3	3	3	3	3	3	2	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Legion Receiving	0	0	13	24	11	0	0	0	0	0	0	0	11	0	0	0	0	0	50	50	0	11	0	18	15	15	15	15	0	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue Northwest Launching	0	0	0	0	0	0	0	1	1	3	3	3	2	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Park Road West Receiving	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tandem Trailer Launching	0	0	0	0	0	0	0	0	0	0	1	1	1	3	3	3	3	3	0	0	0	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
UMass Property Large Connection	0	0	0	0	0	0	0	0	0	0	4	8	6	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	5	10	10	10	0	0	0	0	0	0	0	0
Park Road East Large Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
School Street Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Mary Street Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hegarty Pumping Station Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newton Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hultman Aqueduct Isolation Valve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Spine Mains Connection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	3	10	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
On-Road Total	**0**	**0**	**13**	**25**	**12**	**3**	**3**	**5**	**4**	**6**	**11**	**15**	**22**	**3**	**4**	**5**	**5**	**5**	**52**	**53**	**51**	**35**	**16**	**32**	**17**	**19**	**16**	**18**	**5**	**10**	**10**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Total Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northeast Launching	-	-	130	118	233	667	667	667	667	667	667	667	223	-	310	310	225	674	674	674	674	673	46	136	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	142	141	112	-	-	-	-	-	-	-	77	-	-	-	-	-	50	50	-	235	-	137	15	15	15	15	-	-	-	-	-	-	-	-	-	-	-	-
Highland Avenue Northwest Launching	-	-	-	-	-	-	130	118	233	668	668	668	445	1	225	674	674	224	-	46	136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Park Road West Receiving	-	-	-	-	-	-	130	118	107	67	-	-	66	-	-	-	-	224	-	120	40	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tandem Trailer Launching	-	-	-	-	-	-	-	-	-	-	259	13	233	667	667	667	667	667	-	-	105	538	986	986	674	225	136	46	0	-	-	-	-	-	-	-	-	-	-	-
UMass Property Large Connection	-	-	-	-	-	-	-	-	-	-	4	8	6	-	-	-	-	-	-	35	95	23	-	-	-	2	-	2	5	10	10	10	-	-	-	-	-	-	-	-
Park Road East Large Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	95	23	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101	66	148	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	141	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	138	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	155	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	208	68	10	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All Total	**-**	**-**	**272**	**259**	**345**	**667**	**927**	**904**	**1,007**	**1,402**	**1,598**	**1,356**	**1,052**	**668**	**1,202**	**1,651**	**1,567**	**1,790**	**724**	**924**	**1,912**	**1,620**	**1,191**	**1,311**	**784**	**286**	**152**	**63**	**5**	**10**	**10**	**10**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Trailing 4 Quarter Off-Road Total	**-**	**-**	**259**	**493**	**826**	**1,491**	**2,156**	**2,820**	**3,490**	**4,222**	**4,887**	**5,328**	**5,355**	**4,623**	**4,233**	**4,538**	**5,070**	**6,191**	**5,665**	**4,891**	**5,190**	**4,991**	**5,492**	**5,899**	**4,806**	**3,487**	**2,448**	**1,215**	**448**	**181**	**45**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Trailing 4 Quarter On-Road Total	**-**	**-**	**13**	**38**	**50**	**53**	**43**	**23**	**15**	**18**	**25**	**36**	**54**	**52**	**45**	**35**	**18**	**19**	**67**	**114**	**160**	**191**	**155**	**135**	**101**	**85**	**85**	**70**	**58**	**49**	**42**	**34**	**29**	**20**	**10**	**-**	**-**	**-**	**-**	**-**
Trailing 4 Quarter Total	**-**	**-**	**272**	**531**	**876**	**1,544**	**2,198**	**2,843**	**3,505**	**4,240**	**4,912**	**5,365**	**5,409**	**4,674**	**4,278**	**4,573**	**5,088**	**6,210**	**5,732**	**5,005**	**5,351**	**5,181**	**5,648**	**6,034**	**4,906**	**3,571**	**2,533**	**1,285**	**506**	**230**	**87**	**34**	**29**	**20**	**10**	**-**	**-**	**-**	**-**	**-**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 10A

NOx Emissions (tons)

Off-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northwest Launching	0.0	0.0	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lower Fernald Property Receiving	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road West Large Connection	0.0	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	1.2	0.0	1.2	1.2	1.3	3.8	3.8	3.8	3.8	3.8	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	1.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Road Total	**0.0**	**0.0**	**0.5**	**0.8**	**0.6**	**3.8**	**4.4**	**4.3**	**4.2**	**7.4**	**7.4**	**7.4**	**7.4**	**7.4**	**3.7**	**3.7**	**1.2**	**0.0**	**1.2**	**1.4**	**4.1**	**8.0**	**7.9**	**8.8**	**7.5**	**8.8**	**4.0**	**5.2**	**0.4**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

On-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northwest Launching	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-
Lower Fernald Property Receiving	-	-	0.0	0.1	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
Park Road West Large Connection	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-
Highland Avenue Northeast Launching	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	-	-	-	-	0.0	0.1	0.0	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
On-Road Total	**-**	**-**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.1**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Total Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northwest Launching	-	-	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	-	-	-	-	-	-	-	3.8	3.8	3.8	3.8	3.8	3.8	3.8	0.1	0.2	-	-	-	-	-	-	-	-	-	-
Lower Fernald Property Receiving	-	-	0.1	0.3	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	1.3	0.2	0.0	0.0	0.0	-	-	-	-	-	-	-	-
Park Road West Large Connection	-	-	-	0.2	0.2	0.1	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	0.2	0.1	0.0	0.0	0.0	-	-	-	-	-	-	-
Highland Avenue Northeast Launching	-	-	-	-	-	-	0.4	0.3	0.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	1.2	-	1.2	1.2	1.3	3.8	3.8	3.8	3.8	3.8	0.1	0.2	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	-	-	-	-	0.4	0.3	0.1	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	1.3	0.2	0.1	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	0.4	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	0.2	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All Total	**-**	**-**	**0.5**	**0.8**	**0.6**	**3.8**	**4.5**	**4.3**	**4.2**	**7.4**	**7.4**	**7.4**	**7.4**	**7.4**	**3.7**	**3.7**	**1.2**	**-**	**1.2**	**1.4**	**4.2**	**8.0**	**7.9**	**9.0**	**7.7**	**8.8**	**4.0**	**5.3**	**0.4**	**0.3**	**0.1**	**0.0**	**0.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Trailing 4 Quarter Off-Road Total	**-**	**-**	**0.5**	**1.3**	**1.9**	**5.7**	**9.7**	**13.1**	**16.7**	**20.3**	**23.3**	**26.5**	**29.7**	**29.7**	**26.0**	**22.3**	**16.1**	**8.7**	**6.2**	**3.9**	**6.7**	**14.7**	**21.4**	**28.8**	**32.2**	**33.0**	**29.1**	**25.5**	**18.4**	**9.8**	**5.8**	**0.6**	**0.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Trailing 4 Quarter On-Road Total	**-**	**-**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.3**	**0.4**	**0.3**	**0.4**	**0.2**	**0.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.1**	**0.0**	**0.0**	**-**	**-**	**-**	**-**
Trailing 4 Quarter Total	**-**	**-**	**0.5**	**1.3**	**1.9**	**5.8**	**9.8**	**13.2**	**16.9**	**20.4**	**23.4**	**26.5**	**29.7**	**29.7**	**26.0**	**22.3**	**16.1**	**8.7**	**6.2**	**3.9**	**6.8**	**14.8**	**21.5**	**29.1**	**32.6**	**33.4**	**29.5**	**25.8**	**18.6**	**10.0**	**6.1**	**0.8**	**0.4**	**0.1**	**0.0**	**0.0**	**-**	**-**	**-**	**-**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 10A

VOC Emissions (tons)

Off-Road Emissions	**Year 1**				**Year 2**				**Year 3**				**Year 4**				**Year 5**				**Year 6**				**Year 7**				**Year 8**				**Year 9**				**Year 10**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northwest Launching	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lower Fernald Property Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Park Road West Large Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highland Avenue Northeast Launching	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American Legion Receiving	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School Street Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
St. Mary Street Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hegarty Pumping Station Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Spine Mains Connection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Road Total	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.3**	**0.3**	**0.3**	**0.3**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.3**	**0.3**	**0.1**	**0.0**	**0.1**	**0.1**	**0.2**	**0.7**	**0.6**	**0.7**	**0.6**	**0.7**	**0.3**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

On-Road Emissions	**Year 1**				**Year 2**				**Year 3**				**Year 4**				**Year 5**				**Year 6**				**Year 7**				**Year 8**				**Year 9**				**Year 10**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northwest Launching	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-
Lower Fernald Property Receiving	-	-	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
Park Road West Large Connection	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-
Highland Avenue Northeast Launching	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
On-Road Total	**-**	**-**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Total Emissions	**Year 1**				**Year 2**				**Year 3**				**Year 4**				**Year 5**				**Year 6**				**Year 7**				**Year 8**				**Year 9**				**Year 10**			
Launching, Receiving, and Large Connection Shaft Sites	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northwest Launching	-	-	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-	-	-	-	-	-	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	-	-	-	-	-	-	-	-	-	-
Lower Fernald Property Receiving	-	-	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	0.1	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
Park Road West Large Connection	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-
Highland Avenue Northeast Launching	-	-	-	-	-	-	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	-	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	-	-	-	-	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All Total	**-**	**-**	**0.0**	**0.1**	**0.0**	**0.3**	**0.3**	**0.3**	**0.3**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.3**	**0.3**	**0.1**	**-**	**0.1**	**0.1**	**0.2**	**0.7**	**0.6**	**0.7**	**0.6**	**0.7**	**0.3**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Trailing 4 Quarter Off-Road Total	**-**	**-**	**0.0**	**0.1**	**0.1**	**0.4**	**0.7**	**1.0**	**1.2**	**1.5**	**1.7**	**2.0**	**2.2**	**2.2**	**1.9**	**1.7**	**1.2**	**0.6**	**0.5**	**0.3**	**0.3**	**1.0**	**1.5**	**2.1**	**2.5**	**2.5**	**2.2**	**1.9**	**1.4**	**0.7**	**0.4**	**0.0**	**0.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Trailing 4 Quarter On-Road Total	**-**	**-**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**-**	**-**	**-**
Trailing 4 Quarter Total	**-**	**-**	**0.0**	**0.1**	**0.1**	**0.4**	**0.7**	**1.0**	**1.2**	**1.5**	**1.7**	**2.0**	**2.2**	**2.2**	**1.9**	**1.7**	**1.2**	**0.6**	**0.5**	**0.3**	**0.4**	**1.1**	**1.6**	**2.2**	**2.6**	**2.5**	**2.2**	**1.9**	**1.4**	**0.7**	**0.4**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**-**	**-**	**-**

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-1 Program-Related Construction Emissions over the Modeled 10-Year Duration

Alternative 10A

GHG (CO2) Emissions (tons)

Off-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northwest Launching	-	-	129	117	232	665	665	665	665	665	665	665	665	665	-	-	-	-	-	-	-	672	672	672	672	672	672	672	45	136	-	-	-	-	-	-	-	-	-	-
Lower Fernald Property Receiving	-	-	43	117	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66	-	-	-	-	-	-	-	224	119	-	-	-	-	-	-	-	-	-	-	-
Park Road West Large Connection	-	-	-	86	78	101	-	-	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	224	-	-	-	-	119	40	-	-	-	-	-	-	-	-	-	-
Highland Avenue Northeast Launching	-	-	-	-	-	-	129	117	232	665	665	665	665	665	665	665	222	-	309	309	224	672	672	672	672	672	45	136	-	-	-	-	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	-	-	-	-	129	117	101	-	-	-	-	-	-	-	-	-	-	66	-	-	-	-	-	224	119	-	-	-	-	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97	65	144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	198	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-Road Total	-	-	172	321	411	765	923	899	1,064	1,329	1,329	1,329	1,329	1,329	665	665	222	-	309	442	1,279	1,559	1,489	1,569	1,345	1,589	837	1,032	284	176	-	-	-	-	-	-	-	-	-	-

On-Road Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northwest Launching	-	-	0	1	1	3	3	3	3	3	3	3	3	3	-	-	-	-	-	-	-	1	1	1	1	1	1	1	0	0	-	-	-	-	-	-	-	-	-	-
Lower Fernald Property Receiving	-	-	3	20	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	3	4	5	5	5	-	-	-	-	-	-	-	-
Park Road West Large Connection	-	-	-	0	1	0	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	0	0	0	0	0	-	-	-	-	-	-	-
Highland Avenue Northeast Launching	-	-	-	-	-	-	0	1	1	3	3	3	3	3	3	3	2	-	1	1	1	1	1	1	1	1	0	1	0	0	0	0	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	-	-	-	-	13	24	11	-	-	-	-	-	-	-	-	-	-	11	-	-	-	56	56	11	18	15	15	15	15	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	3	10	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
On-Road Total	-	-	4	22	11	3	16	28	15	6	6	6	6	6	3	3	2	-	1	22	50	24	16	70	58	13	20	19	20	21	20	5	0	-	-	-	-	-	-	-

Total Emissions	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10			
Launching, Receiving, and Large Connection Shaft Sites	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Highland Avenue Northwest Launching	-	-	130	118	233	668	668	668	668	668	668	668	668	668	-	-	-	-	-	-	-	674	674	674	674	674	674	673	45	136	-	-	-	-	-	-	-	-	-	-
Lower Fernald Property Receiving	-	-	46	138	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	-	-	-	-	-	-	-	227	124	5	5	5	-	-	-	-	-	-	-	-
Park Road West Large Connection	-	-	-	86	79	101	-	-	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	224	-	-	-	-	120	40	0	0	0	-	-	-	-	-	-	-
Highland Avenue Northeast Launching	-	-	-	-	-	-	130	118	233	667	667	667	667	667	667	667	223	-	310	310	225	674	674	674	674	674	46	136	0	0	0	0	-	-	-	-	-	-	-	-
American Legion Receiving	-	-	-	-	-	-	142	141	112	-	-	-	-	-	-	-	-	-	-	77	-	-	-	56	56	235	137	15	15	15	15	-	-	-	-	-	-	-	-	-
Connection Shaft and Isolation Valve Sites																																								
Cedarwood Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
School Street Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101	66	148	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Mary Street Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	141	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hegarty Pumping Station Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	138	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Newton Street Pumping Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	155	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Spine Mains Connection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	208	68	10	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hultman Aqueduct Isolation Valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All Total	-	-	176	343	423	769	940	927	1,079	1,335	1,335	1,335	1,335	1,335	667	667	223	-	310	464	1,328	1,584	1,505	1,639	1,403	1,602	857	1,052	305	197	20	5	0	-	-	-	-	-	-	-

Trailing 4 Quarter Off-Road Total	-	-	172	493	905	1,670	2,421	2,999	3,652	4,216	4,622	5,052	5,317	5,317	4,652	3,988	2,880	1,551	1,195	972	2,029	3,589	4,768	5,896	5,962	5,992	5,340	4,803	3,742	2,329	1,492	460	176	-	-	-	-	-	-	-
Trailing 4 Quarter On-Road Total	-	-	4	25	37	40	53	59	62	65	55	32	23	23	20	17	13	7	5	24	72	97	112	160	169	158	161	110	73	80	81	67	46	25	5	0	-	-	-	-
Trailing 4 Quarter Total	-	-	176	518	941	1,710	2,473	3,058	3,714	4,281	4,676	5,084	5,340	5,340	4,672	4,005	2,893	1,558	1,200	997	2,102	3,685	4,881	6,056	6,131	6,150	5,501	4,913	3,815	2,410	1,573	527	222	25	5	0	-	-	-	-

Highlight indicates peak 12-month period of construction emissions (rolling four quarter total)

Table E-2 Study Area Truck Routes - Existing (2023) Volumes and Estimated Emissions

Launching, Receiving, and Large Connection Shaft Sites (Existing Conditions)

					Vehicle Trips per Quarter 2023 Existing Conditions				NOx EMISSIONS 2023 Existing Conditions				VOC EMISSIONS 2023 Existing Conditions				GHG (CO_2) EMISSIONS 2023 Existing Conditions			
All Traffic per Quarter	**Miles**	**NOx EF (g/mi)**	**VOC EF (g/mi)**	**GHG (CO_2) EF (g/mi)**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Highland Avenue Northeast Launching	0.2	0.18	0.14	362.25	2,032,830	2,032,830	2,032,830	2,032,830	0.08	0.08	0.08	0.08	0.06	0.06	0.06	0.06	154	154	154	154
American Legion Receiving	8.0	0.18	0.14	362.25	2,856,870	2,856,870	2,856,870	2,856,870	4.51	4.51	4.51	4.51	3.50	3.50	3.50	3.50	9,100	9,100	9,100	9,100
Bifurcation Launching	0.2	0.18	0.14	362.25	2,032,830	2,032,830	2,032,830	2,032,830	0.08	0.08	0.08	0.08	0.06	0.06	0.06	0.06	154	154	154	154
Highland Avenue Northwest Receiving	0.2	0.18	0.14	362.25	2,032,830	2,032,830	2,032,830	2,032,830	0.08	0.08	0.08	0.08	0.06	0.06	0.06	0.06	154	154	154	154
Tandem Trailer Launching	0.2	0.18	0.14	362.25	2,032,830	2,032,830	2,032,830	2,032,830	0.08	0.08	0.08	0.08	0.06	0.06	0.06	0.06	154	154	154	154
UMass Property Large Connection/ Lower Fernald Property Receiving	6.4	0.18	0.14	362.25	1,096,830	1,096,830	1,096,830	1,096,830	1.38	1.38	1.38	1.38	1.08	1.08	1.08	1.08	2,796	2,796	2,796	2,796
Park Road West Receiving/Large Connection	0.2	0.18	0.14	362.25	2,032,830	2,032,830	2,032,830	2,032,830	0.08	0.08	0.08	0.08	0.06	0.06	0.06	0.06	154	154	154	154
Park Road East Large Connection	0.2	0.18	0.14	362.25	2,032,830	2,032,830	2,032,830	2,032,830	0.08	0.08	0.08	0.08	0.06	0.06	0.06	0.06	154	154	154	154
Total:					**16,150,680**	**16,150,680**	**16,150,680**	**16,150,680**	**6.35**	**6.35**	**6.35**	**6.35**	**4.93**	**4.93**	**4.93**	**4.93**	**12,819**	**12,819**	**12,819**	**12,819**

Connection Shaft and Isolation Valve Sites (Existing Conditions)

					Vehicle Trips per Quarter 2023 Existing Conditions				NOx EMISSIONS 2023 Existing Conditions				VOC EMISSIONS 2023 Existing Conditions				GHG (CO_2) EMISSIONS 2023 Existing Conditions			
All Traffic per Quarter	**Miles**	**NOx EF (g/mi)**	**VOC EF (g/mi)**	**GHG (CO_2) EF (g/mi)**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Cedarwood Pumping Station Connection	3.0	0.18	0.14	362.25	911,610	911,610	911,610	911,610	0.55	0.55	0.55	0.55	0.43	0.43	0.43	0.43	1,110	1,110	1,110	1,110
School St Connection	3.2	0.18	0.14	362.25	862,830	862,830	862,830	862,830	0.55	0.55	0.55	0.55	0.42	0.42	0.42	0.42	1,103	1,103	1,103	1,103
St. Mary Street Pumping Station Connection	4.0	0.18	0.14	362.25	1,186,650	1,186,650	1,186,650	1,186,650	0.94	0.94	0.94	0.94	0.73	0.73	0.73	0.73	1,904	1,904	1,904	1,904
Hegarty Pumping Station Connection	1.8	0.18	0.14	362.25	1,183,320	1,183,320	1,183,320	1,183,320	0.43	0.43	0.43	0.43	0.33	0.33	0.33	0.33	867	867	867	867
Newton Street Pumping Station Connection	12.8	0.18	0.14	362.25	3,489,840	3,489,840	3,489,840	3,489,840	8.80	8.80	8.80	8.80	6.84	6.84	6.84	6.84	17,776	17,776	17,776	17,776
Southern Spine Mains Connection	9.7	0.18	0.14	362.25	3,132,630	3,132,630	3,132,630	3,132,630	6.03	6.03	6.03	6.03	4.69	4.69	4.69	4.69	12,185	12,185	12,185	12,185
Hultman Aqueduct Isolation Valve	0.2	0.18	0.14	362.25	1,188,720	1,188,720	1,188,720	1,188,720	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	90	90	90	90
Total:					**11,955,600**	**11,955,600**	**11,955,600**	**11,955,600**	**17.34**	**17.34**	**17.34**	**17.34**	**13.48**	**13.48**	**13.48**	**13.48**	**35,034**	**35,034**	**35,034**	**35,034**

	NOx Q1	NOx Q2	NOx Q3	NOx Q4	VOC Q1	VOC Q2	VOC Q3	VOC Q4	GHG Q1	GHG Q2	GHG Q3	GHG Q4
TOTAL:	**23.69**	**23.69**	**23.69**	**23.69**	**18.41**	**18.41**	**18.41**	**18.41**	**47,853**	**47,853**	**47,853**	**47,853**
Annual SUM Total:				**94.76**				**73.64**				**191,410**

Appendix F: Transportation Supporting Documentation

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Appendix F.1: Updated Transportation Impact Assessment

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Tables

F.1 Updated Transportation Impact Assessment

An updated Traffic Impact Assessment (TIA), consistent with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA) and Massachusetts Department of Transportation (MassDOT) *Transportation Impact Assessment (TIA) Guidelines*,[1] was prepared to assess the Program's potential traffic impacts associated with the three Supplemental Draft Environmental Impact Report (SDEIR) Alternatives (Alternatives 3A, 4A, and 10A). This TIA updates the original TIA by removing traffic associated with the Fernald Property receiving shaft site previously considered in the Draft Environmental Impact Report (DEIR) and incorporating traffic assumptions associated with the University of Massachusetts (UMass) Property large connection shaft site (SDEIR Alternatives 3A and 4A) and the Lower Fernald Property receiving shaft site (SDEIR Alternative 10A) considered in the SDEIR. It also incorporates updates to address other transportation-related comments received on the DEIR.

This appendix describes existing traffic conditions in terms of vehicular traffic, pedestrian and bicycle traffic, and public transportation. The assessment evaluates the traffic operations for roadways and key intersections on anticipated construction vehicle routes between the highway and shaft sites under existing and future conditions.

This section presents the methodology and results of the study prepared to assess the traffic impacts of the proposed Metropolitan Water Tunnel Program (Program).

F.1.1 Existing Conditions

Anticipated construction vehicle routes were established for each Program site by identifying the most direct route along main state and local roadways to/from the nearest highway. Critical intersections and roadways along the anticipated routes were examined. As described in **SDEIR Chapter 3, Outreach and Environmental Justice**, an analysis was also undertaken to determine the location of U.S. Census block groups containing environmental justice (EJ) populations in proximity to anticipated construction routes. The analysis included the identification of EJ populations along the routes with existing unfair or inequitable environmental burdens as established by the Massachusetts Department of Public Health (DPH) vulnerable health criteria (refer to **SDEIR Chapter 3 Figures 3-3** to **3-19**). Using the most direct route seeks to minimize construction vehicle travel time and mileage, and the resulting Program-related traffic and emissions in both EJ and non-EJ communities (refer to **SDEIR Chapter 3, Section 3.5**, **Technical Analysis to Respond to Comments** and **SDEIR Chapter 9, Transportation, Section 9.3, Technical Analysis to Respond to Comments**, for more information).

1 Massachusetts Department of Transportation, *Transportation Impact Assessment (TIA) Guidelines*, updated September 21, 2017, https://www.mass.gov/doc/transportation-impact-assessment-guidelines (accessed May 2, 2023).

Sensitive receptors, defined as properties/locations that may be impacted by construction of the Program, were identified and described in **DEIR Appendix F.4, Transportation Impact Assessment, Section F.4.7.1**. A high-level crash analysis was performed for each Study Area intersection identified by MassDOT as a high-crash location potentially eligible for Highway Safety Improvement Program funding (see **SDEIR Table 9-4** and **DEIR Table F.4-17**).

F.1.1.1 Construction Period Impacts – Diesel Truck and Worker Trips

For the SDEIR Alternatives, most traffic estimated to be generated by construction activities at the proposed shaft sites would be due to construction workers driving to and from the sites at the beginning and ends of their workday shifts. This analysis serves as a conservative estimate since construction worker trips are not expected to occur during the evening peak hour. Shift change is anticipated to take place at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM. Average daily diesel truck trips and worker trips were calculated for the UMass Property site in SDEIR Alternatives 3A and 4A, and for the Lower Fernald Property site in SDEIR Alternative 10A, as summarized below.

Alternatives 3A/4A

The intersection of Trapelo Road at Waverley Oaks Road in Waltham is estimated to experience an additional 43 trips in the morning peak hour due to temporary Program-related construction activities at the UMass Property site. The intersections of Main Street at Moody Street and Main Street at Bacon Street are conservatively estimated to have 43 trips during the evening peak hour. If these additional trips are realized, mitigation measures would be considered to minimize potential impacts to traffic operations at these intersections.

Alternative 10A

The intersection of Trapelo Road at Waverley Oaks Road in Waltham is estimated to experience an additional 68 trips in the morning peak hour due to temporary Program-related construction activities at the Lower Fernald Property site. The intersections of Main Street at Moody Street and Main Street at Bacon Street are conservatively estimated to have 68 trips during the evening peak hour. If these additional trips are realized, mitigation measures would be considered to minimize potential impacts to traffic operations at these intersections.

Surface Piping Construction Impacts

See **SDEIR Chapter 9, Transportation, Section 9.2.2.7, Near-Surface Piping Construction Traffic Impacts**.

F.1.2 Regulatory Framework

See **DEIR Appendix F.4, Section F.4.3**.

F.1.3 Methodology

F.1.3.1 Study Area

The updated SDEIR Study Area for the TIA incorporates traffic assumptions associated with the two new sites considered in place of the DEIR Fernald Property site, namely the UMass Property site and Lower Fernald Property site. Updated traffic counts were collected along the anticipated construction vehicle routes to and from the two new alternative sites. The updated assumptions were incorporated into the Program's overall traffic analysis for the three SDEIR Alternatives. The Study Area encompasses the anticipated shortest construction vehicle or haul routes between the access point(s) to each site and the nearest major highway. Haul routes are assumed to be used by contractors supplying equipment and materials and for hauling away excavated material from tunnel excavation. See **SDEIR Chapter 2, Alternatives**, for a description of each alternative and the associated Program launching, receiving, large connection, connection, and isolation valve sites. Details of the roads within the Study Area are provided in **DEIR Chapter 4, Transportation, Section 4.10.2.1, Study Area (pg. 4.10-18)**.

F.1.3.2 Existing Conditions Methodology

See **DEIR Appendix F.4, Section F.4.4.2**.

F.1.3.3 Construction Conditions Impact Assessment Methodology

See **DEIR Appendix F.4, Section F.4.4.3**.

F.1.4 Existing Conditions

Existing site and access conditions for the two new alternative sites considered for the northern terminus of the North Tunnel, Segment 1, are described below.

F.1.4.1 UMass Property (Waltham) Large Connection Shaft Site

The proposed large connection shaft site is on a portion of the UMass Property site along Beaver Street in Waltham. The site is proposed as a large connection shaft site for SDEIR Alternative 3A and 4A. Access and egress to the site is via Beaver Street. The Waltham Agriculture Fields are located south of the proposed large connection shaft site. There is no bus service along Beaver Street or near the site. Beaver Street is a two-lane street and is classified as an urban minor arterial. There are no pedestrian or bicycle accommodations along the roadway within the site limits and proposed construction access and egress routes.

F.1.4.2 Lower Fernald Property (Waltham) Receiving Shaft Site

The proposed Lower Fernald Property site is on a portion of the former Walter E. Fernald State School property owned by the City of Waltham. This site is proposed as a receiving shaft site for SDEIR

Alternative 10A. The proposed receiving shaft site is located near the intersection of Chapel Road and Waverley Oaks Road (Route 60). Access and egress to the site are via Chapel Road from/to Waverley Oaks Road. Residential and commercial properties are located along the northwest and southeast side of Waverley Oaks Road, respectively. There is no bus service along Waverley Oaks Road or near the site. No traffic is allowed on Chapel Road to the north of the site as Chapel Road is an unstriped local road without pedestrian and bicycle accommodations. A gate is present on Chapel Road to the west of the Chapel Road/Waverley Oaks Road intersection to control access.

F.1.5 Study Area Roadways – Existing Conditions

Table F.1-1 lists the roadways along the anticipated routes to and from each shaft site. The anticipated construction vehicle routes are to and from the UMass Property site and Lower Fernald Property site are shown in **SDEIR Figure 9-2** and **Figure 9-3**. Existing 24-hour traffic volumes collected via automatic traffic recorders (ATRs) along the study roadways are also provided. Detailed descriptions of the Study Area roadways can be found in **DEIR Appendix F.1**.

Table F.1-1 Study Area Roadways – Existing Conditions

Shaft Site (Alternative)	Roadway	From	To	City/ Town	Existing Average 24-Hour Traffic Volume
UMass Property Large Connection (Alternatives 3A, 4A)	Trapelo Road	I-95	Waverley Oaks Road	Waltham	20,489
	Waverley Oaks Road	Trapelo Road	Linden Street	Waltham	13,665
	Linden Street	Waverley Oaks Road	Main Street	Waltham	9,398
	Main Street	Linden Street	Weston Street (Route 20)	Waltham	12,342
	Weston Street (Route 20)	Main Street	I-95	Waltham	13,208
Lower Fernald Property Receiving (10A)	Trapelo Road	I-95	Waverley Oaks Road	Waltham	20,489
	Waverley Oaks Road	Trapelo Road	Linden Street	Waltham	13,665
	Linden Street	Waverley Oaks Road	Main Street	Waltham	9,398
	Main Street	Linden Street	Weston Street (Route 20)	Waltham	12,342
	Weston Street (Route 20)	Main Street	I-95	Waltham	13,208
School Street Connection (All)	*Weston Street (Route 20)*	*I-95*	*Main Street*	*Waltham*	*13,208*
	Main Street	*Weston Street (Route 20)*	*Bacon Street*	*Waltham*	*12,342*
	Bacon Street	*Main Street*	*School Street*	*Waltham*	*8,612*
	School Street	*Bacon Street*	*Macks Court*	*Waltham*	*6,942*
	Weston Street (Route 20)	*I-95*	*South Street*	*Waltham*	*13,208*

Table F.1-1 Study Area Roadways – Existing Conditions

Shaft Site (Alternative)	Roadway	From	To	City/ Town	Existing Average 24-Hour Traffic Volume
Cedarwood Pumping Station Connection (All)	*South Street*	*Weston Street (Route 20)*	*Shakespeare Road*	*Waltham*	*11,755*
Bifurcation Launching (3A)	*I-90 to I-95 Ramp*	*-*	*-*	*Weston*	*162,000*
Tandem Trailer Launching (3A, 4A)	*South Avenue (Route 30)*	*Site Exit*	*I-95*	*Weston*	*22,587*
	I-95 to I-90 West Ramp	*I-95*	*Site Entrance*	*Weston*	*134,000*
Park Road East Large Connection (3A, 4A)	*South Avenue (Route 30)*	*I-95*	*Park Road*	*Weston*	*22,587*
	Park Road	*South Avenue (Route 30)*	*Site Entrance*	*Weston*	*9,050*
Park Road West Receiving (4A)/Large Connection (10A)	*South Avenue (Route 30)*	*I-95*	*Park Road*	*Weston*	*22,587*
Hegarty Pumping Station Connection (All)	*Worcester Street (Route 9)*	*I-95*	*Cedar Street*	*Wellesley*	*47,052*
	Cedar Street	*Worcester Street (Route 9)*	*Barton Road*	*Wellesley*	*13,463*
St. Mary Street Pumping Station Connection (All)	*Worcester Street (Route 9)*	*I-95*	*Cedar Street*	*Wellesley*	*47,052*
	Cedar Street	*Worcester Street (Route 9)*	*Central Avenue*	*Wellesley/ Needham*	*15,552*
	Central Avenue	*Cedar Street*	*St. Mary Street*	*Needham*	*10,817*
Highland Avenue Northeast/ Southeast Launching (All)	*I-95 Northbound On-Ramp*	*Highland Avenue*	*I-95*	*Needham*	*162,000*
	I-95 Northbound Off-Ramp	*I-95*	*Highland Avenue*	*Needham*	*149,000*
Highland Avenue Northwest Receiving (3A)/ Northwest/ Southwest Launching (4A, 10A)	*I-95 Southbound On-Ramp*	*Highland Avenue*	*I-95*	*Needham*	*162,000*
	I-95 Southbound Off-Ramp	*I-95*	*Highland Avenue*	*Needham*	*149,000*
Newton Street Pumping Station (Connection) (All)	*Boylston Street (Route 9)*	*I-95*	*Lee Street*	*Newton/ Brookline*	*57,001*
	Lee Street	*Boylston Street (Route 9)*	*Clyde Street*	*Brookline*	*15,458*
	Clyde Street	*Lee Street*	*Newton Street*	*Brookline*	*16,716*
	Newton Street	*Clyde Street*	*Site Entrance*	*Brookline*	*12,833*
Southern Spine Mains Connection (All)	*Gallivan Blvd. (Route 203)*	*I-93*	*Morton Street (Route 203)*	*Boston*	*48,894*
	Morton Street (Route 203)	*Gallivan Blvd. (Route 203)*	*Arborway (Route 203)*	*Boston*	*35,658*

Table F.1-1 Study Area Roadways – Existing Conditions

Shaft Site (Alternative)	Roadway	From	To	City/ Town	Existing Average 24-Hour Traffic Volume
Southern Spine Mains Connection (All)	*Arborway (Route 203)*	*Morton Street (Route 203)*	*Centre Street*	*Boston*	*32,778*
	South Street	*Arborway (Route 203)*	*Asticou Road*	*Boston*	*11,755*
American Legion Receiving (All)	*Gallivan Blvd. (Route 203)*	*I-93*	*Morton Street (Route 203)*	*Boston*	*48,894*
	Morton Street (Route 203)	*Gallivan Blvd. (Route 203)*	*Arborway (Route 203)*	*Boston*	*35,778*
	Arborway (Route 203)	*Morton Street (Route 203)*	*Centre Street*	*Boston*	*32,778*

F.1.6 Study Area Intersections

The TIA studies the following key Study Area intersections associated with different shaft sites. These intersections were selected based on estimates of vehicle traffic and pedestrian and bicyclist impacts that may result at these intersections from construction and operation of the Program. **Table F.1-2** lists the Study Area intersections and their associated shaft sites by municipality. Study Area intersections along the anticipated construction vehicle routes to/from the UMass Property site and Lower Fernald Property site are shown in **SDEIR Figure 9-1**. Detailed descriptions of the Study Area intersections can be found in **DEIR Appendix F.1**.

Table F.1-2 Study Area Intersections by Municipality

City/Town	Intersection	Associated Shaft Site(s)
Waltham	Trapelo Rd. at Lexington St.	UMass Property, Lower Fernald Property
	Waverley Oaks Rd. at Trapelo Rd.	UMass Property, Lower Fernald Property
	Beaver St. at Waverley Oaks Rd.	UMass Property, Lower Fernald Property
	Main St. at Linden St./Ellison Park	UMass Property, Lower Fernald Property
	Elm St. at Main St.	UMass Property, Lower Fernald Property
	Moody St. at Main St.	UMass Property, Lower Fernald Property
	Bacon St. at Main St.	UMass Property, Lower Fernald Property, School Street
	Weston St. at Main St.	UMass Property, Lower Fernald Property, School Street
	South St. at Weston St.	UMass Property, Lower Fernald Property, School Street, Cedarwood Pumping Station
	Shakespeare Rd. at South St.	*Cedarwood Pumping Station*

Table F.1-2 Study Area Intersections by Municipality

City/Town	Intersection	Associated Shaft Site(s)
Weston	*River Rd. at South Ave.*	*Tandem Trailer, Park Road East, Park Road West*
	I-95 N off-ramp at South Ave.	*Tandem Trailer, Park Road East, Park Road West*
	Park Rd. at South Ave.	*Park Road West*
Needham	*Central Ave. at Cedar St.*	*Hegarty Pumping Station, St. Mary Street Pumping Station*
Wellesley	*Worcester St. at Cedar St.*	*Hegarty Pumping Station, St. Mary Street Pumping Station*
Newton	*Woodward St./Elliot St. at Rt 9*	*Newton Street Pumping Station*
Brookline	*Grove St. at Newton St.*	*Newton Street Pumping Station*
	Newton St. at Clyde St.	*Newton Street Pumping Station*
	Dudley St. at Lee St.	*Newton Street Pumping Station*
	Lee St. at Rt 9	*Newton Street Pumping Station*
	Chestnut Hill Ave. at Rt 9	*Newton Street Pumping Station*
	Hammond St. at Rt 9	*Newton Street Pumping Station*
Boston	*Canterbury Ln. at Morton St.*	*American Legion, Southern Spine Mains*
	Morton St. at Harvard St.	*American Legion, Southern Spine Mains*
	Morton St. at Blue Hill Ave.	*American Legion, Southern Spine Mains*
	Morton St. at Norfolk St.	*American Legion, Southern Spine Mains*
	Morton St. at Corbet St.	*American Legion, Southern Spine Mains*
	Morton St. at Gallivan Blvd.	*American Legion, Southern Spine Mains*
Boston	*Gallivan Blvd. at Washington St.*	*American Legion, Southern Spine Mains*
	Gallivan Blvd. at Dorchester Ave.	*American Legion, Southern Spine Mains*
	Gallivan Blvd. at Granite Ave./Adams St.	*American Legion, Southern Spine Mains*
	Gallivan Blvd. at Hallet St.	*American Legion, Southern Spine Mains*
	Gallivan Blvd. at Neponset Ave.	*American Legion, Southern Spine Mains*
	Neponset Ave. at Morrissey Blvd.	*American Legion, Southern Spine Mains*
	South St. at Washington St.	*Southern Spine Mains*
	South St. at Arborway	*Southern Spine Mains*
	Washington St. at Arborway	*Southern Spine Mains*
	Arborway at Circuit Dr.	*Southern Spine Mains*

Italicized text within the table indicates no change from the DEIR.

F.1.7 Regional Highway Volumes Existing Conditions

Construction vehicle routes were established for each shaft site by identifying the shortest path to and from the nearest highway. Construction vehicle routes are assumed to be used by contractors supplying equipment and materials and for hauling away excavated material from tunnel excavation. Traffic data collected includes ATR and turning movement counts (TMC) data along the nearest highways. **Table F.1-3** shows the existing volumes at the four designated highway access points.

Table F.1-3 Regional Highway Existing Volumes

Shaft Site	Highway	Location	MassDOT Loc. ID	AM Peak Hour Trips	PM Peak Hour Trips	Average 24-Hour Traffic Volumes
Lower Fernald, UMass, School Street, Cedarwood, Bifurcation, Tandem Trailer, Park Road East, Park Road West	I-95	North of I-90	32	10,200	10,900	162,000
Bifurcation, Tandem Trailer, Park Road East, Park Road West	I-90	West of I-95	AET10	8,350	9,000	134,000
Hegarty, St Mary St, Highland Ave NE, Highland Ave NW, Newton St	I-95	South of I-90	4165	9,800	10,200	149,000
Southern Spine Mains, American Legion	I-93	South of Route 203	8932	8,700	10,100	169,000

F.1.8 Sensitive Receptors

See **DEIR Appendix F.4, Section F.4.7.1**.

F.1.9 Bus Routes

See **DEIR Appendix F.4, Section F.4.7.2**.

F.1.10 Safety

See **DEIR Appendix F.4, Section F.4.7.3**.

F.1.11 Construction Period Impacts

For the SDEIR Alternatives, most traffic expected to be generated by construction activities at the proposed shaft sites would be due to construction workers driving to and from the sites at the beginning and ends of their workday shifts. To identify potential peak cumulative impacts, estimates of diesel truck and worker trips were identified on a quarterly basis for the duration of the construction activities. These conservative assumptions include:

1. Construction of the launching and receiving shaft sites would occur at the same time and not sequentially.
2. All connection shaft sites would be constructed at the same time.
3. All surface piping connections would also be constructed at the time.

However, it is important to note the following:

1. This conservative approach was chosen to allow the contractor the most flexibility in determining the sequencing within a construction package without increasing impacts discussed herein.
2. It is highly unlikely that the assumed concurrent activities would happen at the same time. Rather the peak periods would likely be distributed with lesser degrees of impact over a longer duration.
3. It is also highly unlikely that the activities will occur during the exact year or quarter projected for the cumulative impact analysis. These will vary based on construction packaging and sequencing within a construction package.

F.1.11.1 Study Area Roadways Traffic Volume Construction Period Impacts

The vehicle trips expected at each Program site were distributed onto the surrounding roadway network based on the previously described construction vehicle routes. This section describes the maximum net new vehicle trips estimated to travel through each Study Area intersections during the morning and evening peak hours in comparison to the existing volumes. Vehicle trips combine both construction worker trips and diesel truck trips. The analysis serves as a conservative estimate since construction worker trips are not expected to occur during the evening peak hour (shift change is anticipated to take place at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM). As shown in **Table F.1-4**, Program-related vehicle traffic is estimated to temporarily increase peak 24-hour traffic volumes by approximately 0.1 percent to 2.0 percent on local roadways compared to existing conditions.

Table F.1-4 Non-Highway Study Area Roadway Traffic Volumes

					AM Peak Hour Trips				PM Peak Hour Trips [1]				24-Hour Volume			
Shaft Site	**Roadway**	**From**	**To**	**City/Town**	**Existing**	**Alt 3A**	**Alt 4A**	**Alt 10A**	**Existing**	**Alt 3A**	**Alt 4A**	**Alt 10A**	**Existing**	**Alt 3A**	**Alt 4A**	**Alt 10A**
UMass Property/Lower Fernald Property entering	Trapelo Road	West of	Smith Street	Waltham	1,850	43 (2.4%)	43 (2.4%)	68 (3.8%)	1,650	3 (0.2%)	3 (0.2%)	4 (0.3%)	20,500	51 (0.3%)	51 (0.3%)	82 (0.5%)
UMass Property/Lower Fernald Property entering	Trapelo Road	Old Lexington Road	Bow Street	Waltham	1,200	43 (3.7%)	43 (3.7%)	68 (5.8%)	1,350	3 (0.3%)	3 (0.3%)	4 (0.4%)	14,600	51 (0.4%)	51 (0.4%)	82 (0.6%)
UMass Property/Lower Fernald Property entering	Trapelo Road	Manning Road	Upton Road	Waltham	850	43 (5.2%)	43 (5.2%)	68 (8.2%)	1,050	3 (0.3%)	3 (0.3%)	4 (0.4%)	10,650	51 (0.5%)	51 (0.5%)	82 (0.8%)
UMass Property/Lower Fernald Property entering	Waverly Oaks Road	Shirley Road	Brookfield Road	Waltham	1,000	43 (4.4%)	43 (4.4%)	68 (6.9%)	1,350	3 (0.3%)	3 (0.3%)	4 (0.4%)	13,700	51 (0.4%)	51 (0.4%)	82 (0.7%)
UMass Property/Lower Fernald Property exiting	Linden Street	North of	Middlesex Road	Waltham	650	3 (0.5%)	3 (0.5%)	4 (0.7%)	800	43 (5.5%)	43 (5.5%)	68 (8.7%)	9,400	51 (0.6%)	51 (0.6%)	82 (0.9%)
UMass Property/Lower Fernald Property exiting	Main Street	Linden Street	Weston Street	Waltham	*650*	*3 (0.5%)*	*3 (0.5%)*	*4 (0.7%)*	*800*	*43 (5.5%)*	*43 5.5%)*	*68 (8.7%)*	*9,400*	*51 (0.6%)*	*51 (0.6%)*	*82 (0.9%)*
School Street	*School Street*	*Exchange Street*	*Spring Street*	*Waltham*	*450*	*20 (4.7%)*	*20 (4.7%)*	*20 (4.7%)*	*650*	*20 (3.2%)*	*20 (3.2%)*	*20 (3.2%)*	*6,950*	*44 (0.7%)*	*44 (0.7%)*	*44 (0.7%)*
School Street	*Bacon Street*	*South of*	*School Street*	*Waltham*	*600*	*20 (3.6%)*	*20 (3.6%)*	*20 (3.6%)*	*700*	*20 (3.0%)*	*20 (3.0%)*	*20 (3.0%)*	*8,650*	*44 (0.6%)*	*44 (0.6%)*	*44 (0.6%)*
School Street, Cedarwood Pumping Station, UMass Property/Lower Fernald Property *exiting*	*Weston Street*	*South Street*	*Elm Street*	*Waltham*	*900*	*43 (4.9%)*	*43 (4.9%)*	*44 (5.0%)*	*1,050*	*83 (8.3%)*	*83 (8.3%)*	*108 (10.7%)*	*13,250*	*141 (1.1%)*	*141 (1.1%)*	*170 (1.3%)*
Cedarwood Pumping Station	*South Street*	*Morris Street*	*Drew Street*	*Waltham*	*1,050*	*20 (2.0%)*	*20 (2.0%)*	*20 (2.0%)*	*1,000*	*20 (2.1%)*	*20 (2.1%)*	*20 (2.1%)*	*11,800*	*44 (0.4%)*	*44 (0.4%)*	*44 (0.4%)*
Bifurcation, Park Road West	*South Avenue (Route 30)*	*I-95 NB Ramp*	*I-95 SB Ramp*	*Weston*	*2,250*	*83 (3.8%)*	*52 (2.4%)*	*33 (1.5%)*	*1,950*	*146 (7.7%)*	*52 (2.8%)*	*34 (1.8%)*	*22,600*	*406 (1.8%)*	*128 (0.6%)*	*113 (0.6%)*
St. Mary Street Pumping Station	*Central Avenue*	*East of*	*Cedar Street*	*Needham*	*1,050*	*20 (2.0%)*	*20 (2.0%)*	*20 (2.0%)*	*1,050*	*20 (2.0%)*	*20 (2.0%)*	*20 (2.0%)*	*10,850*	*46 (0.5%)*	*46 (0.5%)*	*46 (0.5%)*
Hegarty Pumping Station	*Cedar Street*	*South of*	*Redwing Road*	*Wellesley*	*1,300*	*20 (1.6%)*	*20 (1.6%)*	*20 (1.6%)*	*1,250*	*20 (1.7%)*	*20 (1.7%)*	*20 (1.7%)*	*13,500*	*46 (0.4%)*	*46 (0.4%)*	*46 (0.4%)*
St. Mary Street Pumping Station	*Cedar Street*	*South of*	*Worcester Street*	*Wellesley*	*1,550*	*20 (1.4%)*	*20 (1.4%)*	*20 (1.4%)*	*1,450*	*20 (1.5%)*	*20 1.5%)*	*20 (1.5%)*	*15,600*	*46 (0.3%)*	*46 (0.3%)*	*46 (0.3%)*
Hegarty Pumping Station, St. Mary Street Pumping Station	*Newton Street*	*North of*	*Grove Street*	*Brookline*	*850*	*40 (4.9%)*	*40 (4.9%)*	*40 (4.9%)*	*1,350*	*40 (3.1%)*	*40 (3.1%)*	*40 (3.1%)*	*12,850*	*92 (0.8%)*	*92 (0.8%)*	*92 (0.8%)*
Newton Street Pumping Station	*Clyde Street*	*Whitney Street*	*Larkin Street*	*Brookline*	*1,600*	*20 (1.3%)*	*20 (1.3%)*	*20 (1.3%)*	*1,750*	*20 (1.2%)*	*20 (1.2%)*	*20 (1.2%)*	*16,750*	*46 (0.3%)*	*46 (0.3%)*	*46 (0.3%)*
Newton Street Pumping Station	*Lee Street*	*South of*	*Boylston Street*	*Brookline*	*1,400*	*20 (1.5%)*	*20 (1.5%)*	*20 (1.5%)*	*1,350*	*20 (1.5%)*	*20 (1.5%)*	*20 (1.5%)*	*15,500*	*46 (0.3%)*	*46 (0.3%)*	*46 (0.3%)*
Newton Street Pumping Station	*Worcester Street (Route 9)*	*Harris Avenue*	*Minuteman Lane*	*Wellesley*	*3,750*	*20 (0.6%)*	*20 (0.6%)*	*20 (0.6%)*	*3,650*	*20 (0.6%)*	*20 (0.6%)*	*20 (0.6%)*	*47,100*	*46 (0.1%)*	*46 (0.1%)*	*46 (0.1%)*
Newton Street Pumping Station	*Boylston Street (Route 9)*	*East of*	*Hickory Cliff Road*	*Newton*	*3,950*	*20 (0.6%)*	*20 (0.6%)*	*20 (0.6%)*	*3,900*	*20 (0.6%)*	*20 (0.6%)*	*20 (0.6%)*	*56,500*	*46 (0.1%)*	*46 (0.1%)*	*46 (0.1%)*
Newton Street Pumping Station	*Boylston Street (Route 9)*	*West of*	*Langley Road*	*Newton*	*4,400*	*20 (0.5%)*	*20 (0.5%)*	*20 (0.5%)*	*3,800*	*20 (0.6%)*	*20 (0.6%)*	*20 (0.6%)*	*57,050*	*46 (0.1%)*	*46 (0.1%)*	*46 (0.1%)*

Table F.1-4 Non-Highway Study Area Roadway Traffic Volumes

					AM Peak Hour Trips				PM Peak Hour Trips [1]				24-Hour Volume			
Shaft Site	**Roadway**	**From**	**To**	**City/Town**	**Existing**	**Alt 3A**	**Alt 4A**	**Alt 10A**	**Existing**	**Alt 3A**	**Alt 4A**	**Alt 10A**	**Existing**	**Alt 3A**	**Alt 4A**	**Alt 10A**
Newton Street Pumping Station	*Boylston Street (Route 9)*	*West of*	*Norfolk Road*	*Newton*	*2,900*	*20 (0.7%)*	*20 (0.7%)*	*20 (0.7%)*	*2,750*	*20 (0.8%)*	*20 (0.8%)*	*20 (0.8%)*	*40,000*	*46 (0.2%)*	*46 (0.2%)*	*46 (0.2%)*
Southern Spine Mains	*Arborway*	*South of*	*Centre Street*	*Boston*	*2,400*	*20 (0.9%)*	*20 (0.9%)*	*20 (0.9%)*	*2,500*	*20 (0.9%)*	*20 (0.9%)*	*20 (0.9%)*	*32,800*	*46 (0.2%)*	*46 (0.2%)*	*46 (0.2%)*
Southern Spine Mains	*Arborway*	*West of*	*Forest Hills Street*	*Boston*	*2,600*	*20 (0.8%)*	*20 (0.8%)*	*20 (0.8%)*	*2,700*	*20 (0.8%)*	*20 (0.8%)*	*20 (0.8%)*	*36,000*	*46 (0.2%)*	*46 (0.2%)*	*46 (0.2%)*
Southern Spine Mains	*Morton Street*	*West of*	*Canterbury Street*	*Boston*	*2,900*	*20 (0.7%)*	*20 (0.7%)*	*20 (0.7%)*	*2,750*	*20 (0.8%)*	*20 (0.8%)*	*20 (0.8%)*	*35,700*	*46 (0.2%)*	*46 (0.2%)*	*46 (0.2%)*
Southern Spine Mains, American Legion	*Morton Street*	*West of*	*West Main Street*	*Boston*	*2,650*	*72 (2.8%)*	*70 (2.7%)*	*72 (2.8%)*	*2,400*	*120 (5.1%)*	*106 (4.5%)*	*108 (4.6%)*	*32,700*	*334 (1.1%)*	*304 (1.0%)*	*318 (1.0%)*
Southern Spine Mains, American Legion	*Morton Street*	*East of*	*Norfolk Street*	*Boston*	*1,800*	*72 (4.1%)*	*70 (4.0%)*	*72 (4.1%)*	*2,000*	*120 (6.1%)*	*106 (5.4%)*	*108 (5.5%)*	*27,150*	*334 (1.3%)*	*304 (1.2%)*	*318 (1.2%)*
Southern Spine Mains, American Legion	*Gallivan Boulevard*	*Vera Street*	*Milton Street*	*Boston*	*1,150*	*72 (6.5%)*	*70 (6.3%)*	*72 (6.5%)*	*1,250*	*120 (9.8%)*	*106 (8.6%)*	*108 (8.8%)*	*17,050*	*334 (2.0%)*	*304 (1.8%)*	*318 (1.9%)*
Southern Spine Mains, American Legion	*Gallivan Boulevard*	*Rangeley Street*	*Carruth Street*	*Boston*	*1,550*	*72 (4.8%)*	*70 (4.6%)*	*72 (4.8%)*	*1,600*	*120 (7.6%)*	*106 (6.8%)*	*108 (6.9%)*	*23,800*	*334 (1.5%)*	*304 (1.3%)*	*318 (1.4%)*
Southern Spine Mains, American Legion	*Gallivan Boulevard*	*East of*	*Clover Street*	*Boston*	*2,850*	*72 (2.6%)*	*70 (2.5%)*	*72 (2.6%)*	*3,450*	*120 (3.5%)*	*106 (3.1%)*	*108 (3.2%)*	*48,900*	*334 (0.7%)*	*304 (0.6%)*	*318 (0.7%)*

Existing traffic volumes are rounded up to the nearest 50 trips.
Italicized text within the table indicates no change from the DEIR.
1 Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

F.1.11.2 Regional Highway Construction Period Traffic Impacts

The vehicle trips estimated at each shaft site were distributed onto the nearest highway access points. This section describes the maximum net new vehicle trips expected to travel through the highway access points during the morning, evening, and 24-hour volumes in comparison to existing volumes. Vehicle trips combine both construction worker trips and diesel truck trips. The analysis serves as a conservative estimate since construction worker trips are not expected to occur during the evening peak hour. Shift change is anticipated to take place at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM. As shown in **Table F.1-5**, the estimated Program-related vehicle trips at the highway access points are expected to have a less than 3.5 percent increase in peak hour traffic volumes and a less than 0.7 percent increase in peak 24-hour traffic volumes compared to existing conditions. Program-related vehicle traffic is anticipated to increase peak 24-hour traffic volumes along highways by approximately 0.2 percent to 0.7 percent for SDEIR Alternatives 3A and 4A, and approximately 0.1 percent to 0.7 percent for SDEIR Alternative 10A compared to existing conditions.

Table F.1-5 Program-Related Vehicle Trips Compared to Existing Highway Volumes

Shaft Site	Road-way	Location	MassDOT Loc ID	AM Peak Hour Trips				PM Peak Hour Trips [1]				24-Hour Trips			
				Existing	Alt 3A	Alt 4A	Alt 10A	Existing	Alt 3A	Alt 4A	Alt 10A	Existing	Alt 3A	Alt 4A	Alt 10A
Lower Fernald, UMass, School Street, Cedarwood, Bifurcation, Tandem Trailer, Park Road East, Park Road West	I-95	North of I-90	32	10,200	274 (2.7%)	250 (2.5%)	145 (1.5%)	10,900	400 (3.7%)	313 (2.9%)	146 (1.4%)	162,000	1,058 (0.7%)	794 (0.5%)	365 (0.3%)
Bifurcation, Tandem Trailer, Park Road East, Park Road West	I-90	West of I-95	AET10	8,350	188 (2.3%)	164 (2.0%)	33 (0.4%)	9,000	314 (3.5%)	227 (2.6%)	34 (0.4%)	134,000	866 (0.7%)	602 (0.5%)	113 (0.1%)
Hegarty, St Mary St, Highland Ave NE, Highland Ave NW, Newton St	I-95	South of I-90	4165	9,800	178 (1.9%)	226 (2.4%)	176 (1.8%)	10,200	197 (2.0%)	352 (3.5%)	352 (3.5%)	149,000	622 (0.5%)	954 (0.7%)	904 (0.7%)
Southern Spine Mains, American Legion	I-93	South of Route 203	8932	8,700	72 (0.9%)	70 (0.9%)	72 (0.9%)	10,100	120 (1.2%)	106 (1.1%)	108 (1.1%)	169,000	334 (0.2%)	304 (0.2%)	318 (0.2%)

Existing traffic volumes are rounded up to the nearest 50 trips.

1 *Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.*

F.1.11.3 Alternatives 3A/4A

SDEIR Alternatives 3A and 4A would use the UMass Property site for a large connection shaft.

Construction Vehicle Routes

Construction vehicle routes were developed for the shaft site based on the shortest path between the site and the nearest major highway for analysis purposes. MWRA would coordinate with the City of Waltham to determine the most appropriate construction vehicle routes. **Table F.1-6** shows the characteristics of the construction vehicle route associated with the shaft sites used in Alternative 3A and 4A, including travel distance and time between the shaft site and nearest highway, land use along the route, functional classification, major signalized intersections, and traffic impact level. Construction vehicle routes are shown in **SDEIR Figure 9-2**.

Table F.1-6 Alternative 3A/4A – Construction Vehicle Route Characteristics at the UMass Property Site

Shaft Site	Construction Vehicle Travel Distance (mi)	Construction Vehicle Travel Time (min) to Nearest Highway	Construction Vehicle Route Land Use	Construction Vehicle Route Functional Classification	Major Signalized Intersections	Potential Traffic Impact Level
UMass Property	3.4	15	Residential, Industrial	Arterial	Some	Moderate

As shown in **Table F.1-6**, the construction vehicle route would have a moderate level of potential traffic impact.

Table F.1-7 and **Table F.1-8** show the average daily number of diesel truck trips expected to be generated by each shaft site during each quarter throughout construction. The analysis represents a conservative estimate since shift change is approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM. The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s). This impact assessment is based on conservative (i.e., worst case, most impactful) construction sequencing. Durations of construction activities and equipment were estimated to occur concurrently, resulting in conservative (higher) peak cumulative impacts that were assessed.

As shown in **Table F.1-7**, the maximum estimated overall number of daily diesel truck trips by quarter is 389, which would be expected to occur during Quarter 4 of Year 3, when construction activities take place simultaneously at Highland Avenue Northeast, Bifurcation, and the Tandem Trailer sites for SDEIR Alternative 3A.

As shown in **Table F.1-8**, the maximum estimated overall number of daily diesel truck trips by quarter is 393, which would be expected to occur during Quarter 4 of Year 3, when construction activities take place simultaneously at the Highland Avenue sites, UMass Property site, and Tandem Trailer site for SDEIR Alternative 4A.

The estimate of 156 diesel truck trips per day at the Tandem Trailer and Highland Avenue sites is based on a worst-case estimate. The worst-case estimate assumes approximately 70 feet of excavation per day by a TBM, and that that construction would only occur on business days. The average rate for excavation is likely to be less than 60 feet per day, translating to fewer than 150 additional ADT by diesel trucks. Although the excavation on some days may reach or exceed 70 feet a day, the likelihood of exceeding 60 feet a day continuously for over four consecutive quarters (one year) is extremely low. Accordingly, the estimated number of diesel trucks represents a conservative estimate considering the full duration of construction.

The annual ADT generated by the Program would be around 111 average daily trips per year. This conclusion is reached by taking the maximum number of daily truck trips (156) and multiplying that by the typical workdays in a year (260) and dividing that amount over a full 365 days to identify the number of annual ADT. Based on the MEPA EJ guidance for an impact assessment, the annual ADT 111 is below the 150 ADT threshold and thus a one-mile radius for the EJ assessment is appropriate.

Table F.1-7 Alternative 3A – Average Daily Diesel Truck Trips by Quarter

	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8			
Shaft Site	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
UMass Property	0	0	0	0	0	0	0	0	0	0	1	11	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	18	18	18
School Street	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	6	0	0	0	0	0	0	0	0	0
Cedarwood Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Tandem Trailer	0	0	0	0	0	0	0	0	0	0	12	70	8	156[1]	156[1]	156[1]	156	156[1]	0	0	6	34	72	72	58	20	32	12	0	0	0	0
Park Road East	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	4	0	0	0	0	0	0
Bifurcation	0	0	0	0	0	8	6	74	10	152[1]	152[1]	152[1]	102	0	20	58	58	20	0	12	34	0	0	0	0	0	0	0	0	0	0	0
Hegarty Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
St. Mary Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue NW	0	0	0	0	0	0	6	34	16	4	0	0	2	0	14	14	0	2	0	18	6	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue NE	0	0	6	78	10	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	52	0	0	0	20	60	60	60	60	60	12	34	0	0	0	0	0	0	0	0
Newton Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Southern Spine Mains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	4	0	0	0	0	0	0	0	0	0	0
American Legion	0	0	14	60	10	0	0	0	0	0	0	0	4	0	0	0	0	0	124	124	0	2	0	30	58	58	58	58	0	0	0	0
Total	**0**	**0**	**20**	**138**	**20**	**164**	**168**	**264**	**182**	**312**	**321**	**389**	**171**	**156**	**190**	**228**	**234**	**238**	**184**	**214**	**150**	**104**	**90**	**138**	**128**	**83**	**90**	**70**	**6**	**18**	**18**	**18**

1 The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s) and thus not known at this time. The assessment of ADT of diesel trucks was based on a conservative, worst-case scenario where approximately 70 feet of excavation per day is assumed, and that construction would only occur on business days. The average rate for excavation is likely to be less than 60 feet per day, translating to fewer than 150 additional ADT by diesel trucks. The annual ADT generated by the Program would be around 111 average daily trips per year. The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s).
Italicized text within the table indicates no change from the DEIR.

Table F.1-8 Alternative 4A – Average Daily Diesel Truck Trips by Quarter

	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8			
Shaft Site	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
UMass Property	0	0	0	0	0	0	0	0	0	0	1	11	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	18	18	18
School Street	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	6	0	0	0	0	0	0	0	0	0
Cedarwood Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Tandem Trailer	0	0	0	0	0	0	0	0	0	0	12	70	8	156[1]	156[1]	156[1]	156[1]	156[1]	0	0	6	34	72	72	72	50	12	12	0	0	0	0
Park Road West	0	0	0	0	0	0	2	32	14	4	0	0	2	0	0	0	0	2	0	16	6	0	0	0	0	0	0	0	0	0	0	0
Park Road East	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	4	0	0	0	0	0	0
Hegarty Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
St. Mary Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue NW	0	0	0	0	0	0	0	78	10	156[1]	156[1]	156[1]	106	0	20	60	60	20	0	12	34	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue NE	0	0	6	78	10	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	52	0	38	38	20	60	60	60	60	60	0	0	0	0	0	0	0	0	0	0
Newton Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Southern Spine Mains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	4	0	0	0	0	0	0	0	0	0	0
American Legion	0	0	14	62	10	0	0	0	0	0	0	0	4	0	0	0	0	0	106	106	0	2	0	32	60	60	60	60	0	0	0	0
Total	**0**	**0**	**20**	**140**	**20**	**156**	**158**	**266**	**180**	**316**	**325**	**393**	**175**	**156**	**214**	**254**	**236**	**238**	**166**	**194**	**150**	**104**	**78**	**106**	**144**	**115**	**72**	**72**	**6**	**18**	**18**	**18**

1 The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s) and thus not known at this time. The assessment of ADT of diesel trucks was based on a conservative, worst-case scenario where approximately 70 feet of excavation per day is assumed, and that construction would only occur on business days. The average rate for excavation is likely to be less than 60 feet per day, translating to fewer than 150 additional ADT by diesel trucks. The annual ADT generated by the Program would be around 111 average daily trips per year. The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s).
Italicized text within the table indicates no change from the DEIR.

Table F.1-9 shows the maximum number of diesel truck trips estimated to be generated per day at the UMass Property site and the duration of the maximum volume.

Table F.1-9 Alternatives 3A/4A – Daily Diesel Truck Trips at the UMass Property Site

Shaft Site	Maximum Truck Trips per day	Duration of Maximum Truck Volume	Start of Maximum Truck Volume	End of Maximum Truck Volume
UMass Property	18	3 Quarters	Year 8, Quarter 2	Year 8, Quarter 4

Net New Vehicle Trips

To estimate the temporary increase in traffic during peak hours, the daily diesel truck trips identified above were converted to hourly diesel truck volumes. It was assumed that diesel trucks would access the site over a period of eight hours, so the daily diesel truck total was divided by eight.

To model the worst-case scenario, it was conservatively assumed that all construction worker trips to and from the UMass Property site would take place during the peak hours. The analysis assumed that workers would arrive during the morning peak hour and depart during the evening peak hour. The analysis represents a conservative estimate since shift change is approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM. **Table F.1-10** and **Table F.1-11** show the number of net new vehicle trips expected to access each shaft site during the morning and evening peak hours under SDEIR Alternative 3A.

Table F.1-10 Alternative 3A – Net New Vehicle Trips by Shaft Site – AM Peak Hour

Shaft Site	Construction Workers			Diesel Trucks			All Vehicles		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
UMass Property	40	0	30	3	3	6	43	3	46
School Street	18	0	18	1	1	2	19	1	20
Cedarwood Pumping Station	18	0	18	1	1	2	19	1	20
Tandem Trailer	63	0	63	10	10	20	73	10	83
Park Road East	20	0	20	1	1	2	21	1	22
Bifurcation	63	0	63	10	10	20	73	10	83
Hegarty Pumping Station	18	0	18	1	1	2	19	1	20
St. Mary Street Pumping Station	18	0	18	1	1	2	19	1	20
Highland Avenue NW	31	0	31	2	2	4	33	2	35
Highland Avenue NE	63	0	63	10	10	20	73	10	83
Newton Street Pumping Station	18	0	18	1	1	2	19	1	20
Southern Spine Mains	18	0	18	1	1	2	19	1	20
American Legion	36	0	36	8	8	16	44	8	52

Italicized text within the table indicates no change from the DEIR.

As shown in **Table F.1-10**, the Highland Avenue Northeast, Bifurcation, and Tandem Trailer site construction activities are expected to generate the highest number of vehicle trips in the morning peak hour. Each of these sites were estimated to generate 63 construction worker trips and 20 diesel truck trips during the morning peak hour.

Table F.1-11 Alternative 3A – Net New Vehicle Trips by Shaft Site – PM Peak Hour [1]

Shaft Site	Construction Workers			Diesel Trucks			All Vehicles		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
UMass Property	0	40	40	3	3	6	3	43	46
School Street	0	18	18	1	1	2	1	19	20
Cedarwood Pumping Station	0	18	18	1	1	2	1	19	20
Tandem Trailer	63	63	126	10	10	20	73	73	146
Park Road East	0	20	20	1	1	2	1	21	22
Bifurcation	63	63	126	10	10	20	73	73	146
Hegarty Pumping Station	0	18	18	1	1	2	1	19	20
St. Mary Street Pumping Station	0	18	18	1	1	2	1	19	20
Highland Avenue NW	26	26	52	1	1	2	27	27	54
Highland Avenue NE	63	63	126	10	10	20	73	73	146
Newton Street Pumping Station	0	18	18	1	1	2	1	19	20
Southern Spine Mains	0	18	18	1	1	2	1	19	20
American Legion	42	42	84	8	8	16	50	50	100

Italicized text within the table indicates no change from the DEIR.

1 Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

Table F.1-11 presents the new net vehicle trips in the evening peak hour. The evening peak hour, the Bifurcation, Tandem Trailer, and Highland Avenue Northeast site construction activities are expected to generate the highest number of vehicle trips during the change from first to second shift. Each of these sites is expected to generate 126 construction worker trips and 20 diesel truck trips in the worst-case scenario.

Table F.1-12 and **Table F.1-13** show the number of net new vehicle trips estimated to access each shaft site during the morning and evening peak hours under SDEIR Alternative 4A. As described previously, the analysis represents a conservative estimate since shift change is approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

As shown in **Table F.1-12**, the Highland Avenue Northeast, Highland Avenue Northwest, and Tandem Trailer site construction activities are expected to generate the highest number of vehicle trips in the morning peak hour. Each of these sites was estimated to generate 63 construction worker trips and 20 diesel truck trips during the morning peak hour.

Table F.1-12 Alternative 4A – Net New Vehicle Trips by Shaft Site – AM Peak Hour

Shaft Site	Construction Workers			Diesel Trucks			All Vehicles		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
UMass Property	40	0	30	3	3	6	43	3	46
School Street	18	0	18	1	1	2	19	1	20
Cedarwood Pumping Station	18	0	18	1	1	2	19	1	20
Tandem Trailer	63	0	63	10	10	20	73	10	83
Park Road West	50	0	50	1	1	2	51	1	52
Park Road East	27	0	27	1	1	2	28	1	29
Hegarty Pumping Station	18	0	18	1	1	2	19	1	20
St. Mary Street Pumping Station	18	0	18	1	1	2	19	1	20
Highland Avenue NW	63	0	63	10	10	20	73	10	83
Highland Avenue NE	63	0	63	10	10	20	73	10	83
Newton Street Pumping Station	18	0	18	1	1	2	19	1	20
Southern Spine Mains	18	0	18	1	1	2	19	1	20
American Legion	36	0	36	7	7	14	43	7	50

Italicized text within the table indicates no change from the DEIR

In the evening peak hour, the Highland Avenue Northeast, Highland Avenue Northwest, and Tandem Trailer site construction activities are expected to generate the highest number of vehicle trips during the change from first to second shift. Each of these sites was estimated to generate 126 construction worker trips and 20 diesel truck trips in the worst-case scenario. As described previously, the analysis represents a conservative estimate since shift change is approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

Table F.1-13 Alternative 4A – Net New Vehicle Trips by Shaft Site – PM Peak Hour [1]

Shaft Site	Construction Workers			Diesel Trucks			All Vehicles		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
UMass Property	0	40	40	3	3	6	3	43	46
School Street	0	18	18	1	1	2	1	19	20
Cedarwood Pumping Station	0	18	18	1	1	2	1	19	20
Tandem Trailer	63	63	126	10	10	20	73	73	146
Park Road West	0	50	50	1	1	2	1	51	52
Park Road East	0	27	27	1	1	2	1	28	29
Hegarty Pumping Station	0	18	18	1	1	2	1	19	20
St. Mary Street Pumping	0	18	18	1	1	2	1	19	20

Table F.1-13 Alternative 4A – Net New Vehicle Trips by Shaft Site – PM Peak Hour [1]

Shaft Site	Construction Workers			Diesel Trucks			All Vehicles		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
Station									
Highland Avenue NW	63	63	126	10	10	20	73	73	146
Highland Avenue NE	63	63	126	10	10	20	73	73	146
Newton Street Pumping Station	0	18	18	1	1	2	1	19	20
Southern Spine Mains	0	18	18	1	1	2	1	19	20
American Legion	42	42	84	1	1	2	43	43	86

Italicized text within the table indicates no change from the DEIR.

1 *Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.*

Study Area Intersections Construction Period Traffic impacts

The vehicle trips expected at each shaft site were distributed onto the surrounding roadway network based on the previously described construction vehicle routes. This section describes the maximum net new vehicle trips estimated to travel through each Study Area intersection in Waltham during the morning and evening peak hours. The vehicle trips combine both construction worker trips and diesel truck trips.

Table F.1-14 and shows the number of net new vehicle trips conservatively estimated to travel through each Study Area intersection in Waltham in SDEIR Alternatives 3A and 4A. These trips are also shown in **SDEIR Figure 9-4**.

Table F.1-14 Alternative 3A/4A – Net New Vehicle Trips – Waltham Study Area Intersections

Study Area Intersection	Associated Shaft Site(s)	AM Peak Hour	PM Peak Hour [1]
Trapelo Rd. at Lexington St.	UMass Property	43	3
Waverley Oaks Rd. at Trapelo Rd.	UMass Property	43	3
Beaver St. at Waverley Oaks Rd.	UMass Property	43	3
Main St. at Linden St./Ellison Park	UMass Property	3	43
Elm St. at Main St.	UMass Property	3	43
Moody St. at Main St.	UMass Property	3	43
Bacon St. at Main St.	UMass Property, School Street	23	63
Weston St. at Main St.	UMass Property, School Street	23	63

1 *Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.*

Surface Piping Construction Period Trucks

A surface pipe is proposed between the proposed valve chamber at the UMass Property site and the existing MWRA pipeline along Waverley Oaks Road. This connection may require a short-term detour along Waverley Oaks Road, which is functionally classified as an urban principal arterial. It may also require a temporary lane closure along Beaver Street. Duration of the construction is anticipated to be approximately 40 weeks (refer also to **DEIR Appendix F.4, Tables F.4-30** and **F.4-43**.

F.1.11.4 Alternative 10A

SDEIR Alternative 10A would use the Lower Fernald Property as a receiving shaft site.

Construction Vehicle Routes

Construction vehicle routes were developed for each shaft site based on the shortest path between the site and the nearest major highway. **Table F.1-15** shows the characteristics of the anticipated construction vehicle route associated with Lower Fernald Property site, including travel distance and time between the shaft and nearest highway, land use along the route, functional classification, major signalized intersections, and traffic impact level. The anticipated construction vehicle route is shown in **SDEIR Figure 9-3.**

Table F.1-15 Alternative 10A – Construction Vehicle Route Characteristics at the Lower Fernald Property Site

Shaft Site	Route Travel Distance (mi)	Route Travel Time (min)	Route Land Use	Route Functional Classification	Major Signalized Intersections	Potential Traffic Impact Level
Lower Fernald Property	4.0	10	Residential, Industrial	Arterial	Some	Moderate

As shown in **Table F.1-15**, the construction vehicle route would have a moderate level of potential traffic impact.

Table F.1-16 shows the average daily number of diesel truck trips expected to be generated by each shaft site during each quarter throughout construction. The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s) and thus not known at this time. This impact assessment is based on conservative (i.e., worst case, most impactful) construction sequencing. Durations of construction activities and equipment were estimated to occur concurrently, resulting in conservative (higher) peak cumulative impacts that were assessed.

The maximum estimated overall number of daily diesel truck trips by quarter is 312, which would be expected to occur from Quarter 2 of Year 3 to Quarter 2 of Year 4, when construction activities take place simultaneously at the Highland Avenue Northeast and Highland Avenue Northwest sites.

The estimate of 156 diesel truck trips per day at the Highland Avenue sites is based on a worst-case estimate. The worst-case estimate assumes approximately 70 feet of excavation per day by a TBM, and that that construction would only occur on business days. The average rate for excavation is likely to be less than 60 feet per day, translating to fewer than 150 additional ADT by diesel trucks. Although the excavation in some days may reach or exceed 70 feet a day, the likelihood of exceeding 60 feet a day continuously for over four consecutive quarters (one year) is extremely low. Accordingly, the estimated number of diesel trucks represents a conservative estimate considering the full duration of construction.

The annual ADT generated by the Program would be around 111 average daily trips per year. This conclusion is reached by taking the maximum number of daily truck trips (156) and multiplying that by the typical workdays in a year (260) and dividing that amount over a full 365 days to identify the number of annual ADT. Based on the MEPA EJ guidance for an impact assessment, the annual ADT 111 is below the 150 ADT threshold and thus a 1-mile radius for the EJ assessment is appropriate.

Table F.1-16 Alternative 10A – Average Daily Diesel Truck Trips by Quarter

	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8			
Shaft Site	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Lower Fernald Property	0	0	2	27	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	4	5	5	5
School Street	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	6	0	0	0	0	0	0	0	0	0
Cedarwood Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Park Rd West	0	0	0	6	42	6	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	16	6	0	0
Hegarty Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
St. Mary Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Highland Avenue NW	0	0	6	78	10	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	0	0	0	0	0	0	0	56	56	56	56	56	56	56	12	34	0	0
Highland Avenue NE	0	0	0	0	0	0	6	78	0	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	156[1]	52	0	14	14	20	60	60	60	60	60	12	34	0	0	0	0
Newton Street Pumping Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Southern Spine Mains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	4	0	0	0	0	0	0	0	0	0	0
American Legion	0	0	0	0	0	0	14	64	10	0	0	0	0	0	0	0	0	0	0	4	0	0	0	126	126	2	32	60	60	60	60	0
Total	**0**	**0**	**8**	**111**	**56**	**162**	**176**	**298**	**170**	**312**	**312**	**312**	**312**	**312**	**156**	**156**	**52**	**0**	**14**	**20**	**64**	**124**	**122**	**244**	**242**	**118**	**100**	**151**	**92**	**105**	**65**	**5**

1 *The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s) and thus not known at this time. The assessment of ADT of diesel trucks was based on a conservative, worst-case scenario where approximately 70 feet of excavation per day is assumed, and that construction would only occur on business days. The average rate for excavation is likely to be less than 60 feet per day, translating to fewer than 150 additional ADT by diesel trucks. The annual ADT generated by the Program would be around 111 average daily trips per year. The sequence of constructing each element within a construction package will be at the discretion of the selected contractor(s).*
Italicized text within the table indicates no change from the DEIR.

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Table F.1-17 shows the maximum number of diesel truck trips expected to be generated at the Lower Fernald Property site per day and the anticipated duration of the maximum impact.

Table F.1-17 Alternative 10A – Daily Diesel Truck Trips at the Lower Fernald Property Site

Shaft Site	Maximum Truck Trips per day	Duration of Maximum Truck Volume	Start of Maximum Truck Volume	End of Maximum Truck Volume
Lower Fernald Property Receiving	27	1 Quarter	Year 1, Quarter 4	Year 1, Quarter 4

Net New Vehicle Trips

To estimate the temporary increase in traffic during peak hours, the daily diesel truck trips identified above were converted to hourly diesel truck volumes. It was assumed that diesel trucks would access the shaft sites over a period of eight hours, so the daily diesel truck total was divided by eight.

To model the worst-case scenario, it was conservatively assumed that all construction worker trips to/from the Lower Fernald Property site would take place during the peak hours. The analysis represents a conservative estimate since shift change is approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

Table F.1-18 and **Table F.1-19** show the number of net new vehicle trips conservatively estimated to access each shaft site during the morning and evening peak hours in SDEIR Alternative 10A.

Table F.1-18 Alternative 10A – Net New Vehicle Trips by Shaft Site – AM Peak Hour

Shaft Site	Construction Workers			Diesel Trucks			All Vehicles		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
Lower Fernald Property	64	0	64	4	4	8	68	4	72
School Street	*18*	*0*	*18*	*1*	*1*	*2*	*19*	*1*	*20*
Cedarwood Pumping Station	*18*	*0*	*18*	*1*	*1*	*2*	*19*	*1*	*20*
Park Road West	*31*	*0*	*31*	*1*	*1*	*2*	*32*	*1*	*33*
Hegarty Pumping Station	*18*	*0*	*18*	*1*	*1*	*2*	*19*	*1*	*20*
St. Mary Street Pumping Station	*18*	*0*	*18*	*1*	*1*	*2*	*19*	*1*	*20*
Highland Avenue NW	*63*	*0*	*63*	*10*	*10*	*20*	*73*	*10*	*83*
Highland Avenue NE	*63*	*0*	*63*	*10*	*10*	*20*	*73*	*10*	*83*
Newton Street Pumping Station	*18*	*0*	*18*	*1*	*1*	*2*	*19*	*1*	*20*
Southern Spine Mains	*18*	*0*	*18*	*1*	*1*	*2*	*19*	*1*	*20*
American Legion	*36*	*0*	*36*	*8*	*8*	*16*	*44*	*8*	*52*

Italicized text within the table indicates no change from the DEIR.

As shown in **Table F.1-18**, Highland Avenue Northwest and Highland Avenue Northeast would be expected to generate the highest number of trips in the morning peak hour. Each of these sites was estimated to generate 63 construction worker trips and 20 diesel truck trips during the morning peak hour.

Table F.1-19 Alternative 10A – Net New Vehicle Trips by Shaft Site – PM Peak Hour [1]

Shaft Site	Construction Workers			Diesel Trucks			All Vehicles		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
Lower Fernald Property	0	64	64	4	4	8	4	68	72
School Street	*0*	*18*	*18*	*1*	*1*	*2*	*1*	*19*	*20*
Cedarwood Pumping Station	*0*	*18*	*18*	*1*	*1*	*2*	*1*	*19*	*20*
Park Road West	*16*	*16*	*32*	*1*	*1*	*2*	*17*	*17*	*34*
Hegarty Pumping Station	*0*	*18*	*18*	*1*	*1*	*2*	*1*	*19*	*20*
St. Mary Street Pumping Station	*0*	*18*	*18*	*1*	*1*	*2*	*1*	*19*	*20*
Highland Avenue NW	*63*	*63*	*126*	*10*	*10*	*20*	*73*	*73*	*146*
Highland Avenue NE	*63*	*63*	*126*	*10*	*10*	*20*	*73*	*73*	*146*
Newton Street Pumping Station	*0*	*18*	*18*	*1*	*1*	*2*	*1*	*19*	*20*
Southern Spine Mains	*0*	*18*	*18*	*1*	*1*	*2*	*1*	*19*	*20*
American Legion	*36*	*36*	*72*	*8*	*8*	*16*	*44*	*44*	*88*

Italicized text within the table indicates no change from the DEIR.

1 Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

In the evening peak hour, Highland Avenue Northwest and Highland Avenue Northeast would be expected to generate the highest number of vehicle trips during the change from first to second shift. Each of these sites was conservatively estimated to generate 126 construction worker trips and 20 diesel truck trips. As described previously, the analysis represents a conservative estimate since shift change is approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

Study Areas Intersection Construction Period Traffic impacts

The vehicle trips expected at each shaft site were distributed onto the roadway network based on the previously described construction vehicle routes. This section describes the maximum net new vehicle trips estimated to travel through each Study Area intersection in each municipality during the morning and evening peak hours. The vehicle trips combine both construction worker trips and diesel truck trips.

Waltham

Table F.1-20 shows the number of net new vehicle trips expected to travel through each Study Area intersection in Waltham for SDEIR Alternative 10A.

Table F.1-20 Alternative 10A – Net New Vehicle Trips – Waltham Study Area Intersections

Study Area Intersection	Associated Shaft Site(s)	AM Peak Hour	PM Peak Hour [1]
Trapelo Rd. at Lexington St.	Lower Fernald Property	68	4
Waverley Oaks Rd. at Trapelo Rd.	Lower Fernald Property	68	4
Beaver St. at Waverley Oaks Rd.	Lower Fernald Property	4	68
Main St. at Linden St./Ellison Park	Lower Fernald Property	4	68
Elm St. at Main St.	Lower Fernald Property	4	68
Moody St. at Main St.	Lower Fernald Property	4	68
Bacon St. at Main St.	Lower Fernald Property, School Street	24	88
Weston St. at Main St.	Lower Fernald Property, School Street	24	88

1 *Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.*

Surface Piping

A surface pipe is proposed between the proposed valve chamber at the Lower Fernald Property site and the existing MWRA pipeline along Waverley Oaks Road. This connection may require a short-term detour along Waverley Oaks Road, which is functionally classified as an urban principal arterial (refer also to **DEIR Appendix F.4, Table F.4-56)**.

F.1.12 Transportation Final Conditions

As described in **SDEIR Chapter 9, Section 9.2.3, Transportation Final Conditions**, regular trip generation associated with shaft sites is not anticipated to be significant once construction is complete. Post-construction (operational) activities are estimated to include an average of two vehicle trips per day at any given location (one trip entering the site and one trip exiting the site) to support infrequent maintenance. Therefore, operational analyses for the Final Condition were not evaluated as part of the TIA.

F.1.13 Intersection Operational Analysis

F.1.13.1 Methodology

See **DEIR Appendix F.4, Section F.4.10.1**.

F.1.13.2 Summary of Results

The Study Area intersections were examined with regard to flow rates, capacity, and delay characteristics to determine the Level of Service (LOS) using the methodology defined in the Highway Capacity Manual[2] for the existing and future (No-Build and Build) traffic conditions. The LOS is an indicator of operating conditions that occur on a given roadway feature while accommodating varying levels of traffic volumes. It is a qualitative measure that accounts for operational factors including roadway geometry, speed, traffic composition, peak hour factors, travel delay, freedom to maneuver, and driver expectation. When these measures are assessed, and an LOS is assigned to a roadway or intersection, it is equivalent to presenting an "index" to the operational qualities of the section under study. LOS is classified into six levels that are designated 'A' through 'F' based on the control delay ranges they fall under. Additionally, a movement with a volume-to-capacity (v/c) ratio of more than 1.00 also has a LOS of 'F', regardless of delay. These are presented below in **Table F.1-21** for unsignalized and signalized intersections.

Table F.1-21 Level of Service Criteria at Unsignalized and Signalized Intersections

Level of Service (LOS)	Unsignalized Intersection Control Delay (Seconds) per Vehicle	Signalized Intersection Control Delay (Seconds) per Vehicle
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50 or v/c ≥1.00	>80 or v/c ≥1.00

v/c = Volume-to-Capacity Ratio
Source: Transportation Research Board, National Academies of Sciences, Engineering, and Medicine, Highway Capacity Manual 7th Edition, Washington, D.C., 2022.

Table F.1-22 and **Table F.1-23** summarize the Study Area intersection operational analyses for Existing, No-Build, and Temporary Construction scenarios during the morning and evening peak hours, respectively. This methodology conforms with MassDOT TIA Guidelines. The No-Build condition projects traffic volumes into the future construction year using a background growth rate but assumes the Program will not take place and no additional trips are added. Build conditions assume construction will take place.

2 Transportation Research Board, National Academies of Sciences, Engineering, and Medicine, *Highway Capacity Manual 7th Edition*, Washington, D.C., 2022.

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 10A
	LOS	LOS	LOS	LOS
Trapelo Road at Lexington Street (Waltham)				
Trapelo Rd. EB L	D	D	D	D
Trapelo Rd. EB T	C	C	C	C
Lexington St. WB L	D	D	D	D
Lexington St. WB T	D	D	D	D
Trapelo Rd. WB R	C	C	C	C
Trapelo Rd. NB L	D	D	D	D
Trapelo Rd. NB T	D	D	D	D
Lexington St. SB L	D	D	D	D
Lexington St. SB T	C	C	C	C
Overall Intersection	**D**	**D**	**D**	**D**
Trapelo Road at Waverley Oaks Road (Waltham)				
Trapelo Rd. EB T	C	C	D	E
Trapelo Rd. WB L	F	F	F	F
Trapelo Rd. WB T	A	A	A	A
Waverley Oaks Rd. NB L	C	C	C	C
Overall Intersection	**F**	**F**	**F**	**F**
Beaver Street at Waverley Oaks Road (Waltham)				
Beaver St. EB L	E	E	E	E
Beaver St. EB T	C	C	C	C
Beaver St. WB L	D	D	D	D
Beaver St. WB T	C	C	C	C
Waverley Oaks Rd. NB L	D	D	D	D
Waverley Oaks Rd. NB T	C	C	C	C
Waverley Oaks Rd. NB R	C	C	C	C
Waverley Oaks Rd. SB L	D	D	D	D
Waverley Oaks Rd. SB T	C	C	C	C
Waverley Oaks Rd. SB R	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 10A
	LOS	LOS	LOS	LOS
Main Street at Ellison Park/Linden Street (Waltham)				
Main St. EB L	F	F	F	F
Main St. EB T	E	E	E	E
Main St. WB T	D	E	E	E
Linden St. NB T	C	C	C	C
Main St. SB L	B	B	B	B
Main St. SB T	B	B	B	B
Main St. SB L	D	D	D	D
Main St. SB R	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**F**
Main Street at Elm Street (Waltham)				
Main St. EB L	A	A	A	A
Main St. EB T	B	B	B	B
Main St. EB R	F	F	F	F
Main St. WB L	A	A	A	A
Main St. WB T	B	B	B	B
Elm St. NB T	D	D	D	D
Overall Intersection	**C**	**D**	**D**	**D**
Main Street at Moody Street (Waltham)				
Main St. EB T	B	B	B	B
Main St. EB R	B	B	B	B
Main St. WB L	F	F	F	F
Main St. WB TR	B	B	B	B
Moody St. NB L	B	B	B	B
Moody St. NB T	B	B	B	B
Moody St. NB R	C	C	C	C
Overall Intersection	**E**	**E**	**E**	**E**
Main Street at Bacon Street (Waltham)				
Main St. EB L	C	C	C	C
Main St. EB T	F	F	F	F
Main St. WB T	C	C	C	C
Main St. NB T	F	F	F	F
Bacon St. SB L	D	D	D	D
Bacon St. SB T	F	F	F	F
Bacon St. SB R	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**F**

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Main Street at Weston Street/ South Street (Waltham)				
Main St. EB T	B	B	B	B
Weston St. WB L	B	B	B	B
Weston St. WB T	C	C	C	C
Main St. NE L	A	A	A	A
Main St. NE R	A	A	A	A
Overall Intersection	**B**	**B**	**B**	**B**
Shakespeare Road at South Street (Waltham) [Unsignalized Intersection]				
South St. NEB LTR	*A*	*A*	*A*	*A*
Pump Station Driveway NB LTR	*D*	*D*	*D*	*D*
South St. SWB LTR	*A*	*A*	*A*	*A*
Shakespeare Rd. SB LTR	*D*	*E*	*E*	*E*
River Road at South Avenue (Weston)				
South Ave. NEB L	*F*	*F*	*F*	*F*
South Ave. NEB T	*B*	*B*	*B*	*B*
I-95 S Exit 39A off-ramp LT	*D*	*D*	*F*	*D*
I-95 S Exit 39A off-ramp R	*B*	*B*	*B*	*B*
South Ave. WB L	*F*	*F*	*F*	*F*
South Ave. WB T	*B*	*B*	*F*	*B*
River Rd. SB L	*C*	*C*	*C*	*C*
River Rd. SB T	*C*	*C*	*C*	*C*
River Rd. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***D***	***D***	***E***	***D***
I-95 N Off Ramp at South Avenue/Commonwealth Ave (Weston)				
South Ave. EB T	*B*	*A*	*B*	*B*
I-95 N off-ramp L	*C*	*B*	*E*	*D*
I-95 N off-ramp R	*B*	*B*	*B*	*B*
Commonwealth Ave. WB T	*B*	*C*	*B*	*C*
Commonwealth Ave. WB TR	*C*	*C*	*C*	*C*
Overall Intersection	***A***	***B***	***C***	***B***

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 10A
	LOS	LOS	LOS	LOS
Park Road at South Avenue (Weston)				
South Ave. EB T	*D*	*D*	*D*	*D*
South Ave. EB R	*A*	*A*	*A*	*A*
Park Rd. NB L	*D*	*D*	*D*	*D*
Park Rd. NB LR	*D*	*D*	*D*	*D*
South Ave. WB L	*E*	*E*	*E*	*E*
South Ave. WB T	*C*	*C*	*C*	*C*
Overall Intersection	***C***	***C***	***C***	***C***
Central Avenue at Cedar Street (Needham) [Unsignalized Intersection]				
Central Ave. EB L	*A*	*A*	*A*	*A*
Central Ave. WB L	*A*	*A*	*A*	*A*
Cedar St. SB LTR	*F*	*F*	*F*	*F*
Worcester Street at Cedar Street (Wellesley)				
Worcester St. EB L	*D*	*D*	*D*	*D*
Worcester St. EB T	*D*	*D*	*D*	*D*
Cedar St. NB L	*A*	*A*	*A*	*A*
Cedar St. NB T	*C*	*C*	*C*	*C*
Worcester St. WB LTR	*C*	*C*	*C*	*C*
Cedar St. SB L	*A*	*A*	*A*	*A*
Cedar St. SB T	*A*	*A*	*A*	*A*
Overall Intersection	***C***	***C***	***C***	***C***
Route 9 at Woodward Street/Elliot Street (Newton)				
Route 9 EB L	*F*	*F*	*F*	*F*
Route 9 EB T	*F*	*F*	*F*	*F*
Elliot St. NB L	*C*	*C*	*C*	*C*
Elliot St. NB T	*D*	*D*	*D*	*D*
Route 9 WB L	*F*	*F*	*F*	*F*
Route 9 WB T	*F*	*F*	*F*	*F*
Woodward St. SB L	*F*	*F*	*F*	*F*
Overall Intersection	***F***	***F***	***F***	***F***

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 10A
	LOS	LOS	LOS	LOS
Grove Street at Newton Street (Brookline)				
Newton St. EB L	*D*	*D*	*D*	*D*
Newton St. EB R	*B*	*B*	*B*	*B*
Grove St. NB T	*B*	*C*	*C*	*C*
Newton St. SB T	*A*	*B*	*B*	*B*
Newton St SB R	*A*	*A*	*A*	*A*
Overall Intersection	***B***	***B***	***B***	***B***
Newton Street at Clyde Street (Brookline)				
Newton St. EB L	*F*	*F*	*F*	*F*
Newton St. EB T	*F*	*F*	*F*	*F*
Newton St. WB T	*E*	*E*	*E*	*E*
Clyde St. SB L	*D*	*D*	*D*	*D*
Clyde St. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***E***	***F***	***F***	***F***
Warren Street at Lee Street (Brookline)				
Lee St. NEB L	*A*	*A*	*A*	*A*
Lee St. NEB R	*A*	*A*	*A*	*A*
Warren St. WB LR	*F*	*F*	*F*	*F*
Lee St. SB L	*A*	*A*	*A*	*A*
Lee St. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***D***	***D***	***D***	***D***
Lee Street at Route 9 (Brookline)				
Route 9 EB T	*C*	*D*	*D*	*D*
Route 9 EB R	*A*	*A*	*A*	*A*
Lee St. NB L	*D*	*D*	*D*	*D*
Route 9 WB L	*F*	*F*	*F*	*F*
Route 9 WB T	*D*	*E*	*E*	*E*
Overall Intersection	***D***	***D***	***D***	***D***
Chestnut Hill Avenue at Route 9 (Brookline)				
Route 9 EB L	*F*	*F*	*F*	*F*
Route 9 EB T	*C*	*C*	*C*	*C*
Route 9 WB L	*D*	*D*	*D*	*D*
Route 9 WB T	*E*	*E*	*E*	*E*
Route 9 WB R	*A*	*A*	*A*	*A*
Chestnut Hill Ave. SB L	*F*	*F*	*F*	*F*
Chestnut Hill Ave. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***D***	***D***	***D***	***D***

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Hammond Street at Route 9 (Brookline)				
Route 9 EB L	*F*	*F*	*F*	*F*
Route 9 EB T	*E*	*E*	*E*	*E*
Hammond St. NB T	*F*	*F*	*F*	*F*
Route 9 WB L	*F*	*F*	*F*	*F*
Route 9 WB T	*F*	*F*	*F*	*F*
Route 9 WB R	*A*	*A*	*A*	*A*
Hammond St. SB L	*F*	*F*	*F*	*F*
Hammond St. SB T	*D*	*D*	*D*	*D*
Overall Intersection	***F***	***F***	***F***	***F***
Canterbury Lane at Morton Street (Boston)				
Canterbury Ln. EB LR	*C*	*C*	*C*	*C*
Morton St. NB L	*A*	*A*	*A*	*A*
Morton St. NB T	*B*	*B*	*B*	*B*
Morton St. SB T	*A*	*A*	*A*	*A*
Overall Intersection	***A***	***A***	***A***	***A***
Morton Street at Harvard Street (Boston)				
Harvard St. EB L	*F*	*F*	*F*	*F*
Harvard St. EB T	*C*	*C*	*C*	*C*
Morton St. NB L	*E*	*E*	*E*	*E*
Morton St. NB T	*E*	*E*	*E*	*E*
Harvard St. WB L	*D*	*D*	*D*	*D*
Harvard St. WB T	*F*	*F*	*F*	*F*
Morton St. SB L	*F*	*F*	*F*	*F*
Morton St. SB T	*C*	*C*	*C*	*C*
Overall Intersection	***F***	***F***	***F***	***F***
Morton Street at Blue Hill Avenue (Boston)				
Morton St. EB T	*C*	*C*	*C*	*C*
Morton St. EB R	*A*	*A*	*A*	*A*
Blue Hill Ave. NB L	*E*	*E*	*E*	*E*
Blue Hill Ave. NB T	*D*	*D*	*D*	*D*
Morton St. WB T	*D*	*D*	*D*	*D*
Blue Hill Ave. SB L	*F*	*F*	*F*	*F*
Blue Hill Ave. SB T	*D*	*D*	*D*	*D*
Overall Intersection	***E***	***E***	***E***	***E***

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Morton Street at Norfolk Street (Boston)				
Morton St. EB L	*D*	*D*	*D*	*D*
Morton St. EB T	*D*	*E*	*E*	*E*
Norfolk St. NB T	*C*	*C*	*C*	*C*
Norfolk St. NB R	*A*	*A*	*A*	*A*
Morton St. WB L	*D*	*D*	*D*	*D*
Morton St. WB T	*D*	*F*	*F*	*F*
Norfolk St. SB LTR	*C*	*C*	*C*	*C*
Overall Intersection	***D***	***D***	***E***	***E***
Morton Street at Corbet Street (Boston)				
Morton St. EB L	*C*	*C*	*C*	*C*
Morton St. EB T	*C*	*C*	*C*	*C*
W. Selden St. NB LTR	*C*	*C*	*C*	*C*
Morton St. WB L	*D*	*C*	*D*	*C*
Morton St. WB T	*C*	*D*	*C*	*D*
Corbet St. SB LTR	*C*	*C*	*C*	*C*
Overall Intersection	***C***	***C***	***C***	***C***
Morton Street at Woodmere Street/Gallivan Boulevard (Boston)				
Morton St. SEB L	*C*	*B*	*B*	*B*
Morton St. SEB T	*C*	*C*	*C*	*C*
Woodmere St. NEB LTR	*A*	*A*	*A*	*A*
Morton St. NWB LT	*B*	*B*	*B*	*B*
Gallivan Blvd. WB T	*A*	*A*	*A*	*A*
Overall Intersection	***B***	***B***	***B***	***B***
Gallivan Boulevard at Washington Street (Boston)				
Gallivan Blvd. EB LT	*B*	*B*	*B*	*B*
Gallivan Blvd. EB R	*A*	*A*	*A*	*A*
Washington St. NB LTR	*B*	*B*	*B*	*B*
Gallivan Blvd. WB LTR	*B*	*B*	*B*	*B*
Washington St. SB LTR	*C*	*C*	*C*	*C*
Overall Intersection	***B***	***B***	***B***	***B***
Gallivan Boulevard at Dorchester Avenue (Boston)				
Gallivan Blvd. EB T	*B*	*B*	*B*	*B*
Dorchester Ave. NB LTR	*C*	*C*	*C*	*C*
Gallivan Blvd. WB T	*B*	*B*	*B*	*B*
Dorchester Ave. SB LTR	*C*	*C*	*C*	*C*
Overall Intersection	***B***	***B***	***B***	***B***

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Gallivan Boulevard at Granite Avenue/Adams Street (Boston)				
Gallivan Blvd. EB L	*C*	*C*	*C*	*C*
Gallivan Blvd. EB T	*D*	*D*	*D*	*D*
Granite Ave. NB L	*C*	*C*	*C*	*C*
Granite Ave. NB TR	*D*	*D*	*D*	*D*
Gallivan Blvd. WB L	*F*	*F*	*F*	*F*
Gallivan Blvd. WB T	*C*	*D*	*D*	*D*
Adams St. SB L	*C*	*B*	*C*	*C*
Adams St. SB T	*D*	*D*	*D*	*D*
Adams St. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***C***	***D***	***D***	***D***
Gallivan Boulevard at Hallet Street (Boston)				
Gallivan Blvd. EB T	*C*	*C*	*C*	*C*
Hallet St. NB L	*D*	*D*	*D*	*D*
Hallet St. NB R	*D*	*D*	*D*	*D*
Gallivan Blvd. WB T	*B*	*B*	*B*	*B*
Hallet St. SB L	*C*	*C*	*C*	*C*
Hallet St. SB T	*B*	*B*	*B*	*B*
Overall Intersection	***C***	***C***	***C***	***C***
Gallivan Boulevard at Neponset Avenue (Boston)				
Neponset Ave. EB L	*B*	*B*	*B*	*B*
Neponset Ave. EB T	*B*	*B*	*B*	*B*
Gallivan Blvd. NB T	*A*	*A*	*A*	*A*
Gallivan Blvd. NB R	*A*	*A*	*A*	*A*
Overall Intersection	***B***	***B***	***B***	***B***
Neponset Avenue at Morrissey Boulevard (Boston)				
Neponset Ave. EB T	*A*	*A*	*A*	*A*
Morrissey Blvd. SB L	*A*	*A*	*B*	*B*
Morrissey Blvd. SB T	*A*	*A*	*A*	*A*
Morrissey Blvd. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***A***	***A***	***A***	***A***
South Street at Washington Street (Boston)				
South St. EB L	*E*	*E*	*E*	*E*
Washington St. NB T	*B*	*B*	*B*	*B*
South St. SB T	*B*	*B*	*B*	*B*
Overall Intersection	***C***	***C***	***C***	***C***

Table F.1-22 Study Area Intersection Operational Analysis Results: Morning Peak Hour

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
South Street at Arborway/New Washington Street (Boston)				
Arborway EB T	*B*	*B*	*B*	*B*
Arborway EB R	*A*	*A*	*A*	*A*
South St. NB L	*D*	*E*	*E*	*E*
South St. NB T	*D*	*D*	*D*	*D*
New Washington St. WB T	*C*	*C*	*C*	*C*
South St. SB L	*F*	*F*	*F*	*F*
South St. SB T	*D*	*D*	*D*	*D*
Overall Intersection	***C***	***C***	***C***	***C***
Washington Street at Arborway (Boston)				
New Washington St. EB T	*D*	*D*	*D*	*D*
Washington St. NB L	*D*	*D*	*D*	*D*
Washington St. NB TR	*D*	*D*	*D*	*D*
Arborway WB L	*F*	*F*	*F*	*F*
Arborway WB T	*B*	*B*	*B*	*B*
Washington St. SB L	*D*	*E*	*E*	*E*
Washington St. SB TR	*D*	*D*	*D*	*D*
Overall Intersection	***D***	***D***	***D***	***D***
Arborway at Morton Street/Circuit Drive (Boston)				
Arborway EB L	*E*	*E*	*E*	*E*
Arborway EB T	*B*	*B*	*B*	*B*
Morton St. NB T	*D*	*D*	*D*	*D*
Morton St. WB L	*E*	*E*	*E*	*E*
Morton St. WB T	*C*	*C*	*C*	*C*
Circuit Dr. SB T	*D*	*D*	*D*	*D*
Overall Intersection	***D***	***D***	***D***	***D***

Abbreviations:
EB = Eastbound *NB = Northbound* *L = Left* *R = Right*
WB = Westbound *SB = Southbound* *T = Through* *LOS = Level of Service*
Italicized text within the table indicates no change from the DEIR.

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 10A
	LOS	LOS	LOS	LOS
Trapelo Road at Lexington Street (Waltham)				
Trapelo Rd. EB L	D	D	D	D
Trapelo Rd. EB T	C	C	C	C
Lexington St. WB L	E	E	E	E
Lexington St. WB T	D	D	D	D
Trapelo Rd. WB R	C	C	C	C
Trapelo Rd. NB L	D	E	E	E
Trapelo Rd. NB T	D	D	D	D
Lexington St. SB L	D	D	D	D
Lexington St. SB T	D	D	D	D
Overall Intersection	**D**	**D**	**D**	**D**
Trapelo Road at Waverley Oaks Road (Waltham)				
Trapelo Rd. EB T	C	C	C	C
Trapelo Rd. WB L	F	F	F	F
Trapelo Rd. WB T	A	A	A	A
Waverley Oaks Rd. NB L	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**F**
Beaver Street at Waverley Oaks Road (Waltham)				
Beaver St. EB L	E	F	F	F
Beaver St. EB T	C	C	C	C
Beaver St. WB L	D	D	D	D
Beaver St. WB T	C	C	C	C
Waverley Oaks Rd. NB L	D	D	D	D
Waverley Oaks Rd. NB T	D	D	D	D
Waverley Oaks Rd. NB R	C	C	C	C
Waverley Oaks Rd. SB L	D	D	D	D
Waverley Oaks Rd. SB T	C	C	C	C
Waverley Oaks Rd. SB R	C	C	C	C
Overall Intersection	**C**	**C**	**C**	**C**

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Main Street at Ellison Park/Linden Street (Waltham)				
Main St. EB L	F	F	F	F
Main St. EB T	D	D	D	D
Main St. WB T	D	D	D	D
Linden St. NB T	C	C	C	C
Main St. SB L	C	C	C	C
Main St. SB T	C	C	C	C
Main St. SB L	C	C	C	C
Main St. SB R	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**F**
Main Street at Elm Street (Waltham)				
Main St. EB L	A	A	A	A
Main St. EB T	B	B	B	B
Main St. EB R	D	D	D	D
Main St. WB L	A	A	A	A
Main St. WB T	B	B	B	B
Elm St. NB T	D	D	D	D
Overall Intersection	**C**	**C**	**C**	**C**
Main Street at Moody Street (Waltham)				
Main St. EB T	B	B	B	B
Main St. EB R	B	B	B	B
Main St. WB L	F	F	F	F
Main St. WB TR	B	B	B	C
Moody St. NB L	B	B	B	B
Moody St. NB T	B	B	B	B
Moody St. NB R	C	C	C	C
Overall Intersection	**F**	**F**	**F**	**F**
Main Street at Bacon Street (Waltham)				
Main St. EB L	A	A	A	A
Main St. EB T	C	C	C	C
Main St. WB T	A	A	B	B
Main St. NB T	A	A	A	A
Bacon St. SB L	C	C	C	C
Bacon St. SB T	F	F	F	F
Bacon St. SB R	B	B	B	B
Overall Intersection	**F**	**F**	**F**	**F**

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Main Street at Weston Street/ South Street (Waltham)				
Main St. EB T	D	D	D	D
Weston St. WB L	A	A	A	A
Weston St. WB T	E	E	E	E
Main St. NE L	A	A	A	A
Main St. NE R	A	A	A	A
Overall Intersection	**C**	**C**	**C**	**C**
Shakespeare Road at South Street (Waltham) [Unsignalized Intersection]				
South St. NEB LTR	*A*	*A*	*A*	*A*
Pump Station Driveway NB LTR	*C*	*C*	*C*	*C*
South St. SWB LTR	*A*	*A*	*A*	*A*
Shakespeare Rd. SB LTR	*D*	*D*	*E*	*E*
River Road at South Avenue (Weston)				
South Ave. NEB L	D	D	D	D
South Ave. NEB T	B	B	B	B
I-95 S Exit 39A off-ramp LT	F	F	F	F
I-95 S Exit 39A off-ramp R	A	A	A	A
South Ave. WB L	F	F	F	F
South Ave. WB T	A	A	A	A
River Rd. SB L	F	F	F	F
River Rd. SB T	F	F	F	F
River Rd. SB R	A	A	A	A
Overall Intersection	***D***	***D***	***E***	***D***
I-95 N Off Ramp at South Avenue/Commonwealth Ave (Weston)				
South Ave. EB T	*C*	*A*	*C*	*B*
I-95 N off-ramp L	*B*	*B*	*B*	*B*
I-95 N off-ramp R	*A*	*B*	*A*	*B*
Commonwealth Ave. WB T	*C*	*C*	*C*	*C*
Overall Intersection	***B***	***B***	***C***	***B***
Park Road at South Avenue (Weston)				
South Ave. EB T	*C*	*C*	*C*	*C*
South Ave. EB R	*A*	*A*	*A*	*A*
Park Rd. NB L	*C*	*C*	*C*	*C*
Park Rd. NB LR	*B*	*B*	*B*	*B*
South Ave. WB L	*C*	*C*	*D*	*C*
South Ave. WB T	*F*	*F*	*F*	*F*
Overall Intersection	***D***	***D***	***D***	***D***

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 10A
	LOS	LOS	LOS	LOS
Central Avenue at Cedar Street (Needham) [Unsignalized Intersection]				
Central Ave. EB L	*A*	*A*	*A*	*A*
Central Ave. WB L	*A*	*A*	*A*	*A*
Cedar St. SB LTR	*F*	*F*	*F*	*F*
Worcester Street at Cedar Street (Wellesley)				
Worcester St. EB L	*C*	*C*	*C*	*C*
Worcester St. EB T	*C*	*C*	*C*	*C*
Cedar St. NB L	*B*	*B*	*B*	*B*
Cedar St. NB T	*C*	*C*	*C*	*C*
Worcester St. WB LTR	*C*	*C*	*C*	*C*
Cedar St. SB L	*A*	*A*	*A*	*A*
Cedar St. SB T	*B*	*B*	*B*	*B*
Overall Intersection	***C***	***C***	***C***	***C***
Route 9 at Woodward Street/Elliot Street (Newton)				
Route 9 EB L	*F*	*F*	*F*	*F*
Route 9 EB T	*E*	*E*	*E*	*E*
Elliot St. NB L	*D*	*D*	*D*	*D*
Elliot St. NB T	*D*	*D*	*D*	*D*
Route 9 WB L	*F*	*F*	*F*	*F*
Route 9 WB T	*E*	*E*	*E*	*E*
Woodward St. SB L	*F*	*F*	*F*	*F*
Overall Intersection	***E***	***E***	***E***	***E***
Grove Street at Newton Street (Brookline)				
Newton St. EB L	*D*	*D*	*D*	*D*
Newton St. EB R	*A*	*A*	*A*	*A*
Grove St. NB T	*C*	*D*	*D*	*D*
Newton St. SB T	*F*	*F*	*F*	*F*
Newton St. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***F***	***F***	***F***	***F***
Newton Street at Clyde Street (Brookline)				
Newton St. EB L	*F*	*F*	*F*	*F*
Newton St. EB T	*F*	*F*	*F*	*F*
Newton St. WB T	*D*	*D*	*D*	*D*
Clyde St. SB L	*C*	*C*	*C*	*C*
Clyde St. SB R	*B*	*B*	*B*	*B*
Overall Intersection	***F***	***F***	***F***	***F***

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 10A
	LOS	**LOS**	**LOS**	**LOS**
Warren Street at Lee Street (Brookline)				
Lee St. NEB L	*A*	*A*	*A*	*A*
Lee St. NEB R	*A*	*A*	*A*	*A*
Warren St. WB LR	*F*	*F*	*F*	*F*
Lee St. SB L	*A*	*A*	*A*	*A*
Lee St. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***C***	***C***	***D***	***D***
Lee Street at Route 9 (Brookline)				
Route 9 EB T	*B*	*B*	*B*	*B*
Route 9 EB R	*A*	*A*	*A*	*A*
Lee St. NB L	*D*	*D*	*D*	*D*
Route 9 WB L	*F*	*F*	*F*	*F*
Route 9 WB T	*B*	*B*	*B*	*B*
Overall Intersection	***C***	***C***	***C***	***C***
Chestnut Hill Avenue at Route 9 (Brookline)				
Route 9 EB L	*F*	*F*	*F*	*F*
Route 9 EB T	*C*	*C*	*C*	*C*
Route 9 WB L	*F*	*F*	*F*	*F*
Route 9 WB T	*D*	*D*	*D*	*D*
Route 9 WB R	*A*	*A*	*A*	*A*
Chestnut Hill Ave. SB L	*F*	*F*	*F*	*F*
Chestnut Hill Ave. SB R	*B*	*B*	*B*	*B*
Overall Intersection	***E***	***F***	***F***	***F***
Hammond Street at Route 9 (Brookline)				
Route 9 EB L	*F*	*F*	*F*	*F*
Route 9 EB T	*F*	*F*	*F*	*F*
Hammond St. NB T	*F*	*F*	*F*	*F*
Route 9 WB L	*E*	*E*	*E*	*E*
Route 9 WB T	*E*	*E*	*E*	*E*
Route 9 WB R	*A*	*A*	*A*	*A*
Hammond St. SB L	*F*	*F*	*F*	*F*
Hammond St. SB T	*E*	*E*	*E*	*E*
Overall Intersection	***F***	***F***	***F***	***F***

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Canterbury Lane at Morton Street (Boston)				
Canterbury Ln. EB LR	*C*	*C*	*C*	*C*
Morton St. NB L	*B*	*B*	*D*	*B*
Morton St. NB T	*A*	*A*	*A*	*A*
Morton St. SB T	*A*	*A*	*B*	*A*
Overall Intersection	***A***	***A***	***B***	***B***
Morton Street at Harvard Street (Boston)				
Harvard St. EB L	*E*	*E*	*E*	*E*
Harvard St. EB T	*C*	*C*	*C*	*C*
Morton St. NB L	*E*	*E*	*E*	*E*
Morton St. NB T	*C*	*D*	*D*	*D*
Harvard St. WB L	*D*	*D*	*D*	*D*
Harvard St. WB T	*E*	*E*	*E*	*E*
Morton St. SB L	*E*	*E*	*E*	*E*
Morton St. SB T	*C*	*D*	*D*	*D*
Overall Intersection	***D***	***D***	***D***	***D***
Morton Street at Blue Hill Avenue (Boston)				
Morton St. EB T	*C*	*C*	*C*	*C*
Morton St. EB R	*A*	*A*	*A*	*A*
Blue Hill Ave. NB L	*E*	*E*	*E*	*E*
Blue Hill Ave. NB T	*D*	*D*	*D*	*D*
Morton St WB T	*C*	*C*	*C*	*C*
Blue Hill Ave. SB L	*F*	*F*	*F*	*F*
Blue Hill Ave. SB T	*D*	*D*	*D*	*D*
Overall Intersection	***D***	***D***	***D***	***D***
Morton Street at Norfolk Street (Boston)				
Morton St. EB L	*E*	*E*	*E*	*E*
Morton St. EB T	*E*	*F*	*F*	*F*
Norfolk St. NB T	*C*	*C*	*C*	*C*
Norfolk St. NB R	*A*	*A*	*A*	*A*
Morton St. WB L	*D*	*D*	*D*	*D*
Morton St. WB T	*C*	*C*	*C*	*C*
Norfolk St. SB LTR	*C*	*C*	*C*	*C*
Overall Intersection	***D***	***D***	***E***	***E***

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Morton Street at Corbet Street (Boston)				
Morton St. EB L	*E*	*E*	*E*	*E*
Morton St. EB T	*C*	*C*	*C*	*C*
W Selden St. NB LTR	*C*	*C*	*C*	*C*
Morton St. WB L	*E*	*F*	*F*	*F*
Morton St. WB T	*D*	*D*	*D*	*D*
Corbet St. SB LTR	*C*	*C*	*C*	*C*
Overall Intersection	***C***	***C***	***C***	***C***
Morton Street at Woodmere Street/Gallivan Boulevard (Boston)				
Morton St. SEB L	*C*	*C*	*D*	*C*
Morton St. SEB T	*D*	*D*	*D*	*D*
Woodmere St. NEB LTR	*B*	*B*	*B*	*B*
Morton St. NWB LT	*C*	*C*	*C*	*C*
Gallivan Blvd. WB T	*A*	*A*	*A*	*A*
Overall Intersection	***C***	***C***	***C***	***C***
Gallivan Boulevard at Washington Street (Boston)				
Gallivan Blvd. EB LT	*B*	*B*	*B*	*B*
Gallivan Blvd. EB R	*A*	*A*	*A*	*A*
Washington St. NB LTR	*B*	*B*	*B*	*B*
Gallivan Blvd. WB LTR	*B*	*C*	*B*	*C*
Washington St. SB LTR	*C*	*B*	*C*	*B*
Overall Intersection	***B***	***B***	***C***	***B***
Gallivan Boulevard at Dorchester Avenue (Boston)				
Gallivan Blvd. EB T	*B*	*B*	*B*	*B*
Dorchester Ave. NB LTR	*B*	*B*	*B*	*B*
Gallivan Blvd. WB T	*B*	*B*	*B*	*B*
Dorchester Ave. SB LTR	*C*	*C*	*C*	*C*
Overall Intersection	***B***	***B***	***B***	***B***

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
Gallivan Boulevard at Granite Avenue/Adams Street (Boston)				
Gallivan Blvd. EB L	*B*	*B*	*B*	*B*
Gallivan Blvd. EB T	*B*	*B*	*B*	*B*
Granite Ave. NB L	*D*	*E*	*E*	*E*
Granite Ave. NB TR	*D*	*D*	*D*	*D*
Gallivan Blvd. WB L	*D*	*D*	*E*	*E*
Gallivan Blvd. WB T	*C*	*C*	*C*	*C*
Adams St. SB L	*C*	*C*	*C*	*C*
Adams St. SB T	*D*	*D*	*D*	*D*
Adams St. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***C***	***C***	***C***	***C***
Gallivan Boulevard at Hallet Street (Boston)				
Gallivan Blvd. EB T	*C*	*C*	*C*	*C*
Hallet St. NB L	*C*	*C*	*C*	*C*
Hallet St. NB R	*C*	*C*	*C*	*C*
Gallivan Blvd. WB T	*B*	*B*	*B*	*B*
Hallet St. SB L	*C*	*C*	*C*	*C*
Hallet St. SB T	*C*	*C*	*C*	*C*
Overall Intersection	***C***	***C***	***C***	***C***
Gallivan Boulevard at Neponset Avenue (Boston)				
Neponset Ave. EB L	*B*	*B*	*B*	*B*
Neponset Ave. EB T	*D*	*D*	*D*	*D*
Gallivan Blvd. NB T	*A*	*A*	*A*	*A*
Gallivan Blvd. NB R	*C*	*C*	*C*	*C*
Overall Intersection	***C***	***C***	***C***	***C***
Neponset Avenue at Morrissey Boulevard (Boston)				
Neponset Ave. EB T	*B*	*B*	*B*	*B*
Morrissey Blvd. SB L	*B*	*B*	*B*	*B*
Morrissey Blvd. SB T	*A*	*A*	*A*	*A*
Morrissey Blvd. SB R	*A*	*A*	*A*	*A*
Overall Intersection	***B***	***B***	***B***	***B***

Table F.1-23 Study Area Intersection Operational Analysis Results: Evening Peak Hour [1]

Study Area Intersection	Existing LOS	No-Build LOS	Alternative 3A/4A LOS	Alternative 10A LOS
South Street at Washington Street (Boston)				
South St. EB L	*E*	*F*	*F*	*F*
Washington St. NB T	*B*	*B*	*B*	*B*
South St. SB T	*B*	*B*	*B*	*B*
Overall Intersection	***C***	***C***	***C***	***C***
South Street at Arborway/New Washington Street (Boston)				
Arborway EB T	B	B	B	B
Arborway EB R	A	A	A	A
South St. NB L	E	E	E	E
South St. NB T	D	D	D	D
New Washington St. WB T	B	B	B	B
South St. SB L	C	C	C	C
South St. SB T	E	E	E	E
Overall Intersection	***C***	***C***	***C***	***C***
Washington Street at Arborway (Boston)				
New Washington St. EB T	*F*	*F*	*F*	*F*
Washington St. NB L	*D*	*D*	*D*	*D*
Washington St. NB TR	*C*	*C*	*C*	*C*
Arborway WB L	*F*	*F*	*F*	*F*
Arborway WB T	*B*	*B*	*B*	*B*
Washington St. SB L	*D*	*D*	*D*	*D*
Washington St. SB TR	*D*	*D*	*D*	*D*
Overall Intersection	***F***	***F***	***F***	***F***
Arborway at Morton Street/Circuit Drive (Boston)				
Arborway EB L	*C*	*C*	*C*	*C*
Arborway EB T	*C*	*C*	*C*	*C*
Morton St. NB T	*C*	*C*	*C*	*C*
Morton St. WB L	*E*	*E*	*E*	*E*
Morton St. WB T	*C*	*C*	*C*	*C*
Circuit Dr. SB T	*C*	*C*	*C*	*C*
Overall Intersection	***C***	***C***	***C***	***C***

Abbreviations:
EB = Eastbound NB = Northbound L = Left R = Right
WB = Westbound SB = Southbound T = Through LOS = Level of Service
Italicized text within the table indicates no change from the DEIR.
1 Evening peak hour trips are a conservative estimate since construction worker trips are not anticipated to occur in the evening peak hour as shift change is usually at approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM.

F.1.14 Avoidance, Minimization, and Mitigation Measures

Refer to **SDEIR Chapter 9, Section 9.2.4, Transportation Avoidance, Minimization, Mitigation**, and **DEIR Appendix F.4, Section F.4.11**.

F.1.14.1 Alternative 3A/4A

The primary source of traffic expected to be generated temporarily by the Program would include construction worker trips to and from the Program sites, as well as trucks hauling equipment and excavated material. The maximum amount of temporary Program-related traffic would occur at tunnel launching shaft sites where there is a shift change conservatively modeled to take place during the evening peak hour (construction worker trips are not expected to occur during the evening peak hour as shift change is usually at approximately 3:00 PM). Launching shaft sites are adjacent to highway ramps and are therefore not expected to cause a significant traffic impact to nearby local roadways.

Intersection Operations

To minimize potential impacts associated with the temporary increase in Program-related traffic during construction, traffic signal timing adjustments may be considered at the following intersections:

- Trapelo Road at Waverley Oaks Road (Waltham)
  - Adjust traffic signal timings for AM peak hour
- Main Street at Ellison Park/Linden Street (Waltham)
  - Adjust traffic signal timings for AM and PM peak hour

Table F.1-24 and **Table F.1-25** show the Study Area intersection operational analysis results with adjusted traffic signal timings during the morning and evening peak hours. As shown, after adjusting traffic signal timings, estimated delays are generally reduced compared to the unadjusted Build conditions. In various cases, adjusted traffic signal timings could be used as a temporary mitigation strategy during construction, if necessary and where appropriate, to reduce intersection delays compared to the No-Build conditions.

Table F.1-24 Study Area Intersection Operational Analysis Results: Alternative 3A/4A – Morning Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 3A/4A with Mitigation
	LOS	LOS	LOS	LOS
Trapelo Road at Waverley Oaks Road (Waltham)				
Trapelo Rd. EB T	C	C	D	D
Trapelo Rd. WB L	F	F	F	E
Trapelo Rd. WB T	A	A	A	A
Waverley Oaks Rd. NB L	C	C	C	E
Overall Intersection	**F**	**F**	**F**	**D**

Table F.1-24 Study Area Intersection Operational Analysis Results: Alternative 3A/4A – Morning Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 3A/4A with Mitigation
	LOS	LOS	LOS	LOS
Main Street at Ellison Park/Linden Street (Waltham)				
Main St. EB L	F	F	F	F
Main St. EB T	E	E	E	D
Main St. WB T	D	E	E	E
Linden St. NB T	C	C	C	D
Main St. SB L	B	B	B	C
Main St. SB T	B	B	B	C
Main St. SB L	D	D	D	D
Main St. SB R	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**E**

Table F.1-25 Study Area Intersection Operational Analysis Results: Alternative 3A/4A – Evening Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 3A/4A	Alternative 3A/4A with Mitigation
	LOS	LOS	LOS	LOS
Main Street at Ellison Park/Linden Street (Waltham)				
Main St. EB L	F	F	F	F
Main St. EB T	D	D	D	C
Main St. WB T	D	D	D	C
Linden St. NB T	C	C	C	E
Main St. SB L	C	C	C	C
Main St. SB T	C	C	C	C
Main St. SB L	C	C	C	C
Main St. SB R	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**F**

Sensitive Receptors

Safe access to sensitive receptors would be maintained at all times.

Bicycles and Pedestrians

Bicycles and pedestrians would be accommodated through all on-street work zones. Specific details will be worked out through the final design process.

Surface Piping

If necessary and as appropriate, the surface pipe connections on Beaver Street would be installed during off-peak hours to minimize the potential disturbance to traffic operations.

F.1.14.2 Alternative 10A

The primary source of traffic expected to be generated temporarily by the Program would include construction worker trips to and from the Program sites, as well as trucks hauling equipment and excavated material. The maximum amount of temporary Program-related traffic would occur at tunnel launching shaft sites where there is a shift change conservatively modeled to take place during the evening peak hour. Launching shaft sites are adjacent to highway ramps and are therefore not expected to cause a significant traffic impact to nearby local roadways.

Intersection Operations

Study Area intersections subject to potential temporary increases in delay associated with Program-related construction activities at the Lower Fernald Property site could be mitigated, if necessary and where appropriate, by adjusting traffic signal timings at the following intersections:

- Trapelo Road at Waverley Oaks Road (Waltham)
    - Adjust traffic signal timings for AM peak hour
- Main Street at Ellison Park/Linden Street (Waltham)
    - Adjust traffic signal timings for AM and PM peak hour

Table F.1-26 and **Table F.1-27** show the Study Area intersection operational analysis results with adjusted traffic signal timings during the morning and evening peak hours. As shown, after adjusting traffic signal timings, estimated delays are generally reduced compared to the unadjusted Build conditions. In various cases, adjusted traffic signal timings could be used as a temporary mitigation strategy during construction, if necessary and where appropriate, to reduce intersection delays compared to the No-Build conditions.

Table F.1-26 Study Area Intersection Operational Analysis Results: Alternative 10A – Morning Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 10A	Alternative 10A with Mitigation
	LOS	LOS	LOS	LOS
Trapelo Road at Waverley Oaks Road (Waltham)				
Trapelo Rd. EB T	C	C	E	E
Trapelo Rd. WB L	F	F	F	E
Trapelo Rd. WB T	A	A	A	A
Waverley Oaks Rd. NB L	C	C	C	E
Overall Intersection	**F**	**F**	**F**	**D**
Main Street at Ellison Park/Linden Street (Waltham)				
Main St. EB L	F	F	F	D
Main St. EB T	E	E	E	C
Main St. WB T	D	E	E	D
Linden St. NB T	C	C	C	E
Main St. SB L	B	B	B	D
Main St. SB T	B	B	B	D
Main St. SB L	D	D	D	C
Main St. SB R	F	F	F	D
Overall Intersection	**F**	**F**	**F**	**D**

EB = Eastbound WB = Westbound NB = Northbound SB = Southbound
L = Left T = Through R = Right LOS = Level of Service

Table F.1-27 Study Area Intersection Operational Analysis Results: Alternative 10A – Evening Peak Hour

Study Area Intersection	Existing	No-Build	Alternative 10A	Alternative 10A with Mitigation
	LOS	LOS	LOS	LOS
Main Street at Ellison Park/Linden Street (Waltham)				
Main St. EB L	F	F	F	F
Main St. EB T	D	D	D	C
Main St. WB T	D	D	D	C
Linden St. NB T	C	C	C	E
Main St. SB L	C	C	C	C
Main St. SB T	C	C	C	C
Main St. SB L	C	C	C	C
Main St. SB R	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**C**

EB = Eastbound WB = Westbound NB = Northbound SB = Southbound
L = Left T = Through R = Right LOS = Level of Service

Sensitive Receptors

Safe access to sensitive receptors would be maintained at all times.

Bicycles and Pedestrians

Bicycles and pedestrians would be accommodated through all on-street work zones. Specific details will be developed through the final design process.

Surface Piping

If necessary and as appropriate, the surface pipe connections on Waverley Oaks Road would be installed during off-peak hours to minimize the potential disturbance to traffic operations.

F.1.15 Updated Traffic Analysis – Needham

A comment received from the Town of Needham stated that the proposed development at 557 Highland Avenue should be factored into traffic analysis. The estimated traffic volumes from this development have been added to the future traffic volumes at the intersection of Central Avenue and Cedar Street in Needham. **Table F.2-1** and **Table F.2-2** in **SDEIR Appendix F.2** show the updated operational analysis for the future scenarios for the morning and evening peak hours, respectively. The tables indicate that the intersection is expected to operate at LOS F in all future conditions regardless of Program-related trips.

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Appendix F.2: Intersection Operational Analysis

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Table F.2-1 Intersection Operational Analysis: Morning Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c
Central Avenue at Cedar Street (Needham)									
Central Ave. EB L	8.4	A	0.07	8.4	A	0.07	8.4	A	0.07
Central Ave. WB L	0.0	A	-	0.0	A	-	0.0	A	-
Cedar St. SB LTR	178.9	F	1.24	212.7	F	1.33	212.7	F	1.33
Trapelo Road at Lexington Street (Waltham)									
Trapelo Rd. EB L	43.3	D	0.50	43.3	D	0.50	43.3	D	0.50
Trapelo Rd. EB T	32.5	C	0.55	33.6	C	0.61	34.4	C	0.65
Lexington St. WB L	47.7	D	0.62	47.7	D	0.62	47.7	D	0.62
Lexington St. WB T	43.3	D	0.79	43.3	D	0.79	43.3	D	0.79
Trapelo Rd. WB R	28.2	C	0.15	28.2	C	0.15	28.2	C	0.15
Trapelo Rd. NB L	49.3	D	0.72	49.3	D	0.72	49.3	D	0.72
Trapelo Rd. NB T	38.4	D	0.74	38.4	D	0.74	38.4	D	0.74
Lexington St. SB L	39.9	D	0.47	39.9	D	0.47	39.9	D	0.47
Lexington St. SB T	33.0	C	0.51	33.0	C	0.51	33.0	C	0.51
Overall Intersection	**38.1**	**D**	**-**	**38.3**	**D**	**-**	**38.4**	**D**	**-**
Trapelo Road at Waverley Oaks Road (Waltham)									
Trapelo Rd. EB T	28.9	C	0.87	43.0	D	0.96	55.8	E	1.01
Trapelo Rd. WB L	277.1	F	1.53	277.1	F	1.53	277.1	F	1.53
Trapelo Rd. WB T	4.8	A	0.24	4.8	A	0.24	4.8	A	0.24
Waverley Oaks Rd. NB L	21.9	C	0.60	21.7	C	0.60	21.7	C	0.60
Overall Intersection	**94.6**	**F**	**-**	**97.3**	**F**	**-**	**100.8**	**F**	**-**

Table F.2-1 Intersection Operational Analysis: Morning Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c
Beaver Street at Waverley Oaks Road (Waltham)									
Beaver St. EB L	56.8	E	0.82	56.8	E	0.82	56.8	E	0.82
Beaver St. EB T	24.2	C	0.61	24.4	C	0.62	24.2	C	0.61
Beaver St. WB L	38.3	D	0.51	38.3	D	0.51	38.3	D	0.51
Beaver St. WB T	24.5	C	0.58	24.5	C	0.58	24.5	C	0.58
Waverley Oaks Rd. NB L	43.0	D	0.24	43.0	D	0.24	43.0	D	0.24
Waverley Oaks Rd. NB T	32.6	C	0.62	32.6	C	0.62	32.6	C	0.62
Waverley Oaks Rd. NB R	26.9	C	0.07	26.9	C	0.07	26.9	C	0.07
Waverley Oaks Rd. SB L	44.9	D	0.75	44.9	D	0.75	44.9	D	0.75
Waverley Oaks Rd. SB T	20.6	C	0.29	20.6	C	0.29	20.7	C	0.29
Waverley Oaks Rd. SB R	19.1	B	0.08	19.3	B	0.11	19.1	B	0.08
Overall Intersection	**29.3**	**C**	**-**	**29.1**	**C**	**-**	**29.3**	**C**	**-**
Main Street at Ellison Park/Linden Street (Waltham)									
Main St. EB L	408.4	F	1.77	408.4	F	1.77	408.4	F	1.77
Main St. EB T	70.6	E	0.97	70.6	E	0.97	70.6	E	0.97
Main St. WB T	57.2	E	0.87	57.2	E	0.87	57.2	E	0.87
Linden St. NB T	28.0	C	0.03	28.0	C	0.03	28.0	C	0.03
Main St. SB L	19.4	B	0.24	19.4	B	0.24	19.4	B	0.24
Main St. SB T	19.5	B	0.23	19.5	B	0.23	19.5	B	0.23
Main St. SB L	5.4	D	0.47	41.9	D	0.47	41.9	D	0.47
Main St. SB R	73.9	F	1.06	118.3	F	1.07	120.8	F	1.08
Overall Intersection	**108.9**	**F**	**-**	**109.4**	**F**	**-**	**109.8**	**F**	**-**

Table F.2-1 Intersection Operational Analysis: Morning Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c
Main Street at Elm Street (Waltham)									
Main St. EB L	5.4	A	0.19	5.4	A	0.19	5.4	A	0.19
Main St. EB T	15.7	B	0.68	15.7	B	0.68	15.7	B	0.68
Main St. EB R	118.1	F	1.05	118.1	F	1.05	118.1	F	1.05
Main St. WB L	7.2	A	0.16	7.2	A	0.16	7.2	A	0.16
Main St. WB T	10.9	B	0.44	11.0	B	0.44	11.0	B	0.44
Elm St. NB T	44.6	D	0.63	44.6	D	0.63	44.6	D	0.63
Overall Intersection	**41.7**	**D**	**-**	**41.7**	**D**	**-**	**41.7**	**D**	**-**
Main Street at Moody Street (Waltham)									
Main St. EB T	17.2	B	0.56	17.2	B	0.56	17.2	B	0.46
Main St. EB R	14.7	B	0.25	14.7	B	0.25	14.7	B	0.25
Main St. WB L	389.4	F	1.75	389.4	F	1.75	389.4	F	1.75
Main St. WB TR	14.6	B	0.66	14.8	B	0.66	14.8	B	0.66
Moody St. NB L	15.4	B	0.32	15.4	B	0.32	15.4	B	0.32
Moody St. NB T	13.6	B	0.26	13.6	B	0.26	13.6	B	0.26
Moody St. NB R	23.2	C	0.13	23.2	C	0.13	23.2	C	0.13
Overall Intersection	**64.9**	**E**	**-**	**64.8**	**E**	**-**	**64.8**	**E**	**-**
Main Street at Bacon Street (Waltham)									
Main St. EB L	22.3	C	0.68	22.4	C	0.68	22.8	C	0.68
Main St. EB T	205.6	F	1.38	205.6	F	1.38	205.6	F	1.38
Main St. WB T	25.7	C	0.71	25.8	C	0.71	25.8	C	0.71
Driveway NB T	82.4	F	1.03	168.9	F	1.27	168.9	F	1.27
Bacon St. SB LT	60.5	E	0.81	60.5	D	0.81	60.5	D	0.81
Bacon St. SB R	135.7	F	1.15	137.3	F	1.16	137.3	F	1.16
Overall Intersection	**103.9**	**F**	**-**	**119.6**	**F**	**-**	**119.6**	**F**	**-**

Table F.2-1 Intersection Operational Analysis: Morning Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**
Main Street at Weston Street/South Street (Waltham)									
Main St. EB T	16.6	B	0.41	16.6	B	0.41	16.6	B	0.41
Weston St. WB L	13.0	B	0.63	13.1	B	0.64	13.1	B	0.64
Weston St. WB T	20.5	C	0.66	20.5	C	0.66	20.5	C	0.66
Main St. NE L	9.7	A	0.30	9.8	A	0.31	9.8	A	0.31
Main St. NE R	9.1	A	0.20	9.2	A	0.21	9.2	A	0.21
Overall Intersection	**14.5**	**B**	**-**	**14.4**	**B**	**-**	**14.4**	**B**	**-**

Abbreviations:
EB = Eastbound *NB = Northbound* *L = Left* *R = Right* *v/c = Volume-to-Capacity Ratio*
WB = Westbound *SB = Southbound* *T = Through* *LOS = Level of Service*

Table F.2-2 Intersection Operational Analysis: Evening Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c	Delay (sec)	LOS	v/c
Central Avenue at Cedar Street (Needham)									
Central Ave. EB L	9.1	A	0.04	9.2	A	0.04	9.2	A	0.04
Central Ave. WB L	0.0	A	-	0.0	A	-	0.0	A	-
Cedar St. SB LTR	84.7	F	0.94	90.1	F	0.96	90.1	F	0.96
Trapelo Road at Lexington Street (Waltham)									
Trapelo Rd. EB L	49.0	D	0.57	49.0	D	0.57	49.0	D	0.57
Trapelo Rd. EB T	33.7	C	0.46	33.7	C	0.47	33.7	C	0.47
Lexington St. WB L	57.8	E	0.74	57.8	E	0.74	57.8	E	0.74
Lexington St. WB T	43.1	D	0.76	43.1	D	0.76	43.1	D	0.76
Trapelo Rd. WB R	30.9	C	0.22	30.9	C	0.22	30.9	C	0.22
Trapelo Rd. NB L	55.1	E	0.68	55.1	E	0.68	55.1	E	0.68
Trapelo Rd. NB T	39.7	D	0.61	39.7	D	0.61	39.7	D	0.10
Lexington St. SB L	51.0	D	0.59	51.0	D	0.59	51.0	D	0.59
Lexington St. SB T	42.5	D	0.72	42.5	D	0.72	42.5	D	0.72
Overall Intersection	**42.2**	**D**	**-**	42.2	D	-	42.2	D	-
Trapelo Road at Waverley Oaks Road (Waltham)									
Trapelo Rd. EB T	25.7	C	0.77	26.1	C	0.77	26.2	C	0.77
Trapelo Rd. WB L	236.9	F	1.43	236.9	F	1.43	236.9	F	1.43
Trapelo Rd. WB T	8.5	A	0.43	8.5	A	0.43	8.5	A	0.43
Waverley Oaks Rd. NB L	168.9	F	1.30	168.9	F	1.30	168.9	F	1.30
Overall Intersection	**122.2**	**F**	**-**	**122.1**	**F**	**-**	**122.1**	**F**	**-**

Table F.2-2 Intersection Operational Analysis: Evening Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**
Beaver Street at Waverley Oaks Road (Waltham)									
Beaver St. EB L	83.1	F	0.94	83.1	F	0.94	83.1	F	0.94
Beaver St. EB T	27.3	C	0.66	30.6	C	0.74	27.3	C	0.66
Beaver St. WB L	44.0	D	0.61	44.0	D	0.61	44.0	D	0.61
Beaver St. WB T	28.3	C	0.69	28.3	C	0.69	28.3	C	0.69
Waverley Oaks Rd. NB L	42.6	D	0.35	42.6	D	0.35	42.6	D	0.35
Waverley Oaks Rd. NB T	36.1	D	0.71	36.1	D	0.71	36.1	D	0.71
Waverley Oaks Rd. NB R	26.8	C	0.06	26.8	C	0.06	26.8	C	0.06
Waverley Oaks Rd. SB L	51.3	D	0.81	51.3	D	0.81	51.3	D	0.81
Waverley Oaks Rd. SB T	22.5	C	0.43	22.5	C	0.43	24.2	C	0.56
Waverley Oaks Rd. SB R	20.1	C	0.14	20.1	C	0.14	20.1	C	0.14
Overall Intersection	**34.1**	**C**	**-**	**34.5**	**C**	**-**	**34.0**	**C**	**-**
Main Street at Ellison Park/Linden Street (Waltham)									
Main St. EB L	1,449.6	F	4.05	1,449.6	F	4.05	1,449.6	F	4.05
Main St. EB T	48.7	D	0.88	48.7	D	0.88	48.7	D	0.88
Main St. WB T	43.1	D	0.77	43.1	D	0.77	43.1	D	0.77
Linden St. NB T	30.0	C	0.06	30.0	C	0.06	30.0	C	0.06
Main St. SB L	20.9	C	0.21	20.9	C	0.21	20.9	C	0.21
Main St. SB T	21.0	C	0.20	21.0	C	0.20	21.0	C	0.05
Main St. SB L	33.1	C	0.45	33.1	C	0.45	33.1	C	0.45
Main St. SB R	238.0	F	1.40	312	F	1.58	356.0	F	1.68
Overall Intersection	**277.4**	**F**	**-**	**291.7**	**F**	**-**	**301.4**	**F**	**-**

Table F.2-2 Intersection Operational Analysis: Evening Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**
Main Street at Elm Street (Waltham)									
Main St. EB L	6.6	A	0.19	6.7	A	0.20	6.8	A	0.21
Main St. EB T	16.2	B	0.63	15.8	B	0.63	15.7	B	0.62
Main St. EB R	51.8	D	0.76	53.1	D	0.77	53.8	D	0.77
Main St. WB L	8.0	A	0.15	7.9	A	0.15	7.8	A	0.15
Main St. WB T	12.7	B	0.45	13.1	B	0.49	13.4	B	0.51
Elm St. NB T	40.7	D	0.58	41.3	D	0.59	41.5	D	0.60
Overall Intersection	**26.5**	**C**	**-**	**26.6**	**C**	**-**	**26.6**	**C**	**-**
Main Street at Moody Street (Waltham)									
Main St. EB T	17.0	B	0.55	17.0	B	0.55	17.0	B	0.55
Main St. EB R	16.5	B	0.39	16.5	B	0.39	16.5	B	0.39
Main St. WB L	588.9	F	2.21	588.9	F	2.21	588.9	F	2.21
Main St. WB TR	16.7	B	0.73	19.4	B	0.79	21.6	C	0.83
Moody St. NB L	17.4	B	0.46	17.4	B	0.46	17.4	B	0.43
Moody St. NB T	14.1	B	0.34	14.1	B	0.34	14.1	B	0.34
Moody St. NB R	23.6	C	0.19	23.6	C	0.19	23.6	C	0.19
Overall Intersection	**96.2**	**F**	**-**	**95.3**	**F**	**-**	**95.0**	**F**	**-**
Main Street at Bacon Street (Waltham)									
Main St. EB L	6.9	A	0.59	7.5	A	0.10	7.8	A	0.63
Main St. EB T	27.6	C	0.90	27.6	C	0.90	27.6	C	0.90
Main St. WB T	9.9	A	0.50	10.3	B	0.54	10.5	B	0.56
Driveway NB T	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00
Bacon St. SB LT	24.6	C	0.64	24.6	C	0.59	24.6	C	0.59
Bacon St. SB R	10.9	B	0.42	11.1	B	0.46	11.1	B	0.46
Overall Intersection	**16.5**	**F**	**-**	**16.5**	**F**	**-**	**16.6**	**B**	**-**

Table F.2-2 Intersection Operational Analysis: Evening Peak Hour

Study Area Intersection	No-Build			Alternative 3A/4A			Alternative 10A		
	Delay (sec)	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**	**Delay (sec)**	**LOS**	**v/c**
Main Street at Weston Street/South Street (Waltham)									
Main St. EB T	36.1	D	0.62	36.1	D	0.62	36.1	D	0.62
Weston St. WB L	7.2	A	0.39	7.6	A	0.44	7.8	A	0.46
Weston St. WB T	74.7	E	0.97	74.7	E	0.97	74.7	E	0.97
Main St. NE L	6.8	A	0.32	6.9	A	0.32	6.9	A	0.33
Main St. NE R	6.3	A	0.23	6.4	A	0.24	6.4	A	0.25
Overall Intersection	**27.8**	**C**	**-**	**27.2**	**C**	**-**	**27.0**	**C**	**-**

Abbreviations:
EB = Eastbound *NB = Northbound* *L = Left* *R = Right* *v/c = Volume-to-Capacity Ratio*
WB = Westbound *SB = Southbound* *T = Through* *LOS = Level of Service*

Appendix G: Historic/Cultural Resources Supporting Documentation

- Photographic Documentation: University of Massachusetts Property Site (Photos 1-9)
- Photographic Documentation: Lower Fernald Property Site (Photos 10-18)

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1. UMass Property Site – view east towards Waverley Oaks Road showing UMass Property Site (left) and Cornelia Warren Park (right)

2. UMass Property Site – view west along Beaver Street towards Warren Estate (WLT.E)

3. UMass Property Site – looking north across site from Beaver Street towards Warren Estate (WLT.E)

4. UMass Property Site – looking north across site from Beaver Street towards Warren Estate (WLT.E)

5. UMass Property Site – looking east along Beaver Street showing Warren Estate (WLT.E; left)

6. View west towards Massachusetts Agricultural College Field Station (WLT.430)

7. View west towards Warren Estate (WLT.E)

8. View east towards Massachusetts Agricultural College Field Station (WLT.430)

9. UMass Property Site – view north towards Warren Estate (WLT.E) showing UMass Property Site left background

10. Lower Fernald Property Site – looking west towards shed (WLT.788)

11. Lower Fernald Property Site – view northwest toward electric substation (WLT.740)

12. Lower Fernald Property Site – north and west elevations of power plant (WLT.935)

13. Lower Fernald Property Site – east and south elevations of power plant (WLT.935)

14. Lower Fernald Property Site – south-facing façade and west elevation of Cottage #17 – Staff Residence (WLT.731)

15. Lower Fernald Property Site – rear (north) and west elevations of Cottage #18 – Staff Residence (WLT.732)

16. Lower Fernald Property Site – View east showing Cottage #19 – Staff Residence (WLT.733; foreground) and Garage (WLT.770; background) proposed for demolition in Alternative 10A.

17. Lower Fernald Property Site – south-facing façade of Cottage #20 – Staff Residence (WLT.734) proposed for demolition in Alternative 10A.

18. Lower Fernald Property Site – south-facing façade and east elevation of garage (WLT.769)

Appendix H: Draft Section 61 Findings by Agency

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Tables

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Appendix H: Draft Section 61 Findings by Agency

The Massachusetts Environmental Policy Act (MEPA) regulations, at 301 Code of Massachusetts Regulations (CMR) 11.07(j), outline mitigation measures to be addressed in the Environmental Impact Report (EIR) process, including an "assessment of physical, biological and chemical measures and management techniques designed to limit negative environmental impacts or to cause positive environmental impacts during development and operation of a Project."

This Appendix provides a brief overview of the Program, explains the history of the MEPA review process for the Massachusetts Water Resources Authority's (MWRA's) Metropolitan Water Tunnel Program, outlines required state and federal permits and their authorities, and provides draft Section 61 determination language for each state agency issuing Section 61 Findings documenting mitigation commitments.

H.1 Program Description

As described in **Supplemental Draft Environmental Impact Report (SDEIR) Chapter 1, Program Description and Permitting, Section 1.1, Program Description,** the MWRA plans to construct two new deep rock water supply tunnels (north and south alignments) to provide redundancy for the MWRA's existing Metropolitan Tunnel System. The existing Metropolitan Tunnel System includes the City Tunnel (1950), the City Tunnel Extension (1963), and the Dorchester Tunnel (1976). The Metropolitan Tunnel System delivers approximately 60 percent of the water that travels eastward from the Quabbin Reservoir through a series of tunnels and aqueducts to the MWRA's John J. Carroll Water Treatment Plant in Marlborough to serve 53 communities. Treated water is conveyed from the plant through the MetroWest Water Supply Tunnel (MWWST) and the Hultman Aqueduct.

The new, redundant deep-rock tunnels would originate at a site located at the westernmost portion of the Metropolitan Tunnel System roughly in the vicinity of the Interstate I-90/I-95 Interchange (I-90/I-95). The tunnels would be constructed such that water flows in two directions, with one tunnel extending north towards Waltham and the other south towards Boston/Dorchester. Each tunnel would connect to existing water supply infrastructure at key locations to achieve redundancy goals. The Program Study Area encompasses approximately 14.5 miles of deep rock tunnel 200 to 400 feet below the ground surface of several communities. See **SDEIR Chapter 1, Figure 1-1** for a depiction of the Program Study Area.

As described in **Draft Environmental Impact Report (DEIR) Chapter 1, Program Description and Permitting**, **Section 1.1.1, Program Background (pg. 1-2),** the Metropolitan Water Tunnel Program (the Program) was conceived to address outstanding challenges, primarily the inability to maintain or repair the existing Metropolitan Tunnel System or readily respond to emergencies as boil water orders are needed when implementing back-up water supply measures. As a result of the construction of the two new deep-rock tunnels, the Program would allow the MWRA to take its aging existing water tunnel system offline to be rehabilitated without interrupting water service to over 2.5 million water customers.

Consistent with the DEIR Program construction is estimated to take eight to 12 years and is planned to occur between 2027 and 2040. The MWRA expects that the proposed new deep-rock tunnel system would be placed into service before or around 2040 and that the system would have a useful life of more than 100 years. When sizing the proposed facilities, the MWRA considered projected future water demands due to population and employment increases within the service area as well as increased water use efficiency.

The intent of the Program is not to increase total capacity of the system, but to ensure redundancy by providing a backup to the existing Metropolitan Tunnel System if it were ever out of service for planned or unplanned reasons.

H.2 Summary of Program Changes Since the DEIR

The Certificate on the DEIR issued by the Commonwealth of Massachusetts, Secretary of the Executive Office of Energy and Environmental Affairs (EEA) on December 16, 2022, required that the MWRA file an SDEIR to address concerns "related to the viability of the proposed receiving shaft site at the Fernald Property in Waltham, which is common to all alternatives considered for the project for the northern alignment." The Certificate requests that potential alternative receiving locations that could replace the Fernald Property be disclosed and that impacts of those locations are analyzed. Since the DEIR was filed, the MWRA identified other sites for the terminus of the North Tunnel, Segment 1, and identified two new sites that would serve as the end point of the North Tunnel. A description of the site selection process to identify alternative sites for the terminus of the North Tunnel, Segment 1, is documented in **SDEIR Chapter 2, Alternatives, Section 2.2, Changes Since the DEIR**.

A property owned by the University of Massachusetts (UMass) located at 255 Beaver Street (referred to as the UMass Property site) and a different area of the former Walter E. Fernald State School property (referred to as the Lower Fernald Property site) closer to Waverley Oaks Road were identified as candidate sites in place of the Fernald Property site previously considered in the DEIR. The UMass Property site would serve as the end point for SDEIR Alternatives 3A and 4A. The UMass Property site would be a large connection shaft site and unlike under the DEIR scenario, would not be a receiving shaft location for the Tunnel Boring Machine (TBM). The TBM would be disassembled in the tunnel, parts would be transported back through the tunnel and removed through the launch shaft with the shell of the TBM left abandoned in the ground at the large connection site, or the TBM may be backed out the whole length to the launching site at Tandem Trailer. The Lower Fernald Property site would serve as the end point for SDEIR Alternative 10A. The Lower Fernald Property site would be a receiving shaft site for the TBM and would have a larger shaft site diameter than the large connection for the UMass Property site. The change in the proposed site for the terminus of the North Tunnel, Segment 1, revises the alignment of the tunnel which was also assessed in relation to wetlands and waterways, water supply, and Article 97 resources. See **SDEIR Section 2.2, Changes Since the DEIR**, for more information on changes since the DEIR.

This SDEIR evaluates the existing conditions for the two new alternative sites, conducts an environmental impact assessment, and identifies mitigation where needed. The SDEIR also updates the environmental resource analysis for each SDEIR Alternative incorporating the new alternative sites and the refined tunnel alignment (see **SDEIR Chapter 3** to **SDEIR Chapter 14** for documentation of these findings). The assessment reaffirmed that SDEIR Alternative 4A is the Preferred Alternative, and that the two-back up alternatives are SDEIR Alternative 3A and 10A. See **SDEIR Section 2.6, Overview of DEIR Evaluation and Methodology** and **SDEIR Section 2.7, SDEIR Alternatives and Evaluation Methodology,** which describe the alternatives evaluation process and the selection of the preferred alternative, respectively.

This SDEIR responds to the comments raised in the Secretary's Certificate on the DEIR, along with each comment letter received on the DEIR during the public review comment period (see **SDEIR Chapter 15, Responses to Comments**).

H.3 Status of Review/Updates to MEPA Guidance

The MWRA filed an Environmental Notification Form (ENF) for the Program with the MEPA Office on March 31, 2021, to initiate review under MEPA. The ENF was noticed in the Environmental Monitor on April 7, 2021, and the Secretary of the EEA issued a Certificate on the ENF on May 7, 2021, requiring that the Program prepare a mandatory DEIR.

The DEIR was prepared in accordance with the scope outlined in the ENF Certificate. Since the ENF filing, MEPA amended its regulations under 301 CMR 11.00, which were promulgated on December 24, 2021, and amended on January 6, 2023. The DEIR was filed on October 17, 2022, and noticed in the Environmental Monitor of October 24, 2022. On December 16, 2022, the Secretary of the EEA issued a Certificate on the DEIR and determined that the project did not adequately and properly comply with MEPA due to site availability. As described above, two new sites were identified and are assessed in this SDEIR.

The *MEPA Interim Protocol on Climate Change Adaptation and Resiliency*[1] is effective for all new filings as of October 1, 2021, and the *MEPA Public Involvement Protocol for Environmental Justice (EJ) Populations*[2] and the *MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations*[3] were finalized and are effective as of January 1, 2022, for all new filings. Although the ENF was filed before these effective dates, the MWRA continues to voluntarily follow components of the *MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations* and the *MEPA Public Involvement Protocol for Environmental Justice Populations* as a part of this SDEIR. This includes identifying EJ populations using the EJ Maps Viewer and Department of Public Health (DPH) criterion data by census tract within 1 mile of each site and along trucking routes to assess Program impacts on EJ populations. Details on the Program's public outreach plan and a summary of the outreach conducted to

1 MEPA Office (2021, Oct. 1). MEPA Interim Protocol on Climate Change Adaptation and Resiliency. [Online.] Available: https://www.mass.gov/doc/mepa-interim-protocol-on-climate-change-adaptation-and-resiliency-effective-oct-1-2021/download.

2 MEPA Office (2022, Jan. 1). MEPA Public Involvement Protocol for Environmental Justice Populations. [Online.] Available: https://www.mass.gov/doc/final-mepa-public-involvement-protocol-for-environmental-justice-populations-effective-date-of-january-1-2022/download.

3 MEPA Office (2022, Jan. 1). MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations. [Online.] Available: https://www.mass.gov/doc/final-mepa-interim-protocol-for-analysis-of-project-impacts-on-environmental-justice-populations-effective-date-of-january-1-2022/download.

date, as well as EJ populations near the Program's sites, are documented in **SDEIR Chapter 3, Outreach and Environmental Justice**.

The MWRA continues to voluntarily follow components of the *MEPA Interim Protocol on Climate Change Adaptation and Resiliency* as a part of this SDEIR. This includes use of the Resilient Massachusetts Action Teams' Climate Resilience Design Standards Tool (RMAT Tool) for evaluating the Program's climate exposure to sea-level rise, flooding, and extreme heat, as well as methods to mitigate these impacts (see **SDEIR Chapter 7, Climate Change**).

H.4 Draft Section 61 Findings

Massachusetts General Law Chapter 30, Section 61 authorizes state agencies with permitting responsibilities to make an official determination regarding potential impacts from a proposed project and whether impacts have been avoided, minimized, and/or mitigated for appropriately. The law requires agencies/authorities to issue a determination that includes a finding describing the environmental impact, if any, of the Project and whether all feasible measures have been taken to avoid or minimize that impact.

H.4.1 State Agency Actions

In addition to compliance with MEPA, a number of state agency actions would be needed for the Program, as listed in **Table H-1**.

Table H-1 Potential State Actions

Agency/Department	Permit/Approval/Action	Status
Commonwealth of Massachusetts		
Massachusetts Department of Environmental Protection (MassDEP)	*Water Management Act Permit*	*To be obtained*
	Chapter 91 Licenses	*To be obtained, if needed*
	Superseding Order of Conditions, upon appeal[1]	*To be obtained, if needed*
	Section 401 Water Quality Certificate[1]	*To be obtained*
	Distribution System Modification	To be obtained
Massachusetts Department of Transportation (MassDOT)	*Land disposition/easements*[1]	*To be obtained*
	Highway Access/Construction Access Permits[1]	*To be obtained*
Department of Conservation and Recreation (DCR)	*Construction Access Permits*	*To be obtained*
	Land disposition/easements	*To be obtained*
	Compliance with Article 97[1]	*To be obtained*
Massachusetts Bay Transportation Authority (MBTA)	*MBTA Right of Way Access License Agreement*	*To be obtained, if needed*
Massachusetts Historical Commission (MHC)	*Review pursuant to MGL Ch. 9, Section 26-27C (Section 61 Findings not applicable)*	*Underway through MEPA review process*

1 Indicates that the permit or approval is site specific

Italicized text within the table indicates no change from the DEIR

Note: This is a preliminary list of state permits and approvals that may be sought for the Program. This list is based on current information about the Program and is subject to change as the design of the Program evolves.

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H.5 Massachusetts Department of Environmental Protection DRAFT

Project Name: *Metropolitan Water Tunnel Program*

Project Location: *Waltham, Weston, Newton, Wellesley, Needham, Brookline, Boston*

Project Proponent: *Massachusetts Water Resources Authority*

EEA Number: *16355*

Date Noticed in Monitor: *DATE*

Applicable State Action/Permit

- Water Management Act Permit
- Chapter 91 Licenses
- Section 401 Water Quality Certificate
- Distribution System Modification

This Section 61 Finding for the Metropolitan Water Tunnel Program (EEA 16355) 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 Program were characterized and quantified in the Metropolitan Water Tunnel Program Draft Environmental Impact Report (DEIR) and this Supplemental DEIR (SDEIR), that are both incorporated by reference into this Section 61 Finding. To the greatest extent practicable, the MWRA has taken all feasible measures to avoid and/or minimize adverse environmental impacts of the Program. Where impacts are not avoidable, the MWRA has worked throughout the planning and environmental review process to develop measures to mitigate impacts of the Program to the extent practicable. With the implementation of the proposed mitigation, and cooperation with state agencies, the Massachusetts Department of Environmental Protection (MassDEP) finds that there are no significant unmitigated impacts.

*The MWRA recognizes that the identification of effective mitigation, and implementation of that mitigation throughout the life of the Metropolitan Water Tunnel Program, is central to its responsibilities under MEPA. Accordingly, the MWRA has prepared a Table of Mitigation Commitments (***Wetlands and Waterways***,* **Table H-2, Water Supply, Table H-3***) that specifies, for each potential state permit, the mitigation that the MWRA would provide. In the Table of Mitigation Commitments, the MWRA 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 Program phasing.*

MassDEP has reviewed the MEPA filings for the Metropolitan Water Tunnel Program and finds that the environmental impacts resulting from construction of the Metropolitan Water Tunnel Program are those impacts as described in the DEIR, 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 Table of Mitigation Commitments, all practicable and feasible means and measures would have been taken to *avoid or minimize potential damage to the environment due to the construction and operation of the Metropolitan Water Tunnel Program. In making this finding, MassDEP has considered reasonably foreseeable climate change impacts and environmental justice impacts.*

Wetlands and Waterways

Unavoidable permanent impacts to federally jurisdictional Waterway (WW) and state-regulated Land Under Waterway (LUW), and Bordering Land Subject to Flooding (BLSF) would be required due discharge pipes and associated riprap splash pads necessary for dewatering and to enable future tunnel maintenance at the Tandem Trailer and/or Bifurcation, and Highland Avenue sites.

As described in **SDEIR Chapter 1, Program Description and Permitting, Section 1.4.3.10, MassDEP Chapter 91 License**, since the filing of the DEIR, the Program has determined that construction within waterways may be exempt from requiring a Chapter 91 License. All work being completed on, in, over, or under waterways would be installed in accordance with 310 CMR 9.05(3)(g), which states:

"(g) placement in a non-tidal river or stream subject to jurisdiction under 310 CMR 9.04(1)(e) of fill or structures for which a final Order of Conditions has been issued under M.G.L. c. 131, § 40 and 310 CMR 10.00: Wetlands Protection, and which does not reduce the space available for navigation; such fill or structures are limited to:

- *overhead wires, conduits, or cables to be attached to an existing bridge, without substantial alteration thereof, or constructed and maintained in accordance with the National Electrical Safety Code;*
- *fish ladders, fishways, and other devices which allow or assist fish to pass by a dam or other obstruction in the waterway;*
- *pipelines, cables, conduits, sewers, and aqueducts entirely embedded in the soil beneath such river or stream; and*
- *bulkheads, revetments, headwalls, storm drainage outfalls, and similar structures which do not extend into such river or stream, except as may be necessary for bank stabilization;"*

In accordance with 310 CMR 9.05(3)(g)(3) the tunnel would be entirely embedded in the soil (or bedrock) beneath the waterway. In accordance with 310 CMR 9.05(3)(g)(4), proposed outfalls and splash pads would not extend into the waterway or adjacent wetland. The placement of rip rap splash pads and tunneling of the structure below waterways would not reduce the space available for navigation and therefore may not require Chapter 91 authorization. See **Table 5-13** in **SDEIR Chapter 5, Wetlands and Waterways**, for further details. Further consultation would be completed during final design to determine applicability of any Chapter 91 exemptions to proposed Program elements and/or requirements to comply with Chapter 91 regulations should the Program not meet exemption criteria.

Temporary and permanent impacts to federally jurisdictional Vegetated Wetland (VW) or WW resources, or state-regulated Bordering Vegetated Wetlands (BVW), LUW, Bank, Riverfront Areas (RA) or BLSF are described below:

- The Program would require temporary impacts to BVW and VW for connection to the existing water supply infrastructure at the American Legion site.
- The Program would require permanent and temporary impacts to Land Under Water LUW/ WW, Bank, and BLSF for rip rap splash pads at permanent dewatering discharge locations (Tandem Trailer or Bifurcation and Highland Avenue), depending on the SDEIR Alternative. Compensatory flood storage volume would be provided at appropriate elevations within the same floodplains.
- The Program would require temporary impacts to LUW/WW, Bank and RA at the American Legion Site for rip rap splash pads at the temporary dewatering discharge location.
- The pipeline connection to Hegarty Pumping Station would require permanent and temporary impacts to RA.
- Permanent impacts to RA would be required for top of shaft/valve structures and associated paved access roads and parking at the Tandem Trailer site and at the Hultman Aqueduct Isolation Valve.

In accordance with Wetlands Protection Act (WPA) and Clean Water Act (CWA) requirements, mitigation would be provided for all proposed permanent and temporary wetland resource impacts. These impacts and associated mitigation measures are summarized in **Table H-2.** The issuance of a Section 401 Water Quality Certification by MassDEP would be required for the discharges of fill into waters of the U.S. for splash pad and pipeline construction. Notice of Intent filings pursuant to the WPA would be required for Program construction in Waltham, Weston, Wellesley, Needham, and Boston.

Since no new wetland or waterway impacts would occur at the new SDEIR Alternative sites, wetlands and waterways mitigation would remain as described in **DEIR Chapter 4.6, Wetlands and Waterways, Section 4.6.7, Avoidance, Minimization, and Mitigation Measures (pg. 4.6-160)** and would include restoration and revegetation of disturbed areas outside the limits of the riprap for impacts to RA and provision of compensatory flood storage volume within the same floodplain sufficient to offset the volume of flood water displaced by the permanent dewatering discharge infrastructure for impacts to BLSF.

Construction Period Mitigation

To minimize impacts, the following sedimentation and erosion control measures and construction methods would be used:

- The Program would incorporate BMPs specified by MassDEP and U.S. Environmental Protection Agency (USEPA) guidelines.
- Proper implementation of the erosion and sedimentation control program would minimize exposed soil areas through sequencing and temporary stabilization, place structures to manage stormwater runoff and erosion, and establish a permanent vegetative cover or other forms of stabilization as soon as practicable. Stabilization measures may include biodegradable and wildlife friendly erosion control blankets and native seed mixes for vegetative stabilization.
- The structural and non-structural practices proposed for the Program would comply with criteria contained in the 2022 National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP), including inspection, monitoring and implementation of corrective actions.

Nonstructural practices include temporary stabilization, temporary seeding, permanent seeding, pavement sweeping, and dust control.

- Structural practices include erosion-control barriers, stabilized construction exits, temporary sediment basins, diversion swales, temporary check dams, catch basin inlet protection, and dewatering filters.
- Silt fence lines, staked straw bales, compost filter tubes and/or similar devices would be installed along the downgradient slopes at each of the limit-of-work lines to provide erosion and sedimentation controls and define the limits of disturbance for contractor(s).

Regular inspection and monitoring of discharges in accordance with the NPDES CGP (or Dewatering and Remediation General Permit [DRGP]) would be carried out by construction contractors to avoid permanent, temporary and indirect effects due to construction site runoff and/or dewatering flows.

Mitigation measures for construction period impacts are summarized in **Table H-2**. Mitigation measures identified below are consistent with the DEIR unless otherwise stated.

Table H-2 State Wetland and Waterway Resources Impacts and Mitigation

<table>
<tr><th colspan="4">Estimated Impact</th><th>Mitigation</th><th>Responsible Party/Schedule</th></tr>
<tr><td colspan="6">Construction Period Impacts</td></tr>
<tr><td colspan="4">Construction staging impact to state regulated Riverfront Areas (RA), in square feet (sf):</td><td rowspan="2">Restoration and revegetation of areas disturbed by construction, including RA.</td><td rowspan="2">Contractor/Construction Completion</td></tr>
<tr><td>Proposed Site</td><td>Alt. 3A</td><td>Alt. 4A</td><td>Alt. 10A</td></tr>
<tr><td>Tandem Trailer and Park Road East</td><td>105,722</td><td>105,722</td><td>-</td><td rowspan="5">Implementation of erosion and sedimentation Best Management Practices (BMPs).</td><td rowspan="5">Contractor/During Construction</td></tr>
<tr><td>Bifurcation</td><td>33,987</td><td>-</td><td>-</td></tr>
<tr><td>Hegarty Pumping Station</td><td>5,757</td><td>5,757</td><td>5,757</td></tr>
<tr><td>Hultman Aqueduct Isolation Valve</td><td>7,837</td><td>7,837</td><td>7,837</td></tr>
<tr><td>Total</td><td>153,303</td><td>119,316</td><td>13,594</td></tr>
<tr><td colspan="4">Construction of a near-surface pipeline for a connection to existing water supply infrastructure would cause temporary impacts to state regulated Bordering Vegetated Wetland (BVW) and federally jurisdictional Vegetated Wetland (VW), in sf:</td><td rowspan="4">Restoration and revegetation of areas disturbed by construction.</td><td rowspan="4">Contractor/Construction Completion</td></tr>
<tr><td>Proposed Site</td><td>Alt. 3A</td><td>Alt. 4A</td><td>Alt. 10A</td></tr>
<tr><td>American Legion</td><td>1,558</td><td>1,558</td><td>1,558</td></tr>
<tr><td>Total</td><td>1,558</td><td>1,558</td><td>1,558</td></tr>
</table>

Table H-2 State Wetland and Waterway Resources Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th><th>Responsible Party/Schedule</th></tr>
<tr><td rowspan="2">Temporary Impacts to state regulated Bordering Land Subject to Flooding (BLSF) for construction of rip rap splash pads at dewatering discharge locations, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>300</td><td>300</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>250</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>1,340</td><td>1,340</td><td>1,340</td></tr>
<tr><td>Total</td><td>1,890</td><td>1,640</td><td>1,340</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td><td>Contractor/Construction Completion</td></tr>
<tr><td>Provide compensatory flood storage volume within the same floodplain sufficient to offset the volume of flood water displaced by the permanent dewatering discharge infrastructure</td><td>Contractor/Construction Completion</td></tr>
<tr><td>Construction of dewatering discharge pipes and rip rap splash pads would cause temporary impacts to Bank, in linear feet:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>8</td><td>8</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>8</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>8</td><td>8</td><td>8</td></tr>
<tr><td>American Legion</td><td>19</td><td>19</td><td>19</td></tr>
<tr><td>Total</td><td>43</td><td>35</td><td>27</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td><td>Contractor/Construction Completion</td></tr>
<tr><td>Construction of dewatering discharge pipes and rip rap splash pads would cause temporary impacts to Waterways (WW) and Land Under Waterway (LUW), in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer</td><td>652</td><td>652</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>652</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>652</td><td>652</td><td>1,034</td></tr>
<tr><td>American Legion</td><td>380</td><td>380</td><td>380</td></tr>
<tr><td>Total</td><td>2,336</td><td>1,684</td><td>1,414</td></tr>
</table></td><td>Restore the wetland in-place, in-kind upon completion of pipeline construction.</td><td>Contractor/Construction Completion</td></tr>
<tr><td>Construction of dewatering discharge pipes would cause temporary impacts to RA, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Highland Avenue Sites</td><td>4,322</td><td>4,322</td><td>4,322</td></tr>
<tr><td>American Legion</td><td>845</td><td>845</td><td>845</td></tr>
<tr><td>Total</td><td>5,167</td><td>5,167</td><td>5,167</td></tr>
</table></td><td>Restore the wetland in-place, in-kind upon completion of pipeline construction.</td><td>Contractor/Construction Completion</td></tr>
</table>

Table H-2 State Wetland and Waterway Resources Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th><th>Responsible Party/Schedule</th></tr>
<tr><td colspan="3">Potential Construction Period Impacts</td></tr>
<tr><td rowspan="3">Potential impacts on wetlands, surface waters on or adjacent to site to be impacted by erosion or sedimentation
All sites</td><td>Restoration and revegetation of areas disturbed by construction, including Riverfront.</td><td>Contractor/Construction Completion</td></tr>
<tr><td>Implementation of erosion and sedimentation BMPs.</td><td>Contractor/During Construction</td></tr>
<tr><td>Development of Stormwater Pollution Prevention Plan (SWPPP), including appropriate construction measures to prevent siltation in wetlands and waterways</td><td>Contractor/Prior to Construction</td></tr>
<tr><td>Potential impact on surface water quality due to pollutants used in tunnel dewatering discharges, disinfection, and flushing
All sites</td><td>Regular inspection and monitoring of discharges in accordance with NPDES Construction General Permit (CGP) or Dewatering and Remediation General Permit (DRGP) to avoid permanent and indirect effects due to construction.</td><td>Contractor/During Construction</td></tr>
<tr><td>Potential for groundwater drawdown due to tunnel inflows temporarily impacting surface water levels
All sites</td><td>Limitations on volumes of groundwater inflows to require initiation of probing and pre-excavation and/or post-excavation grouting.</td><td>Contractor/During Construction</td></tr>
<tr><td colspan="3">Permanent Impacts</td></tr>
<tr><td>Permanent impact to state regulated RA in square feet (sf):
<table>
<tr><th>Proposed Site</th><th>Alt. 3A</th><th>Alt. 4A</th><th>Alt. 10A</th></tr>
<tr><td>Tandem Trailer and Park Road East</td><td>1,685</td><td>1,685</td><td>-</td></tr>
<tr><td>Hegarty Pumping Station</td><td>157</td><td>157</td><td>157</td></tr>
<tr><td>Hultman Aqueduct Isolation Valve</td><td>2,989</td><td>2,989</td><td>2,989</td></tr>
<tr><td>Total</td><td>4,831</td><td>4,831</td><td>3,146</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td><td>Contractor/During Construction</td></tr>
</table>

Table H-2 State Wetland and Waterway Resources Impacts and Mitigation

Estimated Impact	Proposed Site	Alt. 3A	Alt. 4A	Alt. 10A	Mitigation	Responsible Party/Schedule
Impacts to state regulated BLSF for rip rap splash pads at dewatering discharge locations, in sf:	***Proposed Site***	***Alt. 3A***	***Alt. 4A***	***Alt. 10A***	*Provision of compensatory flood storage volume equal to the volume occupied by the structure within the same floodplain.*	*Contractor/During Construction*
	Tandem Trailer	*368*	*368*	*-*		
	Bifurcation	*368*	*-*	*-*	*Compliance with MassDEP Stormwater Management Standards*	
	Highland Avenue Sites	*660*	*660*	*660*		
	Total	***1,396***	***1,028***	***660***		
Permanent impacts to Bank for rip rap splash pads at dewatering discharge locations, in linear feet:	***Proposed Site***	***Alt. 3A***	***Alt. 4A***	***Alt. 10A***	*Restoration and revegetation of areas disturbed outside of the footprint of the splash pad.*	*Contractor/Construction Completion*
	Tandem Trailer	*26*	*26*	*-*		
	Bifurcation	*26*	*-*	*-*		
	Highland Avenue Sites	*26*	*26*	*36*		
	Total	***78***	***52***	***36***		
Permanent impacts to WW and for rip rap splash pads at dewatering discharge locations, in square feet:	***Proposed Site***	***Alt. 3A***	***Alt. 4A***	***Alt. 10A***	*Restoration and revegetation of areas disturbed outside of the footprint of the splash pad.*	*Contractor/Construction Completion*
	Tandem Trailer	*368*	*368*	*-*		
	Bifurcation	*368*	*-*	*-*		
	Highland Avenue Sites	*368*	*368*	*726*		
	Total	***1,104***	***736***	***726***		

Italicized text within the table indicates no change from the DEIR.

Water Supply

As discussed in **SDEIR Chapter 6**, **Water Supply and Water Management Act**, and **SDEIR Appendix C, Updated Draft Water Supply Contingency Plan**, there would be the potential for groundwater drawdown due to tunnel inflows that could temporarily impact water levels in surface waters and wells during construction. Groundwater withdrawal volumes associated with dewatering are estimated to vary between less than 100,000 gallons er day (GPD) up to an estimated 8 MGD, triggering the need for a WM03 Water Management Withdrawal Permit. No impacts to groundwater resources would be anticipated in the Final Condition. Once online, the tunnels would convey water that is under higher pressure than the groundwater pressure, thus groundwater would not infiltrate and cannot cause a groundwater drawdown condition. Loss of annual recharge resulting from new impervious area at launching and receiving shaft sites, and connection and isolation valve sites would be minimized in accordance with the Stormwater Management Standards as discussed in **SDEIR Section 6.2.3, Water Supply Final Conditions.**

In areas of concern, the TBM has the capability to simultaneously drill and pre-excavation grout the tunnel route, which would reduce the volume of groundwater inflow into the tunnel and help mitigate potential impacts to water supply wells. These impacts are summarized in **Table H-3** and described in detail in the following sections.

The contract documents would specify that the Contractor conduct a preconstruction survey to verify the locations of wells and document well characteristics. The Water Supply Contingency Plan (see **SDEIR Appendix C**) includes a summary of mitigation measures the Contractor would implement if water supplies were to be impacted during construction.

The mitigation to reduce the potential for groundwater inflow and resulting possible drawdown during construction would be probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting (also from the tunnel heading) in the event the probing encounters water-bearing features. Probing and pre-excavation grouting would be implemented before the tunnel proceeds beneath select important areas of groundwater well production or beneath select local water bodies; the determination for probing (both where this may be required and the number and relative position of probe holes) would be assessed during the final design phase of the Program. Construction contract specifications for hard-rock tunnels typically have limits for groundwater inflows into probe holes, which trigger the need for pre-excavation grouting. These limits would also be set during final design.

For cases where groundwater is impacted by tunnel excavation after implementation of the grouting programs, mitigation for disruption of water supply from groundwater wells is to provide users with an alternative water supply until groundwater levels can be restored. This mitigation is described in the Water Supply Contingency Plan in **SDEIR Appendix C**.

Table H-3 Potential Water Supply Construction Period Impacts and Mitigation

Estimated Impact	Mitigation	Responsible Party/Schedule
Potential Construction Period Impacts		
Potential for groundwater drawdown *All sites*	*Pre-construction survey to verify well locations and characteristics*	Contractors/ During Construction
	Probing and pre-excavation grouting before the tunnel proceeds beneath select important areas of groundwater well production or beneath local water bodies	Contractors/ Prior to Construction
	Limitations on volumes of groundwater inflows to require initiation of pre-excavation and/or post-excavation grouting	Contractors/ During Construction
	Monitoring groundwater and implementing post-excavation drilling and cut-off grouting in water-bearing features	Contractors/ During Construction
Surface water impact or *loss of potable or irrigation well along the tunnel Alignment* *All sites*	*Implement Water Supply Contingency Plan with alternate source of water*	MWRA prepares Contingency Plan / Prior to construction. MWRA implements Contingency Plan / During Construction.

Italicized text within the table indicates no change from the DEIR.

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H.6 Massachusetts Department of Transportation DRAFT

Project Name: *Metropolitan Water Tunnel Program*

Project Location: *Waltham, Weston, Newton, Wellesley, Needham, Brookline, Boston*

Project Proponent: *Massachusetts Water Resources Authority*

EEA Number: *16355*

Date Noticed in Monitor: DATE

Applicable State Action/Permits

- Land disposition/easements
- Highway Access/Construction Access Permits

This Section 61 Finding for the Metropolitan Water Supply Tunnel Program (EEA 16355) 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 Program are characterized and quantified in the Metropolitan Water Tunnel Program Draft Environmental Impact Report (DEIR) and this Supplemental DEIR (SDEIR), that are both incorporated by reference into this Section 61 Finding. To the greatest extent practicable, the MWRA has taken all feasible measures to avoid and/or minimize adverse environmental impacts of the Program. Where impacts are not avoidable, the MWRA has worked throughout the planning and environmental review process to develop measures to mitigate impacts of the Program to the extent practicable. With the implementation of the proposed mitigation, and cooperation with state agencies, the Massachusetts Department of Transportation (MassDOT) finds that there are no significant unmitigated impacts.

*The MWRA recognizes that the identification of effective mitigation, and implementation of that mitigation throughout the life of the Metropolitan Water Tunnel Program, is central to its responsibilities under MEPA. Accordingly, the MWRA has prepared a Table of Mitigation Commitments (**see Table H-4**) that specifies, the mitigation that the MWRA would provide. In the Table of Mitigation Commitments, the MWRA 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 Program phasing.*

MassDOT has reviewed the MEPA filings for the Metropolitan Water Tunnel Program and finds that the environmental impacts resulting from construction of the Metropolitan Water Tunnel Program are those impacts as described in the DEIR and SDEIR, 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, MassDOT finds that with the implementation of mitigation measures as identified in the Table of Mitigation Commitments, all practicable and feasible means and measures would have been taken to avoid or minimize potential damage to the environment due to the construction and operation of the Metropolitan Water Tunnel Program. In making this finding, MassDOT has considered reasonably foreseeable climate change impacts and environmental justice impacts.

Potential Transportation Construction Period Mitigation

The analysis represents a conservative estimate since construction worker trips are not expected to occur during the evening peak hour as shift change is approximately 3:00 PM and the evening peak hour generally occurs between 4:00 PM and 6:00 PM. However, if construction activities were to result in significant traffic congestion during the peak hour, work within the roadway may not be permitted during weekday peak hours, which normally occur from 7:00 AM to 9:00 AM and from 3:00 PM to 7:00 PM, in accordance with local ordinances. Coordination with the roadway owner is recommended if the proposed construction work needs to be completed during the weekday peak hours. On heavily traveled urban arterials, work within the roadway may primarily be permitted during off-peak, overnight hours. In some residential areas, work may be restricted to daytime hours to minimize potential disturbance to residents. In some areas, if necessary, time restrictions may also be used to avoid potential impacts to routine street sweeping or other activities.

Measures that will be considered to mitigate potential traffic impacts caused by Program-related construction-period activities are summarized in **Table 14-10**. Most of the potential mitigation measures described in this section would require approval and/or permits from the MassDOT, Massachusetts Department of Conservation and Recreation (DCR), or applicable municipalities. Applicability of these measures will be discussed with the municipalities or agencies prior to submitting permit applications. These potential impacts and associated mitigation measures considered are also detailed in **SDEIR Chapter 9, Transportation, Section 9.2.4, Transportation Avoidance, Minimization, and Mitigation**.

Construction activities relating to MassDOT's planned Newton-Weston-Bridge Bundle Replacement and Rehabilitation Project at the I-90/I-95 Interchange in Newton and Weston (MassDOT Project No. 606783) will be coordinated with MassDOT.

Table H-4 Potential Transportation Construction Period Impacts and Mitigation

Potential Construction Period Impact		**Mitigation**	**Responsible Party/Schedule**
Temporary increase in traffic at local intersections		*When possible and as necessary, conduct trucking during off-peak hours.*	Contractors/During construction
Town (Program Sites)	***Intersections***		
Waltham (UMass Property, Lower Fernald Property, School Street, and Cedarwood Pumping Station)	*Trapelo Rd. at Lexington St.* *Waverley Oaks Rd. at Trapelo Rd.* *Beaver St. at Waverley Oaks Rd.* *Main St. at Linden St./Ellison Park* *Elm St. at Main St.* *Moody St. at Main St.* *Bacon St. at Main St.* *Weston St. at Main St.* *South St. at Weston St.* *Shakespeare Rd. at South St.*		
Weston (Tandem Trailer, Park Road East, Bifurcation, Park Road West, and Hultman Aqueduct Isolation Valve)	*River Rd. at South Ave.* *I-95 N Off Ramp at South Ave.* *Park Rd. at South Ave.*		
Wellesley (Hegarty Pumping Station)	*Worcester St. at Cedar St.*		
Needham (Highland Avenue Sites, St. Mary Street Pumping Station)	*Cedar Avenue at Cedar St.*		
Brookline (Newton Street Pumping Station)	*Grove Street at Newton St.* *Newton St. at Clyde St.* *Dudley Street at Lee St.* *Lee St. at Route 9* *Chestnut Hill Avenue at Route 9* *Hammond Street at Route 9*		
Boston (Southern Spine Mains, and American Legion)	*Canterbury Ln. at Morton St.* *Morton St. at Harvard St.* *Morton St. at Blue Hill Ave.* *Morton St. at Norfolk St.* *Morton St. at Corbet St.*		

Table H-4 Potential Transportation Construction Period Impacts and Mitigation

Potential Construction Period Impact		Mitigation	Responsible Party/Schedule
	Morton St. at Gallivan Blvd. *Gallivan Blvd. at Washington St.* *Gallivan Blvd. at Dorchester Ave.* *Gallivan Blvd. at Granite Ave./Adams St.* *Gallivan Blvd. at Hallet St.* *Gallivan Blvd. at Neponset Ave.* *Neponset Ave. at Morrissey Blvd.* *South St. at Washington St.* *South St. at Arborway.* *Washington St. at Arborway* *Arborway at Circuit Dr.*		
Temporary increase in traffic at intersections along construction vehicle routes:		*When possible, conduct trucking during off-peak hours.*	MWRA /Contractors/ Construction period
Town (Program Sites)	**Intersections**		
Waltham (UMass Property, Lower Fernald Property, School Street, and Cedarwood Pumping Station)	Trapelo Road at Waverly Oaks Road Main St. at Ellison Park/ Linden St.		
Weston (Tandem Trailer, Park Road East, Bifurcation, Park Road West, and Hultman Aqueduct Isolation Valve)	*River Rd. at South Ave.* *Park Rd. at South Ave. (Alt. 4A and 10A)* *I-95 Northbound off-ramp at South Ave./Commonwealth*		
Needham (Highland Avenue Sites, St. Mary Street Pumping Station)	*Cedar Avenue at Cedar St.*		
Newton (no sites, traffic from Newton Street Pumping Station)	*Woodward St./Elliot St. at Route 9*		
Brookline (Newton Street Pumping Station)	*Newton St. at Clyde St.*		
Boston (Southern Spine Mains, and American Legion)	*Morton St. at Blue Hill Ave.* *Morton St. at Norfolk St.* *South St. at Washington St.*		

Table H-4 Potential Transportation Construction Period Impacts and Mitigation

<table>
<tr><th>Potential Construction Period Impact</th><th>Mitigation</th><th>Responsible Party/Schedule</th></tr>
<tr><td rowspan="2">Temporary impacts to bicycle and pedestrian pathways during installation of near-surface piping
Southern Spine Mains: temporary bicycle and pedestrian detour along the Arborway</td><td>Accommodate bikes and pedestrians through on-street work zones.</td><td>MWRA /Contractors/ Construction period</td></tr>
<tr><td>Maintain safe access at all times.</td><td>MWRA /Contractors/ Construction period</td></tr>
<tr><td rowspan="4">Installation of near-surface piping requiring traffic management and/or local detours
<table><tr><th>Proposed Site</th><th>Location</th></tr><tr><td>UMass Property</td><td>Beaver Street and Waverley Oaks Road</td></tr><tr><td>Lower Fernald Property</td><td>Waverley Oaks Road</td></tr><tr><td>Highland Avenue Sites</td><td>Brook Road, Wexford Road, and Freemont Street</td></tr><tr><td>American Legion</td><td>American Legion Highway and Morton Street</td></tr><tr><td>School Street</td><td>School Street</td></tr></table></td><td>Install during off-peak and overnight hours, where possible and as necessary, to minimize potential disturbance to traffic, bicyclists, and pedestrians.</td><td>MWRA /Contractors/ Construction period</td></tr>
<tr><td>Where possible and as appropriate, restripe crosswalks with high-visibility markings and construct Americans with Disabilities Act (ADA)-compliant curb ramps with detectable warning panels on each corner where existing crosswalks or curb ramps are impacted.</td><td>MWRA /Contractors/ Construction period</td></tr>
<tr><td>Maintain two-way traffic whenever possible and one lane traffic at a minimum.</td><td>MWRA/Contractors/ Construction period</td></tr>
<tr><td>Provide temporary local detours where necessary.</td><td>MWRA/Contractors/ Construction period</td></tr>
<tr><td>Temporary increase in truck traffic:
Routes along Program sites</td><td>When possible and as necessary, conduct trucking during off-peak hours.</td><td>MWRA/Contractors/ Construction period</td></tr>
</table>

Italicized text within the table indicates no change from the DEIR.

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H.7 Massachusetts Department of Conservation & Recreation (DCR) DRAFT

Project Name: *Metropolitan Water Tunnel Program*

Project Location: *Waltham, Weston, Newton, Wellesley, Needham, Brookline, Boston*

Project Proponent: *Massachusetts Water Resources Authority*

EEA Number: *16355*

Date Noticed in Monitor: *DATE*

Applicable State Action/Permits

- Construction access permit
- Permanent easements
- Land disposition
- Article 97 Compliance

This Section 61 Finding for the Metropolitan Water Tunnel Program (EEA 16355) 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 Program are characterized and quantified in the Metropolitan Water Tunnel Program Draft Environmental Impact Report (DEIR) and this Supplemental DEIR (SDEIR), that are both incorporated by reference into this Section 61 Finding. To the greatest extent practicable, the MWRA has taken all feasible measures to avoid and/or minimize adverse environmental impacts of the Program. Where impacts are not avoidable, the MWRA has worked throughout the planning and environmental review process to develop measures to mitigate impacts of the Program to the extent practicable. With the implementation of the proposed mitigation, and cooperation with state agencies, the Massachusetts Department of Conservation and Recreation (DCR) finds that there are no significant unmitigated impacts.

*The MWRA recognizes that the identification of effective mitigation, and implementation of that mitigation throughout the life of the Metropolitan Water Tunnel Program, is central to its responsibilities under MEPA. Accordingly, the MWRA has prepared a Table of Mitigation Commitments (**Table H-5**) (that specifies, the mitigation that the MWRA would provide. In the Table of Mitigation Commitments, the MWRA 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 Program phasing.*

DCR has reviewed the MEPA filings for Metropolitan Water Tunnel Program and finds that the environmental impacts resulting from construction of the Metropolitan Water Tunnel Program are those impacts as described in the DEIR, 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, DCR finds that with the implementation of mitigation measures as identified in the Table of Mitigation Commitments, all practicable and feasible means and measures would have been taken to avoid or minimize potential damage to the environment due to the construction and operation of the Metropolitan Water Tunnel Program. In making this finding, DCR has considered reasonably foreseeable climate change impacts and environmental justice impacts.*

DCR Resources Mitigation

Arborway

Typical measures to mitigate the traffic impacts caused by construction-period activities would be applied to the Arborway. Most of the mitigation measures described in **Table H-5** would require approval and/or permits from the DCR or applicable municipalities. Applicability of these measures would be discussed with the municipalities or agencies prior to submitting permit applications.

Article 97 Properties

Permanent impacts on community resources and open space would result from the proposed acquisition of land and/or easements on community resources and open space. Existing open space areas held for natural resources purposes in accordance with Article 97 of the Article of Amendment to the Constitution of the Commonwealth of Massachusetts (Article 97)[4] and the recently passed Public Lands Preservation Act (PLPA)[5] have been avoided to the greatest extent practicable.

Two proposed sites owned by the Commonwealth of Massachusetts under care, custody, and control of DCR would require the disposition of land protected under the EEA Article 97 Land Disposition Policy:

1) The Southern Spine Mains connection site is within Southwest Corridor Park/Arborway I owned by the Commonwealth of Massachusetts under care, custody, and control of the DCR.
2) The American Legion receiving site is within the Morton Street Property owned by the Commonwealth of Massachusetts under care, custody, and control of the DCR.

Portions of these two DCR sites would need to be disposed of to the MWRA following Article 97 legislation, which includes a 2/3 vote of the Massachusetts State Legislature (note the proposed Hegarty Pumping Station connection shaft site may also be subject to Article 97 but is owned by the Town of Wellesley). Any transfer of an interest in Article 97 land would comply with the EEA Article 97 Land Disposition Policy. The MWRA will continue to work closely with DCR and other landowners.

The Arborway, located within the limits of disturbance for the Southern Spine Mains connection shaft site, is protected by Article 97 and would not require a disposition. The Arborway would be subject to temporary impacts due to Program-related construction activities. Permanent Program-related infrastructure within the Arborway would include a belowground near-surface pipeline connection to the

4 Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Article 97 Land Disposition Policy, February 19, 1998.

5 Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, "Article 97 & The Public Lands Preservation Act," https://www.mass.gov/info-details/article-97-the-public-lands-preservation-act (accessed July 15, 2023).

existing MWRA transmission lines located within the Arborway and an associated meter chamber. A paved access road would be constructed to access the proposed shaft site from the Arborway as shown on **DEIR Figure 3.8-28**. Areas disturbed during construction would be restored to pre-construction conditions.

As demonstrated in **SDEIR Chapter 4, Land Use and Article 97 Resources, Section 4.2.4, Land Alteration and Article 97 Avoidance, Minimization, and Mitigation**, the MWRA will comply with the Article 97 Land Disposition Policy and there are no other possible means to avoid disposition. To mitigate the impacts of the disposition, the MWRA will identify and provide compensatory land of equal or greater value to offset any disposed of land required for the Program when applicable or comply with other provisions of the policy.

Table H-5 describes impacts and associated mitigation for DCR properties.

Table H-5 DCR Resources Impacts and Mitigation

Estimated Impact		Mitigation	Responsible Party/ Schedule
Construction Period Impacts			
Construction easement for shaft construction and for near-surface pipe installation ***Boston** (American Legion)*		*Follow and comply with Article 97 land disposition process and Public Lands Preservation Act[1] by identifying and providing compensatory land of equal or greater value to offset any disposed of land required for the Program when applicable or complying with other provisions of the policy*	*MWRA / Prior to construction*
Construction period activities on the Arborway Effecting Local Intersections		*Obtain DCR construction access permit*	*MWRA / Contractors/ Construction period*
***Boston** (Southern Spine Mains and American Legion)*	*South St. at Arborway.* *Washington St. at Arborway* *Arborway at Circuit Dr.*	*Install during off-peak and/or overnight hours only, to minimize disturbance to traffic, bicyclists, and pedestrians*	
		Accommodate bikes and pedestrians separate from vehicles through on-street work zones and nighttime installation	
		Temporary bicycle and pedestrian detours	
		Maintain safe access to sensitive receptors at all times	

Table H-5 DCR Resources Impacts and Mitigation

<table>
<tr><th colspan="2">Estimated Impact</th><th>Mitigation</th><th>Responsible Party/ Schedule</th></tr>
<tr><td colspan="2">*Installation of near-surface piping impacting bikes and pedestrians*</td><td>*Install during off-peak and/or overnight hours only, to minimize disturbance to traffic, bicyclists, and pedestrians.*</td><td rowspan="4">*MWRA / Contractors/ Construction period*</td></tr>
<tr><td rowspan="3">***Boston** (Southern Spine Mains)*</td><td rowspan="3">*Detour along the Arborway*</td><td>*Accommodate bikes and pedestrians through on-street work zones and nighttime installation*</td></tr>
<tr><td>*Temporary bicycle and pedestrian detours*</td></tr>
<tr><td>*Maintain safe access to sensitive receptors at all times*</td></tr>
<tr><td colspan="2">*Installation of near-surface piping causing local detours*</td><td>*Install during off-peak and overnight hours, where possible and as necessary, to minimize potential disturbance to traffic, bicyclists, and pedestrians.*</td><td rowspan="4">*MWRA / Contractors/ Construction period*</td></tr>
<tr><td rowspan="3">*Boston (American Legion)*</td><td rowspan="3">*Installed in two phases on American Legion Highway and Morton Street*</td><td>*Where possible and as appropriate, restripe crosswalks with high-visibility markings and construct Americans with Disabilities Act (ADA)-compliant curb ramps with detectable warning panels on each corner where existing crosswalks or curb ramps are impacted.*</td></tr>
<tr><td>*Maintain two-way traffic whenever possible and one lane traffic at a minimum.*</td></tr>
<tr><td>*Provide temporary local detours where necessary.*</td></tr>
<tr><td colspan="4">***Permanent Impacts***</td></tr>
<tr><td>***Boston***</td><td></td><td rowspan="3">*Follow and comply with Article 97 land disposition process and Public Lands Preservation Act[1] by identifying and providing compensatory land of equal or greater value to offset any disposed of land required for the Program when applicable or complying with other provisions of the policy*</td><td rowspan="3">MWRA /
Prior to construction</td></tr>
<tr><td>*American Legion*</td><td>*Permanent Impact top of shaft structure, parking and access*</td></tr>
<tr><td>*Southern Spine Mains*</td><td>*Permanent Impact top of shaft structure*</td></tr>
</table>

1 Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, "Article 97 & The Public Lands Preservation Act," https://www.mass.gov/info-details/article-97-the-public-lands-preservation-act (accessed July 15, 2023).

Italicized text within the table indicates no change from the DEIR.

H.8 Massachusetts Bay Transportation Authority (MBTA) DRAFT

Project Name: *Metropolitan Water Tunnel Program*

Project Location: *Waltham, Weston, Newton, Wellesley, Needham, Brookline, Boston*

Project Proponent: *Massachusetts Water Resources Authority*

EEA Number: *16355*

Date Noticed in Monitor: DATE

Applicable State Action:

- MBTA Right of Way Access License Agreement

This Section 61 Finding for the Metropolitan Water Tunnel Program (EEA 16355) 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 Program are characterized and quantified in the Metropolitan Water Tunnel Program Draft Environmental Impact Report (DEIR) and this Supplemental DEIR (SDEIR), that are both incorporated by reference into this Section 61 Finding. To the greatest extent practicable, the MWRA has taken all feasible measures to avoid and/or minimize adverse environmental impacts of the proposed Program. Where impacts are not avoidable, the MWRA has worked throughout the planning and environmental review process to develop measures to mitigate impacts of the Program to the extent practicable. With the implementation of the proposed mitigation, and cooperation with state agencies, the Massachusetts Bay Transportation MWRA (MBTA) finds that there are no significant unmitigated impacts.

*The MWRA recognizes that the identification of effective mitigation, and implementation of that mitigation throughout the life of the Metropolitan Water Tunnel Program, is central to its responsibilities under MEPA. Accordingly, the MWRA has prepared a Table of Mitigation Commitments (**Table H-6**) that specifies, for each potential state permit, the mitigation that the MWRA would provide. In the Table of Mitigation Commitments, the MWRA 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 Program phasing.*

The MBTA has reviewed the MEPA filings for Metropolitan Water Tunnel Program and finds that the environmental impacts resulting from construction of the Metropolitan Water Tunnel Program are those impacts as described in the DEIR, 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, the MBTA finds that with the implementation of mitigation measures as identified in the Table of Mitigation Commitments, all practicable and feasible means and measures would have been taken to avoid or minimize potential damage to the environment due to the construction and operation of the Metropolitan

Water Tunnel Program. In making this finding, the MBTA has considered reasonably foreseeable climate change impacts and environmental justice impacts.

MBTA Resources Mitigation

The MWRA will work with the MBTA through design development and where possible avoid the MBTA zone of influence along the tunnel alignment as noted in **Table H-6.**

Table H-6 MBTA Property Impacts and Mitigation

Estimated Impact		Mitigation	Responsible Party/Schedule
Permanent Impacts			
Potential right of way access		Avoid MBTA zone of influence	MWRA/Final Design
Waltham	**All Alternatives**		
Potential tunnel alignment	Three north tunnel alignments pass under MBTA property		