Massachusetts Water Resources Authority

Metropolitan Water Tunnel Program

Draft Environmental Impact Report

October 2022

MWRA Contract 7159

Volume 1

Prepared by

CDM Smith in association with

VHB and JACOBS

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
Fax: (617) 788-4899
TTY: (617) 788-4971

October 17, 2022

Bethany Card, Secretary
Executive Office of Energy and Environmental Affairs (EEA)
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: MWRA's Metropolitan Water Tunnel Program – EEA #16355
Draft Environmental Impact Report

Dear Secretary Card,

MWRA is pleased to submit the enclosed Draft Environmental Impacts Report (DEIR) for the Metropolitan Water Tunnel Program located in multiple communities in the metropolitan Boston area. This DEIR responds to the Secretary of EEA's Environmental Notification Form (ENF) Certificate issued on May 7, 2021 and provides responses to all comments received on the ENF.

Through the Metropolitan Water Tunnel Program (the Program), MWRA proposes to construct approximately 14 miles of two new 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). The Program will also allow MWRA's aging existing water tunnel system to be rehabilitated without interrupting service. Temporary construction impacts will be associated with the construction of the deep rock tunnels, associated construction shaft sites and intermediate shaft sites.

An electronic copy of the DEIR is being forwarded to all parties as noted on the DEIR Distribution List (see Appendix A). We respectfully request that you publish notice of availability of the DEIR for public review in the October 24, 2022 edition of *The Environmental Monitor*. Public comments are due by November 23, 2022 and a certificate is due to be issued on November 30, 2022.

Please let me know if you have any questions regarding this submittal.

Sincerely,

Kathleen Murtagh

Kathleen Murtagh
Director, Tunnel Redundancy Program

This page intentionally left blank

Table of Contents – Volume 1

Table of Contents – Volume 2

Table of Contents – Volume 3

This page intentionally left blank

Table of Contents – Volume 1

Tables - Volume 1

Figures - Volume 1

1 Program Description and Permitting

The Massachusetts Water Resources Authority (MWRA, the Authority) is pleased to submit this Draft Environmental Impact Report (DEIR) for the Metropolitan Water Tunnel Program (the Program) to continue the Program's review under the Massachusetts Environmental Policy Act (MEPA). The Authority is a Massachusetts public authority established by an act of the Legislature in 1984 and provides wholesale water and sewer services to 3.1 million people and more than 5,500 businesses in 61 communities in eastern and central Massachusetts.

1.1 Program Description

The Authority plans to construct two new deep rock water supply tunnels (north and south alignments). Known as the Metropolitan Water Tunnel Program, this important new infrastructure will provide redundancy for the Authority's existing Metropolitan Tunnel System, which 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 Authority's state-of-the-art 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.

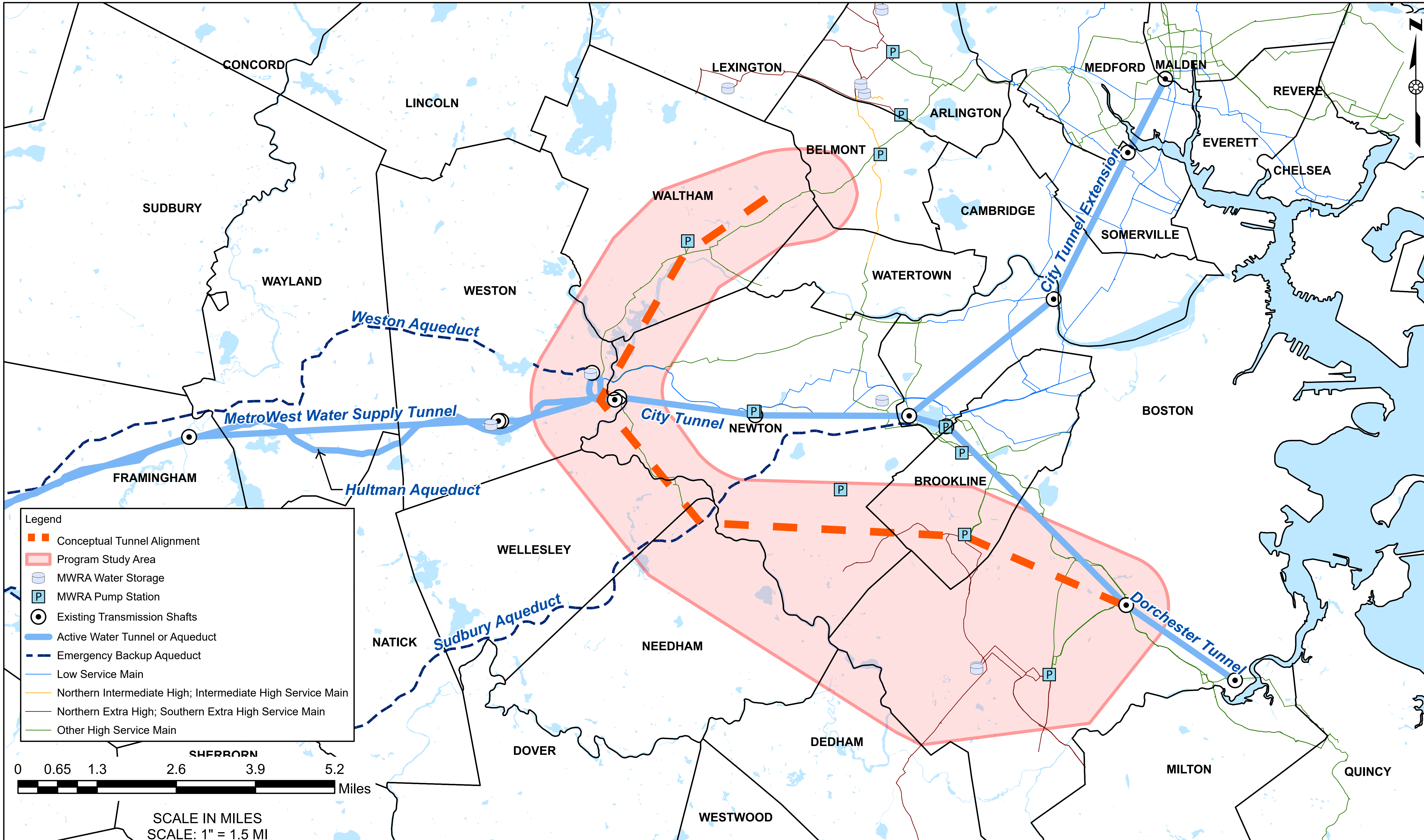
The new, redundant deep-rock tunnels will originate at a site located at the westernmost portion of the Metropolitan Tunnel System roughly in the vicinity of the Interstate I-90/I-95 Interchange (I-90/I-95). The tunnels will be constructed such that water flows in two directions, with one tunnel extending 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. The boundaries of the Program Study Area, which encompasses approximately 14.5 miles of deep rock tunnel 200 to 400 feet below the surface of several communities, are depicted in **Figure 1.1-1**.

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 because 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 Authority to take its aging existing water tunnel system offline to be rehabilitated without interrupting water service to over 2.5 million water customers.

Program construction is estimated to take approximately 8 to 12 years and is planned to occur between 2027 and 2040. The Authority expects that the proposed new deep-rock tunnel system will be placed into service before or around 2040 and that the system will have a useful life of more than 100 years. When sizing the proposed facilities, the Authority 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.

1.1.1 Program Background

The Authority's water system consists of the 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 approximately 100 miles of tunnels and aqueducts and 280 miles of surface pipeline that carry water from the source reservoirs to the communities. **Figure 1.1-2** demonstrates the Authority's water system.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Program Study Area

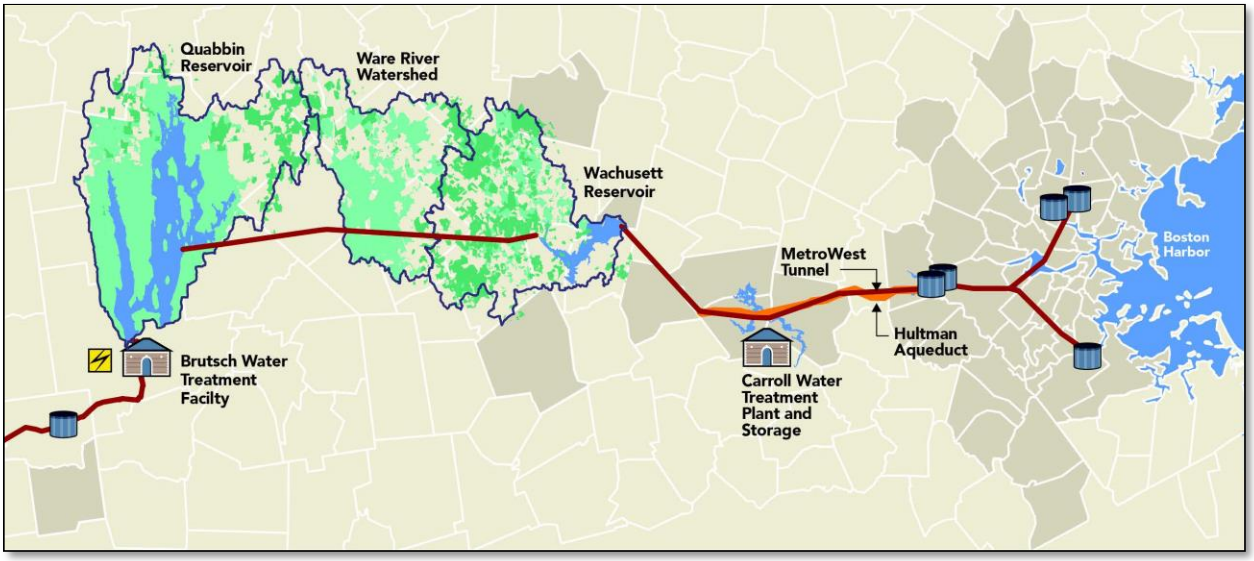
Figure 1.1-1

Belmont, Waltham, Watertown, Weston, Newton, Wellesley, Needham, Brookline, Dedham, and Boston, MA

Source: VHB, MassGIS, MWRA

This page left intentionally blank

Figure 1.1-2 MWRA Water System



Source: MWRA

Recognizing the age of the water system's infrastructure and the need to conduct maintenance and repair without service disruption, the Authority and its predecessor agencies have been planning for system redundancy since the 1930s. Several versions of tunnel loops and redundant tunnel systems have been proposed over the years.

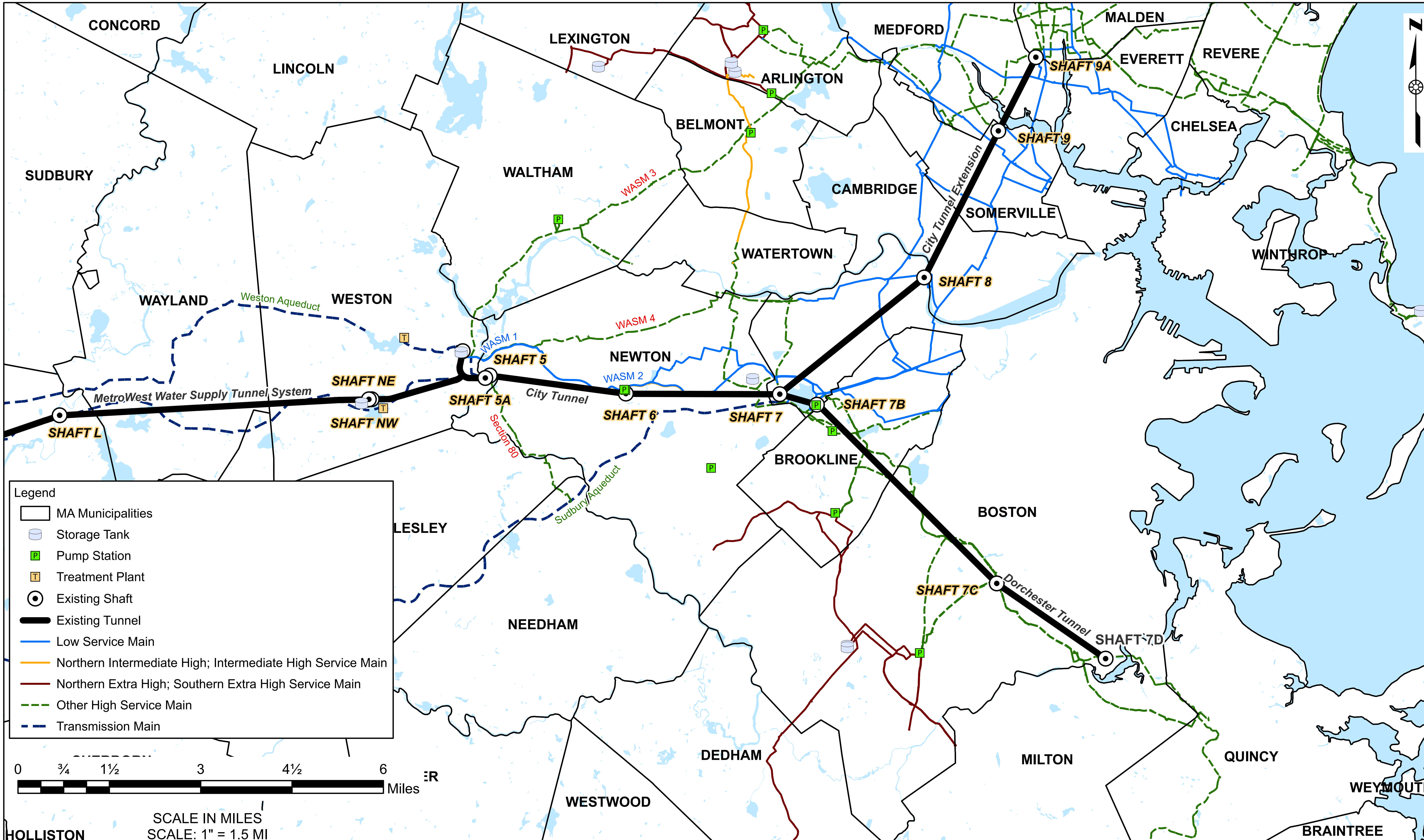
The MetroWest Water Supply Tunnel, completed in 2003, was a vital addition to system redundancy. Approximately 17.6 miles long, the MetroWest Water Supply Tunnel consists of a 12- to 14-foot-diameter deep-rock tunnel that provides redundancy to the Hultman Aqueduct, which is a major transmission line from the John J. Carroll Treatment Plant in Marlborough to Shaft 5/5A near I-90/I-95 in Weston. With the completion of the MetroWest Water Supply Tunnel project, a redundant water transmission system was created for approximately 25 miles from the Wachusett Reservoir to the beginning of the existing Metropolitan Water Tunnel System. However, a redundant system is still needed east of Shaft 5/5A, which includes the Metropolitan Tunnel System (see **Figure 1.1-3**).

The 2018 MWRA Water System Master Plan[1] prioritizes projects on a scale from 1 to 5, with 1 for projects considered critical and 2 through 5 for progressively lower-priority projects. The highest priority projects will resolve critical threats to public health and prevent imminent system failure resulting in significant service loss. The Metropolitan Water Tunnel Program is designated as a Priority 1 (Critical) project. Together, the City Tunnel, the City Tunnel Extension, and the Dorchester Tunnel supply approximately 60 percent of the total water system's daily demand; some of these tunnels, associated surface piping, ancillary valves, and equipment have been in operation for more than 60 years. This aging infrastructure and equipment should be inspected regularly and repaired if necessary. Valve reliability is one of the major areas of system vulnerability for the Metropolitan Tunnel System. However, these tunnels cannot currently be shut down for inspection or repair without a disruption of service.

1.1.2 Summary of Program Changes Since the ENF

The Secretary's Certificate on the Environmental Notification Form (ENF) requested a description of Program changes since the filing of the ENF. While the Program's intent has not changed since the ENF, the alternatives analysis has advanced to ultimately identify a preferred alternative, as well as two back-up alternatives, in this DEIR. Prior to the ENF, the Authority completed a series of preliminary steps to identify the type and size of the tunnels. The ENF built upon the previous studies and identified 13 North Tunnel Alternatives and 15 South Tunnel Alternatives, screening 28 alternatives using two tiers of screening criteria. The alternatives analysis in the ENF concluded that a deep-rock tunnel to the north and south would be the preferred solution to advance for further evaluation. 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.

1 *Massachusetts Water Resources Authority Water System Master Plan*, Massachusetts Water Resources Authority, Boston, MA, 2018. [Online]. Available: https://www.mwra.com/publications/masterplan/2018/mp-water.pdf



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Existing Metropolitan Tunnel System

Figure 1.1-3

Belmont, Waltham, Watertown, Weston, Newton, Wellesley, Needham, Brookline, Dedham, and Boston, MA

Source: VHB, MassGIS

This page left intentionally blank

Since the ENF filing, the Authority identified and evaluated potential launching, receiving, and connection point locations to determine the alternatives that would advance into the DEIR (the DEIR Alternatives). Since the DEIR Alternatives are made up of different combinations of launching, receiving, and connection sites and different tunnel segments, the Authority developed a multi-criteria decision tool 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. The 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.

Ten DEIR Alternatives were evaluated and ranked to ultimately determine the Preferred Alternative and two backup alternatives (in the event the Authority determines the Preferred Alternative or components of it no longer effectively meets the Program's goals). The DEIR details this process in **Chapter 3, Alternatives**. The Authority also conducted an assessment of impacts for the Preferred Alternative and two backup alternatives, as described in **Chapter 4, Existing Conditions and Environmental Assessment**.

1.1.3 Status of Review/Updates to MEPA Guidance

The Authority filed an ENF for the Program with the MEPA Office on March 31, 2021, to initiate MEPA review. The ENF was noticed in the Environmental Monitor on April 7, 2021, and the Secretary of the Executive Office of Energy and Environmental Affairs (EEA) issued an ENF Certificate on May 7, 2021, requiring that the Program prepare a mandatory DEIR.

This DEIR was prepared in accordance with the scope outlined in the ENF Certificate. Since the ENF filing, MEPA amended its regulations under 301 Code of Massachusetts Regulation (CMR) 11.00, which were promulgated on December 24, 2021. Additionally, the *MEPA Interim Protocol on Climate Change Adaptation and Resiliency*[2] is effective for all new filings as of October 1, 2021, and the *MEPA Public Involvement Protocol for Environmental Justice Populations*[3] and the *MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations*[4] were finalized and are effective as of January 1, 2022, for all new filings. Although the ENF was filed before these effective dates, the Authority continues to work with MEPA on assessing Program impacts to environmental justice (EJ) populations and resiliency considerations in accordance with these updates and the DEIR scope outlined in the ENF Certificate.

---

2 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.

3 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.

4 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.

The Authority has elected to voluntarily follow the *MEPA Interim Protocol on Climate Change Adaptation and Resiliency* as a part of this DEIR. This includes use of the Resilient Massachusetts Action Teams' Climate Resilience Design Standards Tool (RMAT Tool) for evaluating the Project's climate exposure to sea-level rise, flooding, and extreme heat as well as to mitigate these impacts as found in **Chapter 6, Climate Change.**

Similarly, the Authority has voluntarily followed 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 DEIR. 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 to assess Program impacts on EJ populations. Details on the Program's public outreach plan and a summary of the outreach conducted to date, as well as EJ populations in the vicinity of the Program's sites, are documented in **Chapter 2, Outreach and Environmental Justice.**

1.2 Program Purpose and Need/Goals

The Metropolitan Tunnel System (City Tunnel, City Tunnel Extension, and Dorchester Tunnel) was constructed from the 1950s to the 1970s and has been in continuous service ever since. 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. To exercise, service, and replace some of these valves and piping without interruption to water supply, a redundant system is needed.

The purpose of the Metropolitan Water Tunnel Program is to enhance the reliability of the Metropolitan Tunnel System that serves the metropolitan Boston area, allowing for system maintenance and repair without disrupting service in a way that maintains the system's ability to provide water needed to support public health and safety.

The primary goal of the Program is to protect public health, provide sanitation, and provide fire protection, in line with the mission of the Authority.

In support of this goal, the Program is intended to:

- Provide redundancy for the Metropolitan Tunnel System
- Provide normal water service and fire protection when the existing tunnel system is out of service
- Provide the ability to perform maintenance on the existing tunnel system year-round
- Provide uninterrupted service in the event of an emergency shutdown
- Meet high day demand flow with no seasonal restrictions
- Avoid activation of emergency reservoirs
- Meet customer expectations for excellent water quality
- Preserve sustainable and predictable rates at the water utility level
- Be constructible
- Avoid boil water orders

1.2.1 Condition of the Metropolitan Tunnel System

Each tunnel comprising the existing Metropolitan Tunnel System 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 pipes and valves connect to the Authority's surface pipe network. These pipes and valves are accessed through subsurface vaults and chambers. The tunnels 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.

Valve reliability is a concern for the Metropolitan Tunnel System. The City Tunnel (1950) appurtenances are 70 years old and cannot be adequately maintained or replaced until a back-up exists. Failure of some valves could cut off most of the system's capacity to supply water. Moreover, due to the physical condition, age, and environment in which they were installed, the valves have not been exercised recently for fear of them failing in a closed position which would prevent water supply to downstream portions of the system. At many of the top-of-shaft structures are smaller piping and valves of varying diameters (ranging from less than an inch to several inches in diameter) that provide air and vacuum relief, along with drains, flushing connections, valve by-passes, and control piping for hydraulic valve actuators. Some of these pipes and valves are in a similar deteriorated condition as the main pipes and valves themselves. Failure of one of these smaller diameter connections could require a tunnel shutdown to allow for a safe repair in some of these confined spaces. The amount of water that can flow out of a modest opening under high pressure can potentially be over 100 million gallons per day (MGD).

Some of these concerns can be mitigated somewhat through replacing corroded bolts, wrapping or coating corroded pipeline segments, replacing air valves, and installing cathodic protection systems. A program is underway to implement some of these measures to reduce the risk of certain failures that would require complete tunnel shutdown. However, all the potential failure points cannot be addressed without tunnel isolation and complete replacement or maintenance of failed or failing components at some point in the future.

1.2.2 A Case Study for Redundancy

The most recent incident that emphasized the need for redundancy occurred in May 2010 when the Authority experienced a major break on a 10-foot-diameter pipe connection at Shaft 5/5A of the City Tunnel. The break occurred at a coupling on the surface pipe interconnection between the recently constructed MetroWest Water Supply Tunnel and the City Tunnel (see **Figure 1.2-1**). Although the leakage was only caused by a 1-inch gap in the pipe, potable water was released at a rate of approximately 250 MGD. A precautionary boil order was put in place for the metropolitan Boston area, and the Authority was able to repair the pipe and bring service back online swiftly. Using a combination of industry standards and case studies from water supply interruptions, the Authority has estimated the economic loss of an interruption of water supply to the metropolitan Boston area would be at least $300 million per day. This example demonstrates the importance of having a redundant system in place to enable the Authority to perform regular inspection, maintenance, and rehabilitation of pipes, key valves, and tunnels for the

Metropolitan Tunnel System, as well as to reliably respond in the event of infrastructure failure, without service disruption.

Figure 1.2-1 The Great Water Main Break of 2010

Source: MWRA

1.3 Program Schedule and Phasing

The Program is composed of two distinct tunnels. The North Tunnel will include a completed tunnel from a site near the I-90/I-95 interchange to the Fernald Property (Segment 1). The South Tunnel will include a completed tunnel from a site near the I-90/I-95 interchange to the Highland Avenue/I-95 interchange (Segment 2), and from the Highland Avenue/I-95 interchange to the American Legion site (Segment 3). The alternatives described in more detail in **Chapter 3, Alternatives Analysis**, outline the specific phasing and contract packaging options for each alternative. The number of construction packages will be confirmed as the Program advances through the design phases. The following subsections provide details of the Program's progression, and a timeline of activities is provided in **Figure 1.3-1**.

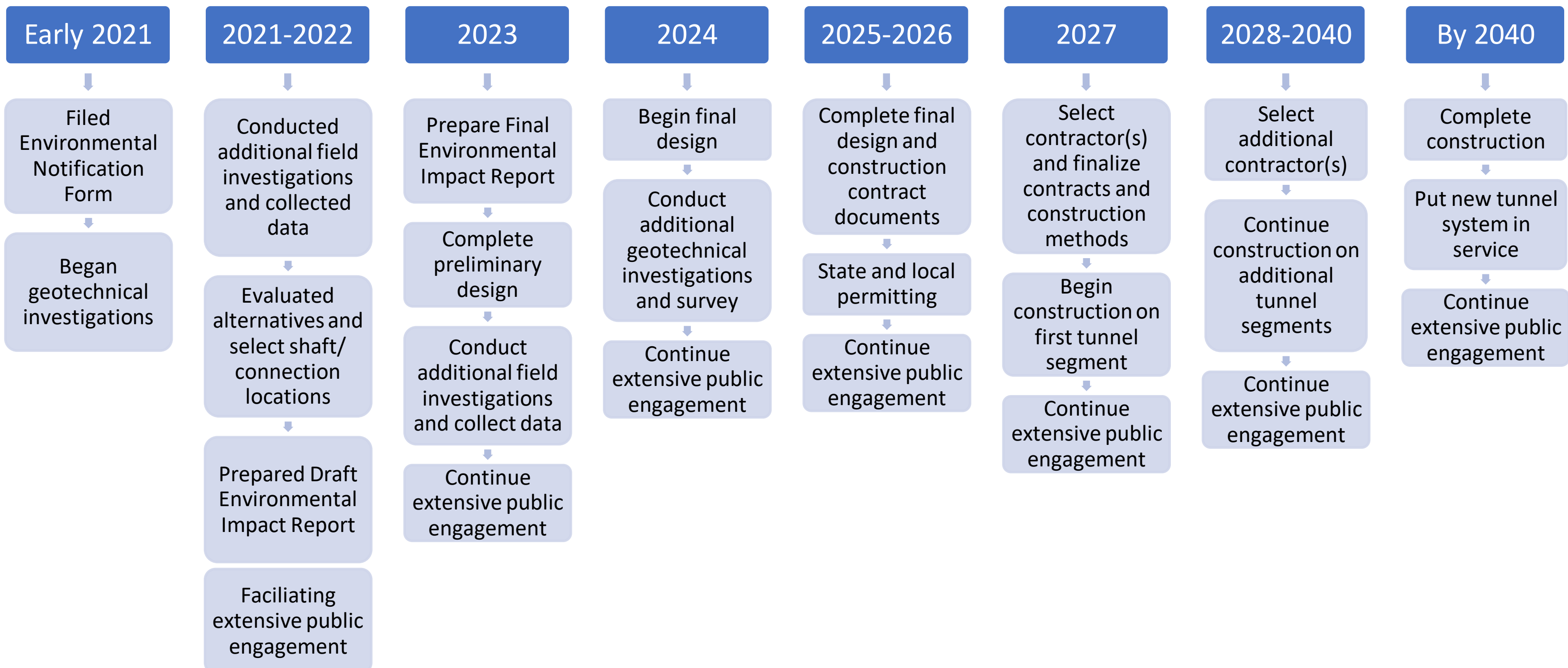
1.3.1 Preliminary Geotechnical Data and Design Reports

To aid in the selection of the appropriate subsurface (underground) alignment for the deep-rock tunnels, the Authority is conducting geotechnical subsurface investigations during preliminary design in two phases at key locations within the Program Study Area. In the summer and fall of 2021, the Authority executed the first phase (Phase 1A) of the preliminary geotechnical investigations, which included the drilling of 10 deep-rock borings, geophysical investigations, and installation of monitoring instrumentation in the borings. Each boring was drilled approximately 50 feet below the proposed tunnel depth and took approximately eight weeks to complete, including in-situ (on-site) testing. The Authority is currently conducting the second phase (Phase 1B) of the preliminary geotechnical investigations, which includes up to 10 deep rock borings, geophysical investigations, and installation of monitoring instrumentation in the borings. The Authority will continue to conduct additional geotechnical investigations and testing as the Program moves through final design. The Authority will prepare a draft and final Preliminary Design Report to support and provide the technical basis for the information included in the DEIR and Final Environmental Impact Report (FEIR). The Preliminary Design Report will include design criteria, construction considerations, and operational requirements for the tunnels, shafts, and valve chambers and pipe connections. The Preliminary Design Report will include a detailed hydraulic analysis of the proposed tunnels using projected future water demands. In addition, the Preliminary Design Report will include preliminary design drawings, proposed construction packaging, a proposed schedule, and a preliminary cost estimate. **Figure 1.3-1** presents the schedule for design activities.

1.3.2 Final Design and Construction

Final Design and the development of construction contract documents will be underway in 2024. The Authority will advance Final Design to prepare procurement documents, including Final Plans, Specifications, and a detailed Construction Cost Estimate. Based on these, the Authority 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.

Figure 1.3-1 Program Timeline



1.4 Regulatory Context

The MEPA Office within the EEA oversees the state environmental review of the Program. 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

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 ENF threshold pursuant to 301 CMR 11.03(1)(b)3 for the conversion of land held for natural resources purposes in accordance with the Amendments to the Constitution of the Commonwealth Article 97 to any purpose not in accordance with Article 97. The Authority 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.

This section will discuss the regulatory context for the Program, addressing the following comments from the Secretary's Certificate:

- A description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the Program's consistency with those standards
- Identification and description of federal, state, and municipal permitting and review requirements associated with the Program and an update on the status of each of these pending actions
- A description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the Program's consistency with those standards
- A description of the permits and/or regulatory approvals required for each component of the Program
- A description of how the Program is consistent with any applicable EEA policies, including but not limited to the Article 97 Land Disposition Policy
- Identification of all MEPA thresholds that will be met or exceeded by the Program, including any not identified in the ENF

1.4.1 Anticipated Permits and Approvals

Table 1.4-1 provides a list of potential permits and approvals that the Program may require. The Authority will further evaluate this list as the design progresses and will update it accordingly in future filings. Some permits and approvals are site specific, as noted in **Table 1.4-1**.

Table 1.4-1 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 herein
Massachusetts Historical Commission (MHC)	Review pursuant to MGL 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[2]	Water Management Act	To be obtained
	Superseding Order of Conditions, upon appeal[1]	To be obtained, if needed
	Section 401 Water Quality Certificate[1]	To be obtained
	Chapter 91 License[1]	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

1 Indicates that the permit or approval is site specific.
2 Indicates State agency that will issue Section 61 Findings.

1.4.2 Federal

The Program may require approval pursuant to several federal environmental regulations.

1.4.2.1 USEPA NPDES Construction General Permit

Construction activities will involve the disturbance of 1 acre or more of land, which will require the completion and submittal of a Notice of Intent (NOI) to the 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 a 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 of the launching, receiving, and connection sites for the Program.

1.4.2.2 USEPA NPDES Dewatering and Remediation General Permit

Dewatering activities associated with construction and operation of the Program may require the issuance of a USEPA NPDES Dewatering and Remediation General Permit (DRGP). This permit will be issued by the USEPA and authorizes discharges of groundwater, stormwater, potable water, and surface water for dewatering and remediation activities, including infrastructure dewatering and remediation. The DRGP will cover all launching, receiving, and connection sites that involve dewatering and remediation activities.

1.4.2.3 Section 404 Department of the Army Permit (General and Project Construction Notice)

The construction of the Program would require the discharge of dredge or fill material into waters of the U.S. Work consisting of construction, dredging, or discharge of fill into a U.S. navigable water or adjacent wetlands requires a Section 404 permit from the U.S. Army Corps of Engineers (USACE). Prerequisites for a Section 404 permit would be the Section 401 Water Quality certificate issued by the Massachusetts Department of Environmental Protection (MassDEP). A Section 404 permit would only be needed for temporary impacts at one of the proposed connection sites (American Legion). Prior to construction, a Preconstruction Notification filing, or a Self-Verification Form would be completed for the applicable site.

1.4.3 State

The Program may require the following state agency actions.

1.4.3.1 Review Pursuant to MGL Ch. 9, Section 26-27C

The Massachusetts Historical Commission (MHC) has review authority over projects requiring state funding, licenses, permits, or approvals, in order to evaluate potential direct or indirect impacts to properties listed in the State Register of Historic Places, in compliance with MEPA and the State Register Review requirements (MGL Ch. 9, Section 26-27C, as amended by Chapter 254 of the Acts of 1988). Similar to Section 106, the consultation process identifies potential adverse effects to historic properties and evaluates ways to avoid, minimize, or mitigate these adverse effects. An evaluation of historic and archaeological resources was conducted as part of the DEIR. The MHC is included in the distribution of the Program's MEPA filings. Additionally, the Authority has coordinated with MHC in advance of this DEIR filing to provide preliminary information to assist in its review. See **Section 4.7, Cultural and Historical Resources**.

1.4.3.2 MassDOT Land Disposition/Easements

The Program requires the use of sites under the care, custody, and control of the Massachusetts Department of Transportation (MassDOT). The use of these sites might require a temporary easement from MassDOT for construction activities or a permanent easement or land disposition from MassDOT for the proposed facilities. Land disposition and/or easement approvals will be needed for multiple proposed launching, receiving, and connection sites (Tandem Trailer, Park Road East, Park Road West, Bifurcation, Highland Avenue Northeast/Southeast, and Highland Avenue Northwest/Southwest).

1.4.3.3 MassDOT Highway Access/Construction Access Permits

Construction activities will take place within the right-of-way or on property in the care, custody and control of MassDOT. Activities on these lands would require Highway Access and Construction Access permits from MassDOT. These permits will be needed at many of the proposed launching, receiving, and connection sites (Tandem Trailer, Park Road East, Park Road West, Bifurcation, Hultman Aqueduct Isolation Valve, Highland Avenue Northeast/Southeast, Highland Avenue Northwest/Southwest, Fernald Property, and American Legion).

1.4.3.4 DCR Land Disposition/Easements

The Program requires the use of sites under the care, custody, and control of the Massachusetts Department of Conservation and Recreation (DCR). The use of these sites may require a temporary easement from DCR for construction activities, and/or a permanent easement and land disposition from DCR for the proposed facilities. For any permanent easements and/or land dispositions, compliance with the EEA Article 97 Land Disposition policy will be necessary for land resources protected under the policy. Two sites (Southern Spine Mains and American Legion) are under the care, custody, and control of DCR and are anticipated to require a land disposition.

1.4.3.5 DCR Construction/Access Permits

Permits for construction activities and access will be needed for land under the care, custody, and control of DCR, in addition to land disposition and easement approvals. A comment letter from DCR on the ENF dated April 27, 2021, confirmed the need for the Program to seek construction access permits at sites under the care, custody, and control of the DCR. This applies to one receiving site (American Legion) and one connection site (Southern Spine Mains).

1.4.3.6 Distribution System Modification Permit

The goal of the Program is to provide redundancy to the existing MWRA distribution system that supplies the Greater Boston area. Modification of a public water supply system requires a Distribution System Modification Permit from MassDEP. This permit is required for modification of water distribution systems serving more than 3,300 people in order to protect public health and welfare. The permit will be required for the entire Program.

1.4.3.7 Water Management Act

Dewatering from construction activities may require a Water Management Act Permit. A Water Management Act Permit is required for complete or partial transfer of the right to withdraw water and for requests to withdraw over 100,000 gallons of water per day annually from a watershed. A comment letter on the ENF from the MassDEP Northeast Regional Office (NERO) dated April 27, 2021, expressed the need for the estimated withdrawal rates and discharge locations for dewatering activities associated with construction to determine if a Water Management Act permit is required. The withdrawal rates and discharge sites are described in **Chapter 5, Water Supply and Water Management Act**. The Program consists of sites located in the Charles River Basin, and withdrawal and discharge activities may necessitate coverage from a Water Management Act Permit for this watershed.

1.4.3.8 Superseding Order of Conditions, Upon Appeal

The Authority will file a Notice of Intent with the local Conservation Commissions to ultimately receive a Wetlands Protection Act (WPA) Order of Conditions from those commissions for some of the proposed launching, receiving, and large connection sites. In the event that there is an appeal of an Order of Conditions issued by a local Conservation Commission, a WPA Superseding Order of Conditions by the MassDEP would be needed. This will occur on a site-specific basis.

1.4.3.9 Section 401 Water Quality Certificate

Construction activities would result in the discharge of dredged or fill material into waters of the U.S. associated with outlet pipes with riprap splash pads for dewatering discharges at Fernald Property, Tandem Trailer, Bifurcation, Highland Avenue Northeast/Southeast, and Highland Avenue Northwest/Southwest and for temporary vegetated wetland impacts and a dewatering outlet pipe with a riprap splash pad at American Legion. These discharge activities would require Section 401 Water Quality Certification (WQC) from MassDEP. It is anticipated that the Program would require a Major Fill/Excavation Project Certification due to the cumulative impact to more than 5,000 square feet of vegetated wetland and land under water. It is not anticipated that the Program would require a Dredge Project Certification because the volume of dredging would not be more than 100 cubic yards.

1.4.3.10 Chapter 91 License

Construction activities would result in the placement of structures within waters of the Commonwealth that are subject to jurisdiction under Chapter 91 and would require a Chapter 91 License. The structures would consist of outlet pipes with riprap splash pads for dewatering discharges at Fernald Property, Tandem Trailer, Bifurcation, Highland Avenue Northeast/Southeast, Highland Avenue Northwest/Southwest and American Legion.

1.4.3.11 Article 97 Land Disposition Legislation

The Program would use land that is protected under the EEA Article 97 Land Disposition Policy. Article 97 includes a no-net-loss policy for designated land within Massachusetts. This Program includes a transfer of ownership, change in physical or legal control, and change in use in and to Article 97 land. For a disposition of Article 97 land to take place, a two-thirds vote from the General Court must occur, demonstrating that there is no reasonable alternative to using land protected by Article 97. A comment letter from DCR on the ENF dated April 27, 2021, expressed that the use of some DCR sites that will require permanent easements may trigger Article 97. The Authority is working directly with DCR in order to comply with Article 97. The Authority will identify compensatory land for any disposition that occurs. Article 97 land disposition is anticipated to be needed for three proposed connection and receiving sites: Hegarty Pumping Station, owned by the Town of Wellesley, Southern Spine Mains and American Legion, both under the care, custody, and control of DCR.

1.4.4 Municipal

The Program may require approval pursuant to the following local environmental regulations.

1.4.4.1 WPA Order of Conditions

This Program has planned work within 100 feet of wetlands and within 200 feet of perennial waterways. Work within the vicinity of such resources requires the issuance of a WPA Order of Conditions by the Conservation Commission for each municipality in which proposed construction will occur. For the Program, a WPA Order of Conditions will be needed from the Conservation Commissions of Waltham, Weston, Needham, Wellesley, and Boston.

1.4.4.2 Roadway Access Permits/Street Opening Permit

Construction at some of the sites for the Program will occur within the public right-of-way or may include alteration to existing driveways or curb cuts. At sites where this work is anticipated, Roadway Access Permits or Street Opening Permits from the Department of Public Works of each respective municipality will be needed. The Authority anticipates this work at some of the proposed launching, receiving, and connection sites located in Waltham, Wellesley, Needham, and Boston (Fernald Property, School Street, Highland Avenue Northwest/Southwest, Highland Avenue Northeast/Southeast, Hegarty Pumping Station, St. Mary Street Pumping Station, Southern Spine Mains, and American Legion).

1.4.5 Interagency Coordination

MWRA has performed extensive interagency coordination to date, including multiple meetings or correspondence with MassDOT, DCR, MHC, DPH, and MassDEP, as well as with the local communities within the Program study area. **Table 2.2-1** in **Chapter 2, Outreach and Environmental Justice** summarizes stakeholder meetings that have been held since the ENF filing. The Authority will coordinate and communicate with the USEPA, the U.S. Army Corps of Engineers (USACE), the MHC, MassDOT, the MBTA, DCR, DPH, MassDEP, the Natural Heritage and Endangered Species Program (NHESP), the Commonwealth of Massachusetts General Court, the local Conservation Commissions, and the local Departments of Public Works and local elected officials of Waltham, Weston, Wellesley, Needham, Newton, Brookline, and Boston as Program MEPA review and permitting progresses.

2 Outreach and Environmental Justice

2.1 Introduction

In accordance with the Draft Environmental Impact Report (DEIR) scope in the Environmental Notification Form (ENF) Certificate[1] and the two Massachusetts Environmental Policy Act (MEPA) environmental justice (EJ) Protocols, *MEPA Public Involvement Protocol for Environmental Justice Populations* and *MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations*, this chapter documents:

- Outreach conducted since the ENF filing on the Metropolitan Water Supply Tunnel Program (Program), including:
  - Outreach to the community working group (**Section 2.2.1**)
  - Public information sessions and workshops (**Section 2.2.7**)
  - Other outreach methods to the community (**Section 2.2.2**)
  - An outreach plan to EJ populations that will be implemented after this DEIR submission and through construction (**Section 2.3**).
- A description and analysis of EJ populations that are within each Designated Geographic Area (DGA) (**Section 2.4, Environmental Justice Assessment**), including:
  - Details on the EJ populations present within 1-mile of each shaft site (**Section 2.4.5.1**)
  - Assessment of existing unfair or inequitable burdens on EJ populations (**Section 2.4.5.1**)
  - Analysis of potential impacts to EJ populations during construction and final conditions (**Section 2.4.6** and **Section 2.4.7**)
  - Avoidance, minimization, and mitigation strategies (**Section 2.4.8**)

The state environmental review process requires public outreach and consideration of designated EJ populations. The Massachusetts Water Resources Authority (MWRA, or the Authority) is a part of the EJ task force led by the Executive Office of Energy and Environmental Affairs (EEA). The Authority will follow EEA guidelines pertaining to outreach to and inclusion of the EJ communities in locations where shaft sites may be located or where the proposed tunnel alignments may traverse. After the ENF was filed, MEPA finalized two MEPA EJ Protocols, *MEPA Public Involvement Protocol for Environmental Justice Populations* and *MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations*, which are effective as of January 1, 2022, for all new filings. Additionally, MEPA amended its regulations under 301 CMR 11.00, which were promulgated on December 24, 2021. Although this DEIR is not a new filing and therefore not subject to the finalized protocols and amended regulations put forth by MEPA, the Authority is voluntarily complying with these updates to the greatest extent possible and is conducting

1 The Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form: "Massachusetts Water Resources Authority, Metropolitan Water Tunnel Program," May 7, 2021.

appropriate and comprehensive outreach and analysis of EJ populations within the Program Study Area that the MWRA evaluated tunnel alignments for as part of the Metropolitan Water Tunnel Program.

The Program Study Area consists of the communities that MWRA evaluated tunnel alignments for as part of the water supply program. Each of the 14 proposed sites has its own Designated Geographic Area (DGA), which is the 1-mile radius or buffer around the site. EJ analysis was conducted within these DGAs. Collectively, the 14 DGAs make up the EJ Study Area.

The Authority has implemented a robust community outreach strategy with stakeholders for the Metropolitan Water Tunnel Program (the Program). Stakeholders include, but are not limited to, communities within the Program Study Area, including local elected officials and municipal departments, property owners (public and private) of potential shaft and construction sites, select state agencies, and legislators. The Program Study Area includes the following communities: Belmont, Boston, Brookline, Dedham, Needham, Newton, Waltham, Watertown, Wellesley, and Weston. However, as the preliminary tunnel alignment is refined through the design phases, the overall EJ Study Area will also be refined. It is expected that Program stakeholders will evolve as the Program advances to later stages of design and construction. The outreach strategy includes meetings with each community within the EJ Study Area, formation of a working group consisting of representatives from communities and stakeholders in the Program Study Area, coordination with MWRA's Board of Directors and Advisory Board, Commonwealth agencies, as well as outreach to environmental advocacy groups and EJ populations. MWRA has performed and continues extensive outreach to agencies and communities regarding land acquisition and/or easements for sites that are proposed as construction shafts (launching, receiving, and connection shafts).

2.2 Stakeholder Outreach

Through individual community meetings, Working Group collaboration, regular updates to the MWRA Board of Directors and MWRA Advisory Board, the Authority has conducted extensive outreach within the Program Study Area to identify key stakeholders.

Table 2.2-1 summarizes stakeholder outreach that has been conducted since the ENF filing, which is further described in **Sections 2.2.1.1** through **2.2.7**, as well as outreach with communities and with State agencies with care, custody, and control of potential shaft sites prior to the ENF filing. No interpretation services were requested for meetings held to date.

Table 2.2-1 Stakeholder Outreach Conducted Since the ENF Filing

Stakeholder	Date	Location	Topic
Working Group	4/7/2021	Virtual	Working Group Meeting #1 – Program Overview, Planned Field Activities, MEPA Process.
Working Group	6/2/2021	Virtual	Working Group Meeting #2 – Program Update and Geotechnical Field Program
Working Group	8/4/2021	Virtual	Working Group Meeting #3 – Program Update and Tunnel/Shaft Construction Methods
Working Group	12/1/2021	Virtual	Working Group #4 – Program Update and Alternatives Evaluation Process
Working Group	6/15/2022	Virtual	Working Group #5 – Program Update and Shortlisted Alternatives Selection
Working Group	9/22/2022	Virtual	Working Group #6 – Program Update and Preferred Alternative Selection
MEPA	4/16/2021	Virtual	Remote MEPA Consultation for Environmental Notification Form (ENF)
MEPA	9/15/2022	Virtual	Tunnel Program Update and Environmental Justice Strategy
MassDOT	5/12/2020	Virtual	MWRA Tunnel Program Overview and Land Need Considerations
MassDOT	12/10/2020	Virtual	MWRA Tunnel Program and MassDOT Coordination - Real Estate Acquisition Process
MassDOT	3/18/2021	Virtual	MWRA Tunnel Program and MassDOT Coordination - Real Estate Acquisition Process
MassDOT	4/12/2021	Virtual	MWRA Tunnel Program and MassDOT Coordination - Real Estate Acquisition Process
MassDOT	5/27/2021	Virtual	MassDOT Canvassing Review
MassDOT	5/28/2021	Virtual	MassDOT Canvassing Review
MassDOT	6/1/2021	Virtual	MassDOT Real Property Meeting
MassDOT	6/8/2021	Virtual	MassDOT Tandem Trailer Site Coordination
MassDOT	6/28/2021	Virtual	MassDOT Canvassing Review
MassDOT	7/29/2021	Virtual	MassDOT Canvassing Review Follow Up
MassDOT	10/6/2021	Virtual	Tandem Trailer Possible Relocation Sites
MassDOT	2/7/2022	Virtual	MassDOT Tandem Trailer Site Coordination
MassDOT	7/25/2022	Virtual	MassDOT Tandem Trailer Site Coordination
MassDOT	9/21/2022	Virtual	MassDOT Early Permitting Discussion
Town of Belmont	2/23/2021	Virtual	Metropolitan Water Tunnel Program Introduction and Program Overview
Town of Brookline	2/10/2021	Virtual	Metropolitan Water Tunnel Program Introduction and Program Overview
Town of Brookline	9/7/2022	Virtual	Tunnel Program Overview, Potential Construction Period Impacts and Management

Table 2.2-1 Stakeholder Outreach Conducted Since the ENF Filing

Stakeholder	Date	Location	Topic
Town of Needham	11/20/2020	Virtual	Metropolitan Water Tunnel Program Introduction and Program Overview
Town of Needham	8/17/2021	Virtual	Program Update and Potential St Mary St Pump Station Connection
Town of Needham	9/16/2022	Virtual	Tunnel Program Overview, Potential Construction Period Impacts and Management
City of Newton	3/1/2021	Virtual	Metropolitan Water Tunnel Program Introduction and Program Overview
City of Newton	8/31/2022	Virtual	Tunnel Program Overview, Potential Construction Period Impacts and Management
City of Waltham	10/27/2020	Virtual	Metropolitan Water Tunnel Program Introduction and Program Overview
City of Waltham	11/4/2020	On-site at Fernald Property	Potential Shaft Site at Fernald Property
City of Waltham	6/21/2021	Waltham City Hall	Metropolitan Water Tunnel Program Update to City Council
City of Waltham	9/8/2021	Virtual	Overview of Cedarwood Pumping Station Concept Plan
City of Waltham	12/22/2021	Virtual	Coordination of Planned Field Work
City of Waltham	7/21/2022	Mayor’s Office	Tunnel Program Land Needs
Town of Wellesley	2/12/2021	Virtual	Metropolitan Water Tunnel Program Introduction and Program Overview
Town of Wellesley	8/17/2021	Virtual	Tunnel Program Update and Potential Hegarty Pumping Station Connection
Town of Wellesley	9/2/2022	Virtual	Tunnel Program Overview, Potential Construction Period Impacts and Management
Town of Weston	11/16/2020	Virtual	Metropolitan Water Tunnel Program Introduction and Program Overview
Town of Weston	9/14/2021	Virtual	Metropolitan Water Tunnel Program Update
Town of Weston	8/31/2022	Virtual	Tunnel Program Overview, Potential Construction Period Impacts and Management
Water Supply Citizens Advisory Committee	2/8/2022	Virtual	Tunnel Program Update
DCR and DCAMM	8/11/2020	Virtual	Tunnel Program Overview and Land Need Considerations
DCR	8/14/2020	Virtual	Tunnel Program Overview and Land Need Considerations Follow Up

Table 2.2-1 Stakeholder Outreach Conducted Since the ENF Filing

Stakeholder	Date	Location	Topic
DCR	9/8/2021	Virtual	Tunnel Program Overview and Land Need Considerations
DCR	2/22/2022	Virtual	Tunnel Program Overview and Land Need Considerations Follow Up
DCR	4/1/2022	Virtual	American Legion – Site Staging and Pipeline Routing
DCR	4/29/2022	Virtual	American Legion – Site Staging and Pipeline Routing Follow Up
DCR	5/19/2022	Virtual	American Legion – Land Acquisition and Article 97 Considerations
DCR	6/17/2022	Virtual	American Legion – Site Staging and Pipeline Routing Follow Up
DCR	7/29/2022	Virtual	American Legion and Arborway – Site Staging, Pipeline Routing, and Site Access
DCR	8/11/2022	Virtual	American Legion and Arborway – Site Staging, Pipeline Routing, and Site Access Follow Up
MassDEP	4/25/2022	Virtual	Tunnel Program Overview and Environmental Considerations, MEPA Process, MassDEP Ongoing Coordination
MassDEP	8/16/2022	Virtual	Program Overview and Water Management Act
MassDEP	8/22/2022	Virtual	Program Overview and Potential Wetlands and Waterways Impacts, Chapter 91 Applicability
MassDEP NERO	8/30/2022	Virtual	Program Overview and Potential Wetlands and Waterways Impacts
Department of Public Health	10/29/2021	Virtual	Tunnel Program Overview and Land Consideration Needs at DPH State Laboratory Jamaica Plain Campus for Southern Spine Connection Site
Department of Public Health, DCAMM	1/26/2022	Virtual	Tunnel Program Overview and Land Need Considerations at DPH State Laboratory Jamaica Plain Campus for Southern Spine Connection Site
Department of Public Health, DCAMM	5/23/2022	Virtual	Tunnel Program Overview and Land Need Considerations at DPH State Laboratory Jamaica Plain Campus for Southern Spine Connection Site Follow Up
Department of Public Health	9/19/2022	Virtual	Tunnel Program Overview and Land Need Considerations at DPH State Laboratory Jamaica Plain Campus for Southern Spine Connection Site Follow Up

Table 2.2-1 Stakeholder Outreach Conducted Since the ENF Filing

Stakeholder	Date	Location	Topic
Department of Public Health	9/20/2022	Virtual	Public Outreach Considerations for Stakeholders Near DPH State Laboratory Jamaica Plain Campus
Department of Corrections	6/8/2022	Virtual	American Legion site work adjacent to the Boston Pre-Release Center
Department of Youth Services	9/15/2022	Virtual	Potential work in support of American Legion site work

2.2.1 Working Group

The Authority formed a working group that includes representatives of each of the 10 communities within the Program Study Area and representatives from the MWRA Advisory Board, the Water Supply Citizens Advisory Committee to the MWRA (WSCAC), and the Metropolitan Area Planning Council (MAPC). MWRA has held a number of meetings with the working group (see **Table 2.2-1**). The goals of the working group meetings are to provide a collaborative and transparent process for evaluating alternatives and yield more informed comments during the MEPA process, as well as to provide a mechanism for ongoing updates regarding field work planned in the communities. The working group meetings to date are summarized below. It is envisioned these meetings will continue through the MEPA review process.

The Authority held the first working group meeting on April 7, 2021, which coincided with publication of the Environmental Monitor that included the Program's ENF. This working group meeting provided members with an overview of the Program, information on planned field activities in the communities, and information regarding the MEPA review process, including how to submit comments on the ENF. The Authority held the second working group meeting on June 2, 2021, at which the Authority provided a Program update and detailed information about the planned geotechnical field program. The Authority held the third working group meeting on August 4, 2021, at which the Authority provided a Program update and an overview of the anticipated shaft and tunnel construction methods so members could gain an initial understanding of potential work and associated impacts in their communities.

The Authority held the fourth working group meeting on December 4, 2021, at which the Authority provided a Program update, a description of the alternatives' evaluation process, and an overview of the 10 alternatives to be evaluated and narrowed down to the three alternatives carried in the DEIR. Note that the three alternatives were not identified in this meeting but were the subject of the subsequent meeting.

The Authority held the fifth working group meeting on June 15, 2022, at which the Authority provided a Program update and the three shortlisted alternatives resulting from the alternatives evaluation process. The three alternatives presented at this meeting had not yet been ranked as the preferred and two backup alternatives. Additional evaluation followed this meeting.

The Authority held the sixth working group meeting on September 22, 2022, at which the Authority provided a Program update and the results of the detailed analysis resulting in the determination of the preferred and two backup alternatives carried in the DEIR. This was the last working group meeting prior to filing the DEIR.

Additional presentations with individual communities will continue through the MEPA process and into the design phases of the Program (see **Section 2.2.1**)

2.2.2 Outreach to Community Representatives

In addition to working group meetings, Authority staff have held meetings with individual communities to introduce the Program to additional community staff and to brief staff on community-specific items that may be of interest, including field work, traffic, noise and vibration, environmental considerations among other topics. The MWRA Program Team will follow up with additional meetings and/or presentations to each of the host communities as requested by the communities to present to the host communities' city council/select members or to interested community members. In addition, the MWRA Program Team will continue communication with each individual community on Program activities through the community nominated working group member.

As shown in **Table 2.2-1**, to date, over 20 meetings have been held with the communities in which sites are located. Topics included a Program overview, summary of potential construction period impacts, and mitigation.

2.2.3 State Agencies

The Authority has organized meetings with EEA, the MEPA Office, Massachusetts Department of Transportation (MassDOT), Division of Capital Asset Management and Maintenance (DCAMM), Department of Conservation and Recreation (DCR), Massachusetts Department of Environmental Protection (MassDEP), and other State agencies. Meetings have already been held with some state regulatory agencies, including MEPA staff and MassDEP to provide an overview of the Program and to seek preliminary guidance on the permitting strategy. MWRA has coordinated with Massachusetts Historical Commission (MHC) during field investigations as well as in advance of the DEIR filing. Ongoing outreach with state agencies will be carried out as the Preliminary Design phase progresses, which will be scheduled to occur prior to major submittals, and more frequently as needed to provide updates on the Program or to address specific issues.

2.2.4 MWRA Board of Directors

The Authority has and will continue to offer briefings for the MWRA Board of Directors to update them on Program status, including the filing of public documents. **Table 2.2-2** summarizes these meetings and includes a link to the Staff Summary and presentation materials.

4/17/2019	Charlestown Navy Yard	Update on Tunnel Hydraulics and Program Support Services Key Personnel: Contract 7655	Link
10/16/2019	Charlestown Navy Yard	Program Update	Link
5/27/2020	Virtual	Geotechnical Investigation and Environmental Impact Report: CDM Smith, Inc. Contract 7159 and Program Update	Link
12/16/2020	Virtual	Program Update	Link
2/17/2021	Virtual	Program Update and Filing of Environmental Notification Form	Link
10/20/2021	Virtual	Program Update	Link
9/14/2022	Virtual	Program Update	Link

1. All MWRA Board of Directors Meeting materials, presentations, and approved minutes may be found on the Authority's website at https://www.mwra.com/02org/html/bodmtg.htm

2.2.5 MWRA Advisory Board

The Authority has conducted briefings and anticipates ongoing briefings and meetings with the MWRA Advisory Board, which represents MWRA's member communities. Ongoing meetings with members from each of the communities within the Program Study Area may be held if requested by community representatives.

2.2.6 Environmental Advocacy Groups

The Authority has commenced and plans to continue comprehensive outreach to environmental advocacy groups. Specifically, the Authority anticipates ongoing coordination with the Charles River Watershed Association.

2.2.7 Public Information Sessions and Workshops

The Authority will hold public information sessions and/or workshops as requested by communities or other stakeholders.

2.3 MWRA Environmental Justice Outreach Strategy

The Authority will tailor outreach to EJ communities throughout the Program to facilitate their involvement in the environmental review process. The DEIR analysis identified EJ communities within the Program Study Area (see **Section 2.4.4**), for each of the 14 proposed sites, and will use a combination of methods to enable full participation in the environmental review process. The Program Study Area consists of the communities that MWRA evaluated tunnel alignments for as part of the water supply program. Each of the 14 proposed sites has its own Designated Geographic Area (DGA), which is the 1-mile radius or buffer around the site. EJ analysis was conducted within these DGAs. Collectively, the 14 DGAs make up the EJ Study Area. These 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. The Authority will hold public information sessions or workshops as requested. Interpretation services will automatically be provided for communities where at least 5 percent of census tract population in each community speak a specific language; and all other communities, the Authority and will provide interpreters as requested (including additional interpretation services for communities where at least 5 percent of census tract population in each community speak a specific language.

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

- 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 or 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

Table 2.3-1 documents a summary of the proposed outreach plan post-DEIR filing. The Authority met with the MEPA Office to present its outreach plan on September 15, 2022.

Table 2.3-1 Outreach Plan

Timing	Outreach Type	Outreach Details
October 2022	Advertisement	Translated project and meeting information will be provided based on languages spoken by at least 5% of census tract population in each community. An Advance Notification Form (EJ Screening Form) was provided to Community Based Organizations ahead of the DEIR filing. In addition, advertise upcoming meetings through www.MWRA.com, organizational social media, and via MWRA's subscription-based notification system.
November-December 2022	Public Meetings	Hold public meetings in the communities within the DGA as requested by the community. Provide virtual option for community members unable to attend in person. Offer interpretation services during the meeting based on languages spoken by at least 5 percent of census tract population in each community. Take meeting minutes as a record of community feedback. Provide notifications of meeting through social media, traditional media outlets, www.MWRA.com, and MWRA's subscription-based notification system. Establish point of contact at MWRA and within project communities that residents can contact regarding questions or concerns throughout the course of the project.
Prior to FEIR Filing	Public Meeting Follow-up	Translate meeting minutes to languages spoken by at least 5 percent of census tract population in each DGA. Post minutes from public meetings on the Program website; share minutes with municipal and other key contacts in project communities; request that project communities to make these minutes available for viewing on municipal websites. Incorporate project feedback gathered at community meetings and project adjustments made based on that feedback into final draft of FEIR prior to submission.
Design Phase	Public Meetings	Hold public meetings with a virtual option for community members who are unable to attend in person. Offer interpretation services during the meeting based on languages spoken by at least 5% of census tract population in each community. Present details regarding project design and provide full-size plan sets for viewing by meeting attendees. Discuss anticipated program-related impacts and allow time for Q&A period regarding these impacts. Take meeting minutes as a record of community feedback. Post minutes from public meetings on the Program website; share minutes with municipal and

Table 2.3-1 Outreach Plan

Timing	Outreach Type	Outreach Details
		other key contacts in project communities; request that project communities make these minutes available for viewing on municipal websites. Implement design changes to the greatest extent practicable based on community feedback. Finalize designs and share project status with communities through www.MWRA.com, organizational social media, and via MWRA's automated notification system.
Pre-Construction Phase	Advertisement	Distribute public meeting notice to local newspapers in project communities for posting at least 2 weeks prior to virtual pre-construction meeting. Mail flyers with project timeline, MWRA and municipal contact information, and pre-construction meeting information to residents and businesses of project communities with focus on abutters in proximity to work zones and residents within the DGA. Translated notices will be provided based on languages spoken by at least 5 percent of census tract population in each community.
Pre-Construction Phase	Public Meeting	A recorded virtual pre-construction meeting, provided in all languages spoken by at least 5 percent of census tract population in each community, will be held for members of all project communities. Finalized details regarding the project design, construction, and proposed construction timeline and work hours will be presented to meeting attendees. A Q&A period will be held at the end of the presentation so that any project-related questions or concerns may be addressed. Take meeting minutes as a record of community feedback; share completed minutes with municipal contacts in project communities so that they may be posted online. Circulate recording of public meeting to public access stations within project communities so that it may be periodically aired prior to project commencement.
Construction Phase	Ongoing Updates of Project Status	Project updates will be provided on a regular basis to project communities through www.MWRA.com, organizational social media, via MWRA's subscription-based notification system, and on municipal websites in communities within the EJ Study Area. Translations of project updates will be provided based on languages spoken by at least 5% of census tract population in each community. Email addresses and phone numbers of project contacts at MWRA will be made available so that residents can reach out with project concerns.

Table 2.3-1 Outreach Plan

Timing	Outreach Type	Outreach Details
		Virtual project update meetings will be held on a quarterly basis for all project communities. These meetings will be recorded and provided in all languages spoken by at least 5 percent of census tract population in each community; recordings will be shared and circulated to public access stations within project communities so that they may be periodically aired throughout the duration of the project until a new meeting is recorded.

2.4 Environmental Justice Assessment

This section provides the regulatory framework and methodology for assessing EJ populations. It provides an existing conditions assessment documenting EJ populations within 1 mile of the launching, receiving, and connection sites (known in the methodology as the DGA), and evaluates temporary and permanent impacts to EJ populations for the three DEIR Alternatives. Avoidance, minimization, and mitigation measures were considered. **Figure 2.4-4** through **Figure 2.4-19** illustrate EJ populations within each DGA.

This section addresses the Secretary's Certificate on the ENF and the scope requirements for the DEIR; included are the following:

- Identification of EJ populations that may be impacted by the Program
- The effects, positive and negative, of the Program on EJ populations to determine whether Program impacts will result in disproportionate or adverse effects on EJ populations
- Evaluation of available data on baseline environmental and health conditions for the EJ population to determine whether Program impacts may exacerbate existing conditions to potentially create a disproportionate or adverse impact, and if so, what measures could be taken to avoid, minimize and mitigate such impacts
- Analysis of construction impacts, including air quality impacts
- Further consideration of EJ communities, including engagement, multilingual outreach, and construction-period and long-term impacts on these communities.

2.4.1 Summary of Findings

The Program is voluntarily complying with MEPA's EJ Protocols, despite not being required to do so since the ENF was filed prior to the amended regulations. **Table 2.4-1** summarizes each of the proposed sites, the presence of EJ populations near those sites, whether there would be anticipated impacts prior to mitigation by resource category, and whether there would be disproportionate adverse effects anticipated for that site and resource category following mitigation. Key findings on impacts of the Program as they relate to EJ are listed below:

- The MWRA separated the analysis of new average daily trips (ADT) of diesel vehicle traffic by site due to the different geographies and EJ block groups at proposed sites. The Program would not generate more than 150 net new ADT according to this analysis.
- To be consistent with MEPA regulations for projects likely to cause damage to the environment that are within 1 mile of an EJ population, the EJ Study Area is defined as a 1-mile radius or buffer around each of the proposed sites.
- 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 (DPH EJ Tool) environmental pollutant and health data and the RMAT 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 impact thresholds. Thus, impacts to EJ communities are expected to be insignificant. Mitigation measures will be implemented to further reduce emissions.
- Greenhouse gases (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 Program.

Based on a review of the existing EJ populations and anticipated Program-related impacts, no disproportionate construction period impacts or full-build impacts would be anticipated for any identified EJ population at any of the Program sites.

2.4.2 Resource Definition

The US Environmental Protection Agency (USEPA) definition of EJ is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The Commonwealth of Massachusetts' specific definition of EJ populations is described further below.

2.4.3 Regulatory Framework

In March 2021, Governor Baker signed *An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy* (the Climate Roadmap Act)[2], which defined EJ principles and populations, and environmental benefits and burdens. *The Environmental Justice Policy of the Executive Office of Energy and Environmental Affairs* (2021 EJ Policy), originally issued in 2002 and updated on June 24, 2021,

---

2 *An Act Creating a Next Generation Roadmap for* Massachusetts Climate Policy (the Climate Roadmap Act) on March 26, 2021, St. 2021, c. 8, ss. 57-60,

incorporates the definitions from the Climate Roadmap Act and reinforces an inclusive community involvement in the environmental decision-making process.[3]

The MEPA Office developed protocols to implement the requirements set forth in the Climate Roadmap Act and 2021 EJ Policy. The *Transition Rules for Public Involvement Requirements for Environmental Justice Populations*, effective June 24, 2021, required all ENFs and expanded ENFs (EENFs) filed with the MEPA Office to identify the location of a project relative to EJ populations as depicted on the EEA's Massachusetts 2020 Environmental Justice Populations mapping tool (EJ Maps Viewer).

MEPA has since finalized the two MEPA EJ Protocols*, MEPA Public Involvement Protocol for Environmental Justice Populations* and *MEPA Interim Protocol for Analysis of Program Impacts on Environmental Justice Populations*, which were effective January 1, 2022, for all new filings. Additionally, MEPA amended its regulations under 301 CMR 11.00, which were promulgated on December 24, 2021. Although this DEIR is not a new filing and therefore not subject to the final protocols and amended regulations, the Authority is voluntarily complying with these updates to the greatest extent practicable and is conducting appropriate and comprehensive outreach and analysis of EJ populations within the EJ Study Area.

2.4.3.1 Definition of an EJ Population

The Climate Roadmap Act defines EJ as "the equal protection and meaningful involvement of all people and communities" regarding environmental issues, laws, regulations, and policies, including the equitable allocation of benefits and burdens. It enacted a new definition of EJ populations in Massachusetts, which includes the following four categories of census block groups with specific demographic characteristics:

- **Income:** The annual median household income is not more than 65 percent of the statewide annual median household income
- **Minority:** Minorities (i.e., individuals who identify themselves as Latino/Hispanic, Black/African American, Asian, Indigenous people, and people who otherwise identify as non-white) comprise 40 percent or more of the population
- **English Language Isolation**: 25 percent or more of households lack English language proficiency
- **Minority + Income:** Minorities comprise 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income

The Secretary of EEA may also designate a geographic portion of a neighborhood as an EJ population.

To understand potential vulnerabilities faced by EJ populations within the EJ Study Area, Vulnerable Health EJ Criteria were identified within the 1-mile radius using the DPH EJ Tool. These criteria include four environmentally related health indicators to determine populations that may have higher than average rates of environmentally related health outcomes, which are:

3 The 2021 EJ Policy also builds upon federal guidelines under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Executive Order 12898 has since been amended under Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, effective January 27, 2021.

- **Heart Attack:** This is evaluated as the 5-year average age-adjusted rates of hospitalizations for heart attack that is equal to or greater than 110 percent of the state rate. Heart attack data is only gathered from people greater than or equal to 35 years of age, and is based on their residential locations, not where the health incident occurred. This is a criterion because air pollution exposure, including particulate matter, can increase the risk for heart attack and other forms of heart disease. This vulnerable health criterion is shown at the community level in the DPH EJ Tool.
- **Childhood Blood Lead Level:** This is evaluated as the 5-year average prevalence of elevated childhood blood lead levels that is equal to or greater than 110 percent of the state rate. This is a criterion because lead exposure from sources, including soil and drinking water contamination, housing, and household items and toys, disproportionately impacts EJ communities. Additionally, low levels of lead exposure to children can cause severe and irreversible health effects. This vulnerable health criterion is shown at the census tract and community level in the DPH EJ Tool.
- **Low Birth Weight:** This is evaluated as the 5-year average low birth weight rate among full-term births that is equal to or greater than 110 percent of the state rate. A baby is considered low birth weight if they were less than 5.5 pounds, and data only considers singleton births. This is a criterion because there is an increased risk of delivering a low-birth-weight baby or a baby having other birth defects when exposed to air and environmental contaminants. Additionally, women of color and women of low income have a higher risk. This vulnerable health criterion is shown at the census tract and community level in the DPH EJ Tool.
- **Childhood Asthma:** This is defined as the 5-year average rate of emergency department visits for childhood asthma that is equal to or greater than 110 percent of the state rate. This is a criterion because EJ populations experience a greater risk of asthma due to an increased exposure to asthma triggers, including air pollution, which impacts one’s overall health and wellbeing. EJ communities also have more limited access to health care services, which is considered a contributing factor. This vulnerable health criterion is shown at the community level in the DPH EJ Tool.

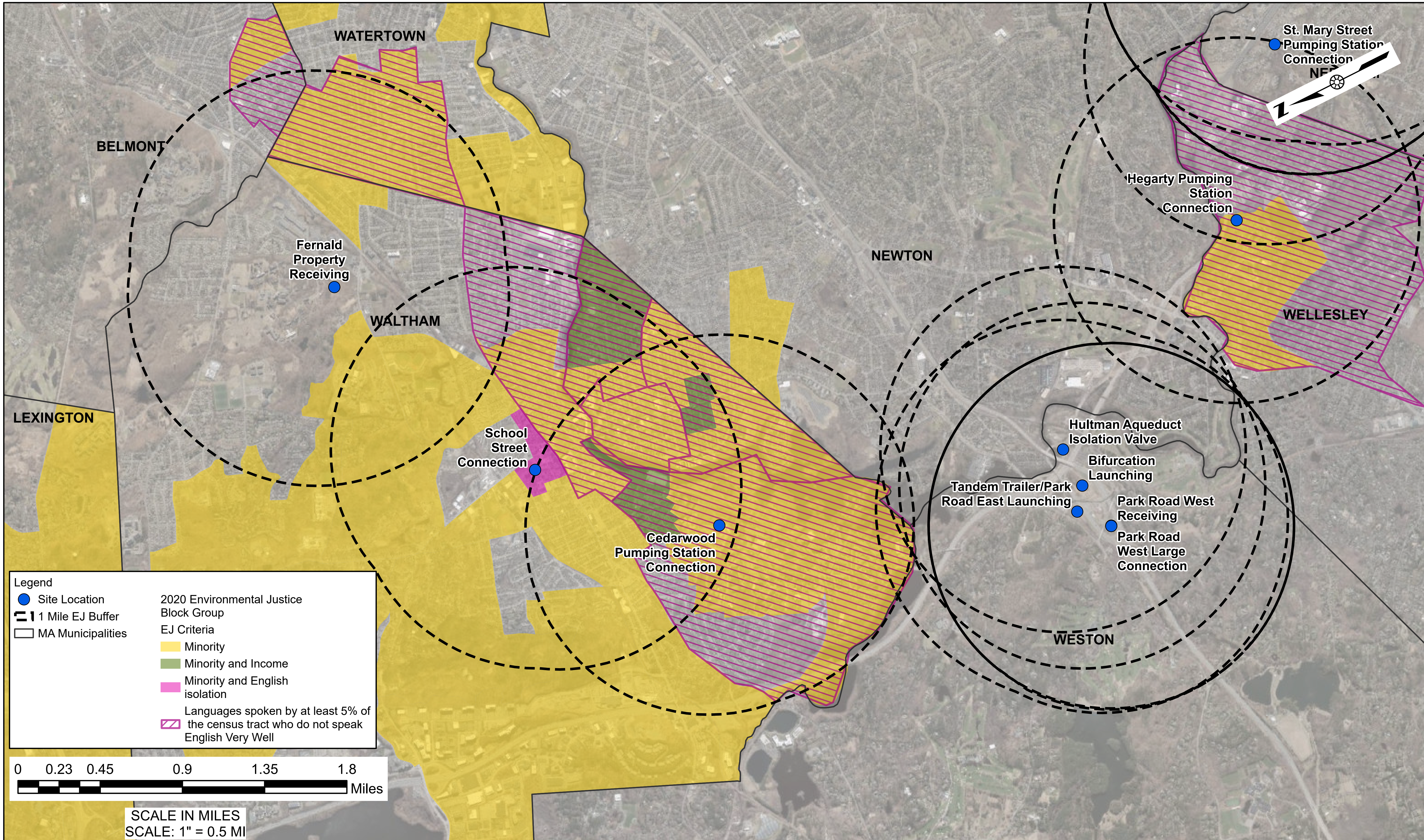
2.4.4 Methodology

This DEIR is not a new filing with MEPA and is therefore not subject to the finalized protocols and amended regulations regardless, the Authority is voluntarily complying with these updates to the greatest extent possible and would conduct appropriate and comprehensive outreach and analysis of EJ populations within the EJ Study Area.

2.4.4.1 Designated Geographic Area

Under the 2021 EJ Policy, projects that impact air quality by meeting or exceeding MEPA review thresholds under 301 CMR 11.03(8)(a) and (b) or that generates 150 or more ADT of diesel vehicle traffic over a duration of 1 year or more, excluding public transit trips, must identify EJ block groups and conduct public outreach to those EJ populations within 5 miles of the project site. Since this Program is complying with the 2021 EJ Policy and Protocols to the greatest extent possible, the MWRA analyzed new ADT of diesel vehicle traffic over 1 year or more at each site instead of analyzing cumulative ADT across all 14 sites because the sites are separated geographically and intersect distinct EJ populations. To closely align with

MEPA's EJ Protocols and amended regulations, the EJ Study Area includes EJ populations defined within a 1-mile radius or buffer around each of the 14 proposed sites (each site has its own DGA, while the EJ Study Area consists of all 14 proposed sites), to assess impacts; this methodology is further explained below. **Figure 2.4-1** through **Figure 2.4-3** depict overview maps of the DGAs for each of the 14 proposed sites.



Metropolitan Water Tunnel Program

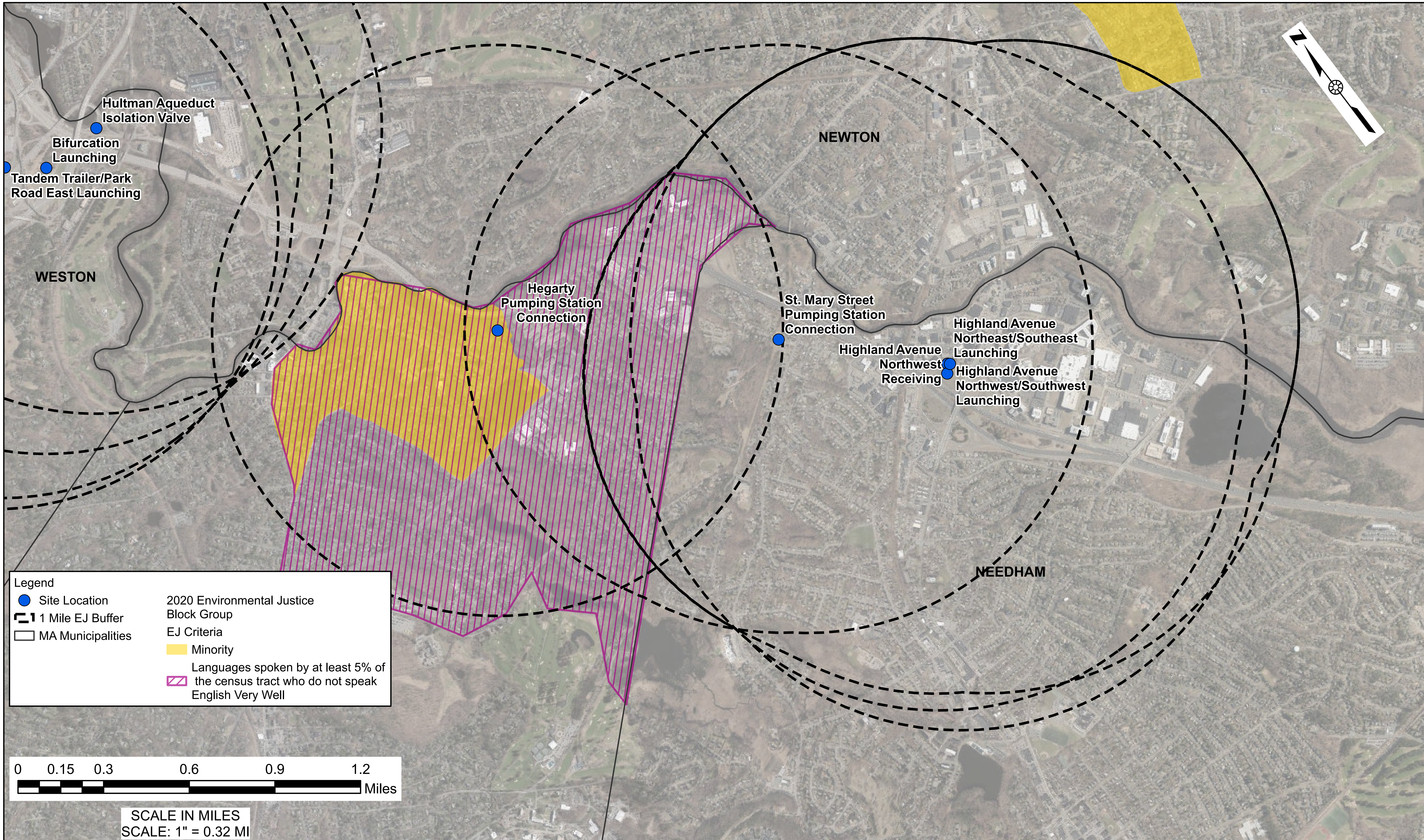
MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
Green International Affiliates, Inc.

Environmental Justice Overview Maps
Panel 1
Figure 2.4-1

Source: MassGIS, NHESP, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

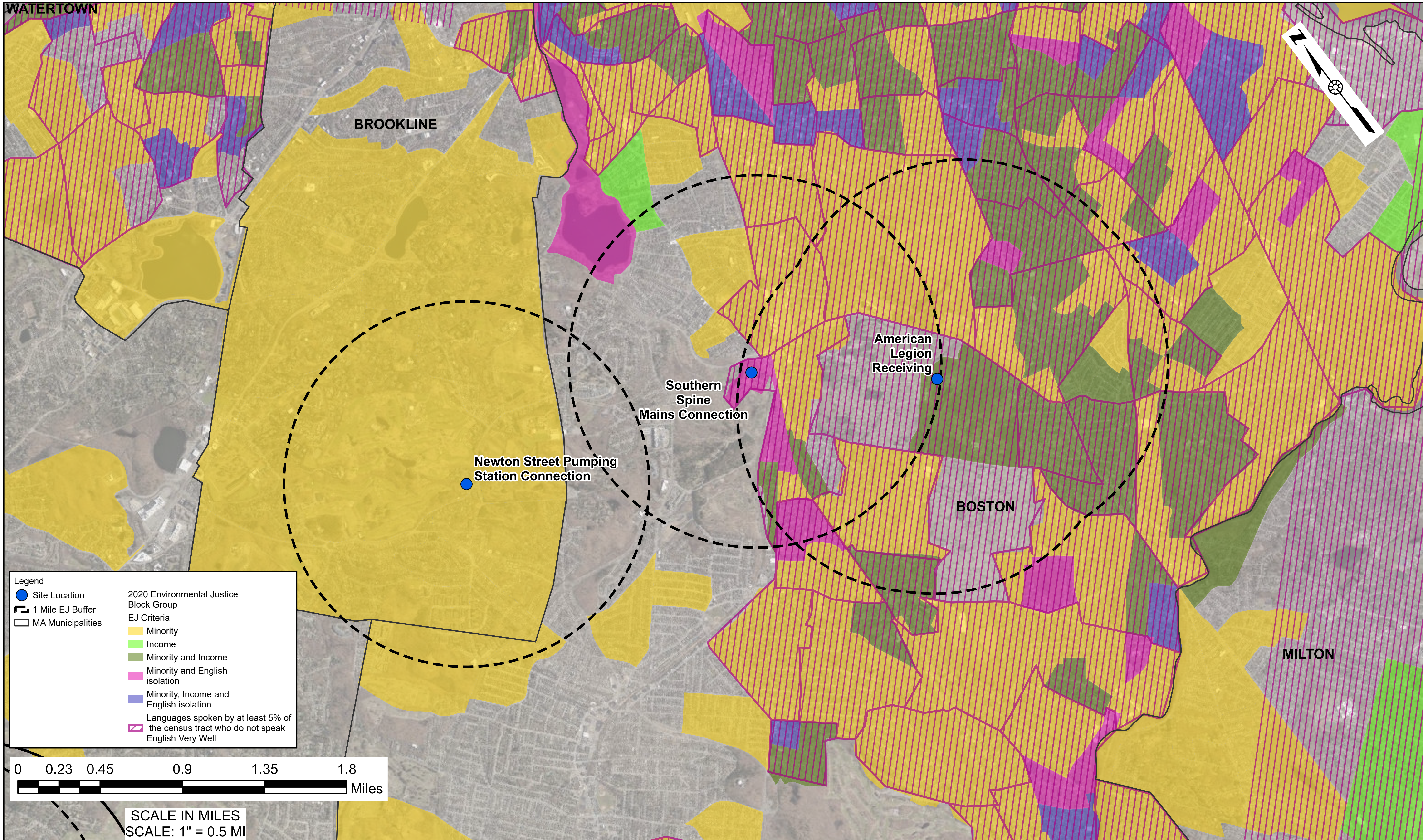
Environmental Justice Overview Maps

Panel 2

Figure 2.4-2

Source: MassGIS, NHESP, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Environmental Justice Overview Maps
Panel 3
Figure 2.4-3

Source: MassGIS, NHESP, MWRA

This page intentionally left blank

2.4.4.2 Existing Conditions Methodology

Online resources, including the EJ Maps Viewer, the DPH EJ Tool, and the RMAT Tool were referenced to understand existing EJ demographics, vulnerabilities, and potential impacts.

The four categories outlined in the RMAT output report are sea-level rise/storm surge, extreme precipitation-urban flooding, extreme precipitation-riverine flooding, and extreme heat. The full RMAT output reports can be found in **Appendix H.**

Identifying EJ Populations and Existing Unfair and Inequitable Environmental Burden

The "2020 Environmental Justice Block Groups" and "Languages Spoken in Massachusetts" data layers from the EJ Maps Viewer, and DPH health criterion data by census tract and community from the DPH EJ Tool, were downloaded for use in ArcGIS Pro for analysis. The "2020 Environmental Justice Block Groups" identified EJ populations at the block group level. The "Languages Spoken in Massachusetts" identified languages spoken by 5 percent or more of the population at the tract level who self-identified as "do not speak English very well" to inform outreach and translation services.

A 1-mile radius (i.e., identified as the DGA in cases of the individual proposed sites, and referred to as the EJ Study Area when discussing the 1-mile radii of all of the proposed sites as a single entity) was defined for every launching, receiving, and connection site using an approximate center-point (i.e., centroid) based on the limit of disturbance (LOD) for that shaft location. A buffer zone of 1 mile from the LOD boundary was established for sites near residential areas with unevenly distributed or separated LODs (Fernald Property site, Tandem Trailer and Park Road East sites, Highland Avenue Northwest/Southwest sites,[4] Highland Avenue Northeast/Southeast sites, American Legion site, School Street site, St. Mary Street Pumping Station site, and Southern Spine Mains site). A buffer zone differs from a radius, as it extends the LOD at all vertices and sides to 1 mile, instead of a circle created from a center point. This ensures a conservative approach to determining potentially disproportionate impacts to EJ block groups in the EJ Study Area.

Using the mapping overlaying capabilities of the GIS, the radius or buffer zone was intersected with the EJ block groups, language isolation, and DPH census tract layers for Heart Attack and Childhood Asthma. This process created a new data layer for each site, which only identified data present within 1 mile, to be contained by the radius or buffer zone visually. Data for each site was exported and summarized in tables in **Section 2.4.5.1** for further analysis. DPH community data is presented before the site-specific DPH data for each of the launching, receiving, and connection sites. All sites that have a block group within one of

4 The Highland Avenue Northwest/Southwest sites had differing LODs depending on the alternative (i.e., Alternative 3 only has one continuous area for its LOD, while Alternatives 4 and 10 share a larger LOD in two segments). A conservative buffer was selected for the 1-mile analysis for the Highland Avenue Interchange, utilizing the combination of the LOD of Alternatives 4 and 10.

these municipalities were identified. Other DPH data, such as MassDEP Major Air and Waste Facilities, were identified for each of the launching, receiving, and connection sites independently.

Data counts identified in the DPH EJ Tool were included in tables in **Appendix B** for transparency; however, it is important to note that not all census tract or community counts are necessarily statistically correlated to environmental factors. The following provides additional explanation about the columns in this Report and the appendix:

- **Case Count and Rate per 1,000 or 10,000:** The case count values identify how many cases have occurred in that census tract or community in the given year range. Individual cases may be counted multiple times in different calendar years. The number of cases is compared to the total population to determine a rate, which is a measure of the frequency with which a health criterion occurs in a defined population.
- **Statewide Rates and 110 percent of Statewide Rates:** As case counts and rates are determined per census tract or community in the given year range, so are case counts and rates for the entire Commonwealth of Massachusetts. If a census tract or community's rate is greater than the 110 percent of the statewide rate, which is the statewide rate multiplied by a factor of 1.1, the census tract or community can be identified as a particular concern. A census tract or community health criterion rate greater than 110 percent of the statewide rate is an additional vulnerability marker to statistical significance.
- **Statistical Significance and Confidence Intervals:** The Massachusetts Environmental Public Health Tracking (MA EPHT) defines statistical significance as the likelihood that the difference found between groups was not due to chance alone. Statistical significance can be based on the use of statistical tests and comparison of confidence intervals. With a 95-percent confidence interval, there is a possibility that those identified as "not statistically different" or "statistically significantly lower" are not due to chance, and that those "statistically significantly higher" are due to chance. Overlapping confidence intervals indicate that any difference in the screening or prevalence observed may be due to chance. Confidence intervals that do not overlap are considered statistically significant and indicate a small likelihood that the difference is due to chance.[5]
- **Stability:** Stability refers to the reliability of the rate; when there are too few cases, the rate is unstable or considered unreliable.[6]

5 Commonwealth of Massachusetts. 2021. *Massachusetts Environmental Public Health Tracking, MA EPHT All Inclusive glossary*. https://matracking.ehs.state.ma.us/Glossary/index.html.

6 Commonwealth of Massachusetts. 2021. *MA DPH Environmental Justice Tool.* https://matracking.ehs.state.ma.us/Environmental-Data/ej-vulnerable-health/environmental-justice.html

Analysis of Program Impacts to Determine Disproportionate Adverse Effect

To determine if there is disproportionate burden on EJ communities, impacts and planned mitigation for each of the alternatives and construction period must be determined. If there is no impact, either before or after planned mitigation, there would be no disproportionate adverse effect. If there is an impact that is felt equally by both EJ communities and non-EJ communities, there would be an impact but no disproportionate adverse effect. If only EJ communities were impacted, even if there are no non-EJ communities in close proximity, there would be a disproportionate impact. This is a compounded concern if non-EJ communities would benefit from the Program but would not experience negative impacts. If the impacted EJ community also has an identified vulnerable health criterion, any exacerbations of this health criterion (e.g., particulate matter from soil movement during construction activities) would have to be identified and mitigated. Evaluation of impacts and mitigation to launching, receiving, and connection sites are identified in **Section 2.4.6** through **Section 2.4.8**.

2.4.5 Existing Conditions

Details of the existing EJ populations, languages other than English spoken by at least 5 percent of the population, and relevant DPH data were identified and summarized for each launching, receiving, and connection site in the sections below. DPH health vulnerabilities for each of the applicable municipalities were listed prior to the specific site sections and detail which sites fall within those municipalities. **Figure 2.4-4** through **Figure 2.4-19** depict the EJ populations and languages spoken data within 1 mile of each of the sites.

Table 2.4-1 summarizes the number of EJ block groups present within the EJ Study Area, approximate area of EJ block groups in terms of the site's DGA, and whether the Program site's LOD falls within an EJ block group. This table is useful in determining potential disproportionate adverse effects in **Section 2.4.6** and **Section 2.4.8**.

2.4.5.1 Summary of EJ Populations Within the Designated Geographic Area

This section summarizes the existing EJ populations and languages other than English spoken by at least 5 percent of the population, within 1 mile of each shaft site (see **Table 2.4-1**). **Figure 2.4-4** through **Figure 2.4-19** illustrate these details by site.

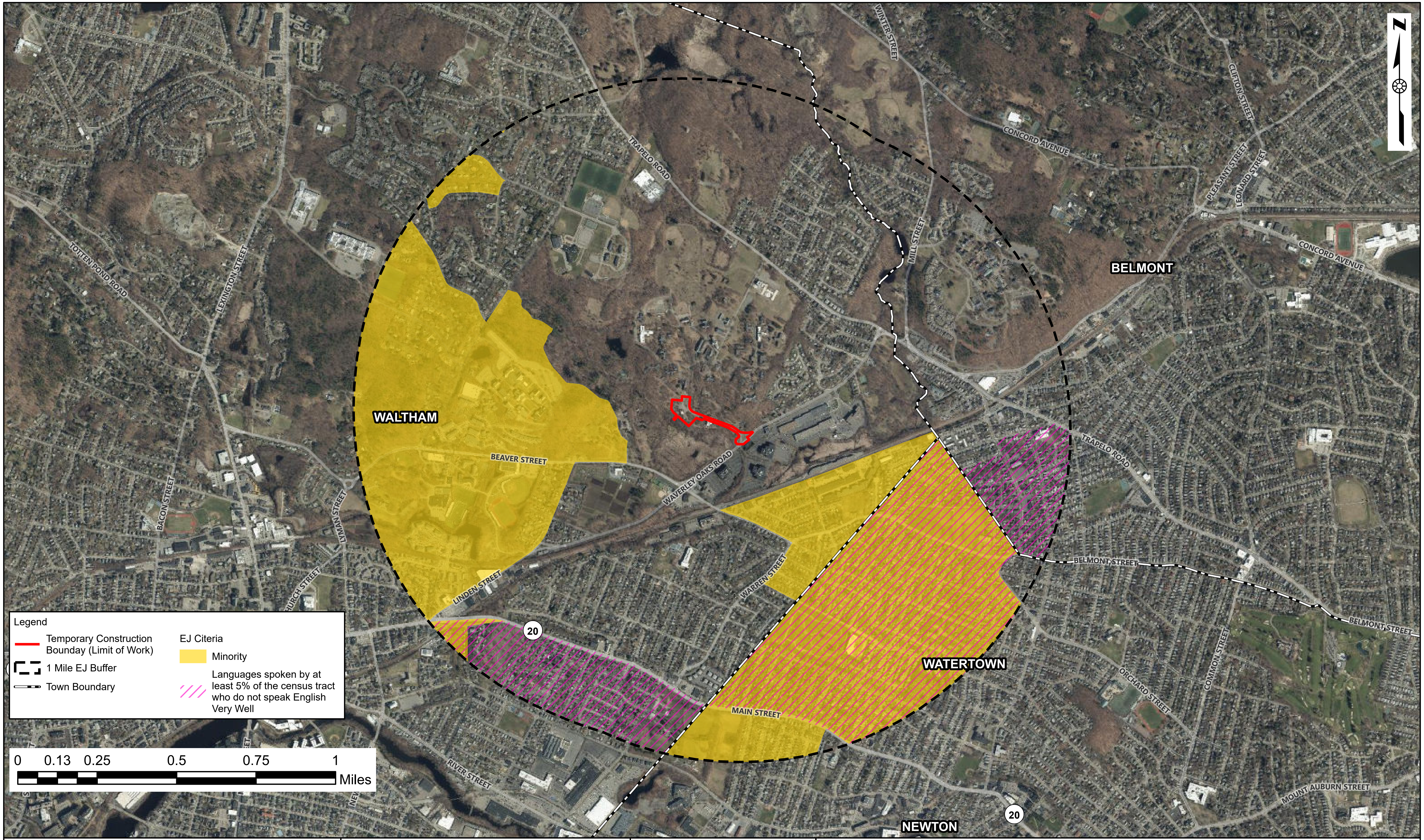
EJ populations are present within 1 mile of all shaft sites, except the Park Road West site. Based on a review of the existing EJ populations and anticipated Program-related impacts, no disproportionate impacts would be anticipated for any identified EJ population at any of the sites, please see **Table 2.4-1**. Additionally, this important new infrastructure would provide redundancy for MWRA's existing Metropolitan Tunnel System, which would substantially benefit EJ and non-EJ populations by reducing the risk of interrupted water supply during unexpected events.

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.



Metropolitan Water Tunnel Program

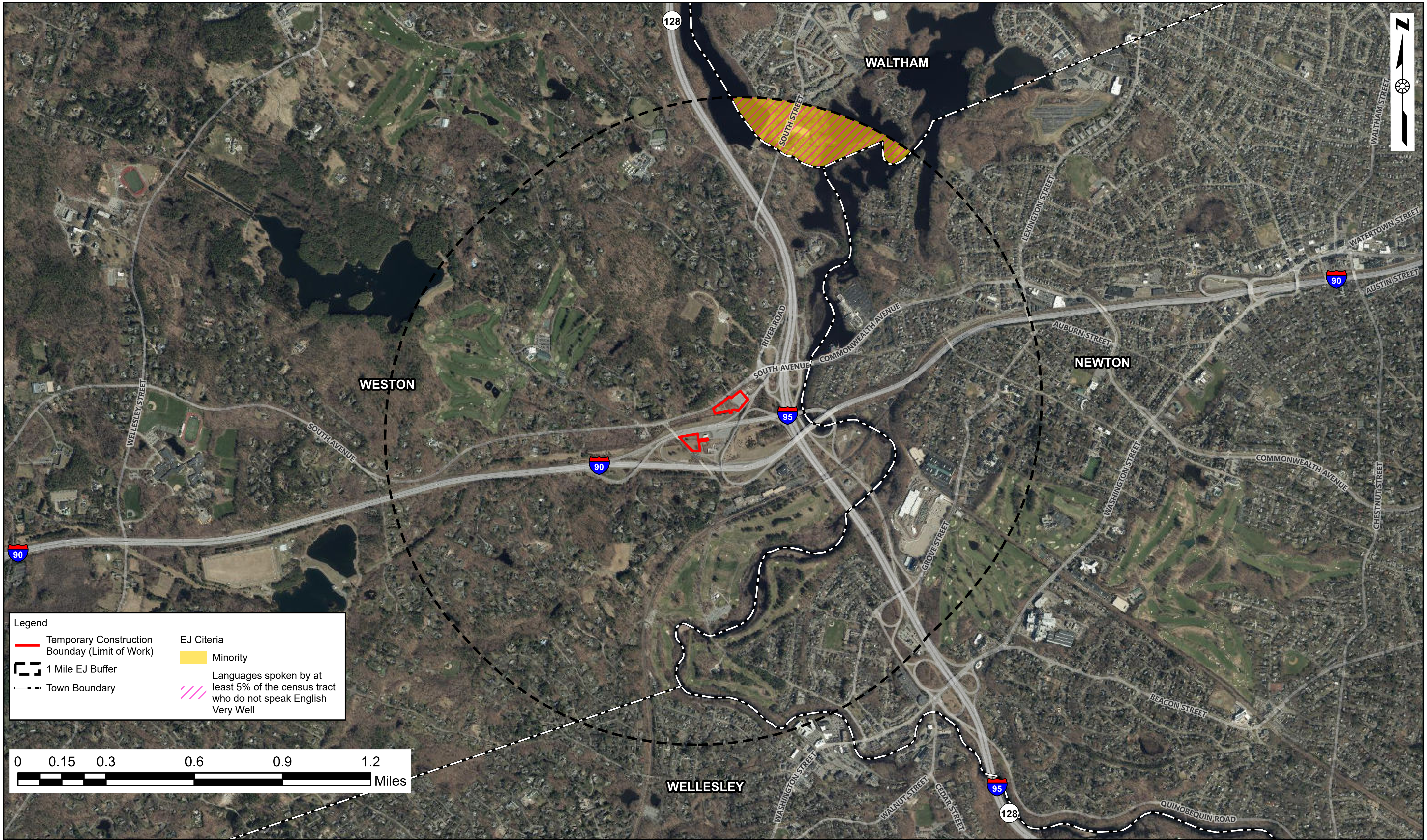
MWRA Contract No. 7159
Draft Environmental Impact Report
2022

Environmental Justice
Fernald Property Receiving
Figure 2.4-4

Waltham, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

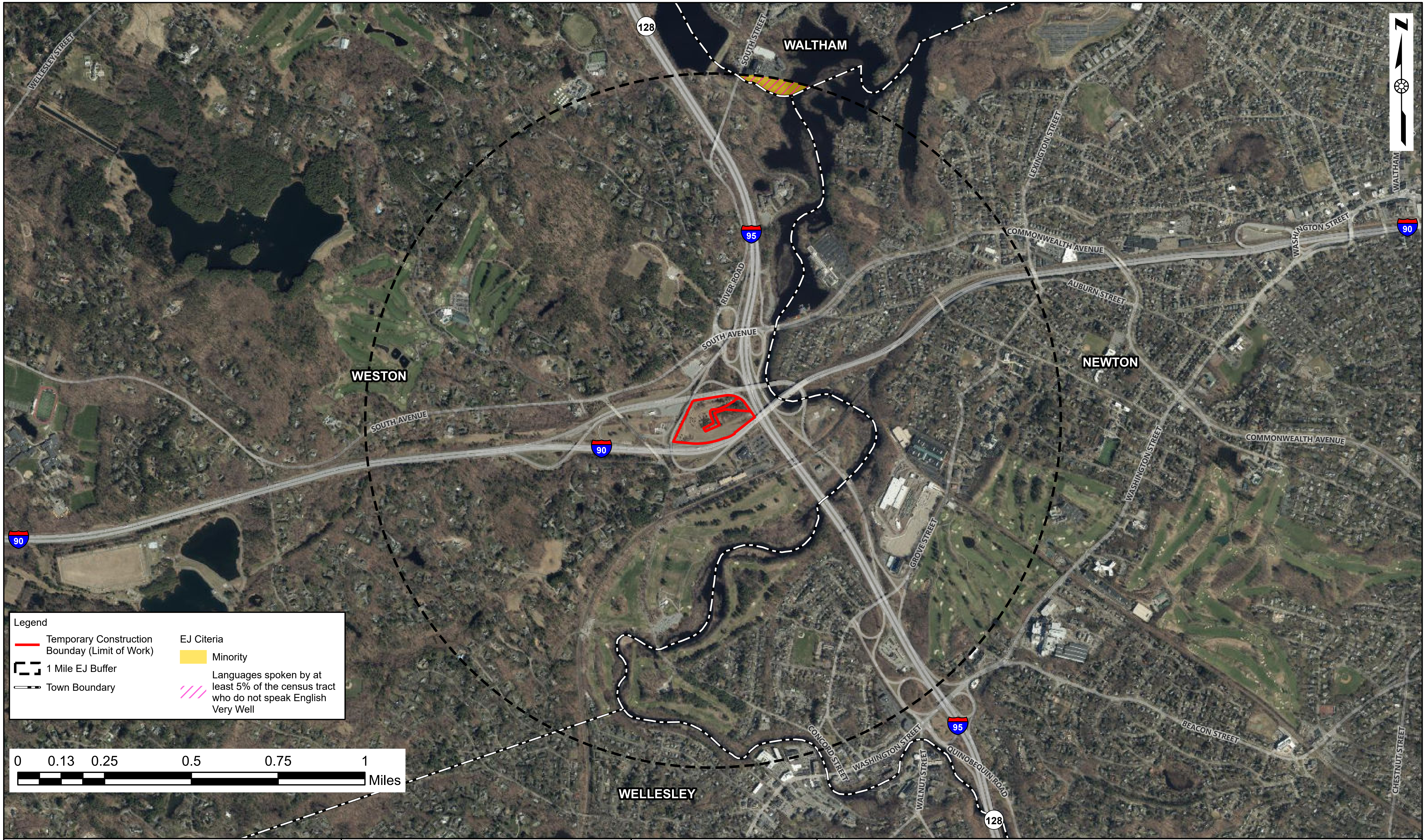
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Environmental Justice
Tandem Trailer/Park Road East Launching
Figure 2.4-5

Weston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

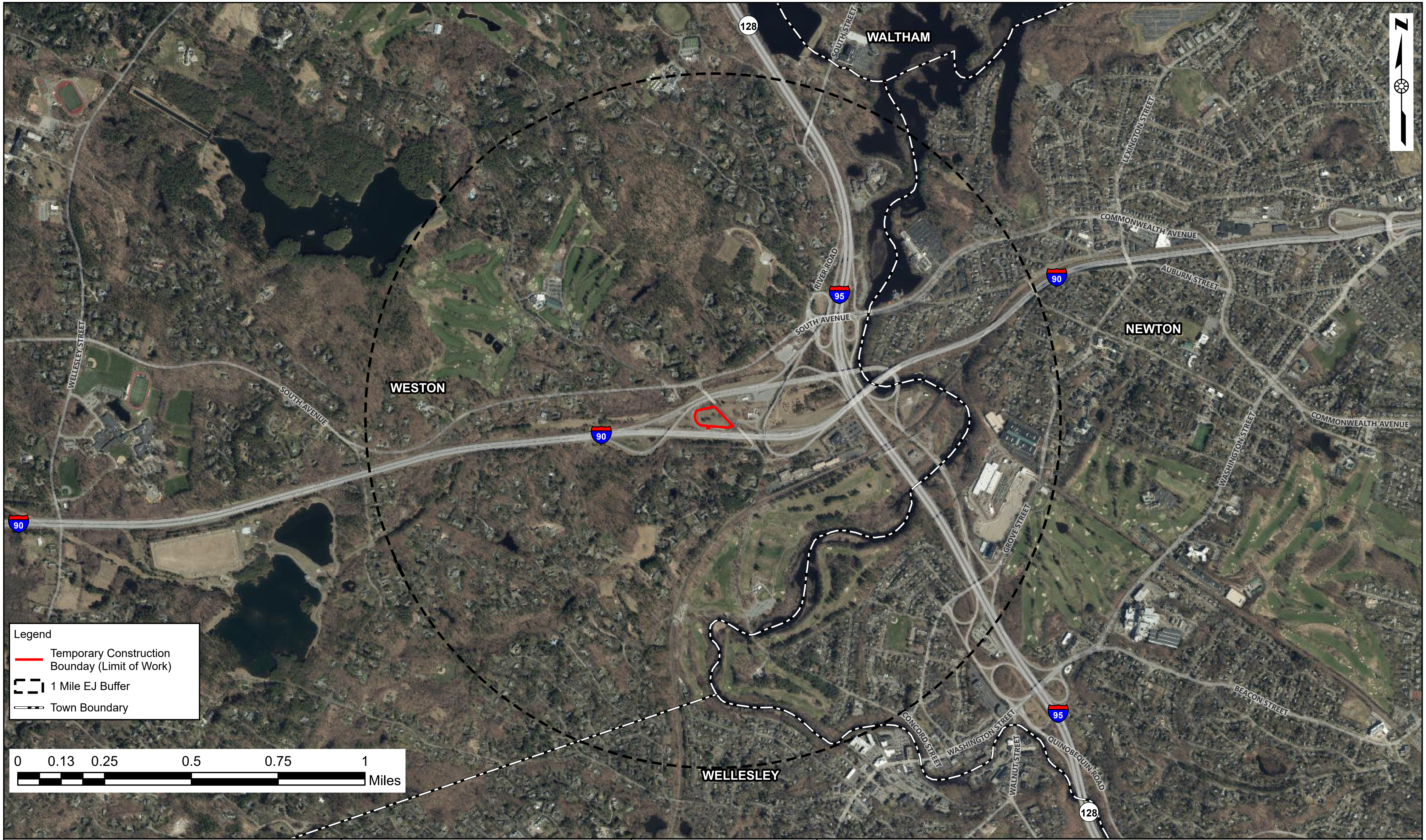
MWRA Contract No. 7159
Draft Environmental Impact Report
2022

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Environmental Justice
Bifurcation Launching
Figure 2.4-6
Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

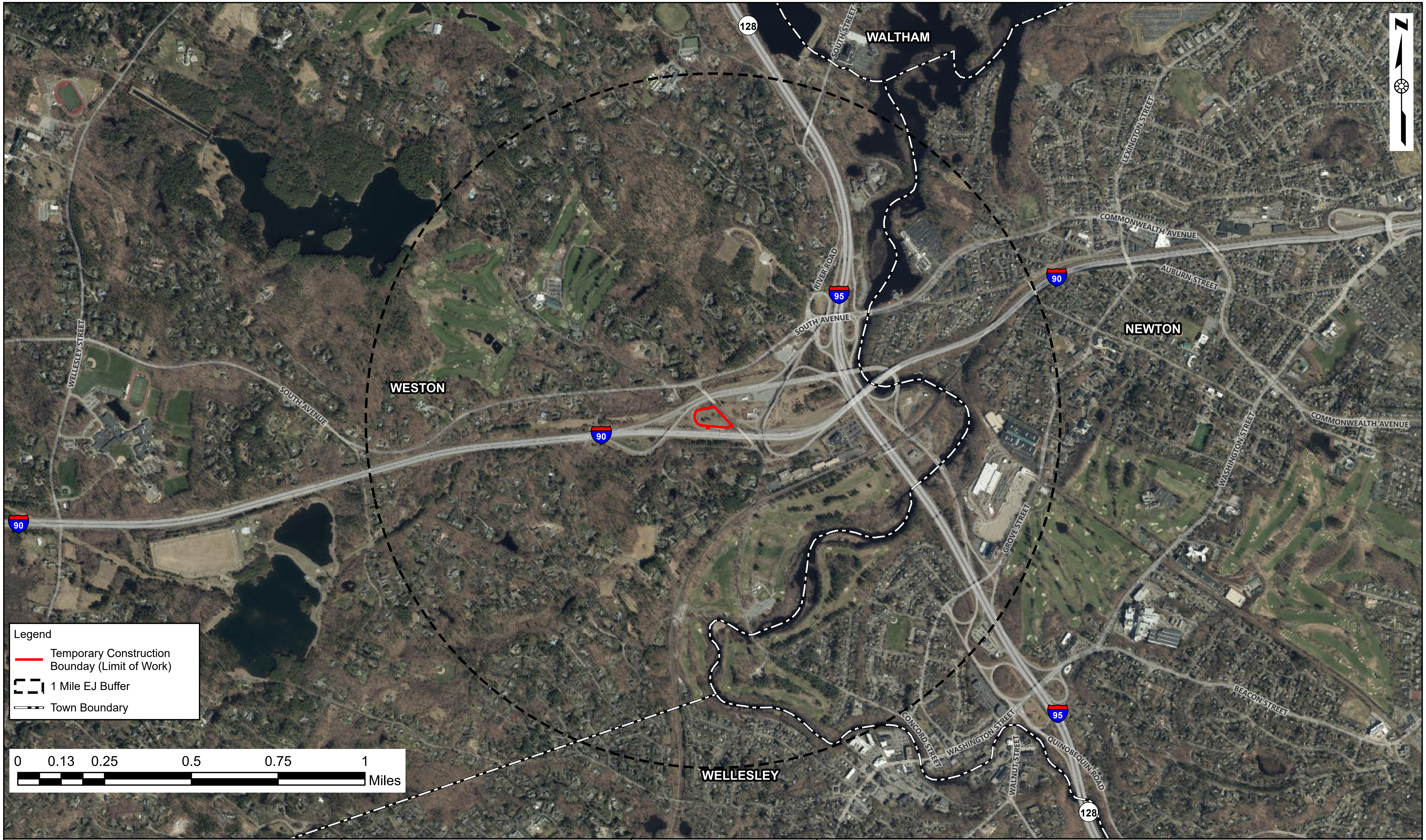
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Environmental Justice
Park Road West Receiving
Figure 2.4-7

Weston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

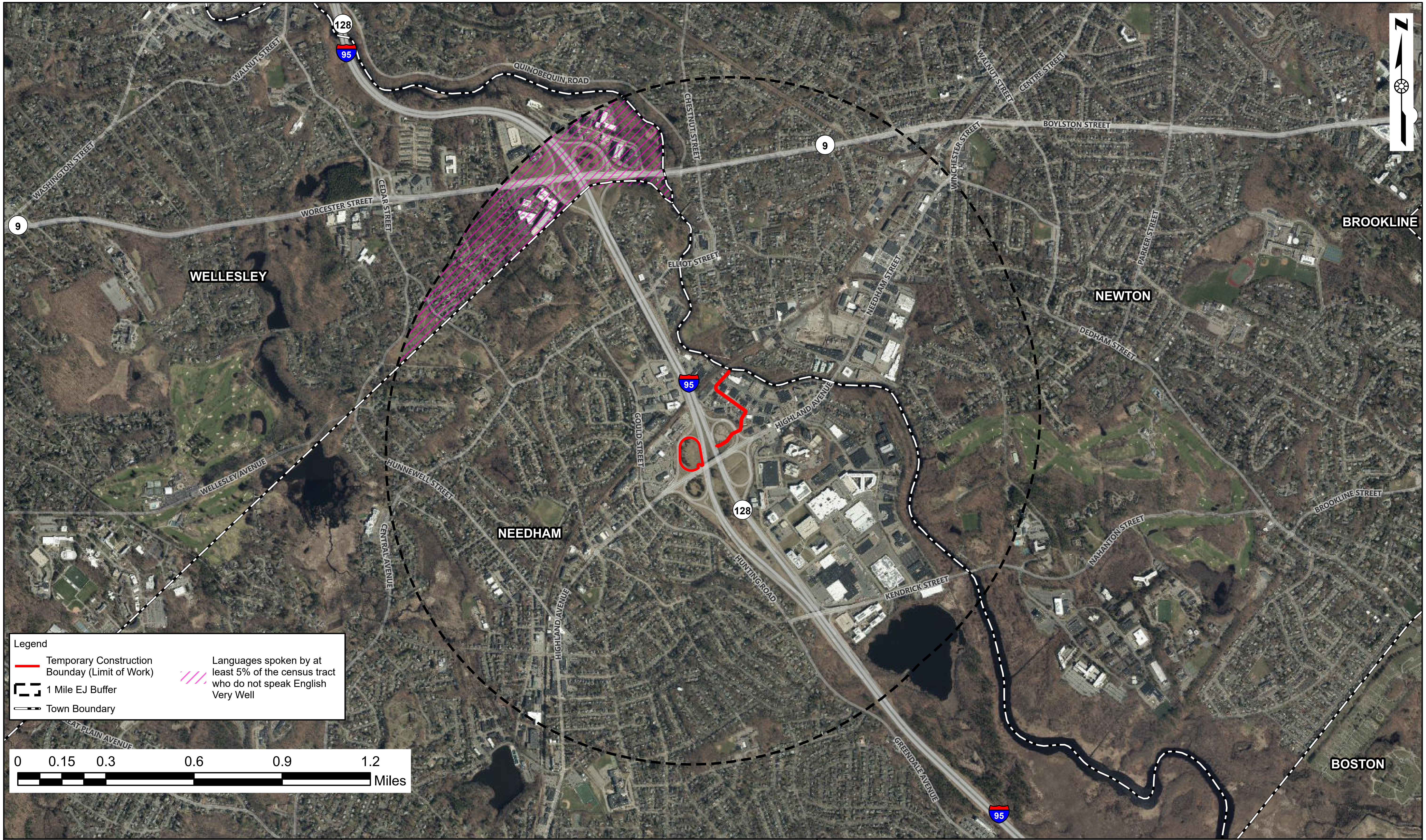
MWRA Contract No. 7159
Draft Environmental Impact Report
2022

Environmental Justice
Park Road West Large Connection
Figure 2.4-8

Weston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

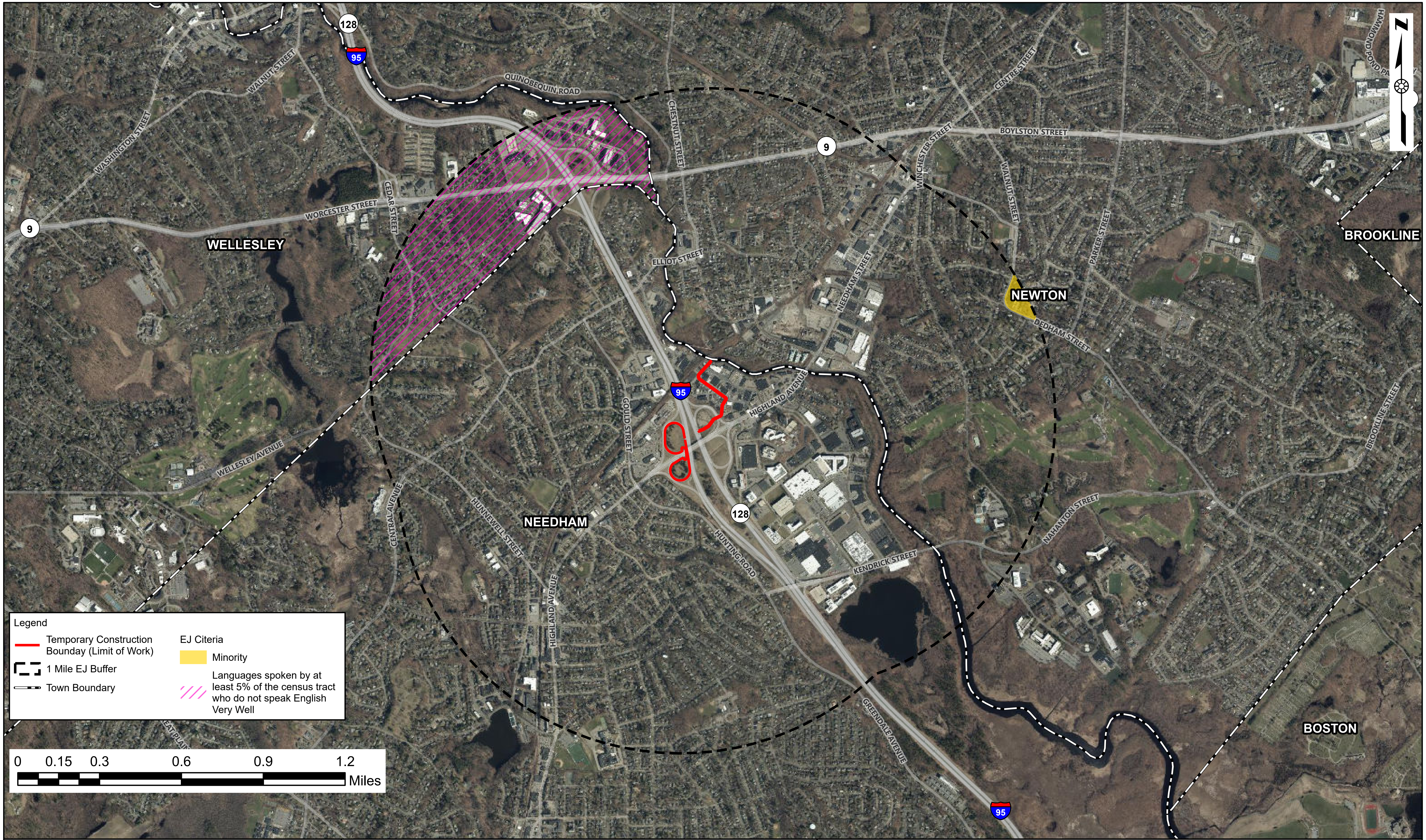
CDM Smith
in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Environmental Justice
Highland Avenue Northwest Receiving
Figure 2.4-9

Needham, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

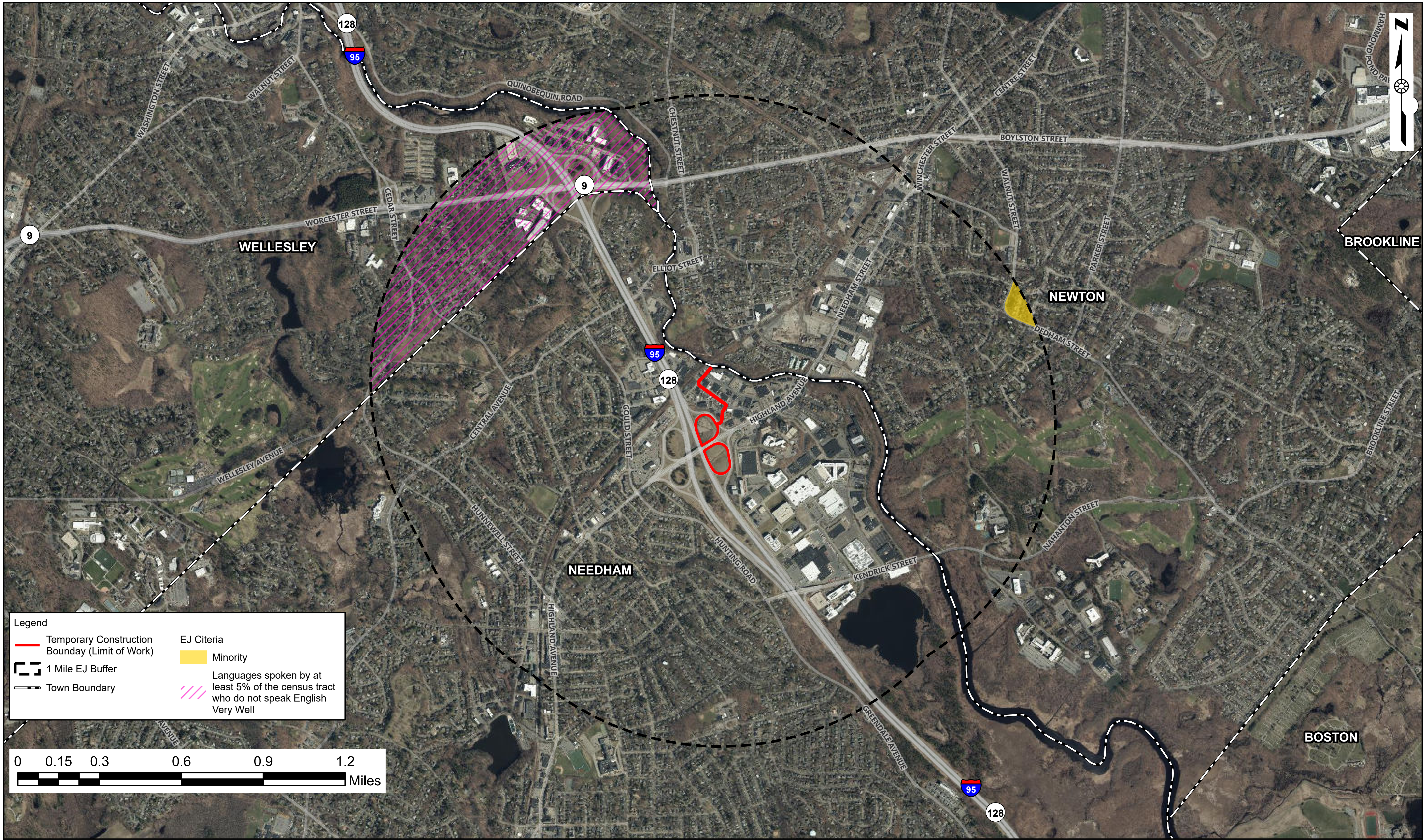
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Needham, MA

Environmental Justice
Highland Avenue Northwest/Southwest Launching
Figure 2.4-10

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

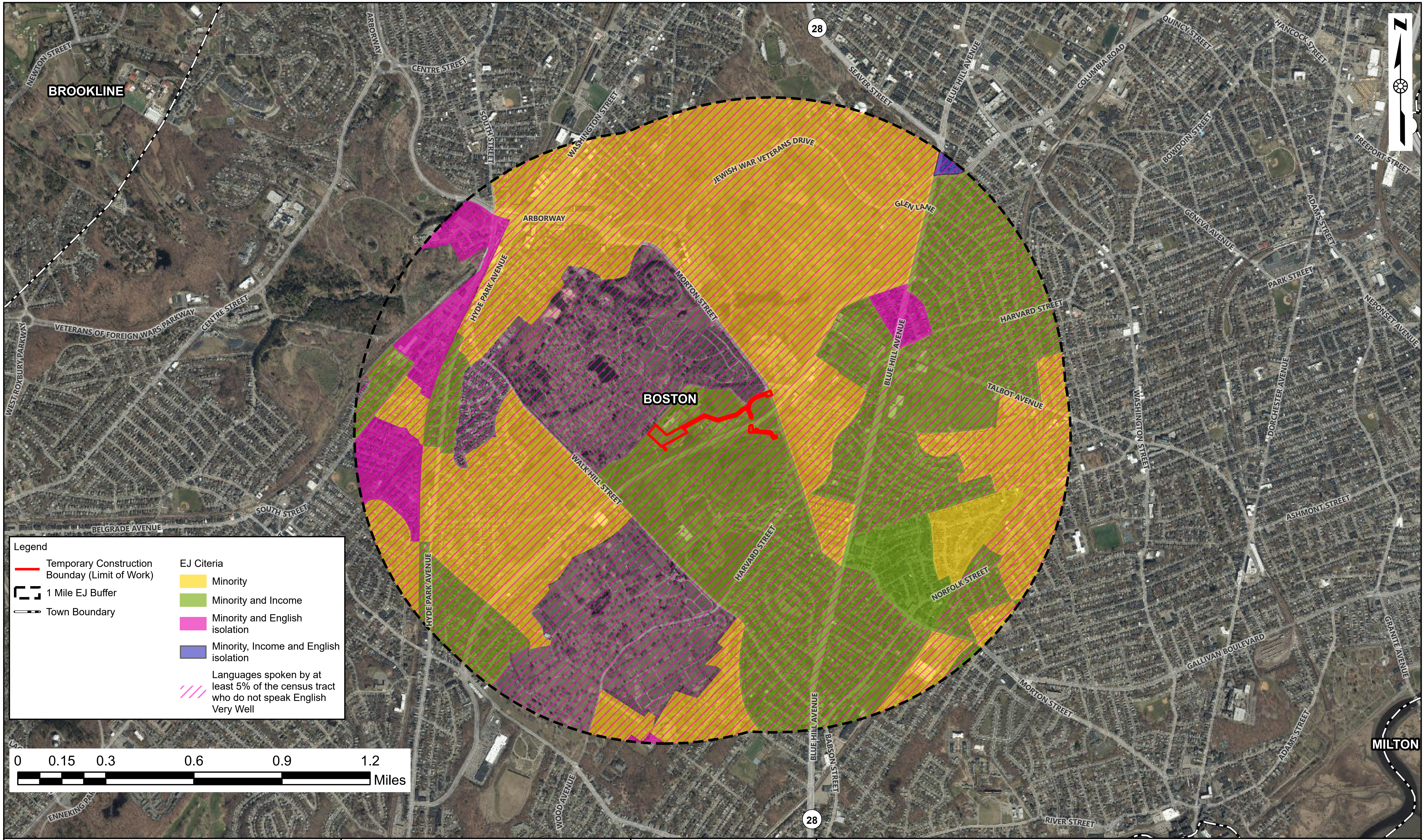
MWRA Contract No. 7159
Draft Environmental Impact Report
2022

Environmental Justice
Highland Avenue Northeast/Southeast Launching
Figure 2.4-11

Needham, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

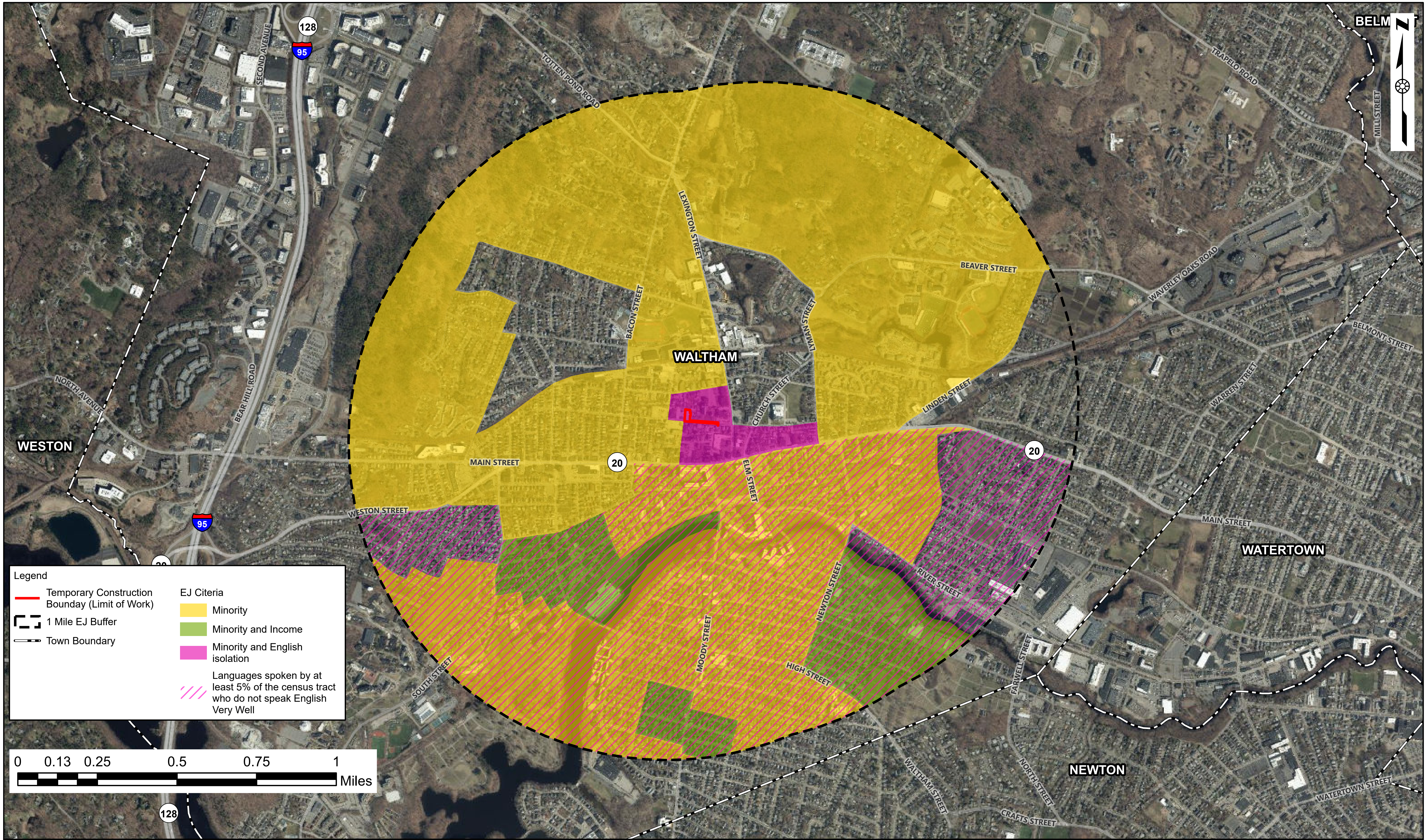
MWRA Contract No. 7159
Draft Environmental Impact Report
2022

Environmental Justice
American Legion Receiving
Figure 2.4-12

Boston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

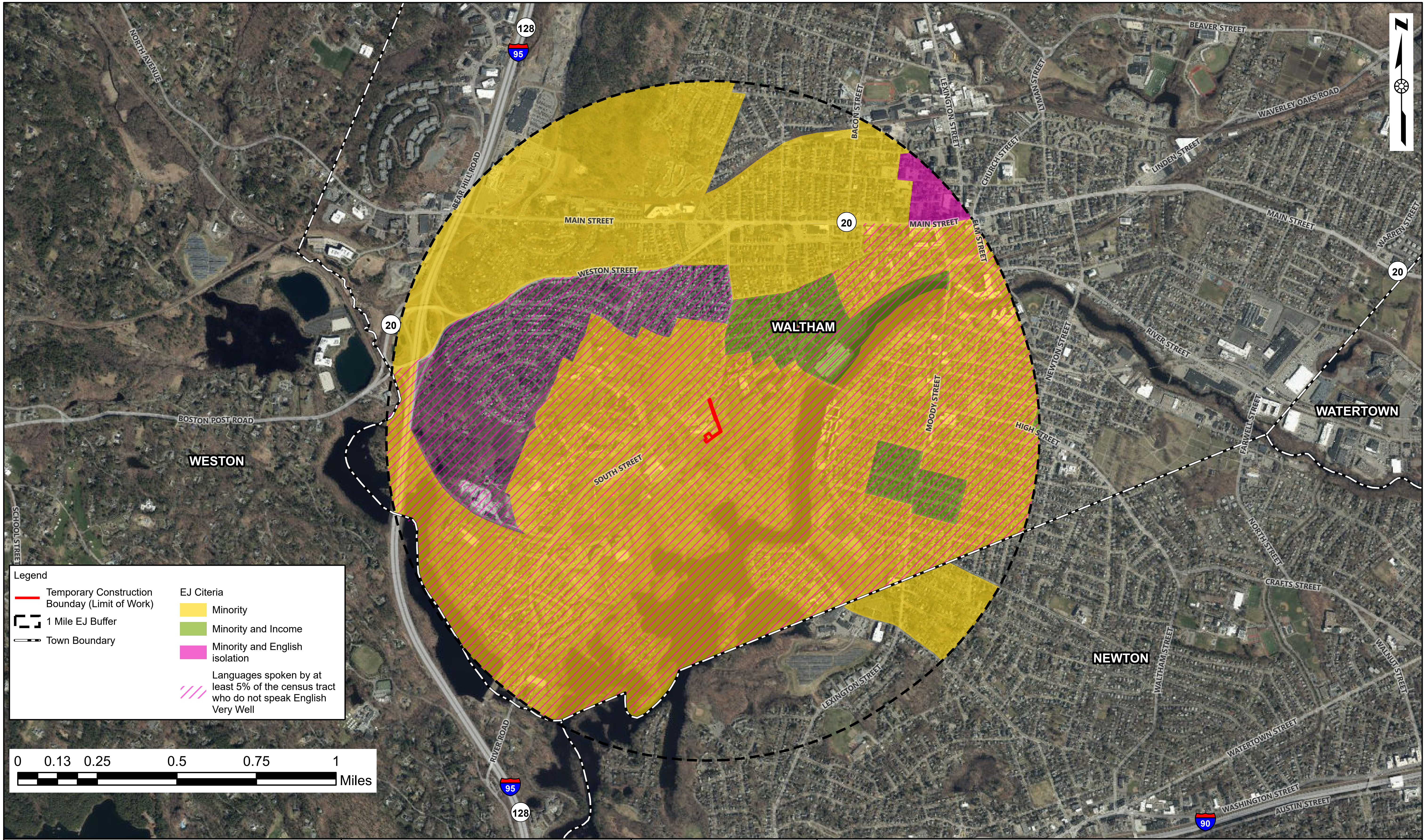
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, MA

Environmental Justice
School Street Connection
Figure 2.4-13

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

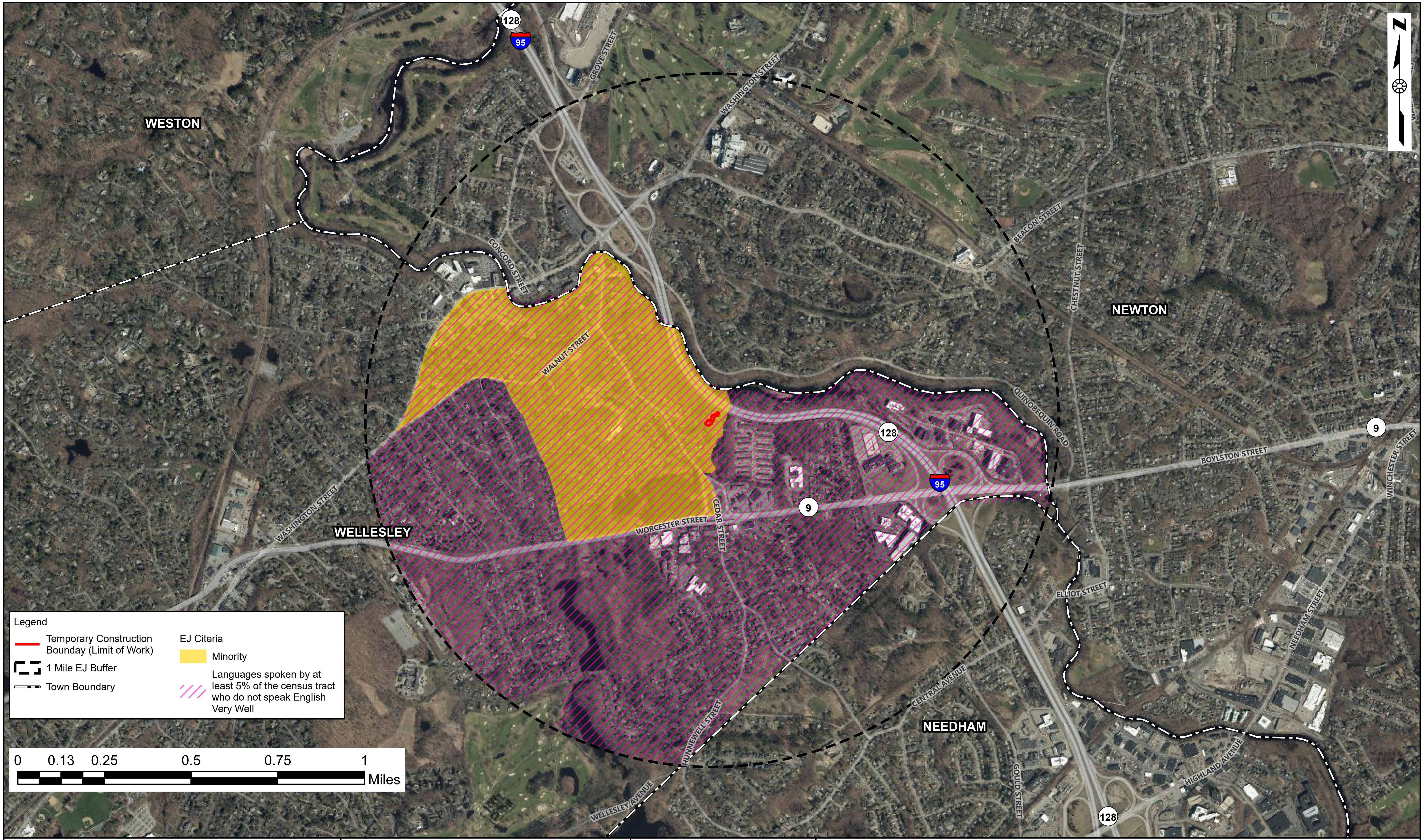
MWRA Contract No. 7159
Draft Environmental Impact Report
2022

CDM Smith
in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, MA

Environmental Justice
Cedarwood Pumping Station Connection
Figure 2.4-14
Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

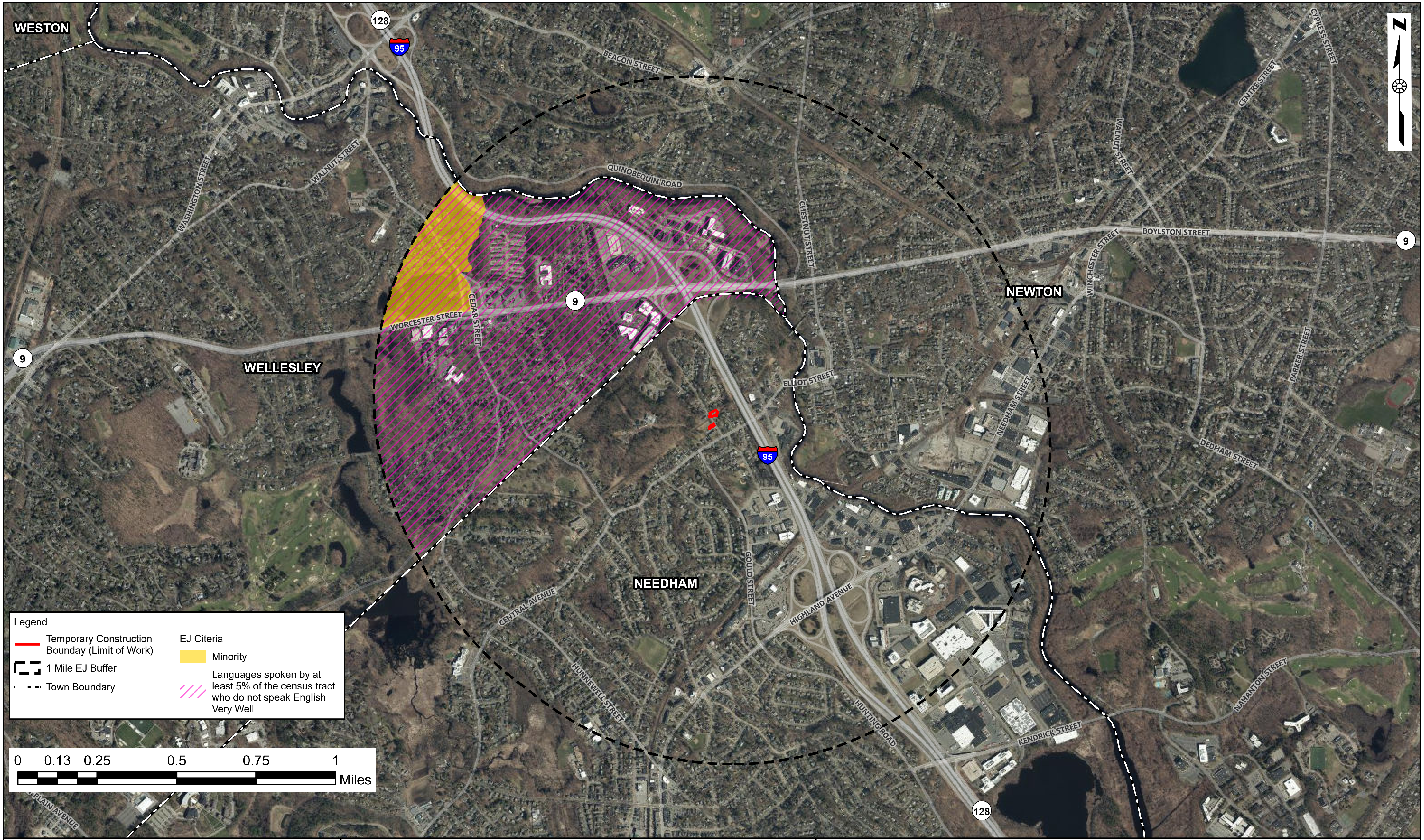
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Environmental Justice
Hegarty Pumping Station Connection
Figure 2.4-15

Wellesley, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

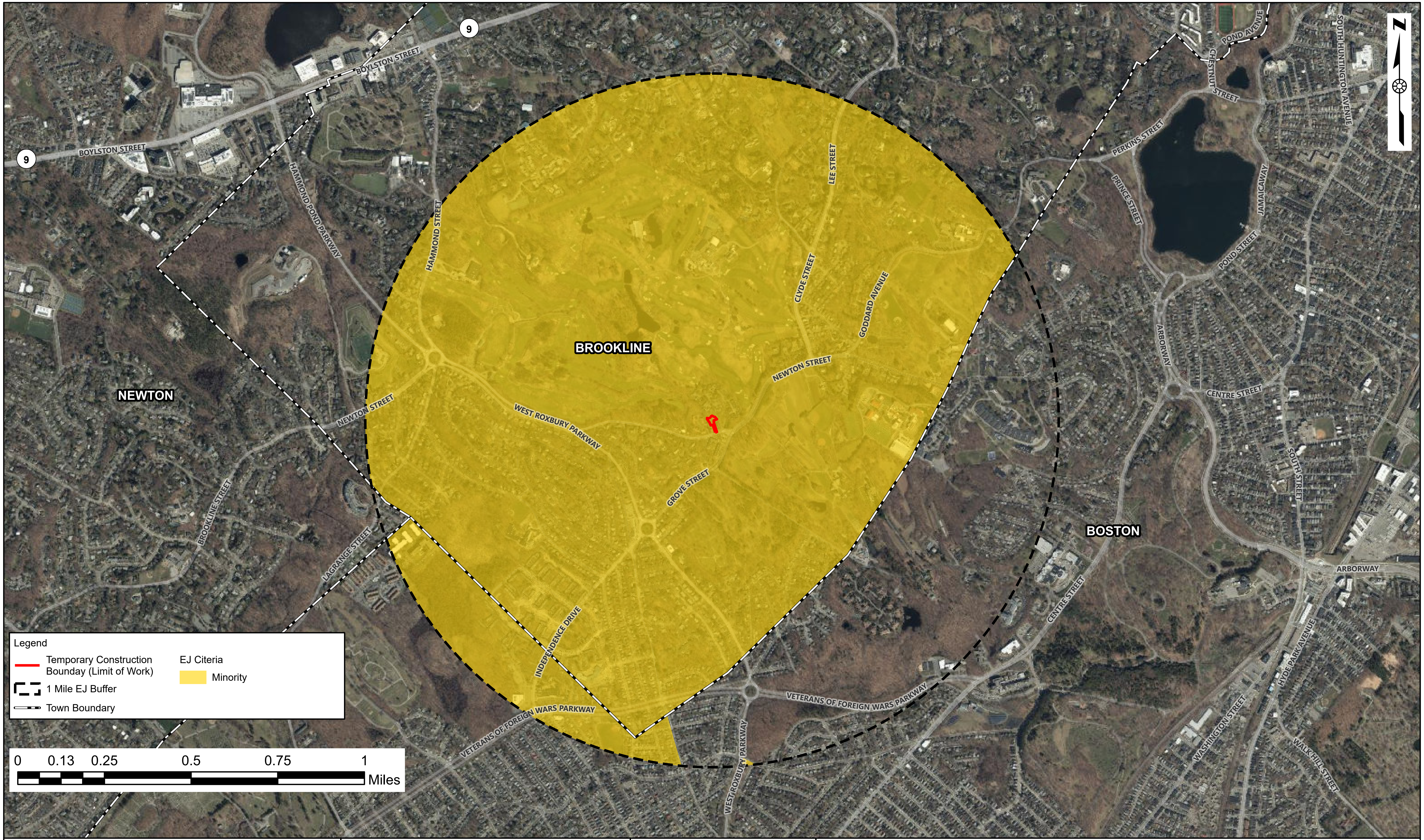
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Environmental Justice
St. Mary Street Pumping Station Connection
Figure 2.4-16

Needham, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

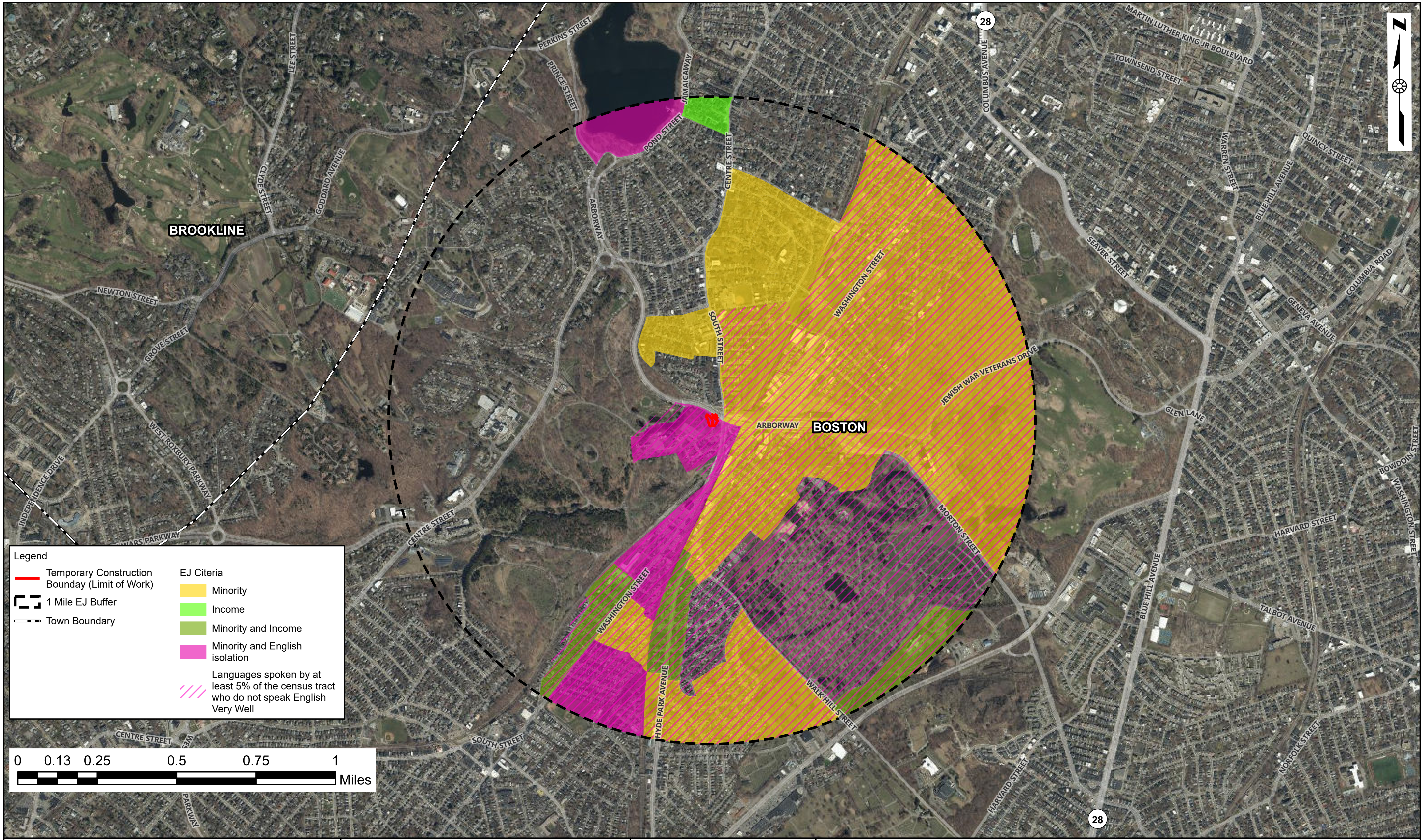
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Brookline, MA

Environmental Justice
Newton Street Pumping Station Connection
Figure 2.4-17

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

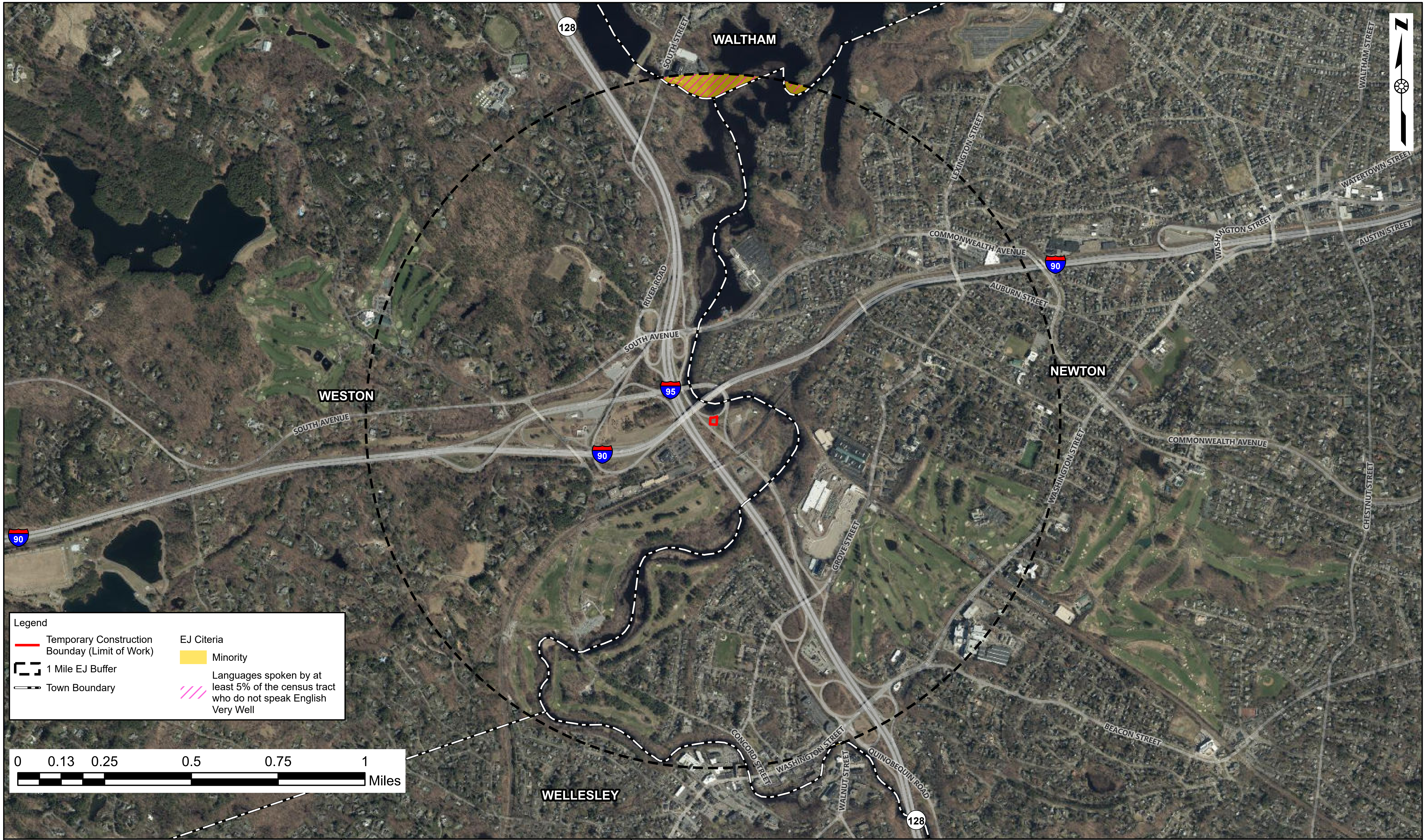
MWRA Contract No. 7159
Draft Environmental Impact Report
2022

Environmental Justice
Southern Spine Mains Connection
Figure 2.4-18

Boston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report
2022

CDM Smith in association with vhb
Jacobs GREEN

Environmental Justice
Hultman Aqueduct Isolation Valve
Figure 2.4-19

Weston, MA

Source: MassGIS, MWRA

This page intentionally left blank

Table 2.4-3 Census Tract DPH Health Criteria Summary by Site Within 1 Mile of Sites

Proposed Site	EJ Population Present?	Elevated Blood Lead Prevalence[1]		Low Birth Weight	
		Statistically Significant?	>110% Statewide Rate?[2]	Statistically Significant?	>110% Statewide Rate?[2]
Fernald Property	Yes	No	Yes	No	Yes
Bifurcation	Yes	No	No	No	No
Tandem Trailer and Park Road East	Yes	No	No	No	No
Park Road West	No	No	No	No	No
Highland Avenue Northwest/Southwest	Yes	No	No	No	No
Highland Avenue Northeast/Southeast	Yes	No	No	No	No
American Legion	Yes	Yes	Yes	No	Yes
School Street	Yes	Yes	Yes	No	Yes
Cedarwood Pumping Station	Yes	Yes	Yes	No	Yes
Hegarty Pumping Station	Yes	No	No	No	No
St. Mary Street Pumping Station	Yes	No	No	No	No
Newton Street Pumping Station	Yes	No	No	No	Yes
Southern Spine Mains	Yes	No	Yes	No	Yes
Hultman Aqueduct Isolation Valve	Yes	No	No	No	No

Source: DPH EJ Tool, 2021.

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 2.4-3 and **Table 2.4-2** show if a proposed site has at least one EJ block group that has a DPH health vulnerability, at either the census tract or community level, and is elaborated on further in each of the site sections and in **Appendix B**. The EJ census blocks within 1 mile of American Legion, School Street, and Cedarwood Pumping Station sites are within census tracts that have rates of Elevated Blood Lead Prevalence per 1,000 that are significantly higher than the state rate shown in **Table 2.4-4**.

The Heart Attack and Childhood Asthma criteria are only presented at the community level. **Table B-1** through **Table B-9** in **Appendix B** present these vulnerabilities, as well as Elevated Blood Lead Prevalence and Low Birth Weight Rate per 1,000 at the community level, respectively, for all municipalities that fall within the DGA. Vulnerable health criteria at the community level in Boston were identified as significantly higher compared to the state rate, which pertains to American Legion, Newton Street Pumping Station, and Southern Spine Mains sites. While Elevated Blood Lead Prevalence and Low Birth Weight were identified as significantly higher at the community level in some municipalities, these findings do not directly correlate to the census tracts that include EJ census blocks because these data are presented at the community level. The census tract-level data better depicts potential vulnerabilities relevant to the EJ block groups present in that census tract. As there are no census tract level-data for Heart Attack and Childhood Asthma, community level data would be used to depict vulnerabilities in EJ block groups.

Table 2.4-2 Anticipated Program-related Impacts to Environmental Justice Populations by Alternative and Site

Alt	Proposed Site	EJ Block Groups Within 1 Mile?	LOD within EJ Block Group?	Phase of Potential Impact	Traffic (I/DI)		Air Quality (I/DI)		Noise and Vibration (I/DI)		Hazardous Materials (I/DI)		Natural Resources (I/DI)		Community Resources (I/DI)	
3	Fernald Property (Receiving)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Bifurcation (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Tandem Trailer and Park Road East (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Highland Avenue Northwest/ Southwest (Receiving)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Highland Avenue Northeast/ Southeast (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	American Legion (Receiving)	Yes	Yes	Construction	Y	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	School Street (Connection)	Yes	Yes	Construction	Y	N	N	N	Y	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Cedarwood Pumping Station (Connection)	Yes	Yes	Construction	N	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Hegarty Pumping Station (Connection)	Yes	Yes	Construction	N	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	St. Mary Street Pumping Station (Connection)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Newton Street Pumping Station (Connection)	Yes	Yes	Construction	Y	N	N	N	Y	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Southern Spine Mains (Connection)	Yes	Yes	Construction	Y	N	N	N	N	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Hultman Aqueduct Isolation Valve (Connection)	Yes	Yes	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
4	Fernald Property (Receiving)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Tandem Trailer and Park Road East (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Park Road West (Receiving)	No	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Highland Avenue Northwest/Southwest (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Highland Avenue Northeast/Southeast (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N

Table 2.4-2 Anticipated Program-related Impacts to Environmental Justice Populations by Alternative and Site

Alt	Proposed Site	EJ Block Groups Within 1 Mile?	LOD within EJ Block Group?	Phase of Potential Impact	Traffic (I/DI)		Air Quality (I/DI)		Noise and Vibration (I/DI)		Hazardous Materials (I/DI)		Natural Resources (I/DI)		Community Resources (I/DI)	
	American Legion Receiving (Receiving)	Yes	Yes	Construction	Y	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	School Street (Connection)	Yes	Yes	Construction	Y	N	N	N	Y	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Cedarwood Pumping Station (Connection)	Yes	Yes	Construction	N	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Hegarty Pumping Station (Connection)	Yes	Yes	Construction	N	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	St. Mary Street Pumping Station (Connection)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Newton Street Pumping Station (Connection)	Yes	Yes	Construction	Y	N	N	N	Y	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Southern Spine Mains (Connection)	Yes	Yes	Construction	Y	N	N	N	N	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Hultman Aqueduct Isolation Valve (Connecting)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
10	Fernald Property (Receiving)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Park Road West (Large Connection)	No	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Highland Avenue Northwest/Southwest (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Highland Avenue Northeast/Southeast (Launching)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	American Legion (Receiving)	Yes	Yes	Construction	Y	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	School Street (Connection)	Yes	Yes	Construction	Y	N	N	N	Y	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Cedarwood Pumping Station (Connection)	Yes	Yes	Construction	N	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Hegarty Pumping Station (Connection)	Yes	Yes	Construction	N	N	N	N	Y	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	St. Mary Street Pumping Station (Connection)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Newton Street Pumping Station (Connection)	Yes	Yes	Construction	Y	N	N	N	Y	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N

Table 2.4-2 Anticipated Program-related Impacts to Environmental Justice Populations by Alternative and Site

Alt	Proposed Site	EJ Block Groups Within 1 Mile?	LOD within EJ Block Group?	Phase of Potential Impact	Traffic (I/DI)		Air Quality (I/DI)		Noise and Vibration (I/DI)		Hazardous Materials (I/DI)		Natural Resources (I/DI)		Community Resources (I/DI)	
	Southern Spine Mains (Connection)	Yes	Yes	Construction	Y	N	N	N	N	N	Y	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N
	Hultman Aqueduct Isolation Valve (Connecting)	Yes	No	Construction	N	N	N	N	N	N	N	N	N	N	N	N
				Final	N	N	N	N	N	N	N	N	N	N	N	N

Source: EJ Maps Viewer, 2021; DEIR Technical Studies: Transportation, Air Quality, Noise and Vibration, Hazardous Materials, Wetlands, Water Resources Technical Study, and Community Resources.

N= No, Y=Yes, LOD = limit of disturbance, I = impact, DI = disproportionate impact.

This page intentionally left blank

Table 2.4-4 Community DPH Health

Proposed Site	EJ Population Present?	Community	Elevated Blood Lead Prevalence[1]		Low Birth Weight		Heart Attack		Pediatric Asthma ED[2] Visits	
			Statistically Significant?	>110% Statewide Rate?[3]	Statistically Significant?	>110% Statewide Rate?[3]	Statistically Significant?	>110% Statewide Rate?[3]	Statistically Significant?	>110% Statewide Rate?[3]
Fernald Property	No	Belmont	No	No	No	No	No	No	No	No
	Yes	Waltham	No	No	No	No	No	No	No	No
	Yes	Watertown	No	No	No	No	No	No	No	No
Bifurcation	No	Newton	No	No	No	No	No	No	No	No
	Yes	Waltham	No	No	No	No	No	No	No	No
	No	Wellesley	No	No	No	No	No	No	No	No
	No	Weston	No	No	No	No	No	No	No	No
Tandem Trailer and Park Road East	No	Newton	No	No	No	No	No	No	No	No
	Yes	Waltham	No	No	No	No	No	No	No	No
	No	Wellesley	No	No	No	No	No	No	No	No
	No	Weston	No	No	No	No	No	No	No	No
Park Road West	No	Newton	No	No	No	No	No	No	No	No
	No	Waltham	No	No	No	No	No	No	No	No
	No	Wellesley	No	No	No	No	No	No	No	No
	No	Weston	No	No	No	No	No	No	No	No
Highland Avenue Northwest/Southwest	No	Needham	No	No	No	No	No	No	No	No
	Yes	Newton	No	No	No	No	No	No	No	No
	No	Wellesley	No	No	No	No	No	No	No	No
Highland Avenue Northeast/Southeast	No	Needham	No	No	No	No	No	No	No	No
	Yes	Newton	No	No	No	No	No	No	No	No
	No	Wellesley	No	No	No	No	No	No	No	No
American Legion	Yes	Boston	Yes	No	Yes	Yes	No	No	Yes	No
School Street	Yes	Waltham	No	No	No	No	No	No	No	No
Cedarwood Pumping Station	Yes	Waltham	No	No	No	No	No	No	No	No
	Yes	Newton	No	No	No	No	No	No	No	No

Table 2.4-4 Community DPH Health

Proposed Site	EJ Population Present?	Community	Elevated Blood Lead Prevalence[1]		Low Birth Weight		Heart Attack		Pediatric Asthma ED[2] Visits	
			Statistically Significant?	>110% Statewide Rate?[3]	Statistically Significant?	>110% Statewide Rate?[3]	Statistically Significant?	>110% Statewide Rate?[3]	Statistically Significant?	>110% Statewide Rate?[3]
Hegarty Pumping Station	No	Needham	No	No	No	No	No	No	No	No
	No	Newton	No	No	No	No	No	No	No	No
	Yes	Wellesley	No	No	No	No	No	No	No	No
St. Mary Street Pumping Station	No	Needham	No	No	No	No	No	No	No	No
	No	Newton	No	No	No	No	No	No	No	No
	Yes	Wellesley	No	No	No	No	No	No	No	No
Newton Street Pumping Station	Yes	Boston	Yes	No	Yes	Yes	No	No	Yes	No
	Yes	Brookline	No	No	No	No	No	No	No	No
	No	Newton	No	No	No	No	No	No	No	No
Southern Spine Mains	Yes	Boston	Yes	No	Yes	Yes	No	No	Yes	No
	Yes	Brookline	No	No	No	No	No	No	No	No
Hultman Aqueduct Isolation Valve	No	Newton	No	No	No	No	No	No	No	No
	Yes	Waltham	No	No	No	No	No	No	No	No
	No	Wellesley	No	No	No	No	No	No	No	No
	No	Weston	No	No	No	No	No	No	No	No

Source: DPH EJ Tool, 2021.

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 ED – Emergency Department

3 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.

2.4.5.2 Launching and Receiving Sites

The following summarizes EJ populations and existing unfair or inequitable environmental burdens that may be present at the launching and receiving sites.

Fernald Property

Fernald Property's LOD is not within an EJ block group. Ten EJ block groups were identified within the DGA, and one census tract (not identified as having any EJ block groups) with a language other than English spoken by at least 5 percent of the population, as seen in **Table 2.4-5**. Three of the block groups have census tracts with Spanish or Spanish Creole-speaking populations, and one census tract has a Chinese-speaking population. The EJ block groups in close proximity to the Fernald Property meet the minority EJ criterion.

No DPH main health criteria labeled as statistically significant exists within the DGA, although there are EJ block groups within census tracts in the DGA that have an elevated blood lead or low birth weight rate that is higher than 110 percent of the statewide rate at the census tract level. There are 30 potential sources of pollution as identified by DPH data within the Fernald Property site's DGA; these include large quantity generators and toxic users, MassDEP Tier Classified 21E sites and Tier II facilities, MassDEP sites with activity and use limitations (AULs), and underground storage tanks (USTs). Sites and facilities include gasoline stations, energy plants and storage, automobile repair, and service businesses. See **Table B-10** through **B-12** in **Appendix B** for DPH health criteria and sources of pollution.

The Fernald Property scored the following exposure ratings in the RMAT Tool; however, as noted above, its LOD is not within an EJ block group:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Moderate Exposure
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the Fernald Property site's DGA. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of the Fernald Property is not within an EJ block group and therefore existing climate burdens were not identified by the RMAT Tool. No existing unfair or inequitable environmental or health burdens on EJ populations are present or identifiable with current data for the Fernald Property.

Table 2.4-5 Environmental Justice Block Groups Within 1 Mile of Fernald Property

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
–	3576.002	Belmont	–	–	–	–	–	Chinese (7%)	–
4	3688.00	Waltham	1,686	606	$155,565	50.7%	1.5%	Spanish or Spanish Creole (12%)	Minority
3	3689.01	Waltham	2,297	1,148	$70,481	46.2%	2.3%	–	Minority
1	3689.01	Waltham	3,019	173	$111,750	33.4%	0%	–	Minority
1	3689.02	Waltham	3,263	878	$69,423	52.6%	12.1%	–	Minority
1	3691.00	Waltham	1,029	342	$88,333	39.4%	2.3%	–	Minority
3	3701.01	Watertown	1,969	811	$119,598	29.7%	0%	Spanish or Spanish Creole (5%)	Minority
4	3701.01	Watertown	2,108	828	$85,156	34.1%	3.7%	Spanish or Spanish Creole (5%)	Minority
1	3701.01	Watertown	1,396	587	$123,264	28.1%	0%	–	Minority
2	3701.01	Watertown	1,986	715	$118,032	31.4%	1.8%	–	Minority
1	3701.02	Watertown	1,928	1,031	$104,475	26.3%	3.8%	–	Minority

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. Data from the “Languages Spoken in Massachusetts” tab of the EJ Maps Viewer identified a language spoken in a census tract that was not present in the 1-mile radius. This census tract was included for consistency and completeness, but only the language, percent spoken by, and municipality would be included.

Note: Data listed as 0 is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0.

Bifurcation Site

While the Bifurcation site's LOD is not within an EJ block group, two identified EJ block groups fall within the DGA, as seen in **Table 2.4-6**. The EJ block groups are within census tracts with Chinese-speaking populations. The EJ block groups in close proximity to the Bifurcation site meet the minority EJ criteria.

There are no DPH main health criteria that have been labeled as statistically significant or have a rate higher than 110 percent of the statewide rate. There are five potential sources of pollution as identified by DPH data within the Bifurcation site's DGA; these include large quantity generators, MassDEP sites with AULs, and USTs. Facilities present include a Massachusetts Bay Transportation Authority (MBTA) facility, a golf course, and gasoline stations. See **Table B-13** through **Table B-15** in **Appendix B** for DPH health criteria and sources of pollution.

The Bifurcation site scored the following exposure ratings in the RMAT Tool; however, as noted above, its LOD is not within an EJ block group:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Moderate Exposure
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the Bifurcation site's DGA. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of the Bifurcation site is not within an EJ block group and therefore existing climate burdens were not identified by the RMAT Tool. No existing unfair or inequitable environmental or health burdens on EJ populations are present or identifiable with current data for the Bifurcation site.

Tandem Trailer and Park Road East Sites

While the Tandem Trailer and Park Road East sites' LOD are not within an EJ block group, two identified EJ block groups fall within the DGA, as seen in **Table 2.4-7**. Both of these EJ block groups are within census tracts that have a Chinese-speaking population. The EJ block groups in close proximity to the Tandem Trailer and Park Road East sites meet the minority EJ criteria.

There are no DPH main health criteria that have been labeled as statistically significant or have a rate that is higher than 110 percent of the statewide rate. There are six potential sources of pollution as identified by DPH data within the Tandem Trailer and Park Road East sites' DGA, including large-quantity generators, MassDEP sites with AULs, and USTs. Facilities include an MBTA facility, a golf course, and gasoline stations. See **Table B-16** through **Table B-18** in **Appendix B** for DPH health criteria and sources of pollution.

The Tandem Trailer and Park Road East sites scored the following exposure ratings in the RMAT Tool; however, as noted above, its LOD is not within an EJ block group:

- Sea-level Rise and Storm Surge: Not Exposed

- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed (Tandem Trailer), Moderate Exposure (Park Road East)
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the Tandem Trailer and Park Road East sites' DGA. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of the Tandem Trailer and Park Road East sites is not within an EJ block group and therefore existing climate burdens were not identified by the RMAT Tool. No existing unfair or inequitable environmental or health burdens on EJ populations are present or identifiable with current data for the Tandem Trailer and Park Road East sites.

Table 2.4-6 Environmental Justice Block Groups Within 1 Mile of Bifurcation Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percent of Households with English Isolation	Languages Spoken by at least 5% of census tract population1	EJ Criterion Description
2	3684.00	Waltham	3,834	452	$96,406	36.8%	4.0%	Chinese (6%)	Minority
3	3684.01	Waltham	1,740	654	$82,083	48.0%	5.7%	Chinese (6%)	Minority

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.

Table 2.4-7 Environmental Justice Block Groups Within 1 Mile of Tandem Trailer and Park Road East Sites

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population1	EJ Criterion Description
2	3684.00	Waltham	3,834	452	$96,406	36.8%	4.0%	Chinese (6%)	Minority
3	3684.01	Waltham	1,740	654	$82,083	48.0%	5.7%	Chinese (6%)	Minority

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.

Park Road West Site

The Park Road West site does not have any EJ block groups within 1 mile. The following and attached DPH data and RMAT Tool outputs for the site are identified for consistency and completeness but should not be used in analysis or comparison of alternatives as there are no EJ Block groups present.

There are no DPH main health criteria that have been labeled as statistically significant or have a rate that is higher than 110 percent of the statewide rate. There are six potential sources of pollution as identified by DPH data within the DGA, including large quantity generators, MassDEP sites with AULs, and USTs. Facilities present include an MBTA facility, a golf course, and gasoline stations. See **Table B-19** through **Table B-21** in **Appendix B** for DPH health criteria and sources of pollution.

The Park Road West site scored the following exposure ratings in the RMAT Tool; however, as noted above, there are no EJ block groups present within 1 mile:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: High Exposure
- Extreme Heat: High Exposure

Since the Park Road West site does not have any EJ block groups present within 1 mile, no existing unfair or inequitable environmental or health burdens on EJ populations are present.

Highland Avenue Northwest/Southwest sites

While the Highland Avenue Northwest/Southwest sites' LOD is not within an EJ block group, one identified EJ block group falls within the DGA, as well as a census tract (which does not include an EJ block group) with Chinese spoken by at least 5 percent of the population, as seen in **Table 2.4-8.** The EJ block group near the Highland Avenue Northwest/Southwest sites meets the minority EJ criteria.

No DPH main health criteria labeled as statistically significant or with a rate higher than 110 percent of the statewide rate exist within the DGA. There are 38 potential sources of pollution as identified by DPH data within the DGA, including large quantity generators and toxic users, MassDEP Tier Classified 21E sites and Tier II facilities, MassDEP sites with AULs, and USTs. Facilities present include scientific laboratory space, beverage manufacturers, automobile services, and a fire station. See **Table B-22** through **Table B-24** in **Appendix B** for DPH health criteria and sources of pollution.

The Highland Avenue Northwest/Southwest sites scored the following exposure ratings in the RMAT Tool; however, as noted above, its LOD is not within an EJ block group:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the Highland Avenue Northwest/Southwest sites' DGA. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of the Highland Avenue Northwest/Southwest sites is not within an EJ block group and therefore existing climate burdens were not identified by the RMAT Tool. No existing unfair or inequitable environmental or health burdens on EJ populations are present or identifiable with current data for the Highland Avenue Northwest/Southwest sites.

Table 2.4-8 Environmental Justice Block Groups Within 1 Mile of Highland Avenue Northwest/Southwest Sites

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percent of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
1	3740.00	Newton	1,579	580	$137,000	50.0%	0%	–	Minority
–	4041.002	Wellesley	–	–	–	–	–	Chinese (8%)	–

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. Data from the "Languages Spoken in Massachusetts" tab of the EJ Maps Viewer identified a language spoken in a census tract that was not present in the 1-mile radius. This census tract was included for consistency and completeness, but only the language, percent spoken by, and municipality would be included.

Note: Data listed as 0% is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0%.

Highland Avenue Northeast/Southeast Sites

While the Highland Avenue Northeast/Southeast sites' LOD is not within an EJ block group, one identified EJ block group falls within the DGA, as well as a census tract with Chinese spoken by at least 5 percent of the population that does not include an EJ block group. See **Table 2.4-9**. The EJ block group near the Highland Avenue Northeast/Southeast sites meets the minority EJ criteria.

No DPH main health criteria labeled as statistically significant or with a rate higher than 110 percent of the statewide rate exists within the 1-mile radius. There are 40 potential sources of pollution as identified by DPH data within the DGA, consisting of large quantity generators and toxic users, MassDEP Tier Classified 21E sites and Tier II facilities, MassDEP sites with AULs, and USTs. Facilities present include scientific laboratory space, beverage manufacturers, automobile services, and a fire station. See **Table B-25** through **Table B-27** in **Appendix B** for DPH health criteria and sources of pollution.

The Highland Avenue Northeast/Southeast sites scored the following exposure ratings in the RMAT Tool; however, as noted above, its LOD is not within an EJ block group:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the Highland Avenue Northeast/Southeast sites' DGA. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of the Highland Avenue Northeast/Southeast sites is not within an EJ block group and therefore existing climate burdens were not identified by the RMAT Tool. No existing unfair or inequitable environmental or health burdens on EJ populations are present or identifiable with current data for the Highland Avenue Northeast/Southeast sites.

Table 2.4-9 Environmental Justice Block Groups Within 1 Mile of Highland Avenue Northeast/Southeast Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percent of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
1	3740.00	Newton	1,579	580	$137,000	50.0%	0%	–	Minority
–	4041.002	Wellesley	–	–	–	–	–	Chinese (8%)	–

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. Data from the "Languages Spoken in Massachusetts" tab of the EJ Maps Viewer identified a language spoken in a census tract that was not present in the 1-mile radius. This census tract was included for consistency and completeness, but only the language, percent spoken by, and municipality would be included.

Note: Data listed as 0% is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0%.

American Legion Site

There are thirty-nine identified EJ block groups within the American Legion site's DGA, with the American Legion site's LOD falling within Block Group 4, Census Tract 9811.00, as seen in **Table 2.4-10**. Thirty-two of the block groups are within census tracts that have populations of Spanish or Spanish Creole speakers, and 23 are within census tracts that have populations of French or French Creole speakers, some overlapping. The EJ block group that the American Legion site falls within meets the minority and income EJ criteria, and other block groups near the site meet the minority, minority and English isolation, and minority and income EJ criteria.

Census tract 1011.02, which contains EJ block groups, is identified as having statistically significant elevated blood lead cases and has rates greater than the 110 percent of the statewide rate. Eight other census tracts have rates greater than the 110 percent of the statewide rates for elevated blood lead cases, and four census tracts for low birth weight, including census tract 1011.02, but these cases are not considered statistically significant. The proposed site is located in the City of Boston, which has vulnerable health criteria that is statistically significantly higher and greater than 110 percent of the statewide rate for elevated blood lead, low birth weight, and pediatric asthma emergency department (ED) visits. There are 42 potential sources of pollution as identified by DPH data within the American Legion site's DGA, consisting of large quantity generators, MassDEP Tier Classified 21E sites and Tier II facilities, MassDEP sites with AUL, and USTs. Facilities present include an MBTA bus facility, gasoline stations, a police department, automobile services, and biologic laboratory space. See **Table B-28** through **Table B-30** in **Appendix B** for DPH health criteria and sources of pollution.

The American Legion site scored the following exposure ratings in the RMAT Tool:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: High Exposure
- Extreme Heat: High Exposure

The DPH EJ Tool identified existing potential sources of pollution and elevated blood lead cases identified as statistically significant for one census tract with EJ populations present within the American Legion site's DGA. The DPH EJ Tool does not identify a definitive connection between the existing potential sources of pollution and the elevated blood lead cases, however, the statistically significant case count is considered an existing unfair or inequitable environmental and health burden on EJ populations. The City of Boston also has elevated blood lead, low birth weight, and pediatric asthma ED cases that may disproportionately impact EJ populations but are not considered an existing unfair or inequitable environmental or health burden for the purposes of this Report due to the geographic range of this data (i.e., the City of Boston). The LOD of the American Legion site is within an EJ block group and therefore existing climate burdens for extreme precipitation contributing to urban and riverine flooding and extreme heat are identified by the RMAT Tool. Existing unfair or inequitable environmental and health burdens on EJ populations are present for the American Legion site.

Table 2.4-10 Environmental Justice Block Groups Within 1 Mile of American Legion Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percent of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criteria Description
2	924.00	Boston	875	278	$27,969	94.6%	4.7%	Spanish or Spanish Creole (8%) and French Creole (6%)	Minority and income
3	924.00	Boston	2,423	776	$46,949	100%	6.1%	Spanish or Spanish Creole (8%) and French Creole (6%)	Minority and income
4	924.00	Boston	1,421	523	$20,095	100%	22.0%	Spanish or Spanish Creole (8%) and French Creole (6%)	Minority and income
5	924.00	Boston	739	278	$0	100%	43.2%	Spanish or Spanish Creole (8%) and French Creole (6%)	Minority and English isolation
1	1001.00	Boston	625	300	$0	90.1%	0%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority
2	1001.00	Boston	1,144	317	$42,104	100%	11.4%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority and income
3	1001.00	Boston	1,356	355	$32,974	100%	18.9%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority and income
4	1001.00	Boston	923	208	$54,949	92.4%	21.2%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority and income
5	1001.00	Boston	689	179	$0	98.5%	0%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority
6	1001.00	Boston	1,235	464	$15,308	99.4%	10.8%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority and income
7	1001.00	Boston	1,041	380	$0	100%	17.1%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority
1	1002.00	Boston	1,254	378	$60,227	96.8%	3.2%	–	Minority
2	1002.00	Boston	664	187	$39,063	97.7%	0%	–	Minority and income
3	1002.00	Boston	1,410	381	$42,219	99.6%	3.4%	–	Minority and income
1	1010.01	Boston	777	275	$0	98.2%	14.9%	French Creole (16%)	Minority

Table 2.4-10 Environmental Justice Block Groups Within 1 Mile of American Legion Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percent of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criteria Description
2	1010.01	Boston	189	149	$0	100%	47.0%	French Creole (16%)	Minority and English isolation
6	1010.01	Boston	1,675	492	$76,071	95.3%	23.4%	French Creole (16%)	Minority
1	1011.01	Boston	877	256	$35,357	97.0%	0%	Spanish or Spanish Creole (15%) and French Creole (7%)	Minority and income
2	1011.01	Boston	1,458	419	$55,649	99.2%	4.1%	Spanish or Spanish Creole (15%) and French Creole (7%)	Minority and income
3	1011.01	Boston	1,257	449	$44,861	100%	11.8%	Spanish or Spanish Creole (15%) and French Creole (7%)	Minority and income
1	1011.02	Boston	787	271	$53,681	100%	18.8%	French Creole (12%) and Spanish Creole (5%)	Minority and income
2	1011.02	Boston	1,812	530	$49,375	99.3%	18.1%	French Creole (12%) and Spanish Creole (5%)	Minority and income
4	1011.02	Boston	1,589	511	$27,277	96.0%	16.4%	French Creole (12%) and Spanish Creole (5%)	Minority and income
1	1101.03	Boston	989	371	$99,886	26.7%	3.8%	Spanish and Spanish Creole (12%)	Minority
2	1101.03	Boston	659	234	$45,370	76.0%	12.8%	Spanish and Spanish Creole (12%)	Minority and income
3	1101.03	Boston	463	175	$0	54.6%	42.3%	Spanish and Spanish Creole (12%)	Minority and English isolation
4	1101.03	Boston	700	292	$52,546	84.3%	17.5%	Spanish and Spanish Creole (12%)	Minority and income
5	1101.03	Boston	1,655	560	$133,636	34.9%	2.0%	Spanish and Spanish Creole (12%)	Minority
7	1101.03	Boston	1,573	336	$58,807	86.0%	16.7%	Spanish and Spanish Creole (12%)	Minority

Table 2.4-10 Environmental Justice Block Groups Within 1 Mile of American Legion Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percent of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criteria Description
1	1102.01	Boston	2,534	906	$45,250	86.6%	19.6%	Spanish or Spanish Creole (9%)	Minority and income
1	1103.01	Boston	1,332	483	$61,728	84.5%	5.2%	Spanish or Spanish Creole (14%)	Minority
2	1103.01	Boston	1,324	526	$101,429	38.4%	4.2%	Spanish or Spanish Creole (14%)	Minority
1	1104.01	Boston	1,977	720	$59,054	85.0%	31.8%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority and English isolation
2	1104.01	Boston	1,830	700	$74,286	42.7%	1.4%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority
1	1202.01	Boston	1,432	615	$88,365	49.8%	10.2%	Spanish or Spanish Creole (15%)	Minority
2	1202.01	Boston	1,951	898	$66,136	55.5%	20.8%	–	Minority
3	1202.01	Boston	608	316	$84,167	44.7%	2.8%	Spanish and Spanish Creole (12%)	Minority
1	9803.00	Boston	380	0	$0	52.4%	0%	Spanish or Spanish Creole (18%)	Minority
4	9811.00	Boston	438	112	$44,423	79.0%	0%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority and income

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.

Note: Data listed as 0 is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0.

2.4.5.3 Connection and isolation Valve Sites

The following summarizes EJ populations and existing unfair or inequitable environmental burdens that may be present at the connection and isolation valve sites.

School Street Site

Twenty-five identified EJ block groups fall within the DGA, with School Street site's LOD falling within Block Group 2, Census Tract 3689.02, as seen in **Table 2.4-11**. Twelve of the block groups are within census tracts that have populations of Spanish or Spanish Creole speakers, and two block groups are within census tracts that have populations of Chinese speakers. The EJ block group that the School Street site falls within meets the minority and English isolation EJ criteria, and other block groups near the site meet the minority, minority and English isolation, and minority and income EJ criteria.

Census tracts 3686.00 and 3687.00, which contain EJ block groups, were identified as having statistically significant elevated blood lead cases and have rates greater than the 110 percent of the statewide rate. Three other census tracts have rates greater than the 110 percent of the statewide rates for elevated blood lead cases, and three census tracts for low birth weight, including census tract 3689.02, but these cases were not considered statistically significant. There are 69 potential sources of pollution as identified by DPH data within the School Street site's DGA, consisting of large-quantity generators and toxic users, MassDEP Tier Classified 21E sites and Tier II facilities, MassDEP sites with AUL, USTs, and a 2017 toxic release inventory site. Facilities present include gasoline stations, a biomedical company, automobile services, materials and goods manufacturing, and a hospital. The toxic release inventory site was located at the Plating for Electronics facility. See **Table B-31** and **Table B-33** in **Appendix B** for DPH health criteria and sources of pollution.

The School Street site scored the following exposure ratings in the RMAT Tool:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed
- Extreme Heat: High Exposure

The DPH EJ Tool identified existing potential sources of pollution and elevated blood lead cases as statistically significant for two census tracts with EJ populations present within the School Street site's DGA. The DPH EJ Tool does not identify a definitive connection between the existing potential sources of pollution and the elevated blood lead cases; however, the statistically significant case count is considered an existing unfair or inequitable environmental and health burden on EJ populations. The LOD of the School Street site is within an EJ block group and therefore existing climate burdens for extreme precipitation contributing to urban and riverine flooding and extreme heat are identified by the RMAT Tool. Existing unfair or inequitable environmental and health burdens on EJ populations are present for the School Street site.

Table 2.4-11 Environmental Justice Block Groups Within 1 Mile of School Street Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criteria Description
1	3681.02	Waltham	2,445	874	$135,147	43.7%	5.7%	–	Minority
1	3682.00	Waltham	1,828	654	$121,875	26.8%	2.8%	–	Minority
4	3682.00	Waltham	1,198	542	$113,400	26.2%	11.3%	–	Minority
1	3683.00	Waltham	1,609	715	$71,891	39.2%	2.9%	–	Minority
2	3683.00	Waltham	672	342	$74,231	39.1%	0%	–	Minority
3	3683.00	Waltham	829	416	$97,143	36.2%	10.1%	–	Minority
4	3683.00	Waltham	1,027	459	$63,993	28.2%	8.3%	–	Minority
5	3683.00	Waltham	870	403	$93,826	25.4%	10.2%	–	Minority
1	3684.00	Waltham	708	322	$47,348	47.2%	16.5%	Chinese (6%)	Minority and income
2	3684.00	Waltham	3,834	452	$96,406	36.8%	4.0%	Chinese (6%)	Minority
1	3685.00	Waltham	909	483	$61,726	64.5%	4.8%	Spanish or Spanish Creole (12%)	Minority
2	3685.00	Waltham	664	363	$60,568	33.1%	0%	Spanish or Spanish Creole (12%)	Minority
3	3685.00	Waltham	1,410	778	$69,688	53.3%	11.8%	Spanish or Spanish Creole (12%)	Minority
1	3686.00	Waltham	554	277	$85,729	31.8%	0%	Spanish or Spanish Creole (12%)	Minority
3	3686.00	Waltham	1,003	517	$43,594	41.6%	23.8%	Spanish or Spanish Creole (12%)	Minority and income
4	3686.00	Waltham	1,810	758	$85,167	27.9%	20.6%	Spanish or Spanish Creole (12%)	Minority
5	3686.00	Waltham	1,572	641	$96,691	36.2%	0%	Spanish or Spanish Creole (12%)	Minority
1	3687.00	Waltham	1,294	546	$95,765	61.4%	4.6%	Spanish or Spanish Creole (19%)	Minority

Table 2.4-11 Environmental Justice Block Groups Within 1 Mile of School Street Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criteria Description
2	3687.00	Waltham	1,195	502	$53,077	61.8%	15.3%	Spanish or Spanish Creole (19%)	Minority and income
1	3688.00	Waltham	924	484	$58,984	53.9%	24.4%	Spanish or Spanish Creole (12%)	Minority
4	3688.00	Waltham	1,686	606	$155,565	50.7%	1.5%	Spanish or Spanish Creole (12%)	Minority
5	3688.00	Waltham	917	394	$70,625	59.0%	14.5%	Spanish or Spanish Creole (12%)	Minority
1	3689.01	Waltham	3,019	173	$111,750	33.4%	0%	–	Minority
1	3689.02	Waltham	3,263	878	$69,423	52.6%	12.1%	–	Minority
2	3689.02	Waltham	484	244	$69,412	34.5%	34.8%	–	Minority and English isolation

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.

Note: Data listed as 0% is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0%.

Cedarwood Pumping Station

Eleven identified EJ block groups fall within the DGA, with Cedarwood Pumping Station's LOD falling within Block Group 2, Census Tract 3684, as seen in **Table 2.4-12**. Five of the block groups are within census tracts that have populations of Spanish or Spanish Creole speakers, and one block group is within census tracts that have populations of Chinese speakers. The EJ block group that the Cedarwood Station LOD is within meets the minority EJ criterion, and other block groups near the site meet the minority EJ criteria.

Census tracts 3686.00 and 3687.00, which contain EJ block groups, are identified as having statistically significant elevated blood lead cases and have rates greater than the 110 percent of the statewide rate. Three other census tracts have rates greater than the 110 percent of the statewide rates for elevated blood lead cases, and three census tracts for low birth weight, but these cases are not considered statistically significant. There are six potential sources of pollution as identified by DPH data within the Cedarwood Pumping Station's DGA, consisting of MassDEP Tier II facilities, MassDEP sites with AUL, and USTs. Facilities present include an ice-skating rink, a landfill, a gasoline station, and the site's pump station. See **Table B-34** through **Table B-36** in **Appendix B** for DPH health criteria and sources of pollution.

The Cedarwood Pumping Station site scored the following exposure ratings in the RMAT Tool:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Moderate Exposure
- Extreme Heat: High Exposure

The DPH EJ Tool identified existing potential sources of pollution and elevated blood lead cases are identified as statistically significant for two census tracts with EJ populations within Cedarwood Pumping Station's DGA. The DPH EJ Tool does not identify a definitive connection between the existing potential sources of pollution and the elevated blood lead cases, however, the statistically significant case count is considered an existing unfair or inequitable environmental and health burden on EJ populations. The LOD of Cedarwood Pumping Station is within an EJ block group and therefore existing climate burdens for extreme precipitation contributing to urban and riverine flooding and extreme heat are identified by the RMAT Tool. Existing unfair or inequitable environmental and health burdens on EJ populations are present for Cedarwood Pumping Station.

Table 2.4-12 Environmental Justice Block Groups Within 1 Mile of Cedarwood Pumping Station

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
4	3682.00	Waltham	1,198	542	$113,400	26.2%	11.3%	Chinese (6%)	Minority
1	3683.00	Waltham	1,609	715	$71,891	39.2%	2.9%	–	Minority
2	3683.00	Waltham	672	342	$74,231	39.1%	0%	–	Minority
3	3683.00	Waltham	829	416	$97,143	36.2%	10.1%	–	Minority
5	3683.00	Waltham	870	403	$93,826	25.4%	10.2%	–	Minority
2	3684.00	Waltham	3,834	452	$96,406	36.8%	4.0%	–	Minority
2	3685.00	Waltham	664	363	$60,568	33.1%	0%	Spanish or Spanish Creole (12%)	Minority
2	3686.00	Waltham	646	285	$0	30.8%	0%	Spanish or Spanish Creole (12%)	Minority
4	3686.00	Waltham	1,810	758	$85,167	27.9%	20.6%	Spanish or Spanish Creole (12%)	Minority
5	3686.00	Waltham	1,572	641	$96,691	36.2%	0%	Spanish or Spanish Creole (12%)	Minority
1	3687.00	Waltham	1,294	546	$95,765	61.4%	4.6%	Spanish or Spanish Creole (19%)	Minority

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.

Note: Data listed as 0% is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0%.

Table 2.4-13 Environmental Justice Block Groups Within 1 Mile of Hegarty Pumping Station

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
2	4041.00	Wellesley	1,244	419	$169,904	41.8%	6.2%	Chinese (8%)	Minority

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.

St. Mary Street Pumping Station

While St. Mary Street Pumping Station's LOD is not within an EJ block group, there is one identified EJ block group within the DGA, as seen in **Table 2.4-14**. This EJ block group falls within a census tract that has a population of Chinese speakers. The EJ block group near St. Mary Street Pumping Station meets the minority EJ criteria.

No DPH main health criteria labeled as statistically significant or with a rate higher than 110 percent of the statewide rate exist within the DGA. There are 28 potential sources of pollution as identified by DPH data within the St. Mary Street Pumping Station's DGA, consisting of large-quantity generators and toxic users, MassDEP Tier Classified 21E sites and Tier II facilities, MassDEP sites with AULs, and USTs. Facilities present include a medical practice, a laboratory space, a fire station, plastics manufacturing, and gasoline stations. See **Table B-41** through **Table B-43** in **Appendix B** for DPH health criteria and sources of pollution.

St. Mary Street Pumping Station scored the following exposure ratings in the RMAT Tool; however, as noted above, its LOD is not within an EJ block group:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the St. Mary Street Pumping Station's DGA. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of St. Mary Street Pumping Station is not within an EJ block group, and therefore existing climate burdens were not identified by the RMAT Tool. No existing unfair or inequitable environmental or health burdens on EJ populations are present or identifiable with current data for St. Mary Street Pumping Station.

Table 2.4-14 Environmental Justice Block Groups Within 1 Mile of St. Mary Street Pumping Station

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criteria Description
2	4041.00	Wellesley	1,244	419	$169,904	41.8%	6.2%	Chinese (8%)	Minority

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.

Newton Street Pumping Station

Nine identified EJ block groups fall within the DGA, with Newton Street Pumping Station's LOD falling within Block Group 1, Census Tract 4012, as seen in **Table 2.4-15**. No block groups are within census tracts that have a language other than English spoken by greater than 5 percent of the population. The EJ block group that Newton Street Pumping Station falls within meets the minority EJ criterion; other block groups near the site meet the minority EJ criteria.

No DPH main health criteria labeled as statistically significant or with a rate higher than 110 percent of the statewide rate for elevated blood lead rates exist within the DGA. One census tract, 1301.00, has a low birth weight rate higher than the statewide rate, but it is not identified as statistically significant. The City of Boston, which has vulnerable health criteria that is statistically significant and/or greater than 110 percent of the statewide rate for elevated blood lead, low birth weight, and pediatric asthma ED visits, is within the DGA. There are six potential sources of pollution as identified by DPH data within the Newton Street Pumping Station's DGA, consisting of MassDEP Tier II facilities, MassDEP sites with AUL, and USTs. Some of the sites and facilities present include an ice-skating rink, a landfill, a gasoline station, and the site's pumping station. See **Table B-44** through **Table B-46** in **Appendix B** for DPH health criteria and sources of pollution.

Newton Street Pumping Station scored the following exposure ratings in the RMAT Tool:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within Brookline's Newton Street Pumping Station's DGA . The City of Boston, which is within the DGA, has elevated blood lead, low birth weight, and pediatric asthma ED cases that may disproportionately impact EJ populations but are not considered an existing unfair or inequitable environmental or health burden for the purposes of this Report due to the geographic range of this data (i.e., the City of Boston). No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of Newton Street Pumping Station is within an EJ block group, and therefore the RMAT Tool identified existing climate burdens for extreme precipitation contributing to urban flooding and extreme heat. Existing unfair or inequitable environmental and health burdens on EJ populations are present for Newton Street Pumping Station.

Table 2.4-15 Environmental Justice Block Groups Within 1 Mile of Newton Street Pumping Station

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
2	1106.01	Boston	1,134	500	$138,370	24.6%	14.6%	–	Minority
1	1301.00	Boston	943	419	$110,924	26.1%	0%	–	Minority
2	1301.00	Boston	1,886	999	$103,086	45.7%	6.9%	–	Minority
1	4011.00	Brookline	1,481	590	$120,750	33.8%	4.6%	–	Minority
2	4011.00	Brookline	1,024	320	$209,750	26.8%	0%	–	Minority
1	4012.00	Brookline	1,986	659	$119,583	30.1%	15.5%	–	Minority
2	4012.00	Brookline	1,140	358	$194,524	36.9%	3.4%	–	Minority
3	4012.00	Brookline	1,897	792	$115,221	41.1%	15.2%	–	Minority
4	4012.00	Brookline	2,072	705	$190,452	42.5%	1.8%	–	Minority

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.

Note: Data listed as 0% is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0%.

Southern Spine Mains

Twenty-two identified EJ block groups fall within the DGA, with Southern Spine Mains' LOD falling within Block Group 3, Census Tract 1101.03, as seen in **Table 2.4-16**. Seventeen of the block groups are within census tracts that have populations of Spanish or Spanish Creole speakers, and two block groups are within census tracts that have populations of French or French Creole speakers, with overlap. The EJ block group that the Southern Spine Mains LOD falls within meets the minority and English isolation EJ criteria, and other block groups in close proximity to the site meet the minority, income, minority and income, and minority and English isolation EJ criteria.

No DPH main health criteria labeled as statistically significant and with a rate higher than 110 percent of the statewide rate exist within the DGA. Four other census tracts have rates greater than the 110 percent of the statewide rates for elevated blood lead cases, including census tract 3689.02, and three census tracts for low birth weight, but these cases are not considered statistically significant. The proposed site is located in the City of Boston, which has vulnerable health criteria that is statistically significant and/or greater than 110 percent of the statewide rate for elevated blood lead, low birth weight, and pediatric asthma ED visits. There are 18 potential sources of pollution as identified by DPH data within the Southern Spine Mains' DGA, consisting of large-quantity generators, MassDEP Tier Classified 21E sites and Tier II facilities, and USTs. Facilities present include an MBTA bus facility, hospitals, a Harvard University property, gasoline and service stations, and a pumping station. See **Table B-47** through **Table B-49** in **Appendix B** for DPH health criteria and sources of pollution.

The Southern Spine Mains site scored the following exposure ratings in the RMAT Tool:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the Southern Spine Mains' DGA. The City of Boston has elevated blood lead, low birth weight, and pediatric asthma ED cases that may disproportionately impact EJ populations. Due to the geographic range of this data, this is not considered an existing unfair or inequitable environmental or health burden. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of Southern Spine Mains is within an EJ block group; therefore the RMAT Tool identified existing climate burdens for extreme precipitation contributing to urban flooding and extreme heat. Existing unfair or inequitable environmental and health burdens on EJ populations are present for Southern Spine Mains.

Table 2.4-16 Environmental Justice Block Groups Within 1 Mile of Southern Spine Mains

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
1	1101.03	Boston	989	371	$99,886	26.7%	3.8%	Spanish or Spanish Creole (12%)	Minority
2	1101.03	Boston	659	234	$45,370	76.0%	12.8%	Spanish or Spanish Creole (12%)	Minority and income
3	1101.03	Boston	463	175	$0	54.6%	42.3%	Spanish or Spanish Creole (12%)	Minority and English isolation
4	1101.03	Boston	700	292	$52,546	84.3%	17.5%	Spanish or Spanish Creole (12%)	Minority and income
5	1101.03	Boston	1,655	560	$133,636	34.9%	2.0%	Spanish or Spanish Creole (12%)	Minority
7	1101.03	Boston	1,573	336	$58,807	86.0%	16.7%	Spanish or Spanish Creole (12%)	Minority
1	1103.01	Boston	1,332	483	$61,728	84.5%	5.2%	Spanish or Spanish Creole (14%)	Minority
2	1103.01	Boston	1,324	526	$101,429	38.4%	4.2%	Spanish or Spanish Creole (14%)	Minority
1	1104.01	Boston	1,977	720	$59,054	85.0%	31.8%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority and English isolation
2	1104.01	Boston	1,830	700	$74,286	42.7%	1.4%	Spanish or Spanish Creole (10%) and French Creole (5%)	Minority
2	1201.04	Boston	777	314	$82,708	60.6%	14.0%	–	Minority
1	1202.01	Boston	1,432	615	$88,365	49.8%	10.2%	Spanish or Spanish Creole (15%)	Minority
2	1202.01	Boston	1,951	898	$66,136	55.5%	20.8%	Spanish or Spanish Creole (15%)	Minority
3	1202.01	Boston	608	316	$84,167	44.7%	2.8%	Spanish or Spanish Creole (15%)	Minority

Table 2.4-16 Environmental Justice Block Groups Within 1 Mile of Southern Spine Mains

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
3	1203.01	Boston	1,467	501	$89,125	52.1%	12.6%	Spanish or Spanish Creole (18%)	Minority
4	1203.01	Boston	1,509	582	$97,917	50.1%	1.7%	Spanish or Spanish Creole (18%)	Minority
2	1204.00	Boston	635	329	$92,469	42.5%	5.5%	–	Minority
3	1204.00	Boston	1,166	564	$126,090	29.4%	0%	–	Minority
5	1204.00	Boston	1,409	751	$34,476	22.1%	15.4%	–	Income
1	9803.00	Boston	380	0	$0	52.4%	0%	Spanish or Spanish Creole (18%)	Minority
4	9811.00	Boston	438	112	$44,423	79.0%	0%	Spanish or Spanish Creole (10%)	Minority and income
1	9818.00	Boston	32	14	$0	31.3%	28.6%	–	Minority and English isolation

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.

Note: Data listed as 0% is listed how presented in the EJ Maps Viewer data. Some of this data might be missing or intentionally 0%.

Hultman Aqueduct Isolation Valve

While the Hultman Aqueduct Isolation Valve site's LOD is not within an EJ block group, there are two identified EJ block groups within the DGA, as seen in **Table 2.4-17**. The EJ block groups are within census tracts that have a Chinese-speaking population. The EJ block groups near the Hultman Aqueduct Isolation Valve site meet the minority EJ criteria.

There are no DPH main health criteria that have been labeled as statistically significant or have a rate higher than 110 percent of the statewide rate. There are five potential sources of pollution as identified by DPH data within the Hultman Aqueduct Isolation Valve site's DGA, consisting of large-quantity generators, MassDEP sites with AULs, and USTs. Some of the sites and facilities present include a MBTA facility, a golf course, and gasoline stations. See **Table B-37** through **Table B-39** in **Appendix B** for DPH health criteria and sources of pollution.

The Hultman Aqueduct Isolation Valve site scored the following exposure ratings in the RMAT Tool; however, as noted above, its LOD is not within an EJ block group:

- Sea-level Rise and Storm Surge: Not Exposed
- Extreme Precipitation – Urban Flooding: High Exposure
- Extreme Precipitation – Riverine Flooding: Not Exposed
- Extreme Heat: High Exposure

While there are existing potential sources of pollution identified by the DPH EJ Tool, no main health criteria are identified as statistically significant within the Hultman Aqueduct Isolation Valve site's DGA. No currently available DPH data identifies an existing burden through a definitive source of pollution impacting EJ populations or statistically significant main health criteria case count. The LOD of the site is not within an EJ block group and therefore the RMAT Tool did not identify existing climate burdens. No existing unfair or inequitable environmental or health burdens on EJ populations are present or identifiable with current data for the site.

Table 2.4-17 Environmental Justice Block Groups Within 1 Mile of Hultman Aqueduct Valve Site

Block Group	Census Tract	Municipality	Total Population	Total Households	Median Household Income	Total Minority Population	Percentage of Households with English Isolation	Languages Spoken by at least 5% of census tract population[1]	EJ Criterion Description
2	3684.00	Waltham	3,834	452	$96,406	36.8%	4.0%	Chinese (6%)	Minority
3	3684.01	Waltham	1,740	654	$82,083	48.0%	5.7%	Chinese (6%)	Minority

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.

2.4.6 Construction Period Impacts

This section discusses potential construction-period impacts on identified EJ populations and off-site sources that could result in a cumulative negative environmental impact on the surrounding EJ populations.

Table 2.4-18 details the main DPH EJ vulnerable health criteria that were identified within the DGA and the environmental conditions related to these health concerns. General Program activity that could exacerbate these existing health concerns, specifically related to typical environmental causes, are included here as well. DPH sources of pollution data, specifically proximity to facilities and sites that pose an existing threat to public health, can further exacerbate main DPH EJ vulnerable health criteria. Program activities would not be anticipated to further exacerbate existing health vulnerabilities in and around the 14 proposed sites due to the location and type of project activity occurring at those locations. Program activities would not interact with any of the identified sources of pollution. Cleanup activities would be initiated at sites with encountered areas of soil and groundwater contamination benefitting populations with health vulnerabilities.

Table 2.4-18 Causes of DPH EJ Vulnerable Health Criteria

Health Criteria	Environmental Causation1
Heart Attack	Exposure to air pollution (e.g., Particulate Matter [PM])
Elevated Blood Lead	Soil and drinking water contamination (e.g., lead drinking water distribution pipes)
Low Birth Weight	Exposure to air pollution (e.g., PM) and other environmental contaminants)
Pediatric Asthma	Exposure to air pollution (e.g., PM, which includes dust particles)

1 Source: MA DPH, MA Environmental Public Health Tracking and Data, 2022.

Traffic

Construction period impacts were evaluated for the DEIR Alternatives by examining the characteristics of the truck haul routes and daily volume of trucks and worker trips anticipated to be generated at each shaft site location. The level of impact can be defined for each of the four functional classifications identified by American Association of State Highway and Transportation Officials (AASHTO): freeways, arterials, collectors, and local streets. Impacts to the roadways along each truck route were designated as low, moderate, or high depending on the functional classification, land use, and major signalized intersections along the truck routes. Impacts that qualify as low, moderate, or high for each of the functional classifications can be found in **Table 2.4-19**.

Impacts to each intersection were designated as low, moderate, or high depending on the additional delay caused by vehicles traveling to and from the launching and receiving sites. Additionally, many of the shaft sites would require surface piping installation that could impact existing roadways. Traffic impacts to these DGA roadways were designated as low, moderate, or high depending on the recommended traffic management measure and the functional classification of the roadway.

Further information on methodology and construction impacts on traffic can be found in the Traffic Impact Assessment (TIA) found in **Chapter 4**, **Existing Conditions and Environmental Assessment***,* **Section 4.10**.

Table 2.4-19 AASHTO Functional Classifications

AASHTO Functional Classification	Low-Level Impact	Moderate-Level Impact	High-Level Impact
Arterials	No lane closure	A lane closure on a multilane facility	A lane closure on a two-lane arterial
Freeways	No lane closure	A lane closure on a multilane facility	A lane closure on a two-lane freeway
Collectors	Maintenance of two-lane, two-way operation on a collector street	A lane closure on a two-lane collector	Complete closure of a collector street
Local Streets	Any construction operations on local streets, including closure of local streets with proper provisions for residents and emergency vehicles	None	None

Air Quality

As required by the Secretary's Certificate on the ENF, the MWRA prepared a quantitative assessment of emissions of NO_X, VOCs, and GHGs during construction of the Program. The estimated total number of trucks and passenger cars, as well as fossil-fuel-burning equipment by location and time period were estimated for each DEIR Alternative. This information was used as the basis for assessing pollutant emissions associated with the Program's construction.

Construction equipment use and truck trips were estimated by quarter for the full 10-year construction period for each site for the three DEIR Alternatives. On-road emissions would occur from vehicles traveling between the highway network and the launching and receiving sites. Off-road emissions would be from equipment used at the sites such as cranes, drilling rigs, and bulldozers. Assessment of potential disproportionate impacts to EJ communities was based on both on- and off-road emissions.

Further information on methodology and construction impacts on air quality and emissions can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.11**.

Noise and Vibration

Construction activities would be similar at many of the sites for the DEIR Alternatives. The primary differences among the alternatives correspond to construction activities at Tandem Trailer, Park Road West, and Bifurcation sites and whether they would be receiving, launching, or connecting sites. Additionally, the Highland Avenue Northwest/Southwest site would be a receiving site for Alternative 3 rather than a launching site.

Since all construction activities, regardless of the type of site, involve equipment such as excavators, cranes, bulldozers, front-end loaders, and air compressors, construction noise emissions would be similar across all launching and receiving sites even though tunnel shaft construction methods vary. Potential construction noise impact was predicted at the closest receptor locations to each launching and receiving site. There would be potential construction noise impact at receptors where levels would exceed HUD and/or the MassDEP noise limits during the nighttime period. No construction noise impact at receptors would exceed HUG and/or MassDEP noise limits during the daytime period. Assessment of potential disproportionate impacts to EJ communities was based on both anticipated and potential construction noise impacts.

Further information on methodology and construction impacts on noise and vibration can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.12**.

Hazardous Materials

Rock and excavated material generated from tunnel excavation would be properly managed during construction. Protocols governing proper handling of excavated material that might be contaminated would be developed during final design and followed. Suitable locations for reuse or disposal of tunnel excavated material would be identified so that EJ populations would not bear an unequal burden of excavate disposal. Most of the excavated material from the DEIR Alternatives would be clean, crushed rock, which can be reused beneficially at other locations. While contamination of the excavated material is not anticipated, contaminants such as asbestos-containing materials or arsenic may be present, which would require proper management. Uncontaminated excavated material may be used as embankment or road-paving materials. Materials from the demolition of buildings at the Fernald Property will be disposed of at appropriately licensed facilities.

Further information on methodology and construction impacts on potential contaminants can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.8**.

Natural Resources

Dewatering discharges would be collected and treated for turbidity, potential of hydrogen (pH), and petroleum hydrocarbons before discharging into receiving water bodies. During Program construction, the contractor would maintain stormwater controls to make sure they were effective, and any necessary corrective actions would be taken. Dewatering discharges would also be treated to meet surface water quality standards for Class B waters.

Appropriate erosion and sedimentation controls would be implemented on site to protect adjacent wetlands.

Further information on methodology and construction impacts on water resources and wetlands can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.6**.

Climate and Resiliency

Construction-related activities would primarily take place underground with limited disruption to the surface above. The southwest edge of the proposed Tandem Trailer site temporary construction area LOD boundary (closest to I-90) is located within a FEMA Zone A Special Flood Hazard Area (100-year floodplain).

Per the RMAT Tool, climate change exposure is considered in the context of permanent infrastructure over the duration of a finished project's useful life, rather than during a temporary construction period. Therefore, the proposed Tandem Trailer site was not considered to be located within the FEMA designated- Special Flood Hazard Area for the purposes of the RMAT Tool. Upon completion of construction, the area within the temporary construction area LOD boundary would be vacated and reseeded/revegetated, as applicable and where appropriate.

For all proposed launching, receiving, connection and isolation valve 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 impacts on climate change exposure would be anticipated, and thus no disproportionate adverse effects on EJ populations would be anticipated.

Community Resources

Construction-period impacts specific to community resources and open space could include:

- Visual assets of community and open resources may temporarily change.
- Temporary construction easements of open space land would occur at some sites, including Southern Spine Mains, Hegarty Pumping Station, and American Legion Site.
- Surface pipelines used for dewatering at launching and receiving sites would impact some open space

Further information on methodology and construction impacts on community resources can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.13**.

2.4.6.1 Alternative 3

This section presents potential construction-period impacts to the resources described above for Alternative 3 to understand if there are disproportionate impacts to EJ populations.

Traffic

The DGA for the American Legion, School Street, Newton Street Pumping Station, and Southern Spine Mains sites are within EJ populations that would experience moderate traffic impacts. **Table 2.4-20** shows the impacts of truck routes by proposed site for Alternative 3. With planned mitigation to truck routes and daily truck trips, no disproportionate adverse effects for EJ populations would be anticipated. Traffic impacts would be minimized through traffic management measures and monitoring to the greatest extent feasible, and remaining route impacts would be shared by EJ and non-EJ block groups.

Table 2.4-20 Alternative 3 – Impacts of Truck Trips by Site

Shaft Location	LOD within EJ Block Group?	Traffic Impact Level	Truck Route through EJ Block Group?	Traffic (I/DI)		I/DI Explanation
Fernald Property	No	Moderate	Yes	N	N	Truck routes only intersect with the boundary of EJ block groups on a necessary main road, Weston St. (Route 20) and avoid others. Leftover burden after mitigation would be shared by EJ and non-EJ block groups.
Bifurcation	No	Low	No	N	N	Truck routes stay close to the LOD, and no EJ block groups are nearby.
Tandem Trailer and Park Road East	No	Low	No	N	N	Truck routes stay close to the LOD, and no EJ block groups are nearby.
Highland Avenue Northwest/ Southwest	No	Moderate	No	N	N	Truck routes stay close to the LOD, and no EJ block groups are nearby.
Highland Avenue Northeast/ Southeast	No	Low	No	N	N	Truck routes stay close to the LOD, and no EJ block groups are nearby.
American Legion	Yes	Moderate	Yes	Y	N	There would be no opportunities to avoid EJ block groups with truck routes at this site. Moderate impacts from truck routes would be mitigated accordingly.
School Street	Yes	Moderate	Yes	Y	N	There would be no opportunities to avoid EJ block groups with truck routes at this site. Moderate impacts from truck routes would be mitigated accordingly.
Cedarwood Pumping Station	Yes	Low	Yes	Y	N	There would be low levels of traffic impact and truck route impacts would be mitigated accordingly.
Hegarty Pumping Station	Yes	Low	Yes	Y	N	By limiting routes to a main road, Worcester Street (Route 9), truck routes avoid EJ groups as much as possible outside the LOD. There would be low levels of traffic impact, and truck route impacts would be mitigated accordingly.

Table 2.4-20 Alternative 3 – Impacts of Truck Trips by Site

Shaft Location	LOD within EJ Block Group?	Traffic Impact Level	Truck Route through EJ Block Group?	Traffic (I/DI)		I/DI Explanation
St. Mary Street Pumping Station	No	Moderate	Yes	Y	N	Truck routes only intersect with the boundary of an EJ block group on a road necessary to get to Worcester Street (Route 9). Moderate impacts from truck routes would be mitigated accordingly. Leftover burden after mitigation would be shared by EJ and non-EJ block groups.
Newton Street Pumping Station	Yes	Moderate	Yes	Y	N	There would be no opportunities to avoid EJ block groups with truck routes at this site. Moderate impacts from truck routes would be mitigated accordingly.
Southern Spine Mains	Yes	Moderate	Yes	Y	N	The truck routes avoid EJ block groups as much as possible outside of the LOD, in order to limit routes to Route 203. Moderate impacts from truck routes would be mitigated accordingly.
Hultman Aqueduct Isolation Valve	No	Low	No	N	N	Truck routes stay close to the LOD and no EJ block groups are nearby.

Source: DEIR Transportation section.
I = impact, DI = disproportionate impact.

The maximum expected overall number of daily truck trips is 402, which is expected to occur on days when construction activities take place simultaneously at Highland Avenue Northeast/Southeast, Bifurcation, and Fernald Property. Since this Program is voluntarily submitting information to comply with the 2021 EJ Policy and Protocols, the MWRA analyzed new ADT of diesel vehicle traffic over 1 year or more at each site instead of analyzing cumulative ADT across all 14 sites because they are separated geographically and intersect distinct EJ populations. The LOD of the sites with the highest number of truck trips per day do not fall within an EJ block group, and the sites with the highest number of truck trips per day do not exceed 150 net new ADT. No disproportionate adverse effects to EJ populations would be anticipated, as EJ and non-EJ communities would share the construction traffic burden from trucks.

Highland Avenue Northeast/Southeast, Bifurcation, and Tandem Trailer construction activities would generate the highest number of vehicle trips in the morning peak hour. In the evening peak hour, Bifurcation and Tandem Trailer construction activities would generate the highest number of vehicle trips during the change from first to second shift. The LOD of the sites with the highest number of net new trips per day do not fall within an EJ block group. No disproportionate adverse effects to EJ populations would be anticipated, as EJ and non-EJ communities would share the construction traffic burden from new vehicle trips.

American Legion, School Street, Newton Street Pumping Station, and Southern Spine Mains sites have an identified high or moderate traffic impact level, EJ communities within the respective site's LOD, and/or a high prevalence of EJ communities within 1 mile. Detours as a result of surface piping would be short-term at American Legion, School Street, and Southern Spine Mains. Traffic impacts from truck routes would be short-term and minimized through mitigation measures. No disproportionate impacts would be anticipated following planned mitigation. Truck trips related to surface piping construction and their identified level of impact are shown in **Table 2.4-21.**

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Table 2.4-21 Alternative 3 – Surface Piping Construction Period Impacts by Site

Shaft Location	Description of Impact	LOD within EJ Block Group?	Traffic Impact Level
Fernald Property	A short-term detour along Waverley Oaks Road (arterial)	No	High
Highland Avenue Northeast/Southeast	Detours along Brook Road, Wexford Street, and Fremont Street (local roads)	No	Low
American Legion	A short-term detour along Morton Street (arterial) Trenchless construction will be used at this site allowing for a short-term detour along American Legion Highway (arterial)	Yes	Moderate
School Street	A short-term detour along School Street (collector)	Yes	High
St. Mary Street Pumping Station	A short-term detour on St. Mary Street (local road)	No	Low
Southern Spine Mains	Temporary bicycle and pedestrian detours along the Arborway (arterial)	Yes	Moderate

Air Quality

Construction-period emissions would be geographically diverse, occurring across three launching sites, three receiving sites and six connection sites, and spanning several counties. Launching sites would be more emissions intensive than receiving, connection, and isolation valve sites. Emissions would be primarily associated with off-road equipment and, more specifically, equipment at launching sites. During the peak period, most of the emissions would result from tunnel excavation at the launching sites. The Highland Avenue Northeast site contributes to the emissions near the end of the peak year. No connection sites were active in the peak year of emissions. However, as noted in the air quality analysis, construction emissions were quantified by location and time based on schedules and equipment lists planned for the Program. The estimates are conservative and assume major Program elements are constructed at the same time. However, it is highly likely that the peak periods would be distributed with lesser degrees of impact over a longer duration as discussed in **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.3 Analysis Conditions.**

No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.11** for a GHG and air quality discussion, and **Chapter 6, Climate Change**, for a climate change exposure and impact information.

The LOD of the three identified sites are not within an EJ block group. No disproportionate adverse effects to EJ populations would be anticipated, as EJ and non-EJ communities would share any construction emissions burden from both on- and off-road sources.

Noise and Vibration

American Legion, Tandem Trailer, School Street, Newton Street Pumping Station, Cedarwood Pumping Station, St. Mary Street Pumping Station, and Hegarty Pumping Station sites could exceed construction noise levels by as much as 10 decibels, 20 decibels, 14 and 19 decibels, 11 decibels, 6 decibels respectively; the LOD of the sites are within an EJ block group. No disproportionate adverse effects would be anticipated. The Noise and Vibration section details planned mitigation measures to minimize potential noise and vibration impacts using best practices to comply with noise and vibration limits as is feasible.[7] **Table 2.4-22** summarizes the construction noise impact results by site and EJ implications.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

7 As a state agency, the MWRA is not required to comply with other state agency or municipal noise ordinances, but nonetheless the MWRA seeks to minimize potential noise and vibration impacts and comply with such limits, as feasible and practicable.

Table 2.4-22 Alternative 3- Construction Noise Impacts by Site

Shaft Location	LOD within EJ Block Group?	Anticipated to Exceed Noise Levels?
Fernald Property	No	No
Bifurcation	No	No
Tandem Trailer and Park Road East	No	Yes
Park Road West	No	No
Highland Avenue Northwest/Southwest	No	No
Highland Avenue Northeast/Southeast	No	No
American Legion	Yes	Yes
School Street	Yes	Yes
Cedarwood Pumping Station	Yes	Yes
Hegarty Pumping Station	Yes	Yes
St. Mary Street Pumping Station	No	Yes
Newton Street Pumping Station	Yes	Yes
Southern Spine Mains	No	No
Hultman Aqueduct Isolation Valve	No	No

Hazardous Materials

To prevent future impacts to human health and the environment, rock and excavated material removed during construction under Alternative 3 would be stored using appropriate containment within an appropriate facility. School Street site, Newton Street Pumping Station, and Southern Spine Mains have an EJ block group within their LOD and have potential soil and groundwater contamination concerns. With planned mitigation, no disproportionate adverse effects for EJ populations would be anticipated. Improvement of disposal sites would be anticipated for any contamination present on site. See **Table 2.4-23** for soil and groundwater potential construction impacts. Materials from the demolition of buildings at the Fernald Property will be disposed of at appropriately licensed facilities.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Table 2.4-23 Alternative 3- Soil and Groundwater Construction Impacts by Site

Site	LOD within EJ Block Group?	Potential Contamination
Fernald Property	No	Petroleum – soil and groundwater Metals - groundwater
Bifurcation	No	Petroleum – soil Antimony – groundwater
Tandem Trailer and Park Road East	No	Petroleum – soil
Highland Avenue Northwest/Southwest Sites	No	Petroleum – soil and groundwater VOCs – groundwater
Highland Avenue Northeast/Southeast Sites	No	Petroleum – soil and groundwater VOCs – groundwater
School Street	Yes	VOC – groundwater
Newton Street Pumping Station	Yes	Petroleum – soil and groundwater
Southern Spine Mains	Yes	Petroleum – soil and groundwater

Natural Resources

There would be no adverse effects to water resources. Therefore, no disproportionate adverse impacts within EJ communities would be anticipated.

With implementation of appropriate sedimentation and erosion controls during construction and post launching- and receiving site restoration, no permanent impacts on wetland resources would be anticipated as a result of construction. Thus, no disproportionate adverse effects for EJ communities would be anticipated.

Climate and Resiliency

No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.11** for a GHG and air quality discussion, and **Chapter 6, Climate Change,** for a climate change exposure and impact information.

There would be no adverse effects to climate change exposure. Therefore, no disproportionate adverse effects for community resources in or used primarily by EJ communities would be anticipated.

Community Resources

There would be no adverse effects to community resources. Therefore, no disproportionate adverse effects for community resources in or used primarily by EJ communities would be anticipated.

2.4.6.2 Alternative 4

This section presents potential construction-period impacts to the resources described above for Alternative 4 to understand if there are disproportionate impacts to EJ populations.

Traffic

The construction impacts of truck routes would have the same impacts as Alternative 3, excluding the Bifurcation site and including Park Road West in its place. Park Road West would also have a low impact on traffic, and truck routes would not impact an EJ block group. No other traffic impact levels would change from Alternative 3.

The construction impacts of daily truck trips would have the same impacts as Alternative 3, except the Bifurcation site would be replaced with the Park Road West site, and the Highland Avenue Northwest/Southwest site changing from a receiving to a launching site would contribute a higher number of daily truck trips. The maximum expected overall number of daily truck trips is 408. While this Program is voluntarily submitting information to comply with the 2021 EJ Policy and Protocols, the MWRA analyzed new ADT of diesel vehicle traffic over 1 year or more at each site instead of analyzing cumulative ADT across all 14 sites because they are separated geographically and intersect distinct EJ populations. The LOD of the sites with the highest number of truck trips per day do not fall within an EJ block group, and the sites with the highest number of truck trips per day do not exceed 150 net new ADT. No disproportionate adverse effects to EJ populations would be anticipated, as EJ and non-EJ communities would share the construction traffic burden from trucks.

With planned mitigation to truck routes and daily truck trips, no disproportionate adverse effects for EJ populations would be anticipated. Traffic impacts would be minimized through traffic-management measures and monitoring to the greatest extent feasible, and remaining route impacts would be shared by EJ and non-EJ block groups.

The construction impacts of net new vehicle trips would have the same impacts as Alternative 3, except the Bifurcation site would be replaced with Park Road West, and the Highland Avenue Northwest/Southwest site would contribute a higher number of vehicle trips in the morning peak hour. Surface piping under Alternative 4 would be the same as surface piping under Alternative 3. Detours as a result of surface piping would be short-term at American Legion, School Street, and Southern Spine Mains. Traffic impacts from truck routes would be short-term and minimized through mitigation measures. No disproportionate impacts would be anticipated following planned mitigation.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Air Quality

The construction impacts of peak-year emissions would be similar to Alternative 3, with the same activities occurring during the same peak timeframe. The primary difference between the alternatives is that emissions would be associated with Highland Avenue Northwest/Southwest site and Park Road West site in Alternative 4, instead of the Bifurcation site and Highland Avenue Northeast/Southeast site in Alternative 3.

No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. **See Chapter 4, Existing**

Conditions and Environmental Assessment, Section 4.11 for a GHG and air quality discussion, and **Chapter 6, Climate Change**, for a climate change exposure and impact information.

Tandem Trailer, Highland Avenue Northwest/Southwest sites, and Park Road West do not have an EJ block group within their respective LOD. No disproportionate adverse effects to EJ populations would be anticipated, as EJ and non-EJ communities would share any construction emissions burden from both on- and off-road sources.

Noise and Vibration

With Alternative 4, construction noise and vibration levels, potential impact, and potential disproportionate adverse effects to EJ communities would be the same as Alternative 3 at all receptors, except that there would not be construction at the Bifurcation site and there would be construction at the Park Road West site. Construction at the Park Road West site would not exceed noise limits, and therefore no construction noise impact would be anticipated. No disproportionate adverse effects would be anticipated. The Noise and Vibration section details planned mitigation measures to minimize potential noise and vibration impacts using best practices to comply with noise and vibration limits as is feasible.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Hazardous Materials

The construction period impacts outlined under Alternative 3 were the same as the construction impacts for tunnel alignment Alternative 4, with the exception of the Bifurcation site, which was not included under Alternative 4. The Park Road West site does not have potential soil and groundwater contamination concerns. With planned mitigation, no disproportionate adverse effects for EJ populations would be anticipated. Improvement of disposal sites would be anticipated for any contamination present on site.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Natural Resources

There would be no adverse effects to water resources. Therefore, no disproportionate adverse impacts within EJ communities would be anticipated.

The construction period impacts on wetland resources would be the same as Alternative 3. Thus, no disproportionate adverse effects for EJ communities would be anticipated.

Climate and Resiliency

No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.11** for a GHG and air quality discussion, and **Chapter 6, Climate Change**, for a climate change exposure and impact information.

The construction period impacts on climate change exposure would be the same as Alternative 3. No disproportionate adverse effects for climate change exposure of EJ communities would be anticipated.

Community Resources

The construction period impacts on community resources would be the same as Alternative 3. No disproportionate adverse effects for community resources in or used primarily by EJ communities would be anticipated.

2.4.6.3 Alternative 10

This section presents potential construction period impacts to the resources described above for Alternative 10 to understand if there are disproportionate impacts to EJ populations.

Traffic

The construction impacts of truck routes would have the same impacts as Alternative 3, excluding Bifurcation and the Tandem Trailer/Park Road East sites and including the Park Road West site in its place, and changing the Highland Avenue Northwest/Southwest site from a receiving to a launching site. Park Road West would also have a low impact on traffic, and truck routes would not impact an EJ block group. The change of the Highland Avenue Northwest/Southwest site would not result in a traffic impact level change. No other traffic impact levels would change from Alternative 3.

The construction impacts of daily truck trips would be the same as in Alternative 3, except the Park Road West site is replacing the Bifurcation and Tandem Trailer/Park Road East sites, and the Highland Avenue Northwest/Southwest site changing from a receiving to a launching site would contribute a higher number of daily truck trips. The maximum expected overall number of daily truck trips is 312. While this Program is voluntarily submitting information to comply with the 2021 EJ Policy and Protocols, the MWRA analyzed new ADT of diesel vehicle traffic over 1 year or more at each site instead of analyzing cumulative ADT across all 14 sites because they are separated geographically and intersect distinct EJ populations. The LOD of the sites with the highest number of truck trips per day do not fall within an EJ block group, and the sites with the highest number of truck trips per day do not exceed 150 net new ADT.

With planned mitigation to truck routes and daily truck trips, no disproportionate adverse effects for EJ populations would be anticipated; traffic impacts would be minimized through traffic management measures and monitoring to the greatest extent feasible, and remaining route impacts would be shared by EJ and non-EJ block groups.

The construction impacts of net new vehicle trips would have the same impacts as Alternative 3, except the Bifurcation and Tandem Trailer/Park Road East sites would be replaced with the Park Road West site and the Highland Avenue Northwest/Southwest site would contribute a higher number of vehicle trips in the morning peak hour. Surface piping under Alternative 10 would be the same as surface piping under Alternatives 3 and 4. Detours as a result of surface piping would be short-term at the American Legion, School Street, and Southern Spine Mains sites. Traffic impacts from truck routes would be short-term and minimized through mitigation measures. No disproportionate impacts would be anticipated following planned mitigation.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Air Quality

The construction impacts of peak-year emissions would be similar to Alternatives 3 and 4, as the same activities would be occurring during the same peak timeframe. The primary difference between the alternatives is that emissions would be associated with the Highland Avenue Northwest/Southwest launching site and the Park Road West receiving site in Alternative 4 instead of the Bifurcation launching site and Highland Avenue Northwest/Southwest receiving site in Alternative 3. Alternative 10 peak year emissions are similar to Alternatives 3 and 4.

No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.11** for a GHG and air quality discussion, and **Chapter 6, Climate Change**, for a climate change exposure and impact information.

Highland Avenue Northwest/Southwest and Highland Avenue Northeast/Southeast launching sites' LOD does not fall within an EJ block group. No disproportionate adverse effects to EJ populations would be anticipated, as EJ and non-EJ communities would share any construction emissions burden from both on- and off-road sources.

Noise and Vibration

Construction noise and vibration levels, potential impact, and potential disproportionate adverse effects to EJ communities would be the same as Alternatives 3 and 4 at all receptors, except that there would not be construction at the Tandem Trailer and Park Road East or Bifurcation sites, and the construction at the Park Road West site would be for a large connection. With planned mitigation for the American Legion, School Street, Newton Street Pumping Station, Cedarwood Pumping Station, and Hegarty Pumping Station sites, all of which exceed noise levels and are within an EJ block group, no disproportionate adverse effects for EJ populations would be anticipated.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Hazardous Materials

The construction period impacts outlined under Alternatives 3 and 4 would be the same as the construction impacts for Alternative 10 with the exception of the Tandem Trailer the Park Road East sites and the Bifurcation site. With planned mitigation, no disproportionate adverse effects for EJ populations would be anticipated. Improvement of disposal sites would be anticipated for any contamination present on site.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Natural Resources

There would be no adverse effects to water resources. Therefore, no disproportionate adverse impacts within EJ communities would be anticipated.

The construction period impacts on wetland resources would be the same as Alternative 3. Thus, no disproportionate adverse effects for EJ communities would be anticipated.

Climate and Resiliency

No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.11** for a GHG and air quality discussion, and **Chapter 6, Climate Change**, for a climate change exposure and impact information.

The construction period impacts on climate change exposure would be the same as Alternative 3. No disproportionate adverse effects for climate change exposure of EJ communities would be anticipated.

Community Resources

The construction-period impacts on community resources would be the same as Alternative 3. No disproportionate adverse effects for community resources in or used primarily by EJ communities would be anticipated.

2.4.7 Final Conditions

The following sections discuss the permanent impacts associated with the construction of the three DEIR Alternatives. Potential Final Condition impacts of the Program that may impact identified EJ populations are assessed and considered in this section.

2.4.7.1 Alternative 3

This section presents potential Final Condition impacts for Alternative 3 to understand if there are disproportionate impacts to EJ populations.

Traffic

MWRA maintenance workers would access the properties daily, but traffic impacts would be insignificant and would not require mitigation. Therefore, no disproportionate traffic impacts for EJ communities would be anticipated. Further information on final impacts on traffic can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.10** and **Appendix F**.

Air Quality

There would be no permanent fossil-fueled sources of emissions at the finished sites. Sites would have the infrastructure to support portable generators for emergencies but would not have permanent back-up generators on site. The only source of anticipated emissions would be from vehicles accessing the sites for maintenance activities. These trips would be daily inspections and have minor activity. Finished sites would not have any significant continuous use of electricity. Any continuous electricity use would be minor and associated with site lighting or camera systems. The finished sites would not have buildings with conditioned spaces that would require an energy modeling analysis.

No disproportionate adverse effects for EJ communities would be anticipated from operations. Further information on final impacts on air quality can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.11**.

Noise and Vibration

The valve chambers and shaft structures at specific sites may project approximately 1 to 2 feet above the ground surface; however, there is no operational noise or vibration generated by these facilities and no potential for operational noise or vibration impact. Maintenance of these sites would include mowing grassed areas; although there would be associated noise, this would be temporary and would not result in significant adverse noise impact. There would be no anticipated disproportionate impacts to EJ communities for noise and vibration impacts. Further information on final impacts on noise and vibration can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.12**.

Hazardous Materials

The Program would likely have a positive effect on confirmed areas of soil and groundwater contamination within the Program site. Reuse of as much excavated soil as possible, including impacted soil with concentrations below the applicable Massachusetts Contingency Plan (MCP) standards, is the preferred option and is recommended if a pre-risk assessment screening of the material shows no limitations on risk associated with current and foreseeable use of the property. Remediation of soil that could not be reused would most likely consist of soil excavation and off-site disposal. No disproportionate soil and groundwater impacts to EJ communities would be anticipated, and EJ populations impacted by existing contamination would benefit from cleanup activities. Further information on Final Condition impacts on contaminants can be found **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.8**.

Natural Resources

No permanent or temporary impacts to water resources would occur in association with operation of the tunnel. To avoid impact to water resources, all proposed shafts, valve chambers and other permanent appurtenances were located outside of identified water resource areas, and all proposed impervious cover would be mitigated using stormwater management. No disproportionate impacts to water resources within EJ communities would be anticipated. Further information on Final Condition impacts on water resources can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.6**.

There would be no wetland impacts under Final Conditions. No disproportionate impacts to natural resources within EJ communities would be anticipated.

The new pipeline and supporting infrastructure would provide redundancy for MWRA's existing Metropolitan Tunnel System, which would substantially benefit EJ and non-EJ populations by reducing the risk of interrupted water supply during unexpected events. Historically, limited or lack of access to safe, clean drinking water disproportionately impacts EJ populations due to availability of resources, including financial resources, access to alternatives, and representation for advocacy purposes. Enhancing the system's redundancy and resiliency would enable upgrades to take place that are critical to ensuring the continued reliability of the water supply system, which is essential to providing equitable access to a critical resource, public health, sanitation, fire protection, and supporting a viable economy.

Climate and Resiliency

The Program would primarily be constructed underground with limited disruption to the surface above. Above-ground structures would primarily consist of the shaft site locations where vertical concrete-lined tunnels would connect the deep rock tunnel to the surface and/or water distribution infrastructure. Within the permanent sites, a fenced off area would surround valve chambers and tunnel shafts that have an access hatch at or above ground level. The Program would create up to 4 acres of new impervious surface compared to existing conditions, including new pavement proposed for vehicle parking and site access roadways. Further information on Final Condition impacts on climate change exposure can be found in **Chapter 6**, **Climate Change**.

The four categories outlined in the RMAT output report are sea-level rise/storm surge, extreme precipitation-urban flooding, extreme precipitation-riverine flooding, and extreme heat. The full RMAT output reports can be found in **Appendix H**.

The climate change exposure risks identified by the RMAT Tool and the presence of EJ block groups for all sites are summarized in **Table 2.4-24**. For Alternative 3, the American Legion, School Street, Newton Street Pumping Station, Cedarwood Pumping Station, Hegarty Pumping Station, and Southern Spine Mains sites have EJ block groups that have high exposure to extreme precipitation and extreme heat. While all of the aforementioned sites have planned tree removal that might increase heat vulnerabilities, only EJ block groups within the American Legion site have a potential for increased urban flooding due to the amount of increased impervious surface. Additionally, the MEPA Interim Protocol for Analysis of Program Impacts on Environmental Justice Populations notes that the risk rating for extreme heat should not be used as a definitive indicator of elevated climate risks. Planned mitigation measures, including sustainable best practices, would avoid and minimize climate change-related risk identified by the RMAT tool and its resulting impact on EJ populations. With planned mitigation for flooding and heat concerns, vulnerabilities identified by RMAT would not be exacerbated further, and thus no disproportionate adverse effects to EJ populations from the Program would be anticipated.

Further information on planned mitigation measures can be found in **Section 2.4.8**.

Community Resources

Valve chambers and shafts would be surrounded by a chain link fence around the above-ground structures. There would be a small, paved area for maintenance vehicles and an access hatch at, or just above, ground level. These permanent structures would not affect the use and operation of open space and community resources. No permanent impacts on open space and community resources would be anticipated; therefore, no disproportionate adverse effects within EJ communities would be anticipated.

Table 2.4-24 Alternative 3 - Climate Change Exposure and Presence of EJ Block Groups by Site

Site	LOD within EJ Block Group?	Estimated New Impervious Surface (acres)	Tree Removal Anticipated	Sea-level Rise and Storm Surge	Extreme Precipitation		Extreme Heat
					Urban Flooding	Riverine Flooding	
Fernald Property	No	0.4	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
Bifurcation	No	0.7	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
Tandem Trailer and Park Road East	No	0.2 0.3	Yes Yes	Not Exposed Not Exposed	High Exposure High Exposure	Not Exposed Moderate Exposure	High Exposure High Exposure
Park Road West[1]	No	0.4 (Alt. 4) 0.6 (Alt. 10)	Yes	Not Exposed	High Exposure	High Exposure	High Exposure
Highland Avenue Northwest/ Southwest	No	0	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Highland Avenue Northeast/ Southeast	No	0.6	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
American Legion	Yes	0.7	Yes	Not Exposed	High Exposure	High Exposure	High Exposure
School Street	Yes	-0.2 (existing impervious converted to pervious)	No	Not Exposed	High Exposure	Not Exposed	High Exposure
Cedarwood Pumping Station	Yes	0.1	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
Hegarty Pumping Station	Yes	0.1	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
St. Mary Street Pumping Station	No	0.1	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Newton Street Pumping Station	Yes	0.1	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Southern Spine Mains	Yes	0.2	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Hultman Aqueduct Isolation Valve	No	0.1	No	Not Exposed	High Exposure	Not Exposed	High Exposure

1 Park Road West is not included in Alternative 3. Due to its lack of impact on EJ populations, it remains in this table for conciseness of Sections 2.4.6.2 and 2.4.6.3, where Park Road West is applicable.

2.4.7.2 Alternative 4

The Final Condition would have the same impacts as Alternative 3.

2.4.7.3 Alternative 10

The Final Condition would have the same impacts as Alternative 3.

2.4.8 Avoidance, Minimization, and Mitigation Measures

Planned mitigation that would impact both EJ and non-EJ communities is highlighted below. EJ-specific mitigation measures are discussed for any alternative with anticipated disproportionate adverse effects. Full mitigation measures for each of the resource areas can be found in their respective sections and are referenced below.

2.4.8.1 Alternative 3

No recommended EJ-specific mitigation measures are proposed at this time. This is dependent on planned mitigation that would protect both EJ and non-EJ populations from anticipated impacts, as described in **Chapter 4**, **Existing Conditions and Environmental Assessment**, being implemented to the fullest extent. Impacts at sites with a LOD within an EJ population, which would be mitigated, include:

- Increased truck traffic from surface pipe construction at the American Legion, School Street, and Southern Spine Mains sites
- Elevated noise at School Street, Cedarwood Pumping Station, Hegarty Pumping Station, and the American Legion sites
- Potential soil and groundwater contamination from excavation at Newton Street Pumping Station, School Street, and Southern Spine Mains sites

Traffic

When construction measures create the possibility of causing traffic congestion, such work would not be performed during weekday peak hours, which normally occur from 7:00 AM to 9:00 AM and from 3:00 PM to 7:00 PM. On heavily traveled urban arterials, work would be restricted to overnight hours, typically from 8:00 PM to 5:00 AM. Construction work would be avoided during the weekends due to the roads, parks, and any other recreational site that might be heavily used then. Conversely, in some residential areas, work would be restricted to daytime hours so as not to disturb residents.

A comprehensive list and further information of avoidance, minimization, and mitigation measures on traffic impacts can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.10**. Mitigation measures are identified below for sites that have a potential traffic impact where EJ populations are present within the DGA.

American Legion

- Encourage and incentivize carpooling for contractors

Surface pipe connections requiring work on Morton Street and American Legion Highway would be installed during off-peak and/or overnight hours only to minimize disturbance to traffic.

School Street

- Encourage and incentivize carpooling for contractors

The surface pipe along School Street would be installed during off-peak and/or overnight hours only to minimize disturbance to traffic. Traffic would be maintained in at least one direction whenever possible.

Southern Spine Mains

- Encourage/ incentivize carpooling for contractors

Installation of the surface pipe connection from the proposed shaft to the existing MWRA transmission line along Arborway would be performed during off-peak and/or overnight hours only to minimize the impacts to bicyclists and pedestrians.

These mitigation measures address the potential impacts on EJ communities during surface pipe construction for EJ communities within the DGA of American Legion Receiving, School Street, and Southern Spine Mains sites. No further EJ mitigation measures were recommended at this time.

Air Quality

A comprehensive list and information on avoidance, minimization, and mitigation measures for air quality impacts can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.11**. As no identified disproportionate adverse effects to EJ communities are anticipated, no further EJ mitigation is recommended at this time.

Noise and Vibration

Construction noise control methods on sites where construction noise would exceed limits would apply to the School Street, Cedarwood Pumping Station, Hegarty Pumping Station, St. Mary Street Pumping Station, and the American Legion sites, which have LODs and/or the DGA within EJ populations.

A comprehensive list and further information on avoidance, minimization, and mitigation measures that would protect both EJ and non-EJ communities from significant adverse impact of noise and vibration can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.12**. As no identified disproportionate adverse effects to EJ communities are anticipated, no further EJ mitigation is recommended at this time.

Hazardous Materials

Safety and disposal procedures would be executed as needed in impacted locations, including EJ and non-EJ communities. These procedures would apply to the Fernald Property, Newton Street Pumping Station, School Street, and Southern Spine Mains sites, which have LODs and/or the DGA within EJ populations.

A comprehensive list and further information on avoidance, minimization, and mitigation measures for contaminants can be found in **Chapter 4**, **Existing Conditions Environmental Assessment, Section 4.8**. These measures would protect EJ and non-EJ communities from significant adverse impact from contaminants and would provide cleanup of existing contamination and disposal sites that pose a risk to community health. As no identified disproportionate adverse effects to EJ communities are anticipated, no further EJ mitigation is recommended at this time.

Natural Resources

A comprehensive list and information on avoidance, minimization, and mitigation measures related to natural resource impacts can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.6**. As no identified disproportionate adverse effects to EJ communities are anticipated, no further EJ mitigation is recommended at this time.

Climate and Resiliency

The MWRA has taken measures to protect its assets from climate change-related risks, and all new MWRA facility rehabilitation projects include long-term adaptation measures that consider flooding trends and projected flooding impacts from hurricane and 100-year storm events. The Program would provide water and reduce potential interruptions caused by climate change exposure in water supply service for multiple communities, including EJ populations. Completion of the Program would reduce potential climate change-related risks and exposures, given the overall purpose of the project is to provide water system redundancy and minimize disruption during system maintenance.

A comprehensive list and further information on these avoidance, minimization, and mitigation measures, including detailed best management practices for extreme precipitation and extreme heat, can be found in the **Chapter 6, Climate Change**. These measures would protect both EJ and non-EJ communities from significant adverse impact of climate change exposure and would provide addition protection from climate change-related risk for the water supply that serves these communities. As no identified disproportionate adverse effects to EJ communities are anticipated, no further EJ mitigation is recommended at this time.

Community Resources

A comprehensive list and information on avoidance, minimization, and mitigation measures for community resource impacts can be found in **Chapter 4**, **Existing Conditions and Environmental Assessment, Section 4.13**. As no identified disproportionate adverse effects to EJ communities are anticipated, no further EJ mitigation is recommended at this time.

2.4.8.2 Alternative 4

Similar to Alternative 3, no recommended EJ-specific mitigation measures are proposed at this time. This is dependent on planned mitigation that would protect both EJ and non-EJ populations from anticipated impacts, as described in **Chapter 4**, **Existing Conditions and Environmental Assessment**, being implemented to the fullest extent. Impacts at sites with a LOD within an EJ population, which would be mitigated, include:

- Increased truck traffic from surface pipe construction at the American Legion, School Street, and Southern Spine Mains sites
- Elevated noise at School Street, Cedarwood Pumping Station, St. Mary Street Pumping Station, Hegarty Pumping Station, and the American Legion sites
- Potential soil and groundwater contamination from excavation at Newton Street Pumping Station, School Street, and Southern Spine Mains sites

Traffic

The avoidance, minimization, and mitigation measures for traffic impacts on EJ and non-EJ communities Alternative 4 would be the same as Alternative 3.

Air Quality

The avoidance, minimization, and mitigation of potential air quality impacts on EJ and non-EJ communities would be the same as Alternative 3.

Noise and Vibration

The avoidance, minimization, and mitigation of potential noise and vibration impacts on EJ and non-EJ communities would be the same as Alternative 3.

Hazardous Materials

The avoidance, minimization, and mitigation of potential soil, groundwater, and hazardous material impacts on EJ and non-EJ communities would be the same as Alternative 3.

Natural Resources

The avoidance, minimization, and mitigation of potential water and natural resource impacts on EJ and non-EJ communities would be the same as Alternative 3.

Climate and Resiliency

The avoidance, minimization, and mitigation of climate change exposure for EJ and non-EJ communities would be the same as Alternative 3.

Community Resources

The avoidance, minimization, and mitigation of community impacts on EJ and non-EJ communities would be the same as Alternative 3.

2.4.8.3 Alternative 10

Similar to Alternatives 3 and 4, no recommended EJ-specific mitigation measures are proposed at this time. This is dependent on planned mitigation that would protect both EJ and non-EJ populations from anticipated impacts, as described in **Chapter 4**, **Existing Conditions and Environmental Assessment**, being implemented to the fullest extent. Impacts at sites with a LOD within an EJ population, which would be mitigated, include:

- Increased truck traffic from surface pipe construction at the American Legion, School Street, and Southern Spine Mains sites
- Elevated noise at School Street, Cedarwood Pumping Station, Hegarty Pumping Station, and the American Legion sites
- Potential soil and groundwater contamination from excavation at Newton Street Pumping Station, School Street, and Southern Spine Mains sites

Traffic

The avoidance, minimization, and mitigation measures for traffic impacts on EJ and non-EJ communities Alternative 10 would be the same as Alternatives 3 and 4.

Air Quality

The avoidance, minimization, and mitigation of potential air quality impacts on EJ and non-EJ communities would be the same as Alternatives 3 and 4.

Noise and Vibration

The avoidance, minimization, and mitigation of potential noise and vibration impacts on EJ and non-EJ communities would be the same as Alternatives 3 and 4.

Hazardous Materials

The avoidance, minimization, and mitigation of potential soil, groundwater, and hazardous material impacts on EJ communities would be the same as Alternatives 3 and 4.

Natural Resources

The avoidance, minimization, and mitigation of potential natural resource impacts on EJ and non-EJ communities would be the same as Alternatives 3 and 4.

Climate and Resiliency

The avoidance, minimization, and mitigation of climate change exposure for EJ and non-EJ communities would be the same as Alternative 3.

Community Resources

The avoidance, minimization, and mitigation of community impacts on EJ and non-EJ communities would be the same as Alternatives 3 and 4.

This page intentionally left blank

3 Alternatives

3.1 Introduction

The Secretary's Certificate on the ENF requires the DEIR to include an expanded alternative analysis that builds off the preliminary data presented in the ENF. This chapter and the remaining chapters in the DEIR present a detailed assessment of the relative ability of the respective alternatives to achieve the project goals while minimizing environmental impacts. This expanded alternative analysis shows the process of the development of the Preferred Alternative and two backup alternatives as requested in the Secretary's Certificate on the ENF. Specifically, this chapter identifies the Preferred Alternative's and the two backup alternatives' deep-rock tunnel alignment, the location of construction and connection shafts, and provides a conceptual plan for each alternative.

The remaining chapters in the DEIR, **Chapter 4, Existing Conditions and Environmental Assessment**, compares the alternatives with respect to their impacts on environmental resource areas, including wetlands, rare species habitat, cultural and historical resources, open space, land alteration and protected open space, impervious area and stormwater management, and construction period impacts in both a narrative and tabular format. In addition, **Chapters 4, Section 4.11 Air Quality and GHG** and **Chapter 6, Climate Change** provide a comparison of GHG impacts and a review of climate change resiliency features of each alternative and **Chapter 2, Outreach and EJ** compares the alternatives relative to EJ impacts.

The Massachusetts Water Resources Authority (MWRA, the Authority) is a Massachusetts public authority established by an act of the Legislature in 1984 and provides 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 purpose of the Metropolitan Water Tunnel Program (the Program) is to enhance the reliability of the Metropolitan Tunnel System that serves the metropolitan Boston area, allowing for system maintenance and repair without disrupting service in a way that maintains the system's ability to provide water needed to support public health and safety.

The primary goal of the Program is to protect public health, provide sanitation, and provide fire protection, in line with the mission of the Authority. In support of this goal, the Program is intended to:

- Provide redundancy for the Metropolitan Tunnel System
- Provide normal water service and fire protection when the existing tunnel system is out of service
- Provide the ability to perform maintenance on the existing tunnel system year-round
- Provide uninterrupted service in the event of an emergency shutdown
- Meet high day demand flow with no seasonal restrictions
- Avoid activation of emergency reservoirs
- Meet customer expectations for excellent water quality
- Preserve sustainable and predictable rates at the water utility level
- Be constructible

- Avoid boil water orders

3.2 History of the Program

3.2.1 History of Redundancy Planning for the Metropolitan Area

A redundant tunnel system was proposed as early as 1937. The plan included a proposed pressure aqueduct and tunnel system with a tunnel loop beginning in Weston near the Charles River and running east into Boston, turning north to Everett, looping west to Belmont, and connecting back to Weston. While much of the 1937 plan for pressure aqueducts and tunnels was implemented from 1937 to present day, the proposed tunnel loop was never completed.

The MetroWest Water Supply Tunnel (MWWST) was approved for construction and was completed in 2003, providing redundancy between the John J. Carroll Water Treatment Plant in Marlborough to the beginning of the existing Metropolitan Tunnel System at Shaft 5/5A located near the I-90/I-95 interchange in Weston. However, the proposed northern tunnel loop was never constructed. A redundant system is still needed east of Shaft 5/5A.

3.2.2 Previous Evaluation of Metropolitan Area Redundancy Alternatives

In 2011, the Authority completed a new evaluation of alternatives for redundancy within the Metropolitan Boston area. This evaluation included surface pipe alternatives in addition to tunnel alternatives with an objective of incorporating redundancy planning into the existing pipeline asset management program (i.e., allocating funds already budgeted for rehabilitation of existing pipelines toward replacing the existing pipelines with larger pipelines). The result of that evaluation was a plan for constructing primarily large-diameter surface pipes to provide redundancy. As the planning for this program progressed, however, it became apparent that the construction of large-diameter pipelines through dense urban areas would cause unacceptable community disruption and had significant implementation challenges. Given the difficulties associated with the construction and significant community impacts associated with large-diameter surface pipes together with operational reliability concerns, the MWRA developed and evaluated a range of alternatives and selected a two-tunnel alternative presented in the Environmental Notification Form (ENF) based on the results of the previous studies (see **Appendix C**).

3.2.3 Preliminary Alternatives Considered in the ENF

The ENF built on the previously studied alternatives that evaluated 13 north alternatives and 15 south alternatives and screened 28 preliminary alternatives that included several options. The 13 preliminary alternatives evaluated for the north portion of the system were grouped into three categories:

1. Operational changes to the system
2. Increasing the capacity of the existing 60-inch Weston Aqueduct Supply Main 3 (WASM3) pipeline by pumping or replacing WASM3 with a larger capacity pipeline

3. Increasing capacity through construction of a new tunnel

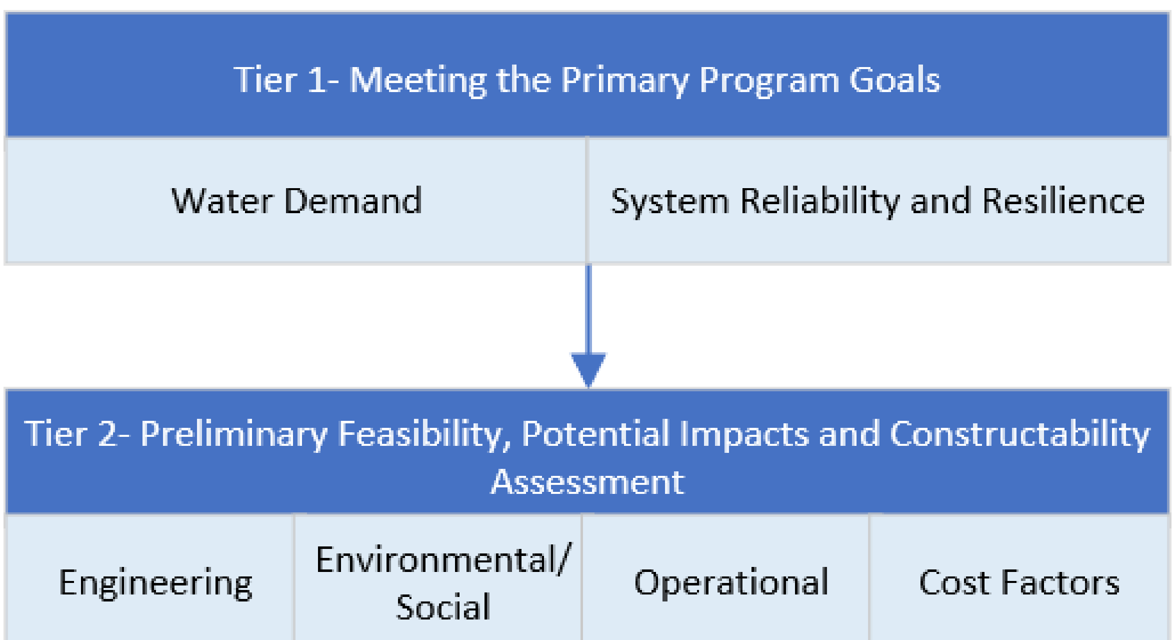
The 15 preliminary alternatives considered for the south portion of the system were grouped into three categories:

1. 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 (CHEPS), including improvements to the CHEPS
2. Construction of a surface pipeline from Shaft 5/5A to a connection along the Dorchester Tunnel
3. Increasing redundancy through construction of a new deep-rock tunnel with connections to the existing MWRA distribution system

3.2.4 ENF Screening Process and Evaluation Criteria

Two tiers of screening criteria were developed and applied. Tier 1 criteria address the primary Program goals. Alternatives that did not meet the primary Program goals were eliminated from further consideration. The second tier of the screening process was a high-level preliminary assessment of each alternative in terms of its feasibility, potential impacts, and constructability. This two-tier screening process resulted in the two-tunnel concept proposed in the ENF. **Figure 3.2-1** illustrates the two-tier alternative screening process. The ENF included an Alternatives Screening Report that documented the ENF Alternatives screening process.

Figure 3.2-1 Two-Tier Alternative Screening Process



The conceptual tunnel alignment and the program study area was identified in the ENF Alternatives Screening Report and is shown in **Figure 3.2-2**.

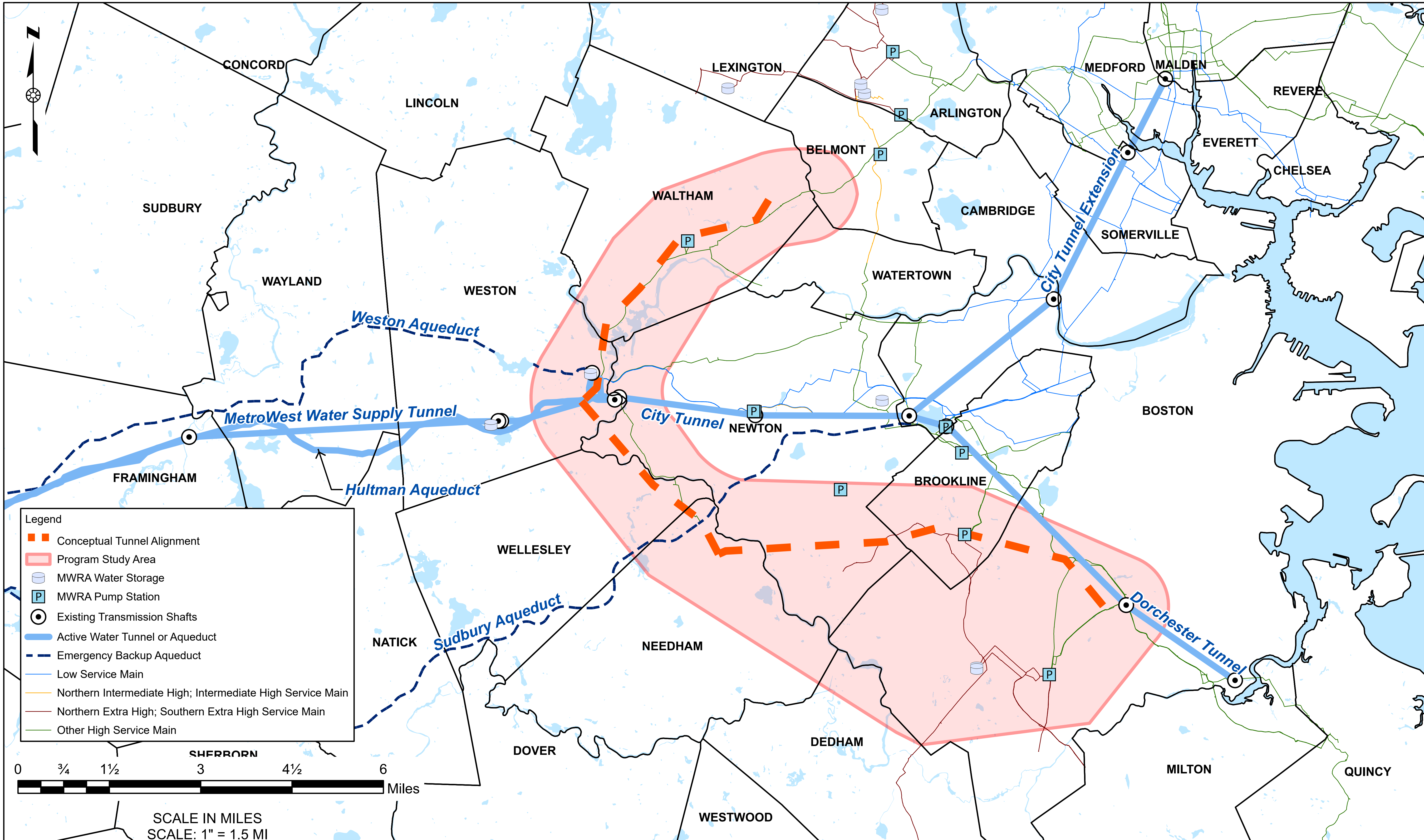
3.3 Tunnel Alignment Elements Considered in DEIR

The ENF alternatives analysis determined that a deep-rock tunnel to the north and south would be the preferred solution to provide the required redundancy east of Shaft 5/5A. Both tunnels are proposed to begin in the Town of Weston, Massachusetts, near the terminus of the Hultman Aqueduct and MetroWest Water Supply Tunnel. The North Tunnel Alternative would extend approximately 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), and the South Tunnel Alternative would extend approximately 10 miles to the south, with a connection to the distribution pipes near Shaft 7C of the Dorchester Tunnel, and ending in Boston.

Based on the geologic characteristics along the proposed tunnel alignments and the lengths of the tunnels, it is expected the tunnel construction of the Program would use rock tunnel boring machines (TBMs) for a majority of the alignment with some areas of drill and blast along the alignment or at receiving shafts, which would begin at a launching shaft[1], excavated down through overburden[2] and rock to a depth of approximately 350 feet below the surface. The deep rock tunnel[3] would be mined to a receiving shaft[4], where the TBM would be extracted or left in place. Launching and receiving shafts are expected to be constructed through rock by drill and blast method (top-down), while connection shafts[5] would be constructed through rock using raisebore[6] (bottom-up) or other construction technique. During tunnel excavation, the primary rock support would include support structures such as rock dowels, shotcrete, and steel set and lagging, and the tunnel final lining would consist of plain concrete lining, reinforced concrete lining, and steel lining depending upon the ground condition and the groundwater infiltration anticipated to be encountered. The tail tunnel[7], which is used to set up TBM trailing gears of the TBM and connection tunnels[8] from intermediate connection points to the main tunnel or between tunnel segments, would be constructed by drill and blast method.

The proposed finished tunnel diameter would be approximately 10-12 feet in diameter and include concrete lining to reach the outside diameter of the TBM bored diameter. For intermediate connection shafts, the finished shaft diameters would range from 2 to 10 feet (to be optimized during final design phase). The raisebore construction method is attractive for intermediate connection shafts, because it requires a relatively small construction footprint and limits the amount of material that needs to be removed from the surface at the intermediate connection shaft site.

1 Launching shaft – Construction shaft where the TBM is assembled and begins excavating
2 Overburden – The overlying material, soil, that is above rock
3 Deep-rock tunnel – A tunnel built deep below the ground surface in rock to avoid surface impacts and utilities
4 Receiving shaft – Construction shaft where the TBM completes excavating and is disassembled.
5 Connection shafts – Smaller construction shafts to facilitate connections to surface pipelines
6 Raisebore – Construction method that involves boring up from below to the ground surface to limit surface impacts
7 Tail tunnel – Underground staging area for assembling the TBM from the launching shaft
8 Connection tunnels – A tunnel constructed by drill and blast methods between the main tunnel and a connection point or between tunnel segments



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.2-2 Program Study Area

Belmont, Waltham, Watertown, Weston, Newton, Wellesley, Needham, Brookline, Dedham, and Boston, MA

Source: VHB, MassGIS, MWRA

This page intentionally left blank

The next step of the tunnel alignment alternatives to support the DEIR candidate alternatives analysis, was to set the general location of the tunnel alignments and associated launching, receiving, and connection sites and identify tunnel alignments made up of segments and routes.

3.3.1 Nodes, Segments and Routes

A node is a site along or at the end of a tunnel segment where a shaft would be constructed. Nodes may include multiple possible shaft sites and corresponding functions. A tunnel segment is the connection of at least 2 nodes that is constructable, e.g. a launching site connected to a receiving site, and may include intermediate shaft sites. An alignment is a connection of segments (a straight-line connection between nodes) that make up a functional tunnel system. The candidate alignment alternatives are a unique collection of tunnel segments, construction shaft sites (at nodes) and hydraulic connection points with each shaft site having a specified functional use (construction shaft or connection point).

The direction of the tunneling along segments have been identified for the three alternatives that proceeded into the DEIR evaluation. However, 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. The proposed North Tunnel Alternative subsurface alignment is expected to be situated either in crystalline rock with predominantly massive granite with mafic dike rock and felsite with minor amounts of mylonite, quartzite, and schist or in Boston Basin argillite; the South Tunnel Alternative subsurface alignment is expected to be mostly in the Boston Basin (except in the vicinity of the I-90/I-95 intersection, where the anticipated ground is in Dedham Zone and would encounter Northern Boundary Fault) with predominantly conglomerate and argillite, with lesser amounts of felsite. Other igneous intrusions such as diabase exists in the Boston Basin.

The direction of excavation of the tunnels by the TBMs would depend on the feasible construction staging site selected. For example, tunnels could be bored from the Hultman Aqueduct node to the north or south, or in the opposite direction, or a combination of both. Thus, each site within these nodes was assessed for their suitability as a TBM launching site, a TBM receiving site, and in some cases, where sufficient suitable land is available for multiple functions.

3.3.2 Launching Site

A launching site allows the TBM to enter and begin excavating the tunnel. A launching site is used for staging, shaft excavation, excavated material removal, concrete operations, and construction dewatering. The site would include a shaft structure, valve chamber, and area for parking, and construction equipment. A site could also function as a double launching site where it launches towards two separate sites through one shaft. The outside diameter of a TBM launching shaft would range from approximately 30 to 40 feet for the tunnel.

3.3.3 Receiving Site

A receiving site is for extracting the TBM upon tunnel completion. A receiving site is used for staging, shaft construction concrete operations, and shaft construction dewatering. The site would include a shaft structure, valve chamber, area for parking, and construction equipment. A site could function as a double receiving site where it receives from two separate launch sites into one shaft. The outside diameter of a single TBM receiving shaft would range from approximately 25 to 35 feet in diameter.

3.3.4 Large Connection Shafts and Connection Tunnels

The Authority also considered options where links to the main tunnel or existing water distribution system could be made via large connections shafts or connection tunnels. Large connection shafts would be similar to a receiving shaft in terms of space requirements, but the diameter of the shaft would be approximately 33 feet (when housing two 10-foot diameter conduits) or two separate large connection shafts potentially each 13 feet in diameter (when housing one 10-foot diameter conduit each). Connection tunnels are made below grade through the drill and blast method to connect to the mainline tunnels and intermediate connection shafts or between tunnel segments and would generally be less than 16 feet in diameter.

3.3.5 Connection Points

Connection points are locations throughout the tunnel system that are either:

- Critical to achieve redundancy (i.e., required)
- Secondary to facilitate tunnel construction, facilitate life safety needs, or to provide benefit to Authority customers and reinforcement to its existing water transmission network

Connection points must be located within close proximity of the pumping stations or near existing supply mains. Connections to pumping stations must be at or adjacent the existing pumping station site, while critical intermediate connection points to the existing distribution system have some flexibility in their exact location as long as they are located within a reasonable distance to the supply main for a surface piping connection.

3.3.5.1 Required Connection Points

When identifying critical connection points, consideration was given to required hydraulic connection points where the tunnel facilities must connect to existing surface infrastructure to achieve the redundancy goals. The critical connection points for the North Tunnel Alternative include:

- **Connection to the Hultman Aqueduct in the vicinity of I-90/I-95 Interchange in Weston**. At this location, the Hultman Aqueduct and MetroWest Tunnel converge and run in parallel to redundantly feed the City Tunnel starting at Shaft 5/5A site at the end of Recreation Road in Weston. The City Tunnel continues to convey water east toward Boston. This location would be the most upstream shaft of the new north and south tunnels as it is the first location in the MWRA water transmission system where full redundancy is not provided downstream by the Metropolitan Tunnel System. Potential sites within the vicinity of the Hultman Aqueduct at the I-90/I-95 Interchange are identified in **Section 3.5** and are grouped into a node around that critical connection point (Hultman Aqueduct Node).

- **Connection Midpoint of WASM3, Waltham, MA.** The other critical connection of the North Tunnel Alternative is approximately at the midpoint of WASM3 near the Waltham and Belmont line. This location provides redundancy for not only WASM3 but also for transmission mains which provide water for much of Belmont at the Belmont Pumping Station and to the Northern Intermediate High system in Arlington. Potential sites within the vicinity of the midpoint of WASM3 are identified in **Section 3.5** and are grouped into a node around that critical connection point (WASM3 Node).

The critical connection points for the South Tunnel Alternative of the Metropolitan Water Tunnel Program include the following.

- **Connection to the Hultman Aqueduct in the vicinity of I-90/I-95 Interchange in Weston.** The southern portion of the Metropolitan Water Tunnel Program would also initiate at the Hultman Aqueduct node in Weston. Water supply for the new south tunnel would be supplied by the Hultman Aqueduct; therefore, this site is considered a critical connection point. Potential sites within the vicinity of the Hultman Aqueduct at the I-90/I-95 Interchange are identified in Chapter 5 and are also located within the Hultman Aqueduct Node.
- **Newton Street Pumping Station, Brookline.** Moving to the east, the Authority's Newton Street Pumping Station supplies water to the Southern Extra High pressure system communities, including Brookline, Newton, Dedham, Westwood, Norwood, Canton, and Milton. The Newton Street Pump Station in Brookline is owned and operated by the Authority and is supplied from the MWRA transmission mains, which in turn are supplied from the Dorchester Tunnel through the Southern Spine Mains. It pumps water to the MWRA Bellevue storage tanks and supplies the MWRA Southern Extra High service area. The Southern Extra High service area is also supplied by the MWRA Hyde Park Pumping Station in Boston. Both the Newton Street Pumping Station and the Hyde Park Pumping Station rely on water supply from the Southern Spine Mains, which is fed off the Dorchester Tunnel. A connection at this location provides a redundant supply to the pumping station, and therefore the station would not be solely reliant on existing MWRA transmission mains, both of which are located within Newton Street.
- **Southern Spine Mains, Boston –** Located along the Southern Spine Mains along the Arborway, a connection to the proposed new tunnel would provide additional redundancy to the Southern High service zone. The proposed site of this connection is on a parcel under the care, custody, and control of the Department of Conservation and Recreation (DCR).
- **In the vicinity of Shaft 7C on the Dorchester Tunnel in Boston.** The final critical connection point of the new south tunnel is near Shaft 7C on the Dorchester Tunnel in Boston. This existing shaft currently supplies water for the southern neighborhoods of Boston, Quincy, and Milton in the Southern High service zone. A connection point to surface piping at this location creates redundancy to this densely populated residential area. Potential sites within the vicinity of Shaft 7C are identified in **Section 3.5** and are grouped into a node around that critical connection point (Shaft 7C Node).

3.3.5.2 Secondary Connection Points

To facilitate tunnel construction or to provide benefit to its customers and reinforcement to its transmission network, the Authority identified additional secondary connection points. The secondary connection points for the North Tunnel Alternative of the Metropolitan Water Tunnel Program include the following.

- **Connection to the Lexington Street Pumping Station.** The connection along the North Tunnel alignment heading east is in the vicinity of the Authority's Lexington Street Pumping Station in Waltham. The Lexington Street Pumping Station provides water from connecting pipelines from WASM3 to the community of Waltham. It pumps water to the Waltham Prospect Hill storage tanks and supplies the Prospect Hill pressure zone of Waltham. The Lexington Street Pumping Station supplies over 40 percent of Waltham's water and is the major supply to this pressure zone with limited back up supply. A connection from the new tunnel would provide redundancy to this pumping station and the community of Waltham.
- **Connection to Cedarwood Pumping Station in Waltham.** The Cedarwood Pumping station is owned and operated by the City of Waltham and is supplied from the WASM3 pipeline. It pumps water to the Cedarwood Standpipe and supplies the Cedarwood pressure zone of Waltham. The Cedarwood Pumping Station is the primary supply to this pressure zone with backup supply available from the Prospect Hill pressure zone through pressure reducing valves. The Cedarwood Pumping Station supplies approximately 15 percent of Waltham's water. Connecting to this location is not required to provide redundancy to the existing tunnel system but would provide benefits to the City of Waltham by providing the Authority with the flexibility of operations to further reinforce its transmission network in proximity to WASM3. It gives the Authority the flexibility to take WASM3 offline while still maintaining water supply to the community.

The secondary connection points for the South Tunnel Alternative of the Metropolitan Water Supply Tunnel Program include:

- **Connection to Hegarty Pumping Station in Wellesley.** The Hegarty Pumping Station is owned and operated by the Town of Wellesley. It pumps to the Wellesley water distribution system from the MWRA Section 80 pipeline. Wellesley is primarily supplied by local groundwater wells, and the Hegarty Pumping Station supplements the local water supply. Connecting to this location would provide benefits to the Town by providing the Authority with the flexibility of operations to further reinforce its transmission network in proximity to Section 80. It gives the Authority the flexibility to take the Section 80 mains offline while still maintaining water supply to the community.
- **St. Mary Street Pumping Station in Needham.** Conveying water to the south, the next secondary connection is the St. Mary Street Pumping Station, which supplies Needham. The pumping station is owned and operated by the Town of Needham and is supplied from the 36-inch diameter Section 80 pipeline. Needham is primarily supplied by local groundwater wells, and the St. Mary Street Pumping Station supplements the local water supply. A connection at the southern end of Section 80 would provide an alternate source of water for Needham allowing for repairs to Section 80 or

emergency service, if needed. With a tunnel connection near this location, Section 80 and the communities of Needham and Wellesley would have redundancy for the first time.

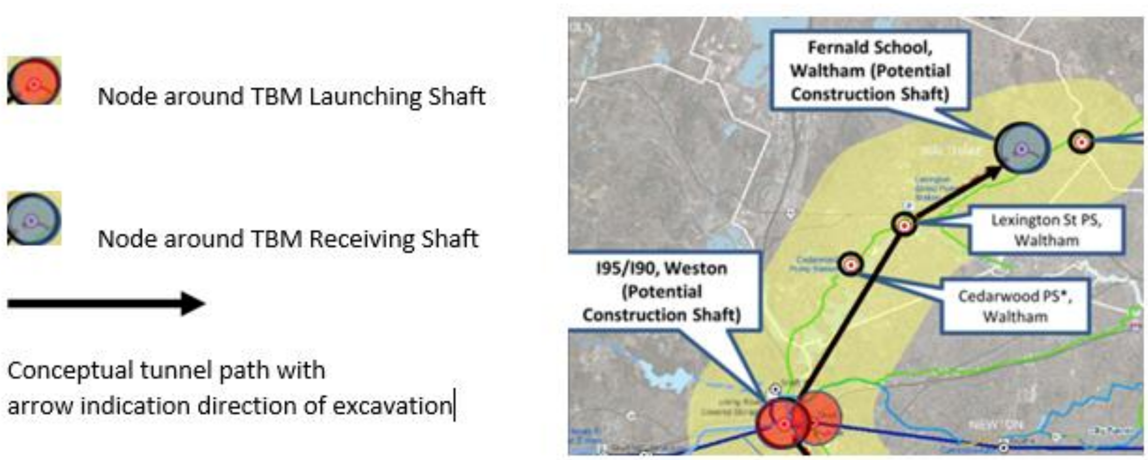
- **Highland Avenue Interchange on I-95 in Needham.** Ideally, construction shafts and connection shafts would be as close as practicable to the connection points identified above. The proposed South Tunnel is approximately 10 miles long. While it may be feasible to construct a single tunnel segment of this length, construction would be better facilitated if there were an interim construction shaft to allow for flexibility in the tunnel excavation activities. The four cloverleafs within the Highland Avenue interchange provide a suitable location for an interim shaft along the route of the South Tunnel. The four cloverleafs within the Highland Avenue interchange are grouped into the Highland Avenue Interchange node.

3.3.6 Nodes

A node is defined as an area with attributes that could allow for shaft construction and hydraulic operation. Defining these nodes helped identify specific site locations to develop the tunnel alignments. For example, from a construction perspective, a site within a node could be proposed as a TBM launching site, a TBM receiving site, an intermediate construction shaft for a TBM, or construction of a connecting shaft. Hydraulically, a node could provide a critical connection point to the distribution system, a secondary connection point, or no connection.

To illustrate this concept, compare the two conceptual sketches shown below in **Figure 3.3-1** where a red circle indicates use of the location to launch a TBM and the gray circle indicates use of the shaft to receive a TBM. The logistical needs and potential impacts at each location would be different depending on its function, and the tunnel path and connections between the two locations is identical.

Figure 3.3-1 Tunnel Network Schematic



When a specific potential shaft location within a node would feature in multiple alignment alternatives, with difference in functionality, the characteristics of the sites would also be different, such as area of land required, construction logistics and operations, and potential social and environmental impacts. Thus, an important element of defining an alignment alternative was to clearly identify the purpose of each site within each node. The purpose then drives the data gathering and design development that supported the evaluation of all the proposed functions of the site within the entire suite of alternatives under consideration. A key approach to identifying sites within nodes around the launching and receiving sites was to avoid and minimize environmental impacts.

3.4 DEIR Alternatives Evaluation and Methodology

The DEIR presents an alternative analysis of the environmental impacts of three Tunnel Redundancy Alignment Alternatives (DEIR Alternatives). As requested in the Secretary's Certificate on the ENF, this alternative analysis details the process of the development of the Preferred Alternative and two backup alternatives from these three Tunnel Redundancy Alignment Alternatives.

The DEIR Alternatives are comprised of two or three deep-rock tunnel segments each with a launching shaft site (for the TBMs), receiving shaft sites (at the terminus of the tunnel boring), and connection shaft sites (where the tunnels are connected to the existing water distribution system). Together these shaft sites and tunnel segments comprise a tunnel alignment. The assessment identified alternatives for each of the shaft site locations, as well as the tunnel alignments as a whole.

These DEIR Alternatives were evaluated using a thorough and transparent methodology that built on the preliminary alternatives analysis conducted prior to and in support of the Tunnel Redundancy ENF. The pre-ENF preliminary alternatives considered and process documentation for identifying the 28 deep-rock tunnel preliminary alternatives to be developed and assessed as candidates in the DEIR can be found in the ENF and in **Appendix C**.

The alternatives screening approach used to identify candidate DEIR Alternatives was an iterative process that considered a similar set of evaluation criteria that were applied in greater and greater detail as the alternatives' identification and evaluation process proceeded, and the alternatives moved from preliminary alternatives to candidate alternatives to DEIR alternatives. See **Appendix C** for additional information**.**

3.4.1 Candidate DEIR Alternatives Evaluation Methodology

Building on the preliminary alternatives' concepts evaluation in the ENF, the deep-rock tunnel concept was the focus of alternatives development with the goal of identifying a small set of tunnel alignment alternatives that would proceed through detailed environmental review and assessment in the DEIR.

Since the candidate DEIR Alternatives are made up of different combinations of launching, receiving, and connecting 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. **Appendix C** describes how the multicriteria decision tool was used to evaluate and score the candidate alternatives' components and alignments.

Key elements of the candidate DEIR Alternatives' evaluation and scoring, and selection methodology include a combination of the following elements as shown in **Table 3.4-1**.

Table 3.4-1 Candidate DEIR Alternatives Evaluation Methodology Features

Features	Purpose
High-level evaluation criteria categories such as Environmental or Engineering Considerations consistent with the ENF evaluation criteria categories	To identify key factors with respect to alternative implementation and impact that allows for differentiation among alternative elements and alignments
Subcriteria for Environmental Considerations for wetlands, cultural resources, hazardous waste sites, and Article 97 applicability	To provide more detailed consideration of the factors that contribute to the high-level evaluation criteria
Scoring mechanism for comparing each criteria category/subcriteria	To compare the relative impacts of each category and subcriterion for each alternative
Selection process	To provide transparent method for selecting the Preferred Alternative and two backup alternatives
Reporting format	To share recommendations and process for alternative(s) selection
Stakeholder input	To allow participation by decision-makers through the iterative alternatives' selection process

3.4.1.2 Candidate DEIR Alternatives Evaluation Steps

The DEIR Alternatives are comprised of two or three deep-rock tunnel segments each with a launching shaft site (for the TBMs), receiving shaft site (at the terminus of the tunnel boring), 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 Alternatives assessment identified alternatives for each of the shaft launching and receiving site locations, as well as the tunnel segments. Together the launching and receiving sites with the tunnel connecting segments are considered to be a tunnel alignment. Each of the tunnel alignments are made up of at least five launching or receiving sites and at least two segments. To facilitate the distribution of the water supply, all of the tunnel alignments would connect to the same connection points located between the launching and receiving sites.

3.5 Candidate Tunnel Alignment Alternatives to be Evaluated in the DEIR

The tunnel alignment evaluation process described in this chapter begins with identifying nodes and shaft sites and functions within each node, which were screened for advancement into 10 candidate DEIR Alternatives that were further evaluated. Connection points were also identified. The 10 candidate DEIR alternatives were screened and resulted in three alignment alternatives, which undergo further detailed analysis in the DEIR. The DEIR presents one preferred alternative and two back-up alternatives. **Appendix C** describes how the 10 candidate DEIR Alternatives were developed, evaluated and scored.

Figure 3.5-1 depicts a summary of the nodes and the connection sites along the tunnel alignment.

As summarized in **Section 3.5.1**, a viable alignment alternative must, above all else, make hydraulic connections at locations that would achieve the primary purpose of the tunnel system: redundancy. Based on the hydraulic analysis and planning conducted to date, the required connection points are understood to be:

- The WASM3 pipeline near the Waltham-Belmont town line
- The Hultman Aqueduct in the vicinity of the I-90/I-95 interchange
- At or near the Newton Street Pumping Station in Brookline
- Near the Southern Spine Mains in Boston
- Near Shaft 7C of the Dorchester Tunnel

To facilitate tunnel construction of the longer south tunnel, an additional construction shaft point was identified. While not a connection point to the MWRA water supply system, it is critical to the feasibility of efficiently executing the construction project. The Authority has identified such a potential construction shaft point at:

- Highland Avenue Interchange on I-95 in Needham

The Authority has identified secondary connection points that would provide benefit to its customers and reinforcement to its transmission network. These locations are:

- School Street to connect to the Lexington Street Pumping Station in Waltham
- The Cedarwood Pumping Station in Waltham
- The Hegarty Pumping Station in Wellesley
- The St. Mary Street Pumping Station in Needham

Ideally, construction shafts and connection shafts would be as close as practicable to the connection points identified above.

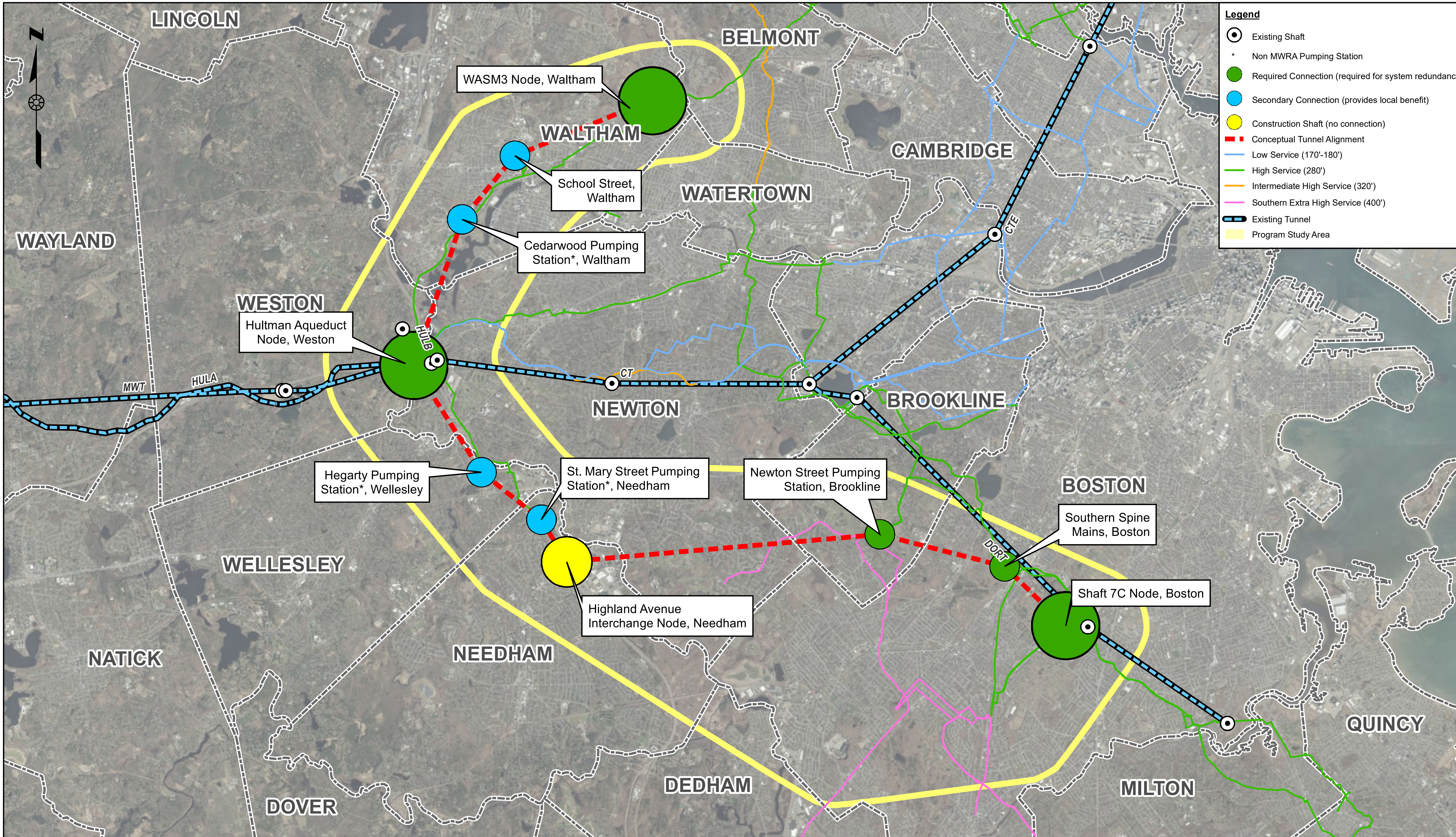


Figure 3.5-1 Nodes and Connection Sites

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

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

This page intentionally left blank

3.5.1 Identify Nodes and Identify Shaft Sites by Function in Vicinity of Nodes

To identify suitable sites for the key connection points to the water supply distribution system, and to facilitate construction**, nodes** were delineated in the following areas:

- **Hultman Aqueduct Node (Weston):** selected as a node because it provides access to the Hultman Aqueduct critical connection point, east of which the MWRA tunnel system required redundancy
- **WASM3 Node (Waltham):** located in the project northern terminus within the northern alignment vicinity and selected as a node because it provides access to a critical connection point at WASM3
- **Highland Avenue Interchange (Needham)**: located within the project southern alignment vicinity and selected as a node to create an interim location along a long tunnel route to facilitate construction
- **Shaft 7C Node (Boston)**: located within the project southern terminus within the southern alignment vicinity selected as a node because it provides a critical connection point to surface piping at Shaft 7C of the Dorchester Tunnel

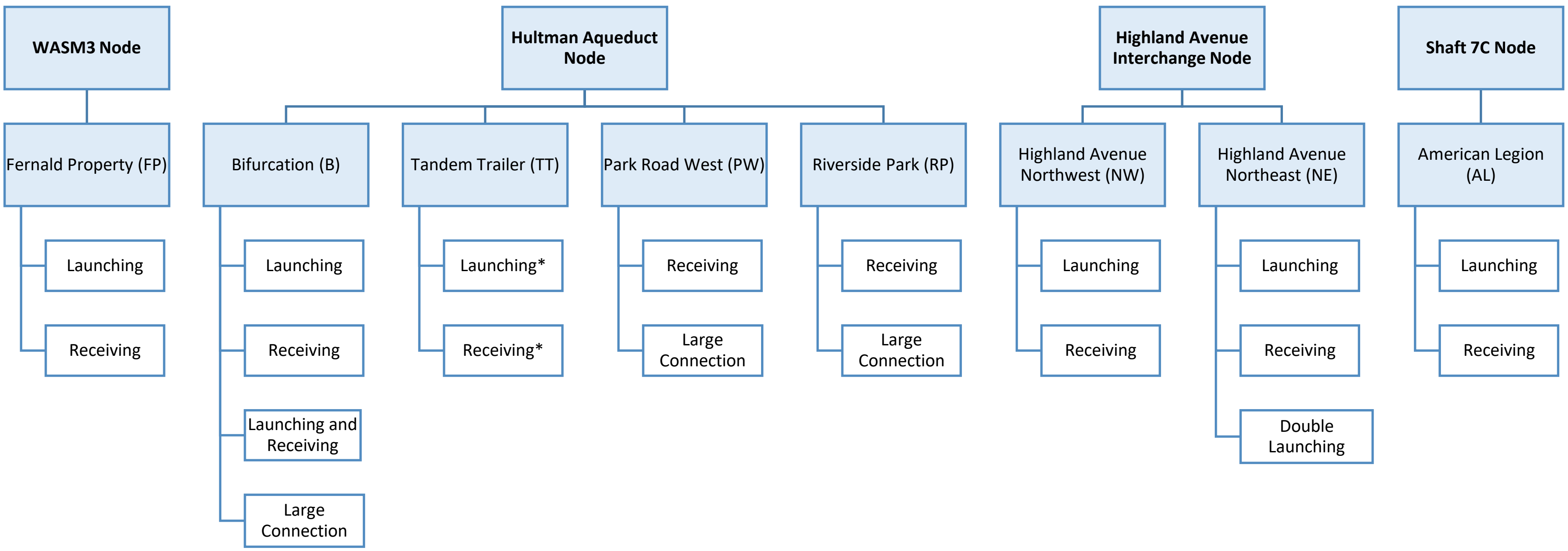
Sites that offered a variety of functions were considered within each node. Functions included launching, receiving, double launching, launching and receiving, and large connection. This initial level of analysis focused on available space needs to support the planned operations, logistical issues, and confidence in the ability to acquire rights to the land. This was intended to be an exercise to identify any “fatal flaws” that would advise against further analysis of the site and location for that use, so as not to spend the resources and effort required to develop a preliminary conceptual design on an alternative that would have no or very low likelihood of receiving serious consideration.

Factors that were considered when identifying sites included:

- Sufficient acreage to serve the evaluated function
- Proximity to highways
- Land ownership (Authority-owned is prioritized for interim connection sites)
- Land availability
- High level environmental screening

Figure 3.5-2 through **Figure 3.5-6** shows evaluated sites and functions within each node, and whether they advanced into the 10 candidate DEIR alternative alignments. **Appendix C** provides additional narrative on each of these potential sites and functions within each and provides the rationale regarding elimination or advancement into future analysis in the DEIR**. Figure 3.5-2** summarizes sites and functions within each node that advanced in the candidate DEIR alternatives analysis; sites that avoided and minimized environmental impacts were prioritized for retention.

Figure 3.5-2 Sites and Functions within each Node Advanced in the Candidate DEIR Alternatives Analysis



**Includes a connection tunnel to Park Road East site for connection to the Hultman Aqueduct.*

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

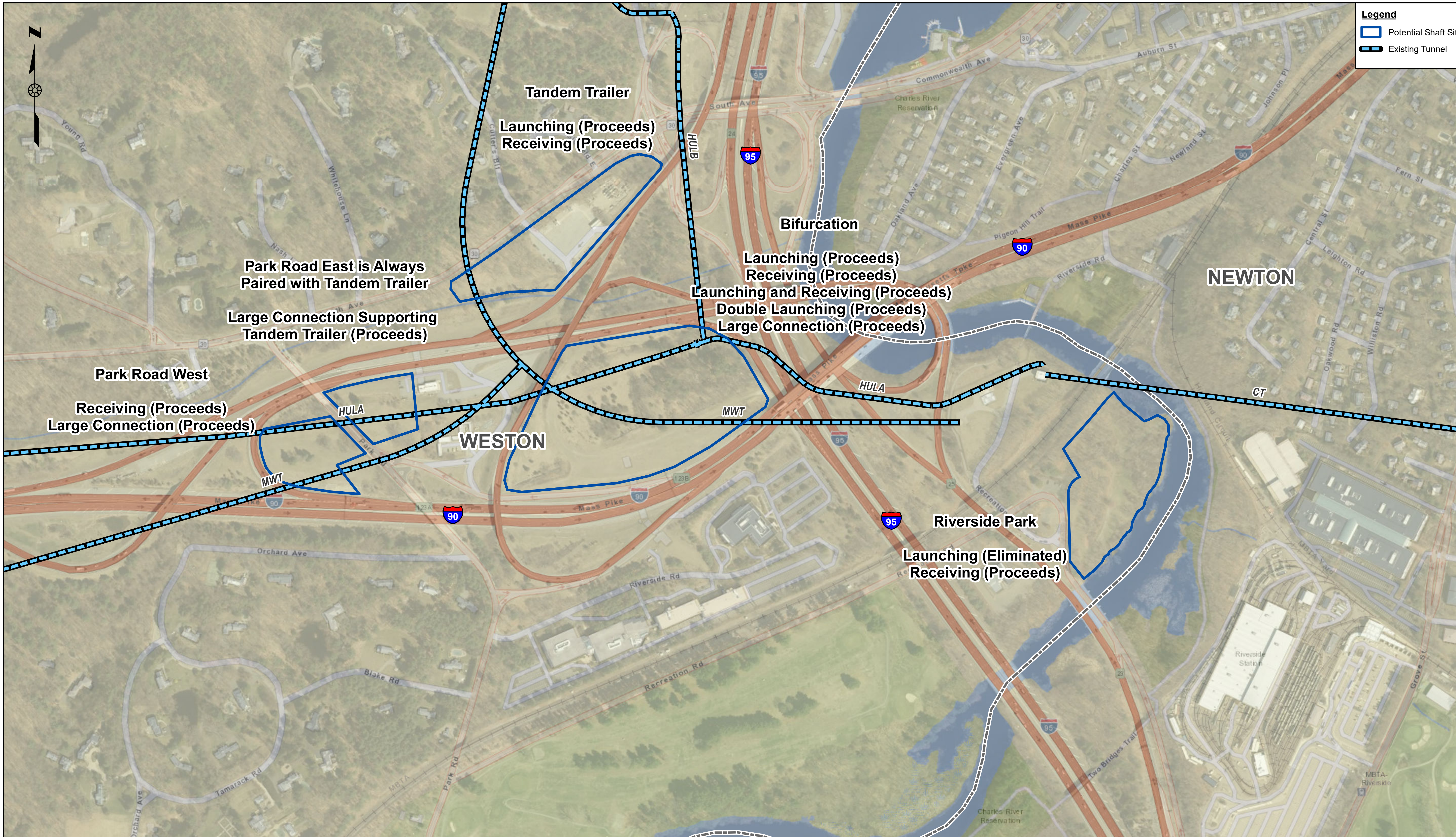
CDM Smith | vhb | Jacobs | Green International Affiliates, Inc.

Belmont, MA
Waltham, MA
Watertown, MA

Figure 3.5-3 Sites Evaluated Within Weston Aqueduct Supply Main 3 (WASM3) Node

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

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Newton, MA
Weston, MA

Figure 3.5-4 Sites Evaluated Within Hultman Aqueduct Node

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

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

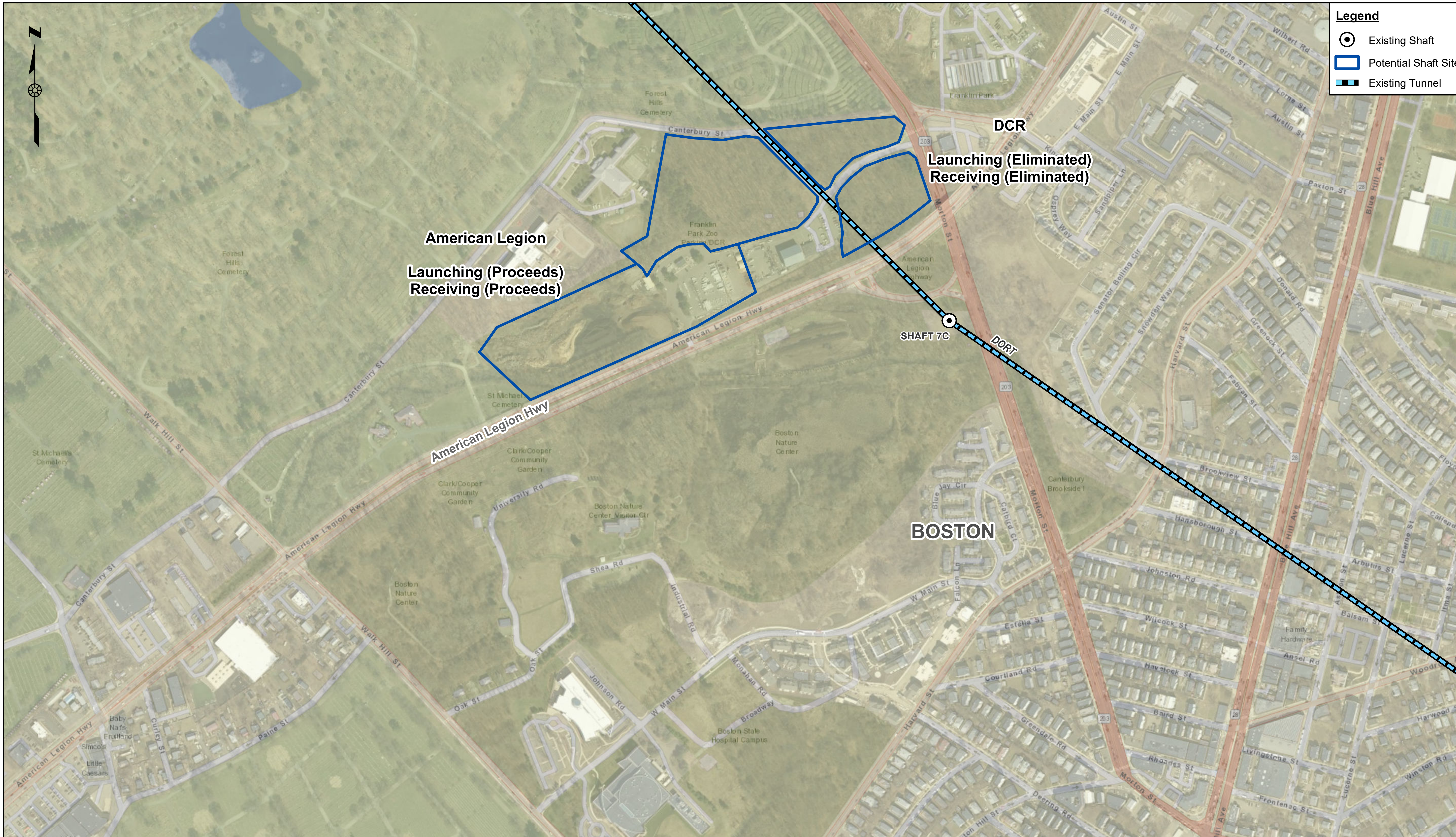
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Needham, MA
Newton, MA

Figure 3.5-5 Sites Evaluated Within Highland Avenue Interchange Node

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

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Boston, MA

0 200 400 600 Feet
SCALE IN FEET
SCALE: 1" = 400'

Figure 3.5-6 Sites Evaluated Within Shaft 7C Node

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

This page intentionally left blank

3.5.2 Assemble Candidate DEIR Tunnel Alignments

Through the evaluation of several sites within each node, and their potential functions, 10 candidate DEIR Alternatives were developed. **Table 3.5-1** summarizes the 10 candidate DEIR Alternatives. The following subsections summarize these alternatives, which are described in greater detail in **Section 3.6**.

Table 3.5-1 Candidate DEIR Alternative Alignments

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Fernald Property	Fernald Property	Fernald Property	Fernald Property	Fernald Property	Fernald Property	Fernald Property	Fernald Property	Fernald Property	Fernald Property
↑		↑	↑	↓	↑	↑	↑	↑	↑
Tandem Trailer	↑	Tandem Trailer	Tandem Trailer	Tandem Trailer	Tandem Trailer	Tandem Trailer	Tandem Trailer	Bifurcation	Park Road West
Bifurcation	Bifurcation	Bifurcation	Park Road West	Bifurcation	Bifurcation	Bifurcation	Riverside Park	Bifurcation	↑
	↑	↓	↑	↑	↓	↑	↑	↑	
	Highland Avenue NW	Highland Avenue NW	Highland Avenue NW	Highland Avenue NW	Highland Avenue NW	Highland Avenue NE	Highland Avenue NW	Highland Avenue NW	Highland Avenue NW
↓									
	Highland Avenue NE	Highland Avenue NE	Highland Avenue NE	Highland Avenue NE	Highland Avenue NE	Highland Avenue NE	Highland Avenue NE	Highland Avenue NE	Highland Avenue NE
	↓	↓	↓	↓	↑	↓	↓	↓	↓
American Legion	American Legion	American Legion	American Legion	American Legion	American Legion	American Legion	American Legion	American Legion	American Legion

Notes: WASM3 node, Hultman Aqueduct node, Highland Avenue Interchange node, Shaft 7C node
Direction of tunnel, and site function, are identified by arrows. The site that the arrow is pointed to is a receiving site. The site that the arrow starts with is the launching site.

Alternatives with the Tandem Trailer site include a connection tunnel to the Park Road East site for the connection to the Hultman Aqueduct and would require reconfiguration of the existing parcel to allow existing tandem trailer operations to continue.

For all alternatives, the permanent tunnel facilities would function as an independent North Tunnel from the Hultman Aqueduct extending north to the Fernald Property site and an independent South Tunnel from the Hultman Aqueduct extending south to the American Legion site. The variations discussed in the candidate alternatives on the following pages break these tunnels into various construction segments for evaluation.

The following section describes each alternative and its component parts and evaluates each alternative in comparison to one another.

3.5.3 Intermediate Connections

The Authority has identified other required and secondary intermediate connection points. The required intermediate connection points are necessary to provide redundancy to the existing tunnel system. The secondary intermediate connection points would provide benefit to its customers and reinforcement to its transmission network. These intermediate connection sites would connect from the deep rock tunnel through a connection shaft, and surface piping to the pumping station or existing mains.

Table 3.5-2 summarizes these intermediate connection sites. See **Figure 3.5-1** for a map indicating the intermediate connection sites that were considered within all 10 candidate DEIR Alternatives and their proximity to the pump station locations.

Table 3.5-2 Intermediate Connection Sites

Connection To	Town/City	Property Owner or Care/Custody/Control
Lexington Street Pumping Station (via School Street Site)	Waltham	MWRA
Cedarwood Pumping Station*	Waltham	Waltham
Hegarty Pumping Station*	Wellesley	Wellesley
St. Mary Street Pumping Station*	Needham	Needham
Newton Street Pumping Station	Brookline	MWRA
Southern Spine Mains	Boston	DCR

**Non-MWRA Pumping Stations*

3.6 Candidate DEIR Alignment Alternatives Evaluation and Scoring Findings

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. For example, 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 Department of Conservation and Recreation (DCR) as the most southern point of the South Tunnel. Additionally, all alternatives include the same six intermediate connection shaft sites and the Hultman Aqueduct isolation valve site.

The tunnel size is assumed to be the same diameter for all segments in all alternatives. The TBM would have a cutterhead up to approximately 15 feet in diameter, while the finished diameter of the deep rock tunnels would be approximately 10-12 feet in diameter. The tunnel diameter would be finalized based on constructability and cost considerations as the final design progresses, but the DEIR analysis includes an assumption of 10 or 12 feet for the finished tunnel diameter, whichever is more conservative for the analysis case.

Alternatives that include the Tandem Trailer site have a connection tunnel to the Park Road East site to provide the required Hultman Aqueduct connection. For the Highland Avenue Northeast site, conceptual plans include use of the Southeast parcel; and similarly, Highland Avenue Northwest site options also include use of the Southwest parcel at Highland Avenue. The Northwest, Southeast, and Southwest parcels would be used temporarily during construction, with no permanent infrastructure. For alternatives where launching and receiving is not in the same cloverleaf, there will be a connection tunnel between Highland Avenue Northwest and Highland Avenue Northeast.

Neither Alternatives 2 nor 10 include TBM launching or receiving sites within MassDOT-owned parcels at the Hultman Node, but do include a large connection at the Hultman Node. Alternative 8 is the only option that includes the Riverside Park site as a receiving shaft site, which is under the care, custody, and control of DCR; Alternative 5 is the only option that includes launching a TBM from the Fernald Property site, and Alternative 6 is the only option that includes launching a TBM from the American Legion site.

The Authority is engaged in conversations with MassDOT regarding securing easements on MassDOT parcels within the Hultman Node (Bifurcation, Tandem Trailer/Park Road East, and Park Road West) located at the I-90 and I-95 Interchange. MassDOT is planning to upgrade the bridges and ramps at the I-90/I-95 interchange in the 2023 to 2027 timeframe, although the specific final design and construction timing of MassDOT Project No. 606783 was not yet confirmed. The uncertainly of the timing of this project was taken into consideration when evaluating and comparing the alternatives. The Authority is also working with MassDOT to share the Tandem Trailer site during tunnel construction so that the tandem trailer operations can continue while the tunnel is under construction. The Authority also is working with MassDOT to secure easements to construct portions of the tunnel project within the cloverleafs of the I-95 Highland Avenue Interchange, in Needham. MassDOT does not have known future plans for these parcels.

In addition, the Authority has had preliminary discussions with DCR for accommodating work on the American Legion parcel. Conversations are proceeding to secure easements or ownership of this parcel. The Authority also has initiated discussions with the City of Waltham regarding using a portion of the Fernald Property, the site of a former school.

Common to all candidate alternatives would be six connection shafts that would enable the deep tunnel system to connect to the MWRA or local municipal distribution systems. The six intermediate connections include School Street and Cedarwood Pumping Station in Waltham, Hegarty Pumping Station in Wellesley, St. Mary Street Pumping Station in Needham, Newton Street Pumping Station in Brookline, and Southern Spine Mains in Boston. An isolation valve on the Hultman Aqueduct in Weston would also be common to all alternatives. Therefore, these sites did not factor into selection of the preferred alternative.

3.6.1 Alternative 1

Alternative 1 (**Figure 3.6-1**) consists of two tunnels, one spanning approximately 4.5 miles to the north and one approximately 10 miles to the south. It would require two TBM drives, one for the North Tunnel and one for the South Tunnel. The North Tunnel starts by launching from Tandem Trailer site in the Hultman Aqueduct node with a connection tunnel to Park Road East and receiving at the Fernald Property in the WASM3 node. The South Tunnel launches from the Bifurcation site in the Hultman Aqueduct node and receiving at the American Legion site in the Shaft 7C node. This alternative consists of a long single construction segment for the South Tunnel with constructability challenges. It does not allow for an isolation point within the South Tunnel.

Tunnel Alignment. Alternative 1 includes two tunnel segments. The north segment would be approximately 4.5 miles; and the South Tunnel segment would be approximately 10 miles long. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once, both branches of the Stony Brook Fault which would likely require additional support measures during construction. This alternative has the longest overall construction schedule. Alternative 1 would require five construction sites, two for launching and two for receiving, and one large connection, on land owned or under the care, custody, and control of MassDOT, DCR, the City of Waltham, and the Town of Weston.

Tandem Trailer (Launching). The TBM for the North Tunnel, which would launch the TBM, is located in a relatively dense urban area with some sensitive receptors and commercial properties within 500 feet of the site. The TBM would launch from Tandem Trailer including a connection tunnel to Park Road East and tunneling would proceed north to the Fernald Property site. Launching from the Tandem Trailer site would require a major power infrastructure upgrade to service the TBM from the utility company. The Tandem Trailer site is currently in active use by commercial carriers using tandem trailer trucks travelling on the Massachusetts Turnpike. There are 34 parking spots at MassDOT's tandem trailer site. Use of this site would require reconfiguration of the existing parcel to allow existing tandem trailer operations to continue while accommodating the required tunnel launching activities.

Park Road East (Large Connection). Park Road East is bounded by Park Road to the west the I-90 to I-95N ramp to the north, the I-95 to I-90E ramp to the east and I-90W to the south. The site is primarily under the care and control of MassDOT and includes an easement for the MWWST. The Authority also has care and control over a portion of land around the Hultman Aqueduct. The Park Road East property would be a large connection for all alternatives that launch from Tandem Trailer.

Fernald Property (Receiving). The Fernald Property site, which would receive the TBM, is located in a relatively dense urban area with some sensitive receptors and commercial properties within 500 feet of the site. Traffic and community impacts are expected to be moderate when compared with launching a TBM from the Fernald Property. The Fernald Property is listed in the National Register. Five contributing resources are at the area of new construction, including non-building features like barn foundation and iron fencing. Approximately 7-9 contributing features are adjacent to access and staging areas. For all Alternatives that use this site, additional design evaluation and documentation to avoid, minimize, or mitigate adverse effects would be required. Access to the Fernald Property would be designed to avoid impacts to the Cedar Hill Reservation to the south of the property, as well as to Camp Cedar Hill, which is located within 500 feet of the site. The Fernald Property also has contaminated sites potentially within the location of the proposed staging area. Any use of this property would require mitigation and coordination with the Department of Environmental Protection (DEP) and the Massachusetts Historical Commission (MHC).

Bifurcation Site (Launching). The Bifurcation site is primarily under the care and control of MassDOT. The Authority has care and control over a portion of land around the Hultman Aqueduct and has an easement for the MWWST and the Town of Weston owns a small area within the boundary of the Bifurcation site. The site would be part of the planned MassDOT Project No. 606783, the extent and timing of which is to be determined. Access to the Bifurcation site and associated truck routes include highway ramps and arterials. Launching from the Bifurcation site would require a major power infrastructure upgrade to service the TBM from the utility company. The Nickerson Well (abandoned), owned by the Town of Weston, is in close proximity to the Bifurcation site.

American Legion Site (Receiving). The American Legion site, which is under the care, custody, and control of DCR, is currently used for landscaping activities by a tenant, Landscape Express. The proposed receiving shaft is expected to have minimal impacts on future land uses. The Audubon's Nature Center and Sanctuary, the Canterbury Park, Judge John J. Connelly Youth Center, Department of Corrections Pre-Release Facility, St. Michael Cemetery, and Clark /Cooper Community Garden are all within close proximity to the proposed receiving shaft and may require screening or other mitigation activities to avoid community impacts. There are few sensitive receptors in the vicinity of the site. For all Alternatives that include the American Legion site as a receiving location, impacts are expected to be minimal and possible to mitigate through design and construction period measures.

3.6.1.1 Overall Evaluation: Alternative 1

Alternative 1 would take the longest to bring the new tunnel system into service and would require a major power infrastructure upgrade for the TBM at Bifurcation. The North Tunnel would take the shortest time to bring into service, but Alternative 1 has the longest overall construction schedule, mostly attributed to the time required to complete the South Tunnel as one long, single tunnel segment. The Tunnel Program can be implemented in two construction packages. This Alternative would require an act of the Legislature for the American Legion site. The Tandem Trailer lot would have to be reconfigured and the Alternative for launching heavily relies on the Tandem Trailer site and the Bifurcation site (both within the MassDOT I-90/I-95 interchange). The Bifurcation site could be impacted by MassDOT Project No. 606783.

3.6.2 Alternative 2

Alternative 2 (**Figure 3.6-2**) consists of two tunnels spanning approximately 8 miles to the north and approximately 7 miles to the south. This Alternative would require two TBM drives and include a connection tunnel between the Highland Avenue Northwest site and the Highland Avenue Northeast site. The North Tunnel construction segment starts by launching from the Highland Avenue Northwest site in the Highland Avenue node and receiving at the Fernald Property in the WASM3 node, with a large connection at the Bifurcation site in the Hultman Aqueduct node. As noted previously, the permanent tunnel facilities would function as a North Tunnel from the Hultman Aqueduct node to the Fernald Property and as a South Tunnel from the Hultman Aqueduct node to the American Legion site. The South Tunnel segment launches from the Highland Avenue Northeast site in the Highland Avenue node and receiving at the American Legion site in the Shaft 7C node. This alternative creates more equal North and South Tunnel construction segment lengths.

Tunnel Alignment. This alternative more evenly distributes the length of each constructed tunnel, with the North and South Tunnel segments at approximately 8 miles and 7 miles respectively, shorter than the 10 miles in Alternative 1. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once, both branches of the Stony Brook Fault which would likely require additional support measures during construction. Alternative 2 would require five construction sites, two for launching and two for receiving, and one large connection, on land owned or under the care, custody and control of by MassDOT, DCR, the City of Waltham, and the Town of Weston.

Highland Avenue Northwest (Launching). The North Tunnel would launch from Highland Avenue Northwest and have a large connection at the Bifurcation site to connect to the Hultman Aqueduct, along the route to being received at the Fernald Property. Launching from the Highland Avenue Northwest site allows for convenient access to major highways, and no wetlands would be impacted. Construction dewatering at the Highland Avenue Northwest/Southwest site would require an engineered solution to find an appropriate discharge point. This location is relatively isolated from the community, with only two commercial receptors within 500 feet of the site. This site would not contain any permanent surface infrastructure.

Bifurcation Site (Large Connection). A large connection at this site requires a smaller area of impact than a full launching shaft. For a large connection, the scale of construction activities and timing of making the connection are more flexible and could likely accommodate MassDOT Project No. 606783.

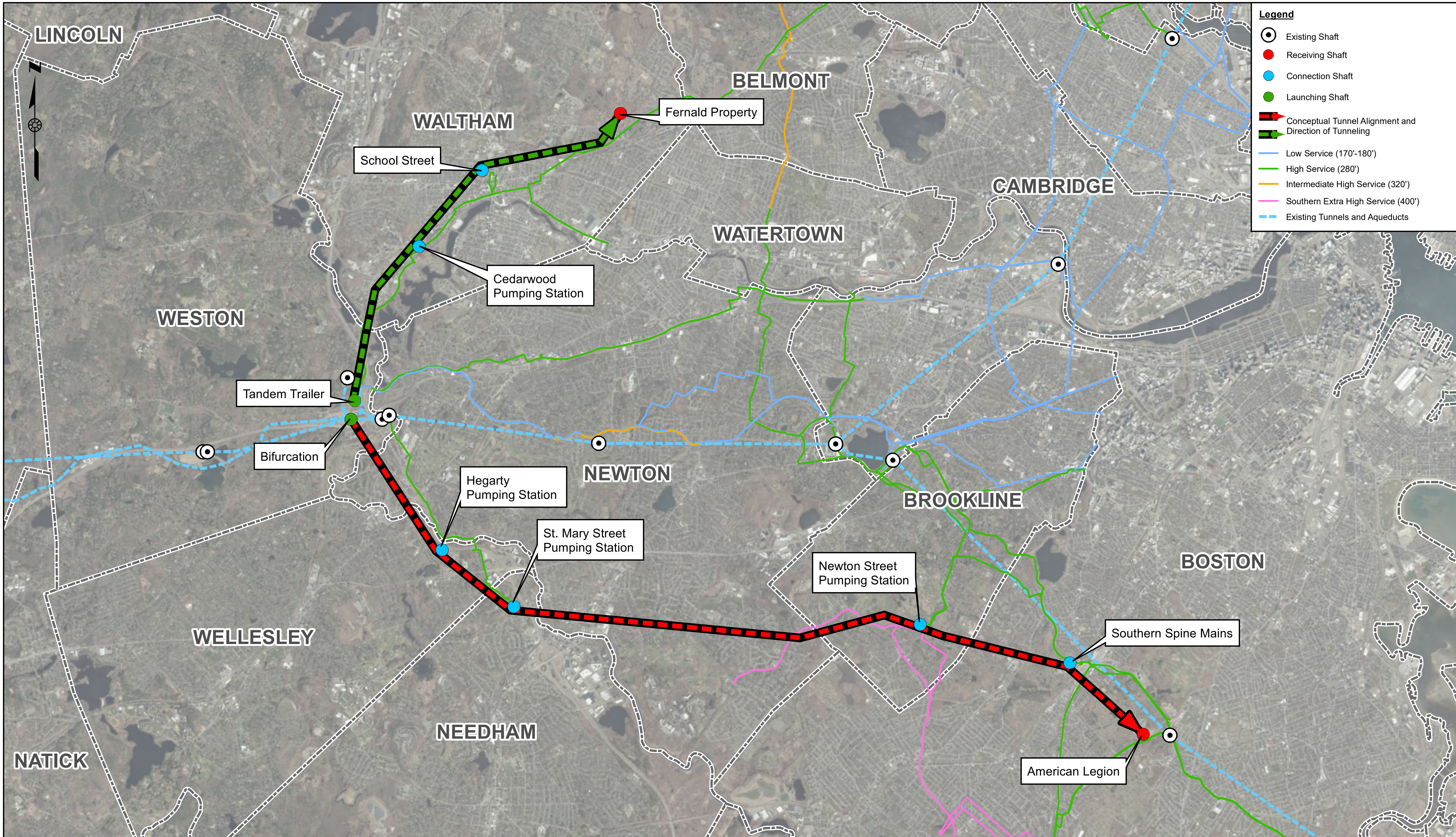
Fernald Property (Receiving). The site is the same as Alternative 1.

Highland Avenue Northeast (Launching). The South Tunnel would launch from the Highland Avenue Northeast and proceed to the south to the American Legion site. The Highland Avenue Northeast location is also relatively isolated from the community, with 14 commercial receptors within 500 feet of the site. Access to regional highways is convenient and no other future uses are planned for the Highland Avenue Interchange on I-95.

American Legion Site (Receiving). The site is the same as Alternative 1.

3.6.2.1 Overall Evaluation: Alternative 2

Alternative 2 option avoids TBM launching and receiving at the Hultman Node (in favor of the Highland Avenue sites), thus reducing the possible risk associated with the timing of the MassDOT Project No. 606783. This Alternative would require an act of the Legislature for the American Legion site. Launching and receiving within the Highland Avenue Node is advantageous since the Highland Avenue is relatively isolated from surrounding sensitive receptors, and access to the highway system is convenient. Alternative 2 could be implemented in two construction packages, but the North Tunnel would take longer to put into service due to the length of the North Tunnel construction segment.



Metropolitan Water Tunnel Program

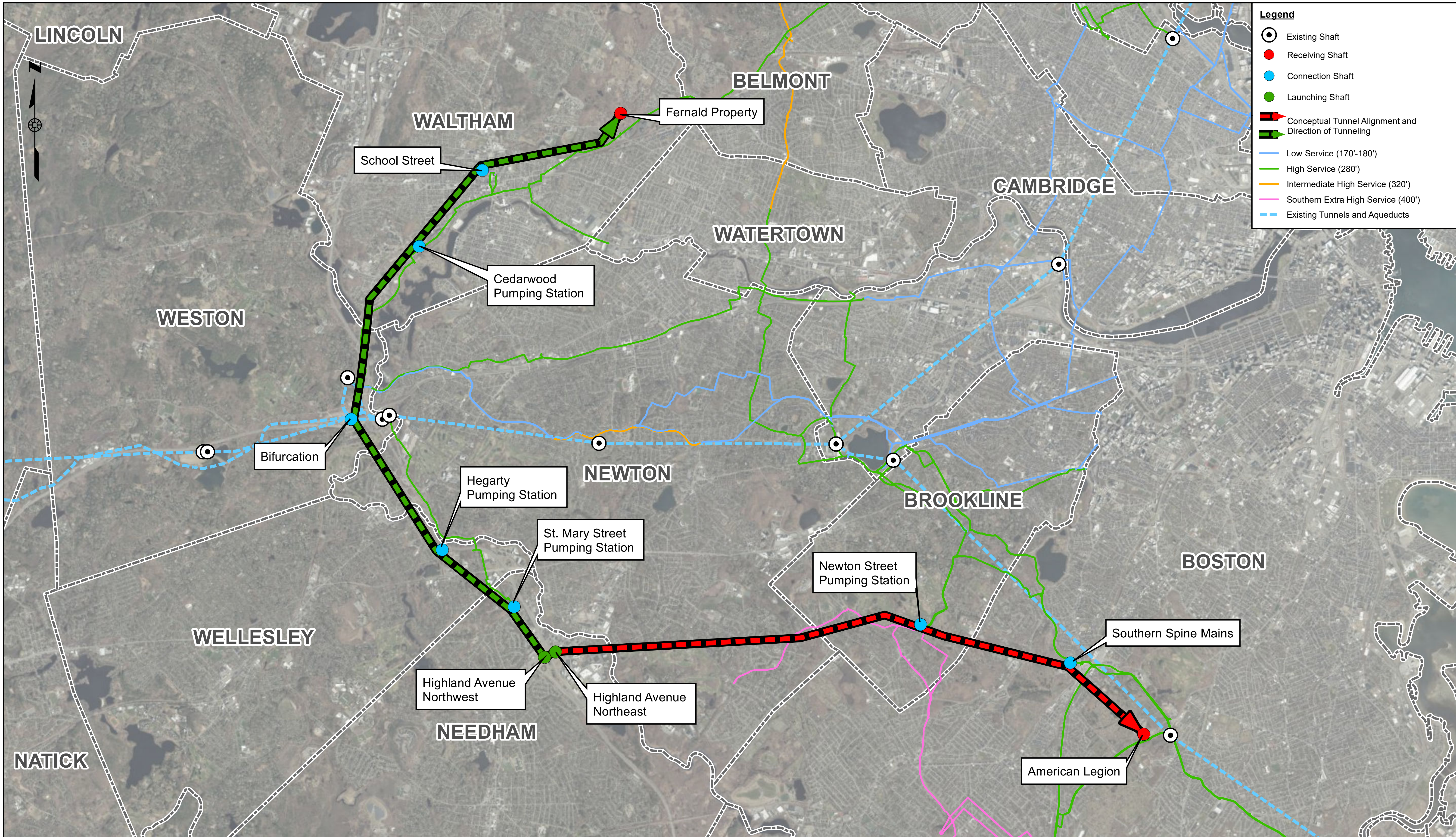
MWRA Contract No. 7159
Draft Environmental
Impact Report

CDM Smith · in association with vhb · Jacobs · GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.6-1 Alternative 1

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

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159 Draft Environmental Impact Report

CDM Smith in association with vhb Jacobs GREEN International Affiliates, Inc.

Figure 3.6-2 Alternative 2

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

This page intentionally left blank

3.6.3 Alternative 3

Alternative 3 (**Figure 3.6-3**) consists of three tunnel segments spanning less than 7 miles each. It would require three TBM drives, one for the North Tunnel and two for the South Tunnel. The North Tunnel starts by launching from the Tandem Trailer site in the Hultman Aqueduct node with a connection tunnel to Park Road East and receiving at the Fernald Property in the WASM3 node. The South Tunnel launches from the Bifurcation site in the Hultman Aqueduct node and receiving at the Highland Avenue Northwest site in the Highland Avenue node. A third tunnel drive would launch from the Highland Avenue Northeast site in the Highland Avenue node and receive at the American Legion site in the Shaft 7C node. A connection tunnel between the Highland Avenue Northwest and Northeast sites is required for this alternative. This alternative splits the South Tunnel into shorter construction segments.

Tunnel Alignment Alternative 3 includes three tunnel segments. The North Tunnel segment would be approximately 4.5 miles and the two South Tunnel segments would be approximately 3 and 7 miles long. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once and both branches of the Stony Brook Fault which would likely require additional support measures during construction. This alternative has one of the shorter overall construction schedules and the flexibility of three construction contracts. Any activity at the Tandem Trailer site would include a connection tunnel to the Park Road East site, to provide a connection from the new tunnel to the Hultman Aqueduct. The three tunnel alignments are all less than 7 miles, which is advantageous from a construction mobilization and phasing perspective. Alternative 3 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.

Tandem Trailer (Launching). The site is the same as Alternative 1.

Fernald Property (Receiving). The site is the same as Alternative 1.

Bifurcation (Launching) The site is the same as Alternative 1 except the TBM excavation would end at Highland Avenue Northwest.

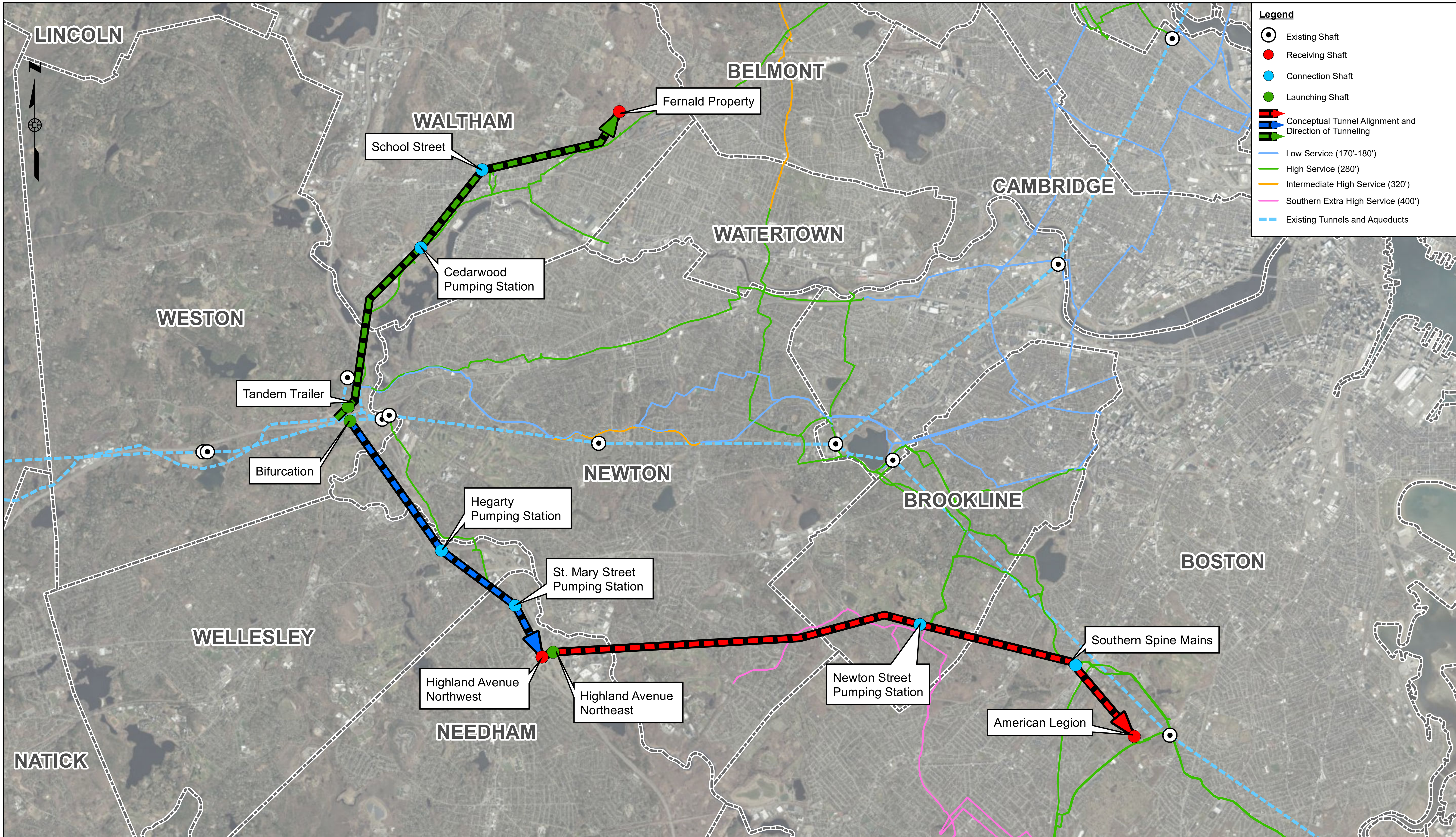
Highland Avenue Northwest (Receiving). The TBM from the Bifurcation site would be received at the Highland Avenue Northwest location. Receiving a TBM at this site would be similar to launching as described in Alternative 2, but with reduced traffic and construction activities.

Highland Avenue Northeast (Launching). This site is the same as Alternative 2.

American Legion Site (Receiving). This site is the same as Alternative 2.

3.6.3.1 Overall Evaluation: Alternative 3

Alternative 3 has one of the shortest overall construction durations for the overall program and could be implemented in three construction packages. This Alternative would provide the earliest opportunity to put either the North or South Tunnel into service, which would provide flexibility to the Authority. The launching sites are all located away from areas of dense urban development, and receiving sites are in areas that are isolated or could be screened from the community. This Alternative would require an act of the Legislature for the American Legion site. The South Tunnel would be spilt into two tunnel segments. The Tandem Trailer lot would have to be reconfigured and this Alternative for launching heavily relies on the Tandem Trailer Site and the Bifurcation site (both within the MassDOT I-90/I-95 interchange). The Bifurcation site could be impacted by MassDOT Project No. 606783.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.6-3 Alternative 3

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

This page intentionally left blank

3.6.4 Alternative 4

Alternative 4 (**Figure 3.6-4**) consists of three tunnel segments spanning less than 7 miles each. It would require three TBM drives: one for the North Tunnel and two for the South Tunnel. The North Tunnel starts by launching from the Tandem Trailer site in the Hultman Aqueduct node with a connection tunnel to Park Road East and receiving at the Fernald Property in the WASM3 node. The South Tunnel launches from the Highland Avenue Northwest site in the Highland Avenue node and receiving at the Park Road West in the Hultman Aqueduct node. A third tunnel drive would launch from the Highland Avenue Northeast site in the Highland Avenue node and receive at the American Legion site in the Shaft 7C node. This alternative splits the South Tunnel into two construction segments.

Tunnel Alignment. Similar to Alternative 3, Alternative 4 includes three tunnel segments. The North Tunnel segment would be approximately 4.5 miles and the two South Tunnel segments would be approximately 3 and 7 miles long. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once and both branches of the Stony Brook Fault which would likely require additional support measures during construction. This alternative has one of the shorter overall construction schedules and the flexibility of three construction contracts. Any activity at the Tandem Trailer site would include a connection tunnel to the Park Road East site, to provide a connection from the new tunnel to the Hultman Aqueduct. The three tunnel alignments are all less than 7 miles, which is advantageous from a construction mobilization and phasing perspective. 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.

Tandem Trailer (Launching). The site is the same as Alternative 1.

Fernald Property (Receiving). The site is the same as Alternative 1.

Highland Avenue Northwest (Launching). The site is the same as Alternative 2 but receives at Park Road West.

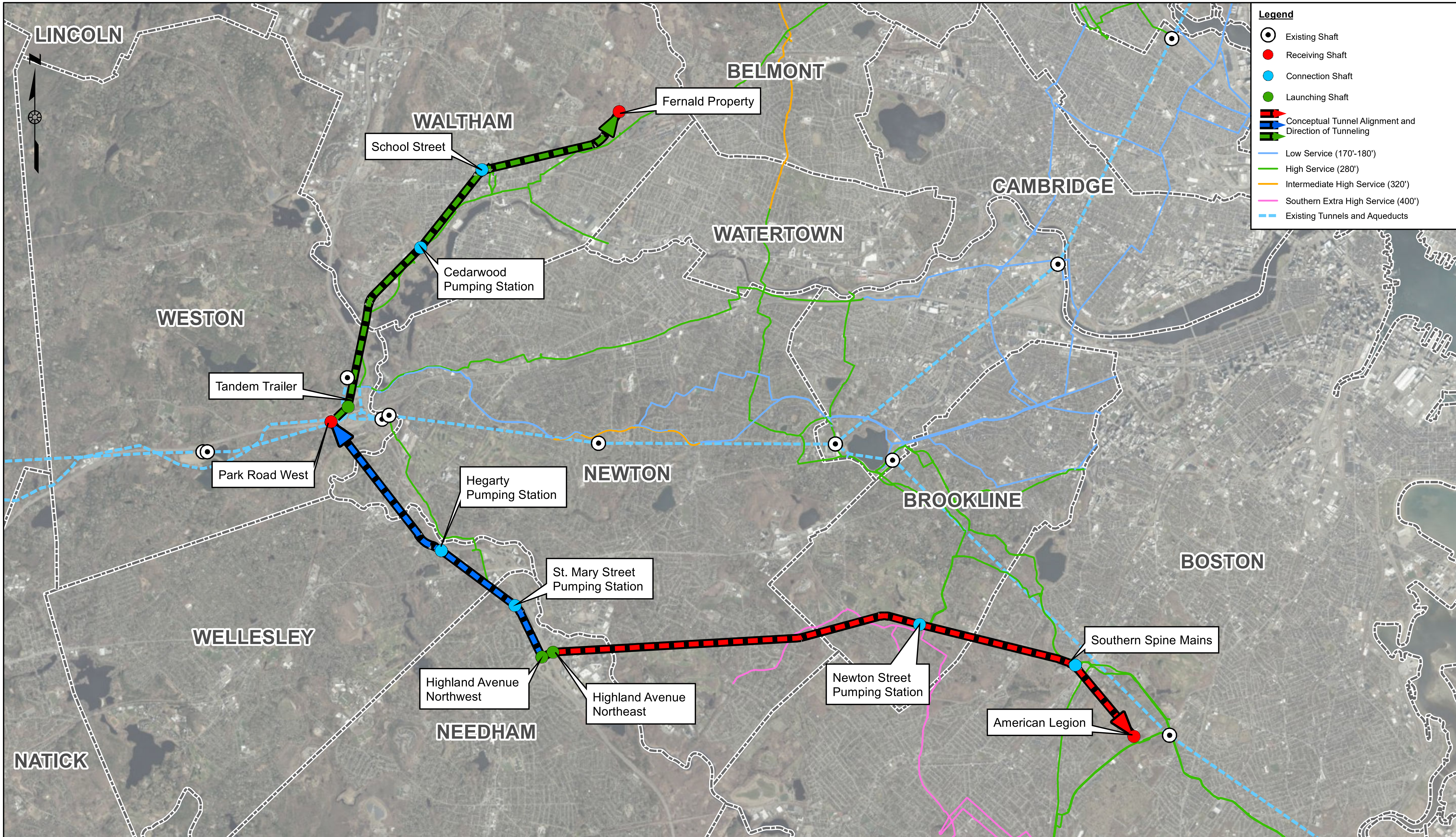
Park Road West (Receiving). Park Road West is immediately adjacent to the Hultman Aqueduct. The site is primarily under the care, custody, and control of MassDOT and includes an easement for the MWWST. The Authority has care and control over a portion of land around the Hultman Aqueduct. MTA obtained an easement over the property controlled by the Authority. Access to the site is off Park Road and is easily accessible to the regional highway system. There are no underground utilities nor surface structures on the site. No future changes in land use are planned for the site. Wetlands are present on a portion of the site and could be avoided through design mitigation. No historic properties are located on the site, and there are no sensitive receptors close to the property. A receiving shaft at this location could be accommodated with little impact to environmental resources or the community.

Highland Avenue Northeast (Launching). This site is the same as Alternative 2.

American Legion Site (Receiving). This site is the same as Alternative 1.

3.6.4.1 Overall Evaluation: Alternative 4

Similar to Alternative 3, Alternative 4 has one of the shortest times to put the North Tunnel into service and could be implemented through three construction segments, which would provide flexibility to the Authority. This Alternative would provide the earliest opportunity to put either the North or South Tunnel into service, which would provide flexibility to the Authority. The launching sites are all located away from areas of dense urban development, and receiving sites are in areas that are isolated or could be screened from the community. This Alternative would require an act of the Legislature for the American Legion site. The Tandem Trailer lot would have to be reconfigured in this Alternative for launching. The main difference between Alternative 3 and Alternative 4 is the excavation direction of the segment between the Hultman node and Highland node is reversed. The TBM launches at the Bifurcation site and is received at Highland Northwest for Alternative 3, whereas for Alternative 4 the segment launches at Highland Northwest and is received at Park Road West, and thus minimizes potential impacts from MassDOT Project No. 606783. This alternative would separate the connections in the vicinity of the Hultman Aqueduct allowing for flexibility in implementation.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

0 2,400 4,800 7,200
Feet
SCALE IN FEET
SCALE: 1" = 5,000'

Figure 3.6-4 Alternative 4

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

This page intentionally left blank

3.6.5 Alternative 5

Alternative 5 (**Figure 3.6-5**) consists of three tunnel segments spanning less than 7 miles each. It would require three TBM drives, one for the North Tunnel and two for the South Tunnel. The North Tunnel starts by launching from the Fernald Property in the WASM3 node and receiving from the Tandem Trailer site in the Hultman Aqueduct node with a connection tunnel to Park Road East. The South Tunnel launches from the Highland Avenue Northwest site in the Highland Avenue node and receiving at the Bifurcation site in the Hultman Aqueduct node. It would also involve launching from the Highland Avenue Northeast site in the Highland Avenue node and receiving at the American Legion site in the Shaft 7C node. This alternative splits the South Tunnel into two construction segments.

Tunnel Alignment. Alternative 5 would launch the TBM from the Fernald Property site and tunneling would proceed south to the Tandem Trailer site. One of the South Tunnel segments would launch from the Highland Avenue Northwest site to the Bifurcation site, and the other South Tunnel segment would launch from the Highland Avenue Northeast site and be received at the American Legion. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once and both branches of the Stony Brook Fault which would likely require additional support measures during construction. The three tunnel segments are all less than 7 miles, which is advantageous from a construction mobilization and phasing perspective. Alternative 5 would require six construction shaft sites, three for launching and three for receiving, on land under the care, custody, and control of or owned by MassDOT, DCR, the City of Waltham, and the Town of Weston.

Fernald Property (Launching). This is the only Alternative that launches a TBM from this location. From an engineering and constructability perspective, an evaluation of TBM power needs would need to be conducted in collaboration with the utility, but at this conceptual phase it is likely feasible that access to the adjacent power grid can be made. The site is located in a relatively dense urban area with 14 sensitive receptors and five commercial properties within 500 feet of the site. Land use is a mix of residential and industrial. This site is over 5 miles from a major highway, and access along the truck route would be through arterials with major signalized intersections. There are 26 sensitive receptors abutting the conceptual access route from Fernald Property along Trapelo Road to the highway. Construction of a launching shaft and associated TBM excavation from this site could take between six and eight years with periods of significant trucking of tunnel excavated material from the site, which would be a significant community disruption. The balance of the impacts described in Alternative 1 apply here as well.

Tandem Trailer (Receiving). The TBM would be received at the Tandem Trailer site, from the Fernald Property. The site is not adjacent to the Hultman Aqueduct and would require a connecting tunnel to the Park Road East site. The impacts at the receiving shaft would be less than the Alternatives for launching but the balance of the impacts described in Alternative 1 apply here as well.

Highland Avenue Northwest (Launching). The site is the same as Alternative 2 except the TBM would be received at Bifurcation.

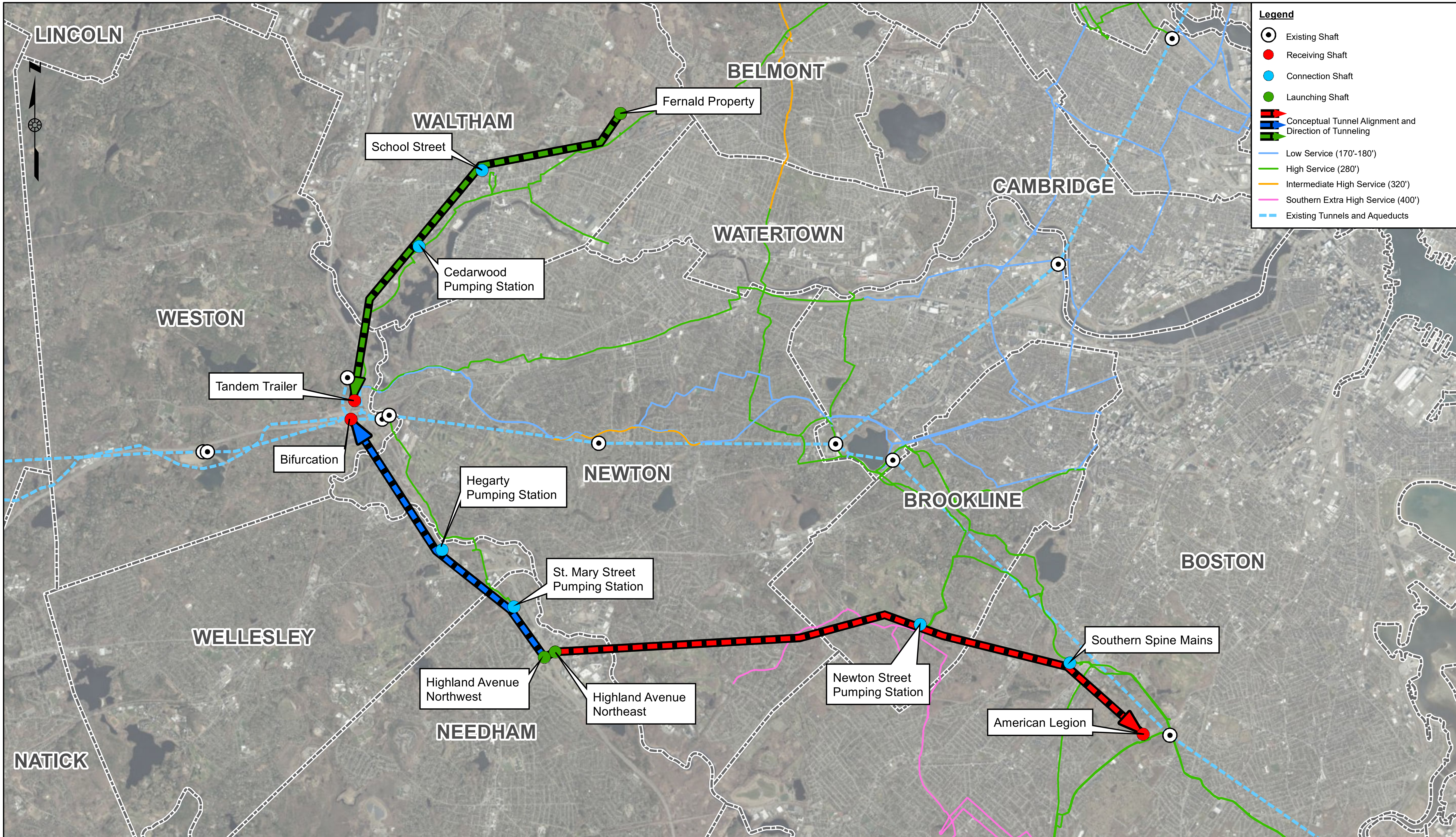
Bifurcation (Receiving). The TBM from Highland Avenue Northwest would be received at the Bifurcation site. The site is isolated but is in close proximity to MassDOT Project No. 606783.

Highland Avenue Northeast (Launching). This site is the same as Alternative 2.

American Legion Site (Receiving). This site is the same as Alternative 1.

3.6.5.1 Overall Evaluation: Alternative 5

Alternative 5 has one of the shortest overall construction durations for the overall program and could be implemented in three construction packages. This Alternative would provide the earliest opportunity to put either the North or South Tunnel into service, which would provide flexibility to the Authority. However, community disruption with launching from the Fernald Property site would create substantial and extended impacts that would be difficult to mitigate. The remaining launching sites are all located away from areas of dense urban development, and receiving sites are in areas that are isolated or could be screened from the community but access to the American Legion site would require an act of the Legislature. The South Tunnel would be spilt into two tunnel segments. The Tandem Trailer lot would have to be reconfigured for this Alternative for receiving and it heavily relies on the Tandem Trailer Site and the Bifurcation site (both within the MassDOT I-90/I-95 interchange). The Bifurcation site could be impacted by MassDOT Project No. 606783.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.6-5 Alternative 5

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

This page intentionally left blank

3.6.6 Alternative 6

Alternative 6 (**Figure 3.6-6**) consists of three tunnel segments spanning less than 7 miles each. It would require three TBM drives, one for the North Tunnel and two for the South Tunnel. The North Tunnel starts by launching from the Tandem Trailer site in the Hultman Aqueduct node with a connection tunnel to Park Road East and receiving at the Fernald Property in the WASM3 node. The South Tunnel launches from the Bifurcation site in the Hultman Aqueduct node and receiving at the Highland Avenue Northwest site in the Highland Avenue node. It would also launch from the American Legion site in the Shaft 7C node and receive at the Highland Avenue Northeast site in the Highland Avenue node. This alternative splits the South Tunnel into two construction segments.

Tunnel Alignment Alternative 6 includes three tunnel segments. The North Tunnel segment would be approximately 4.5 miles and the two South Tunnel segments would be approximately 3 and 7 miles long. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once and both branches of the Stony Brook Fault which would likely require additional support measures during construction. This alternative has one of the shorter overall construction schedules and the flexibility of three construction contracts. Any activity at the Tandem Trailer site would include a connection tunnel to the Park Road East site, to provide a connection from the new tunnel to the Hultman Aqueduct. The three tunnel alignments are all less than 7 miles, which is advantageous from a construction mobilization and phasing perspective. Alternative 6 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. This is the only alternative that would launch a TBM from the American Legion site.

Tandem Trailer (Launching). The site is the same as Alternative 1.

Fernald Property (Receiving). The site is the same as Alternative 1.

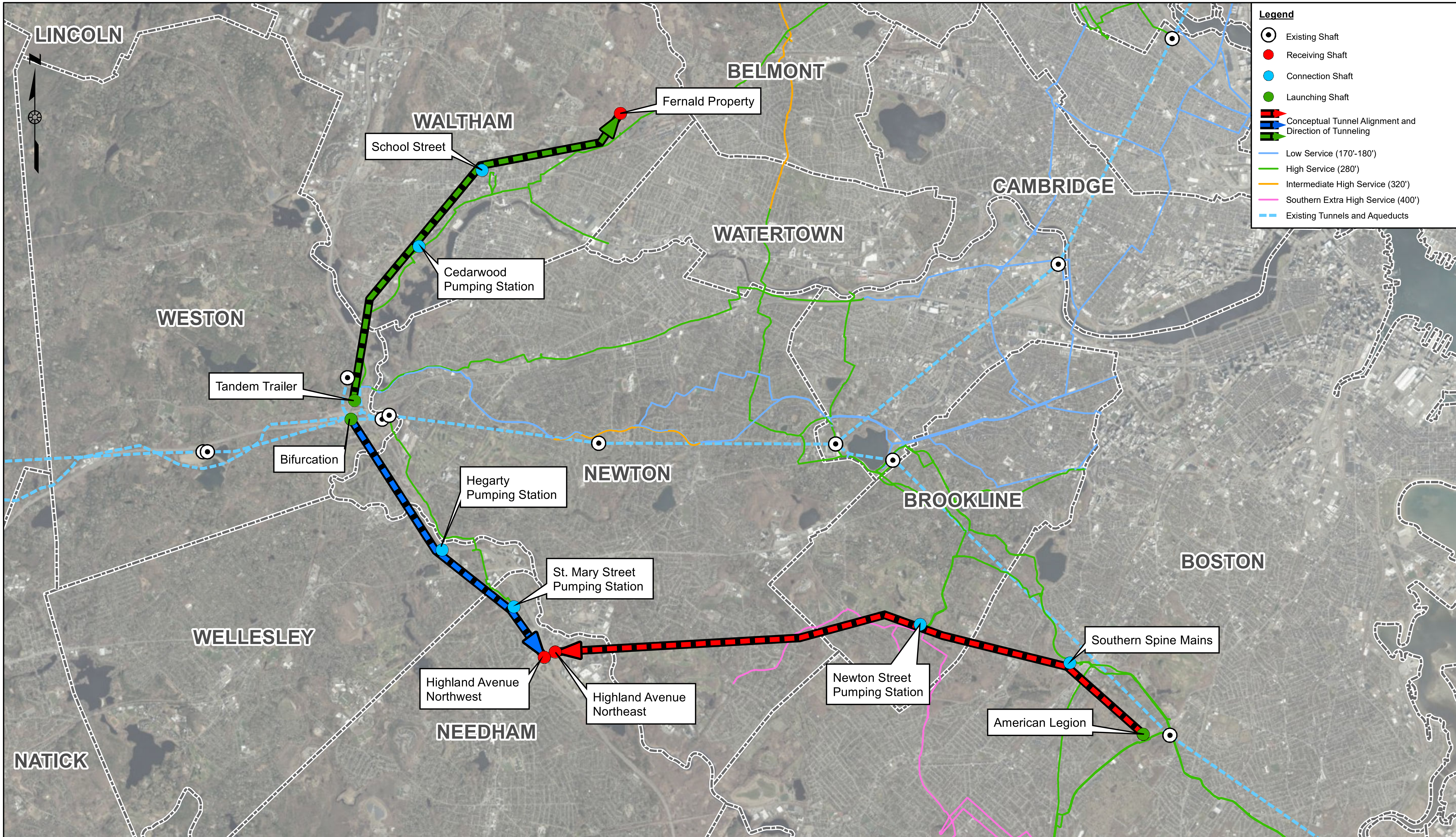
Highland Avenue Northeast (Receiving). This is the only alternative that would receive a TBM at Highland Avenue Northeast, launched from the American Legion site to the south. Receiving a TBM at this site would be similar to launching, but with reduced traffic and construction activities.

American Legion Site (Launching). The American Legion site, which is under the care, custody, and control of DCR, is currently used for landscaping activities by a tenant, Landscape Express. Portions of Landscape Express would be permanently displaced by this option. The utility has indicated that power for launching a TBM at the American Legion site is not possible. The site directly abuts the Judge John J. Connelly Youth Center, Department of Corrections Pre-Release Center; and Canterbury Park. The Audubon's Nature Center and Sanctuary, St Michael Cemetery, and Clark/ Cooper Community Garden are all in close proximity. Impacts from construction of a launching shaft compared to a receiving shaft are greater and would generate larger amounts of excavated material and construction traffic. In addition, the land area needs for a launching shaft are greater and DCR has indicated the additional property needs could be difficult to accommodate.

The site is located more than 7 miles from the nearest major highway, and access along from the highway would be via arterials with major signalized intersections along the truck route, which would likely cause major traffic disruption. Land use is a mix of residential and commercial along the truck route.

3.6.6.1 Overall Evaluation: Alternative 6

Compared to the other alternatives, this one is challenging due to the launching from the American Legion site. A major power infrastructure upgrade would be required, which the utility has deemed not possible. Access from the nearest highway is far from the American Legion site with community disruption expected along the truck route and would require an act of the Legislature for the American Legion site. Community disruption with launching at the American Legion site would create substantial and extended impacts that would be difficult to mitigate.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN

Figure 3.6-6 Alternative 6

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

This page intentionally left blank

3.6.7 Alternative 7

Alternative 7 (**Figure 3.6-7**) consists of three tunnel segments spanning less than 7 miles each. It would require three TBM drives, one for the North Tunnel and two for the South Tunnel. The North Tunnel starts by launching from the Tandem Trailer site in the Hultman Aqueduct node with a connection tunnel to Park Road East and receiving at the Fernald Property in the WASM3 node. The South Tunnel launches from the Highland Avenue Northeast site in the Highland Avenue node and receiving at the Bifurcation site in the Hultman Aqueduct node. It would also launch from the Highland Avenue Northeast site in the Highland Avenue node and receive at the American Legion site in the Shaft 7C node. This alternative splits the South Tunnel into two construction segments and requires the Highland Avenue Northeast Site to function as a double launch site.

Tunnel Alignment. Similar to Alternative 4, Alternative 7 includes three tunnel segments. The North Tunnel segment would be approximately 4.5 miles and the two South Tunnel segments would be approximately 3 and 7 miles long. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once and both branches of the Stony Brook Fault which would likely require additional support measures during construction. This alternative has one of the shorter overall construction schedules and the flexibility of three construction contracts. Any activity at the Tandem Trailer site would include a connection tunnel to the Park Road East site, to provide a connection from the new tunnel to the Hultman Aqueduct. The three tunnel alignments are all less than 7 miles, which is advantageous from a construction mobilization and phasing perspective. Alternative 7 would require 5 construction sites, two for launching and three for receiving, with both receiving and launching from the same shaft at the Highland Avenue Northeast site on land owned or under the care, custody and control of MassDOT, DCR, the City of Waltham, and the Town of Weston.

Tandem Trailer (Launching). The site is the same as Alternative 1.

Fernald Property (Receiving). The site is the same as Alternative 1.

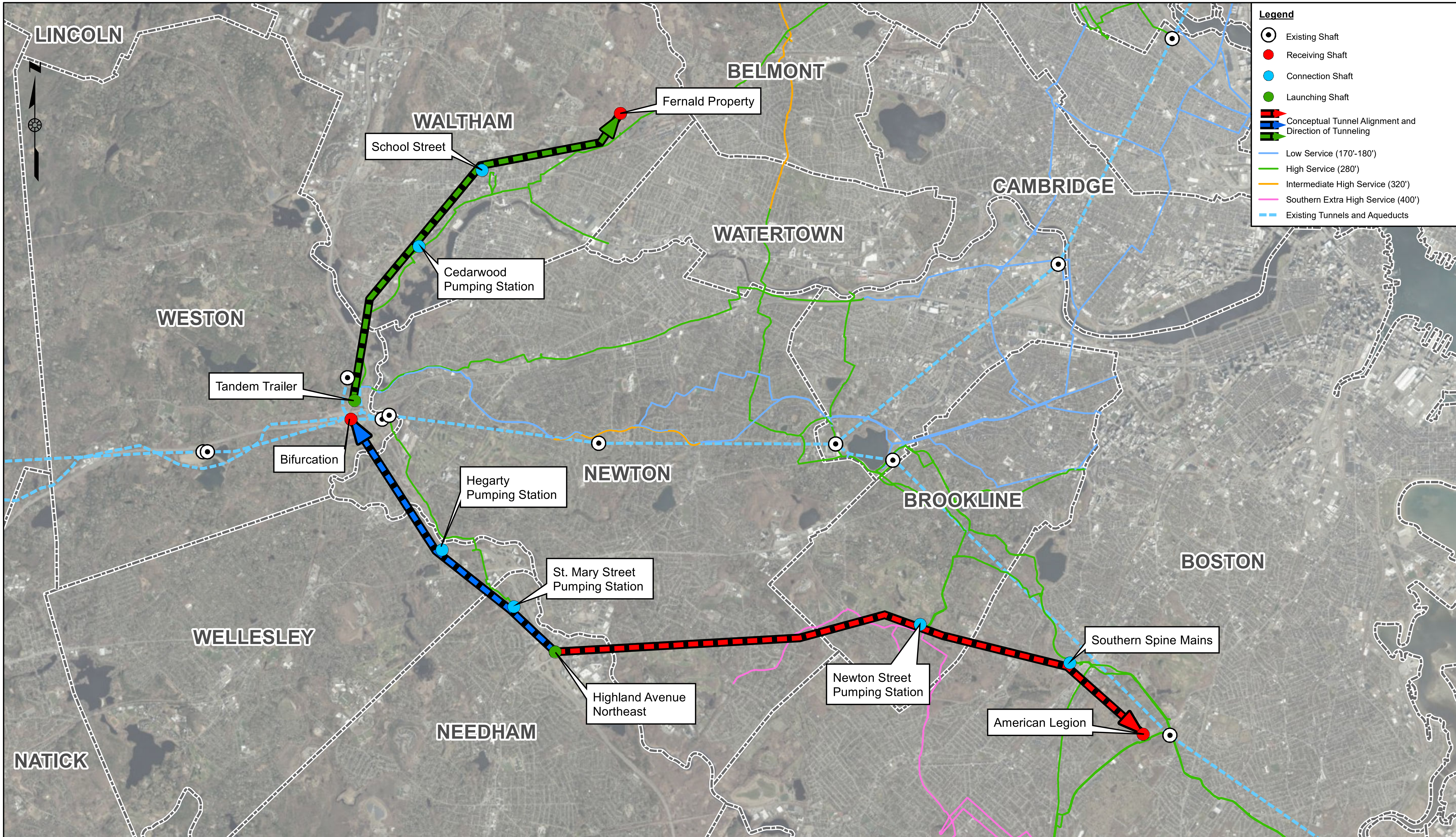
Highland Avenue Northeast (Double Launching). This is the only alternative where there would be a double launching from the same site. There is sufficient land available to accommodate a double launch shaft, although construction phasing would have to be carefully coordinated. The Highland Avenue Northeast location is relatively isolated from the community, with 14 commercial receptors within 500 feet of the site and has highly convenient access from Route I-95.

American Legion Site (Receiving). This site is the same as Alternative 1.

3.6.7.1 Overall Evaluation: Alternative 7

Alternative 7 includes launching sites in areas away from the community, with convenient access to the regional highway system. With two launches from one construction shaft site located at Highland Avenue

Northeast, an isolated location, impacts would be limited to five construction shaft sites, with two of them located in the area potentially impacted by MassDOT Project No. 606783. This alternative has the advantage of no connection tunnel in the Highland Avenue area and an easier dewatering discharge solution, would require an act of the Legislature for the American Legion site but it can only be implemented as two construction packages, which limits flexibility for the Authority.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

0 2,400 4,800 7,200 Feet
SCALE IN FEET
SCALE: 1" = 5,000'

Figure 3.6-7 Alternative 7

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

This page intentionally left blank

3.6.8 Alternative 8

Alternative 8 (**Figure 3.6-8**) consists of three tunnel segments spanning less than 7 miles each. It would require three TBM drives, one for the North Tunnel and two for the South Tunnel. The North Tunnel starts by launching from the Tandem Trailer site in the Hultman Aqueduct node with a connection tunnel to Park Road East and receiving at the Fernald Property in the WASM3 node. The South Tunnel launches from the Highland Avenue Northwest site in the Highland Avenue node and receiving at the Riverside Park site in the Hultman Aqueduct node. Ultimately, this alternative would require a connection from the Riverside Park site to the Hultman Aqueduct with a large pipe through microtunneling or other methods. It would also require launching from the Highland Avenue Northeast site in the Highland Avenue node and receiving at the American Legion site in the Shaft 7C node. This alternative splits the South Tunnel into two construction segments.

Tunnel Alignment. Similar to Alternative 4, Alternative 8 includes three tunnel segments. The North Tunnel segment would be approximately 4.5 miles and the two South Tunnel segments would be approximately 3 and 7 miles long. The North Tunnel alignment crosses the Northern Boundary Fault a few times, and there may be adverse geological conditions along this segment of the proposed tunnel route. The South Tunnel alignment crosses the Northern Boundary Fault once and both branches of the Stony Brook Fault which would likely require additional support measures during construction. This alternative has one of the shorter overall construction schedules and the flexibility of three construction contracts. Any activity at the Tandem Trailer site would include a connection tunnel to the Park Road East site, to provide a connection from the new tunnel to the Hultman Aqueduct. This is the only alternative that uses the Riverside Park as a receiving location and would require connection via a large diameter pipeline beneath active Massachusetts Bay Transportation Authority (MBTA) tracks. The three tunnel alignments are all less than 7 miles, which is advantageous from a construction mobilization and phasing perspective. Alternative 8 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.

Tandem Trailer (Launching). The site is the same as Alternative 1.

Fernald Property (Receiving). The site is the same as Alternative 1.

Highland Avenue Northwest (Launching). The site is the same as Alternative 2, except with receiving at Riverside Park.

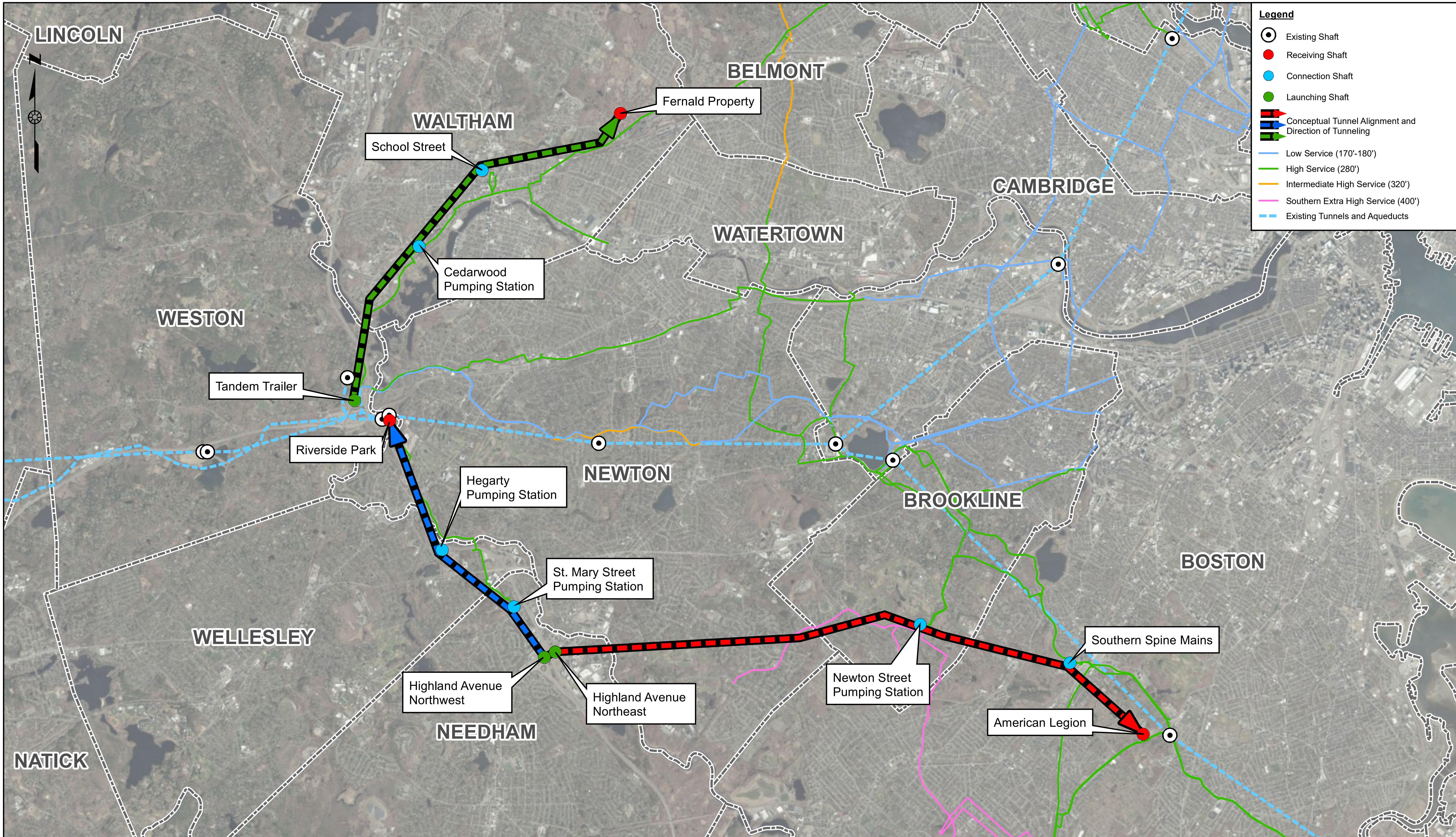
Riverside Park (Receiving). Under the care, custody, and control of DCR, Riverside Park is adjacent to the Charles River and is in active use for public passive recreation. It is also linked to another portion of the park across the Charles River where enhanced recreation facilities and amenities would soon be installed as part of a commercial project. Use of this site for a receiving shaft would permanently disrupt the park facilities and amenities at the site and adversely affect the connected portion of the park across the Charles River. The site would require a connection to the Hultman Aqueduct via a new pipeline installed beneath MBTA tracks, which would require significant coordination with the MBTA and would impact the construction schedule. The site abuts the Charles River and can be used as a discharge point for construction dewatering and flushing /disinfection discharge. Access to the site is within a few minutes from the nearest highway. The Park is an Article 97 property within the Charles River Reservation (owned by the DCR) and would require legislative approval for its use.

Highland Avenue Northeast (Launching). This site is the same as Alternative 2.

American Legion Site (Receiving). This site is the same as Alternative 1.

3.6.8.1 Overall Evaluation: Alternative 8

This is the only option that uses the Riverside Park as a receiving location. Using Riverside Park as a receiving shaft location would displace an actively used recreation area, require an act of the Legislature for Riverside Park and American Legion sites to use the land (due to its Article 97 status), and would require construction beneath active MBTA railroad tracks. Because of the active recreational use, inclusion of the Riverside Park in Alternative 8 makes it a challenging alternative to mitigate these recreational use impacts.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.6-8 Alternative 8

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

This page intentionally left blank

3.6.9 Alternative 9

Alternative 9 (**Figure 3.6-9**) consists of three tunnel segments spanning less than 7 miles each. It would require three TBM drives, one for the North Tunnel and two for the South Tunnel. The North Tunnel starts by launching from the Bifurcation site in the Hultman Aqueduct node and receiving at the Fernald Property in the WASM3 node. The South Tunnel launches from the Highland Avenue Northwest site in the Highland Avenue node and receiving at the Bifurcation site in the Hultman Aqueduct node. It also includes launching from the Highland Avenue Northeast site in the Highland Avenue node and receiving at the American Legion site in the Shaft 7C node. This alternative splits the South Tunnel into two construction segments.

Tunnel Alignment This is the only alternative that both launches and receives the TBMs at the Bifurcation site. Alternative 9 would require five construction sites, two used for launching, two for receiving, and one for both launching and receiving. The sites are under the care, custody, and control of or owned by the City of Waltham, MassDOT and DCR.

Bifurcation (Launching and Receiving). This is the only alternative that launches and receives the TBMs from the Bifurcation site. This alternative launches a TBM north to the Fernald site and receives a TBM from the Highland Avenue Northwest site**.** There is sufficient acreage available on the Bifurcation site. The two TBMs would use separate shafts for launching and receiving. Construction phasing would be key to scheduling with two tunnel construction packages being staged from this location. The site is in close proximity to the proposed MassDOT Project No. 606783.

Fernald Property (Receiving). This site is the same as Alternative 1.

Highland Avenue Northwest (Launching). This site is the same as Alternative 4.

Highland Avenue Northeast (Launching). This site is the same as Alternative 2.

American Legion Site (Receiving). This site is the same as Alternative 1.

3.6.9.1 Overall Evaluation: Alternative 9

Alternative 9 is the only alternative with two shafts and uses (launching and receiving) at the Bifurcation site. Construction phasing would be key to scheduling with two construction packages needing access to this location. This Alternative would require an act of the Legislature for the American Legion site. The site is isolated from the community but is in close proximity to MassDOT Project No. 606783. This option has the least ability to mitigate impacts from MassDOT Project No. 606783.

3.6.10 Alternative 10

Alternative 10 (**Figure 3.6-10**) consists of two tunnel construction segments that are greater than 6 miles, but less than 10 miles in length. It would require two TBM drives, one for the North Tunnel segment and one for the South Tunnel segment. The North Tunnel segment starts by launching from the Highland Avenue Northwest site in the Highland Avenue node and receiving at the Fernald Property in the WASM3 node with a large connection at the Park Road West Site in the Hultman Aqueduct Node. The South Tunnel launches from the Highland Avenue Northeast site in the Highland Avenue node and receiving at the American Legion site in the Shaft 7C node. This alternative creates more equal North and South Tunnel construction segments

Tunnel Alignment The two tunnel segments are the longest evaluated at approximately 7 miles, but less than 10 miles in length. The North Tunnel segment would be excavated from the Highland Avenue Northwest site, with a large connection to the Hultman Aqueduct at the Park Road West site, on the way to the Fernald Property. The South Tunnel segment would be excavated from the Highland Avenue Northeast site to the American Legion site. A connection tunnel would be required between the Highland Avenue Northwest site and Highland Avenue Northeast site. Alternative 10 would require five construction shaft sites, two for launching and two for receiving, and one for a large connection, on land under the care, custody and control of or owned by MassDOT, DCR and the City of Waltham.

Highland Avenue Northwest (Launching). This site is the same as Alternative 4.

Park Road West (Large Connection). Park Road West is immediately adjacent to the Hultman Aqueduct. The site is primarily under the care, custody, and control of MassDOT and includes an easement for the MWWST. The Authority has care, custody, and control over a portion of land around the Hultman Aqueduct. Access to the site is off Park Road and is easily accessed from the regional highway system. There are no underground utilities or surface structures on the site. No future changes in land use is planned for the site. Wetlands are present on a portion of the site and could be avoided through design mitigation. No historic properties are located on the site and there are no sensitive receptors close to the property. A large connection can be accommodated at this location with little impact to environmental resources or the community.

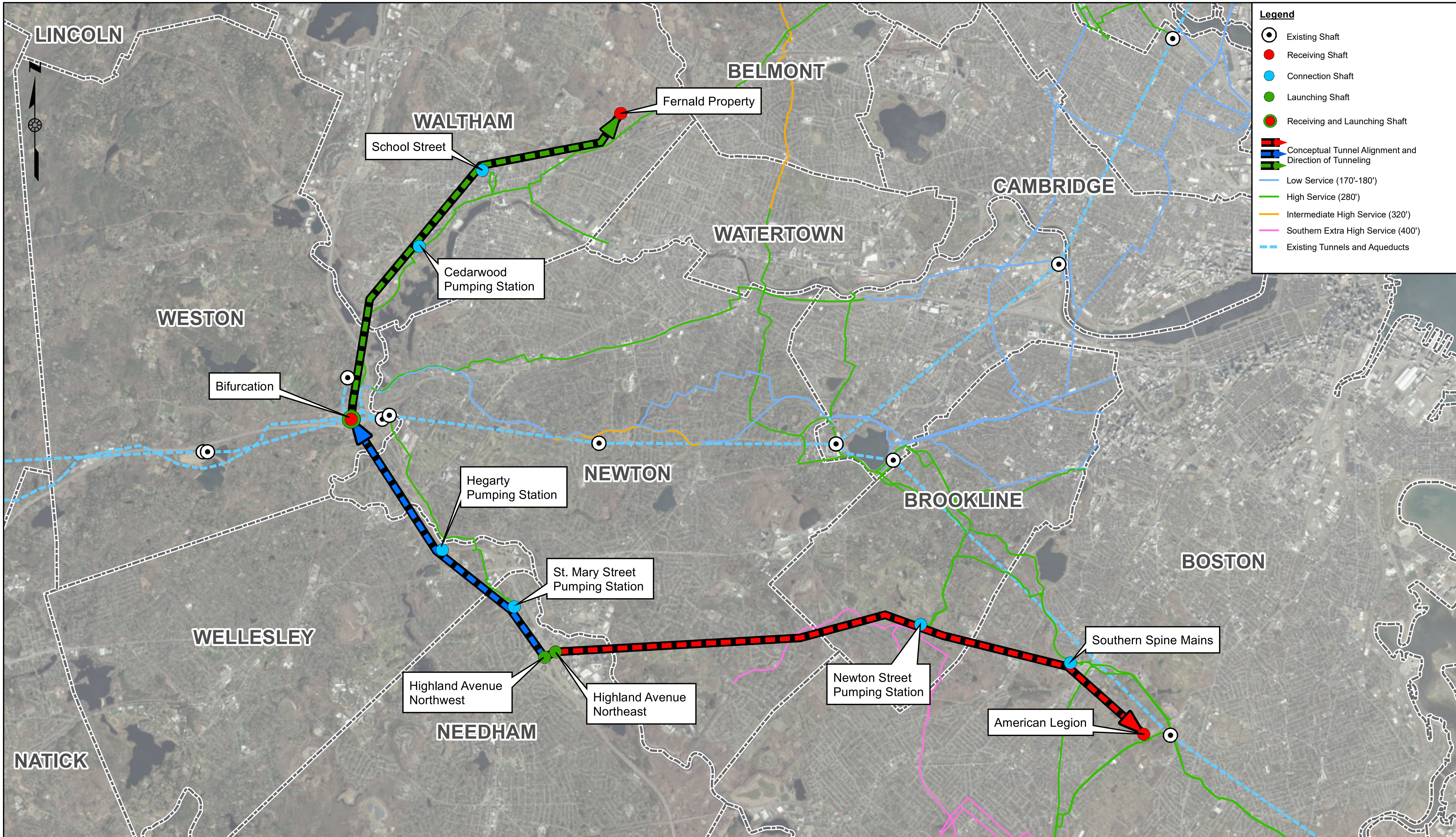
Fernald Property (Receiving). This site is the same as Alternative 1.

Highland Avenue Northeast (Launching). This site is the same as Alternative 2.

American Legion Site (Receiving). This site is the same as Alternative 1.

3.6.10.1 Overall Evaluation: Alternative 10

This alternative avoids MassDOT sites that would be impacted by MassDOT Project No. 606783 and thus would not be constrained or affected by the design or schedule of that project. The launching and receiving sites are located within the Highland Avenue Interchange, which is isolated from the community and has convenient highway access. This Alternative would require an act of the Legislature for the American Legion site. Major construction activities would be limited to one area for the duration of the Tunnel Program. Compared to the other Alternatives, Alternative 10 would result in the latest implementation in service for the North and South tunnels. The alternative configuration relies on the completion of both tunnel segments prior to the ability to commission and disinfect any permanent tunnel segment for service. Since there are two tunnel segments, construction contract packaging provides limited flexibility for the Authority. The option has the least reliance on the MassDOT I-90/I-95 interchange area and is not dependent on the timing of MassDOT Project No. 606783.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

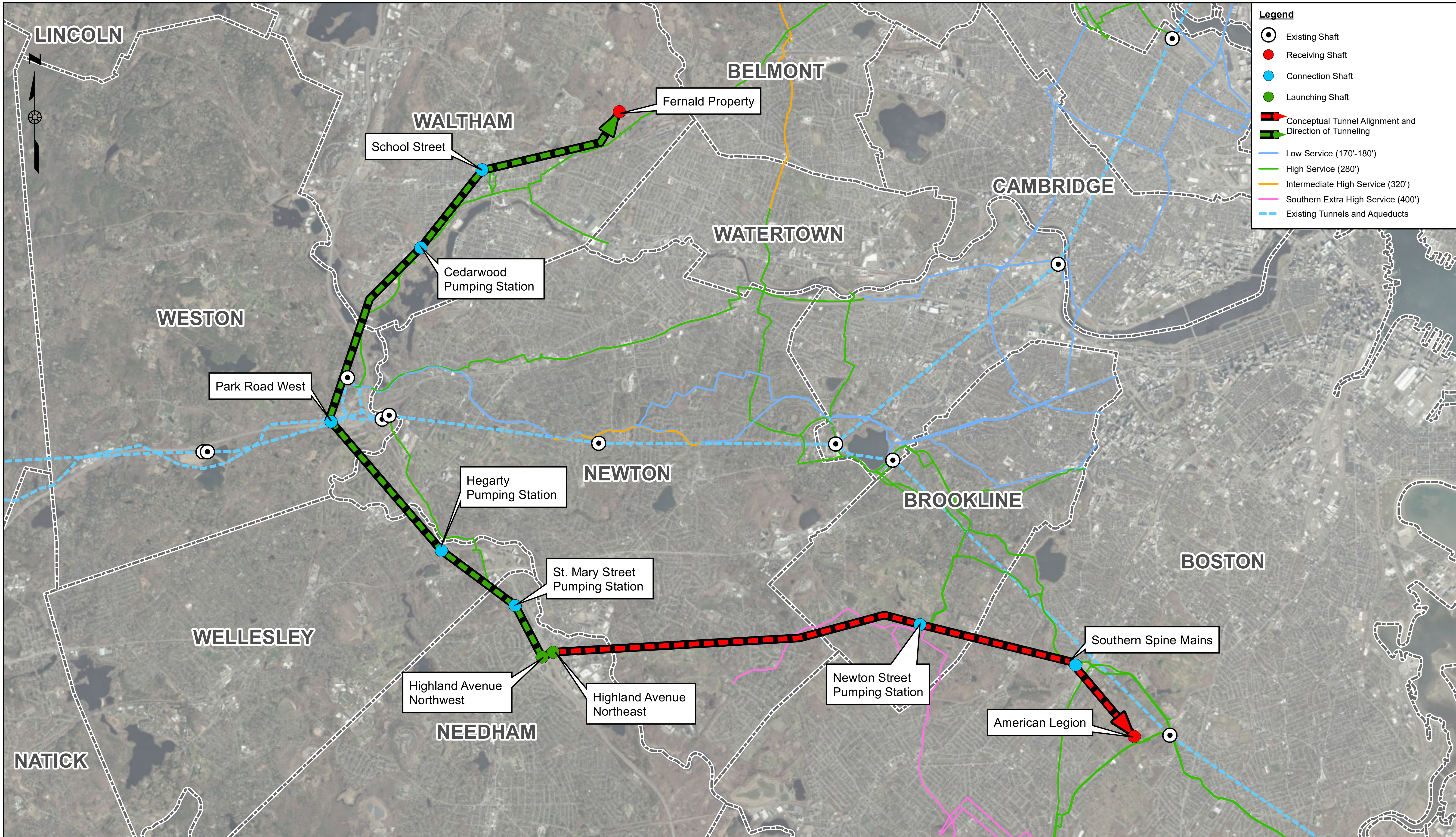
CDM Smith, in association with vhb, Jacobs, Green International Affiliates, Inc.

0 2,400 4,800 7,200 Feet
SCALE IN FEET
SCALE: 1" = 5,000'

Figure 3.6-9 Alternative 9

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

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

0 2,400 4,800 7,200 Feet
SCALE IN FEET
SCALE: 1" = 5,000'

Figure 3.6-10 Alternative 10

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

This page intentionally left blank

3.7 Comparing the Candidate Alternatives and Identifying the DEIR Alternatives

After evaluating the candidate alternative alignments individually, the next step in the process was to compare the alternatives to one another by the evaluation criteria of engineering, land availability, environmental, social/community, operations, cost, and schedule. Using the scoring framework described above, a score of favorable (green), neutral (yellow) or unfavorable (red) was developed for each category for each alternative as summarized in **Figure 3.7-1**. All of the categories were considered equally important and were not weighted. **Appendix C** provides a detailed summary of the evaluation steps that resulted in the screening and scoring result that identified three DEIR alternatives that moved into an impact assessment in this DEIR.

Figure 3.7-1 Alternatives Scoring

Alternative	1	2	3	4	5	6	7	8	9	10
Tunnel Alignment (1)	TT>FE B>AL	NW>FE (B) NE>AL	TT>FE B>NW NE>AL	TT>FE NW>PW NE>AL	FE>TT NW>B NE>AL	TT>FE B>NW AL>NE	TT>FE NE>B NE>AL	TT>FE NW>RP NE>AL	B>FE NW>B NE>AL	NW>FE (PW) NE>AL
Engineering / Constructability	Yellow	Yellow	Green	Green	Green	Red	Green	Green	Yellow	Yellow
Land Availability	Yellow	Yellow	Yellow	Yellow	Red	Red	Yellow	Yellow	Yellow	Green
Environmental	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Red	Yellow	Green
Social / Community	Red	Green	Yellow	Yellow	Red	Red	Yellow	Red	Yellow	Green
Operations	Red	Green	Green	Green	Green	Green	Green	Red	Green	Green
Cost (2)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Schedule (tunnel(s) in service)	Red	Yellow	Green	Green	Green	Green	Green	Green	Green	Yellow
Retain Alternative	N	N	Y	Y	N	N	N	N	N	Y

(1) Site Abbreviations: TT – Tandem Trailer; FE – Fernald Property; B – Bifurcation; NW – Highland Avenue Northwest; NE – Highland Avenue Northeast; AL – American Legion; RP – Riverside Park; PW – Park Road West; (B) or (PW) indicates Large Connection Shaft in that tunnel segment: > indicates tunnel mining direction

(2) Construction cost only for the differential in capital construction costs among the alternatives.

Using the visual presentation of favorable (green), neutral (yellow) or unfavorable (red), a scoring rubric of favorable (1), Neutral (0), and unfavorable (-1) was then applied to the entire alternative alignment so it was possible to rank the alternatives numerically from highest to lowest.

Top ranked alternatives were Alternatives 4 and 10, followed closely by Alternatives 3 and 7. Although Alternative 7 was scored similarly to Alternative 3, the schedule for its implementation would take slightly longer with two TBM drives from the same shaft and was therefore eliminated from moving forward in favor of Alternative 3.

Based on the assessment and comparative evaluation, the alternatives that proceeded into DEIR analysis are Alternatives 3, 4, and 10. Among these alternatives, each of the likely sites were analyzed in detail, with the intent of identifying a Preferred Alternative and two back-up alternatives. **Section 3.9** describes the process of how the Preferred Alternative was selected.

The three top alternatives would evaluate the following sites and functions.

- Tandem Trailer - Launching (requires connection tunnel to Park Road East and reconfiguration of current tandem trailer activities)
- Fernald Property - Receiving
- Bifurcation - Launching
- Highland Avenue Northeast – Launching
- Highland Avenue Northwest – Launching and Receiving
- Park Road West - Receiving and Large Connection
- American Legion - Receiving

Alternative 10 is the only alternative that has only two tunnel segments and avoids sites that could be impacted by the MassDOT Project No. 606783, which limits that risk but the alternative is limited in flexibility for contracting with only two construction packages. Alternative 10 also has the longest implementation and latest time for bringing the North and South Tunnels into service of these top 3 alternatives. Alternatives 3 and 4 have the added flexibility for contracting with three tunnel segments and the potential for two or three construction packages. If the risk surrounding MassDOT Project No. 606783 can be mitigated, the additional flexibility for contract packaging offered in Alternatives 3 and 4 is a substantial benefit to the Authority. All three alternatives include launching from Highland Avenue Northeast, receiving at the American Legion site, receiving at the Fernald Property site, and the same six intermediate connection sites and the Hultman Aqueduct isolation valve.

3.8 DEIR Alternatives

As described above, three alternatives are under consideration for the Metropolitan Water Tunnel Program. These alternatives were identified in a detailed alternatives screening process that narrowed the 10 candidate DEIR alternatives to three DEIR alternatives for further consideration (**Table 3.8-1**). The proposed construction shaft locations (i.e., launching and receiving shafts) and the direction of the tunnel drives are identified for each alternative and its component tunnel segments. Proposed connection shaft locations are described. Major topographic features along the tunnel alignment are identified, including bodies of water and major roads. This section also discusses tunnel gradients as it impacts tunnel dewatering in both the temporary and permanent conditions.

Table 3.8-1 DEIR Alternatives

Alter-native	Segment 1	Segment 2	Segment 3
3	**North Tunnel** - Tandem Trailer Launching in Weston to Fernald Property Receiving in Waltham	**South Tunnel** - Bifurcation Launching in Weston to Highland Avenue Northwest Receiving in Needham	**South Tunnel** – Highland Avenue Northeast Launching in Needham to American Legion Receiving in Boston
4	**North Tunnel** - Tandem Trailer Launching in Weston to Fernald Property Receiving in Waltham	**South Tunnel** - Highland Avenue Northwest in Needham to Park Road West in Weston	**South Tunnel** - Highland Avenue Northeast Launching in Needham to American Legion Receiving in Boston
10[1]	**South Tunnel Segment 2** - Highland Avenue Northwest Launching in Needham to Park Road West Large Connection in Weston **North Tunnel Segment 1** - Continues from Park Road West Large Connection in Weston to Fernald Property Receiving in Waltham		**South Tunnel** - Highland Avenue Northeast Launching in Needham to American Legion Receiving in Boston

[1] Alternative 10 uses one TBM for excavating Segment 2 and Segment 1.

3.8.1 DEIR Alternative 3

The conceptual plan for the Alternative 3 tunnel alignment is provided in **Figure 3.6-3**. The tunnel construction would take place in three segments, the final phasing of which would ultimately be determined based on MWRA procurement schedules. However, it is assumed that the North Tunnel (Segment 1) would be one construction package and that the South Tunnel (Segments 2 and 3) would be either one or two construction packages, with the South Tunnel proceeding first.

3.8.1.1 Alternative 3 - Segment 1

Launching from Tandem Trailer and Receiving at Fernald Property with a connector tunnel from Tandem Trailer to Park Road East. (North Tunnel)

The tunnel drive would begin from a TBM launching shaft at Tandem Trailer, located on the northwest side of the I-90/I-95 interchange in Weston. The drive would proceed approximately 4.5 miles north and east through the Town of Weston and the City of Waltham, to a TBM receiving shaft at the Fernald Property, located on the east side of Waltham. Connection shafts between the launching and receiving shafts would be located at Cedarwood Pumping Station in Waltham and at School Street, also in Waltham.

Major topographical features crossed by Segment 1 (from the launching shaft to the receiving shaft) would include the following:

- I-95 near River Road in Weston
- A narrow strip of land to the east of the dam that separates Stony Brook Basin from the Charles River (including Stony Brook)
- The MBTA Fitchburg Line near Howe Avenue in Waltham; Main Street (Route 20) in the vicinity of Grant Street in Waltham
- Lyman Pond to the south of Bentley University Football Stadium in Waltham
- Beaver Street to the west of Waverley Oaks Road in Waltham

- Clematis Brook to the southwest of the Fernald Property shaft site

The tunnel would be located deep in the rock for its entire length and would be excavated at a slight upward grade from Tandem Trailer to Cedarwood Pumping Station Connection, onward to the School Street Connection, and then ultimately to the Fernald Property Receiving, allowing groundwater inflows to drain by gravity to Tandem Trailer Launching.

Alternative 3 - Segment 1 also includes a short length of connector tunnel, approximately 900 feet long, to connect the TBM launch shaft at the Tandem Trailer site to Park Road East Connection in Weston. The Park Road East Connection is located to the east of Park Road, north of I-90, and is encircled by the ramps and service roads of the I-90/I-95 interchange. The connector tunnel would pass beneath several of these ramps and service roads to reach the connection shaft. The connector tunnel would also be located deep in the rock for its entire length and would be excavated at a slight upward grade from Tandem Trailer to Park Road East, allowing groundwater inflows to drain by gravity to Tandem Trailer Launching.

3.8.1.2 Alternative 3 - Segment 2

Bifurcation Launching mines to Highland Avenue Northwest Receiving (South Tunnel)

A second tunnel drive would begin from a TBM launch shaft at Bifurcation, located within the confines of I-90/I-95 interchange ramps on the west side of I-95 and to the north of I-90 in Weston. The drive proceeds approximately 3.3 miles to the south and east through Weston, Newton, and Wellesley and Needham, to a TBM receiving shaft at Highland Avenue Northwest, which is the northwest cloverleaf of the Highland Avenue/I-95 interchange in Needham. Connection shafts between the launching and receiving shafts would be located at the Hegarty Pumping Station in Wellesley and at the St. Mary Street Pumping Station in Needham.

Major topographical features crossed by the Segment 2 (from the launching shaft to the receiving shaft) would include the following:

- Interstate I-90 including the ramp connecting I-95 South to I-90 East
- Riverside Road and Recreation Road, both in Weston
- Leo Martin Memorial Golf Course and the Charles River, which divides Weston and Newton
- Route 16 to the west of the I-95 interchange in Newton
- A second crossing of the Charles River, which separates Newton from Wellesley near Walnut Street
- Rosemary Brook near Barton Road in Wellesley, Route 9 to the west of the I-95 interchange in Wellesley, Central Avenue near St. Mary Street in Needham
- A commercial development and ramps at the northwest corner of the I-95/Highland Avenue interchange in Needham, just north of the Highland Avenue Northwest receiving shaft site

The tunnel would be located deep in the rock for its entire length and would be excavated at a slight upward grade from Bifurcation to Highland Avenue Northeast, allowing groundwater inflows to drain by gravity to Bifurcation Launching.

3.8.1.3 Alternative 3 - Segment 3

Highland Avenue Northeast Launching (with a connector tunnel to Highland Avenue Northwest) mines to American Legion Receiving (South Tunnel)

A third tunnel drive would begin from a TBM launching shaft at Highland Avenue Northeast, located within the northeast cloverleaf of the Highland Avenue/I-95 interchange. The drive proceeds approximately 7 miles, generally to the east and then to the southeast—through Needham, Newton, Brookline, and into Boston—to a TBM receiving shaft at American Legion, located on the north side of the American Legion Highway between Walk Hill Street and Morton Street, in a clearing to the south of the Judge John J. Connelly Youth Center. Connection shafts between the launching and receiving shafts would be located at Newton Street Pumping Station in Brookline and at Southern Spine Mains in Boston.

Major topographical features crossed by Segment 3 (from the launching shaft to the receiving shaft) would include the following:

- Highland Avenue to the east of the I-95 interchange in Needham
- The Charles River, which divides Needham from Newton near Wallace Street
- The northern limits of the Charles River Country Club in Newton
- Dedham Street between Country Club Road and Greenwood Street in Newton
- Bald Pate Hill in Newton
- Brookline Street near the intersection with Dudley Road in Newton
- Newton Street and the West Roxbury Parkway near Walcott Road in Brookline
- The Robert T. Lynch Municipal Golf Course in Brookline
- A second crossing of Newton Street near the intersection of Grove Street in Brookline
- Beneath Mount Walley in Brookline
- Across Centre Street near Westchester Road in Boston
- To the north of Bussey Hill in Boston
- Crossing Washington Street and Hyde Park Avenue just south of the Arborway (Route 203) in Boston, and
- Crossing through the Forest Hills Cemetery, including Lake Hibiscus, in Boston

The third tunnel drive would be located deep in the rock for its entire length and would be excavated at a slight upward grade from the Highland Avenue Northeast shaft to Newton Street Pumping Station Connection, the Southern Spine Mains Connection and then to American Legion Receiving, allowing for groundwater inflows to drain by gravity to the Highland Avenue Northeast Launching.

Alternative 3-Segment 3 would include a short length of connector tunnel, approximately 700 feet long, to connect the TBM launch shaft at Highland Avenue Northeast with the construction shaft at the Highland Avenue Northwest. The connector tunnel would pass below I-95, both northbound and southbound, and two exit ramps. The connector tunnel would also be located deep in the rock for its entire length and would be excavated at a slight upward grade from Highland Avenue Northeast to Highland Avenue Northwest allowing groundwater inflows to drain by gravity to the Highland Avenue Northeast Launching.

3.8.2 DEIR Alternative 4

The conceptual plan for the Alternative 4 tunnel alignment is provided in **Figure 3.6-4**. The tunnel construction would take place in three segments, the final phasing of which would ultimately be determined based on MWRA procurement schedules. However, we have assumed that the North Tunnel (Segment 1) would be one construction package and that the South Tunnel (Segments 2 and 3) would be either one or two construction packages with the South Tunnel proceeding first.

3.8.2.1 Alternative 4 - Segment 1

Launching from Tandem Trailer and Receiving at Fernald Property with a connector tunnel from Tandem Trailer to Park Road East. (North Tunnel)

The first tunnel drive, including the connector tunnel from the Tandem Trailer launching shaft to the Park Road East connection shaft, would be unchanged from Alternative 3.

3.8.2.2 Alternative 4 - Segment 2

Launching from Highland Avenue Northwest and Receiving at Park Road West (South Tunnel)

The second tunnel drive would begin from a proposed launching shaft at the Highland Avenue Northwest and drive approximately 3.3 miles northwest towards a proposed receiving shaft at Park Road West, which is located to the west of Park Road in Weston and encircled by the I-90 West to I-95 North exit ramp. Connection shafts between the launching and receiving shafts would be located at Hegarty Pumping Station in Wellesley and at St. Mary Street Pumping Station in Needham.

Major topographical features crossed by Segment 2 (from the launching shaft to the receiving shaft are similar to Alternative 3 but in reverse) include the following:

- The ramps on the northwest clover of the I-95/Highland Avenue interchange followed by the commercial development in Needham, just north of the Highland Avenue Northwest site
- Central Avenue near St. Mary Street in Needham, Route 9 to the west of the I-95 interchange in Wellesley, Rosemary Brook near Barton Road in Wellesley
- A crossing of the Charles River, which separates Newton and Wellesley near Walnut Street
- Route 16 to the west of the I-95 interchange in Newton, the Leo Martin Memorial Golf Course, and a second crossing of the Charles River, which separates Newton and Weston
- Recreation Road and Park Road in Weston
- Interstate 90, including the ramp from I-90 West to I-95 North in Weston.

The second tunnel drive would be located deep in the rock for its entire length and is excavated at a slight upward grade from the Highland Avenue Northwest launching shaft to the Park Road West receiving shaft, allowing for groundwater inflows to drain by gravity to the Highland Avenue Northwest launching site.

3.8.2.3 Alternative 4 - Segment 3

Highland Avenue Northeast Launching (with a connector tunnel to Highland Avenue Northwest) proceeds to American Legion Receiving (South Tunnel)

The third tunnel drive, from Highland Avenue Northeast Launching to American Legion Receiving, including the connector tunnel from Highland Avenue Northeast launching to Highland Avenue Northwest construction shaft, would be unchanged from Alternative 3.

3.8.3 DEIR Alternative 10

The conceptual plan for the Alternative 10 tunnel alignment is provided in **Figure 3.6-10**. Unlike Alternatives 3 and 4, Alternative 10 would be excavated by only two TBMs. Segments 1 and 2 would be excavated by one TBM and includes a large connection shaft at Park Road West to separate the North and South Tunnels. Segment 3 remains unchanged from Alternatives 3 and 4.

Tunnel construction would take place in two segments, the final phasing of which would ultimately be determined based on MWRA procurement schedules. However, we have assumed that the package including Segment 2 (South Tunnel) and Segment 1 (North Tunnel) would be one construction package proceeding first and that Segment 3 (South Tunnel) would be another construction package.

3.8.3.1 Alternative 10 – Segments 2 and 1 combined

Launching from Highland Avenue Northwest to Park Road West Large Connection (South Tunnel Segment 2) and continues from Park Road West Large Connection to Fernald Property Receiving (North Tunnel Segment 1)

The first tunnel drive would begin from a proposed launching shaft at Highland Avenue Northwest (Segment 2) and drive approximately 3.3 miles northwest towards a proposed large connection shaft at Park Road West. Connection shafts between the launching and large connection sites would be located at Hegarty Pumping Station site in Wellesley and at St. Mary Street Pumping Station in Needham.

The TBM drive would continue through Park Road West Large Connection (Segment 1) towards Fernald Property for a total approximate length of 8 miles. The tunnel alignment from Park Road West to Fernald Property would be similar to Alternatives 3 and 4 with the exception that the alignment for Alternative 10 would be located to the west of the MetroWest Water Supply Tunnel (MWWST) wye and crosses I-95 and the Weston/Waltham border to the west of River Road as opposed to the east.

The tunnel would be located deep in the rock for its entire length and would be excavated at a slight upward grade from Highland Avenue Northwest launch shaft to the Park Road West large connection shaft and ultimately to Fernald Property Receiving, allowing for groundwater inflows to drain by gravity to the Highland Avenue Northwest Launching.

3.8.3.2 Alternative 10 - Segment 3

Highland Avenue Northeast Launching (with a connector tunnel to Highland Avenue Northwest) to American Legion Receiving (South Tunnel)

This tunnel drive, from Highland Avenue Northeast Launching to American Legion Receiving, including the connector tunnel from Highland Avenue Northeast Launching to Highland Avenue Northwest construction shaft, would be unchanged from Alternatives 3 and 4.

3.8.4 Launching, Receiving and Large Connection Sites Description

This section provides a detailed description of each site and presents construction period activities and final site conditions.

3.8.4.1 Fernald Property Receiving

The Fernald Property would serve as a TBM receiving shaft and near surface pipeline connection point to Weston Aqueduct Supply Main No. 3 (WASM 3) for all alternatives. The Fernald Property is an abandoned state school for the developmentally challenged, located in a largely wooded area in eastern Waltham (a little over half a mile west of the Waltham/Belmont border). Several abandoned buildings in various states of disrepair remain on the former campus. The site is currently owned by the City of Waltham.

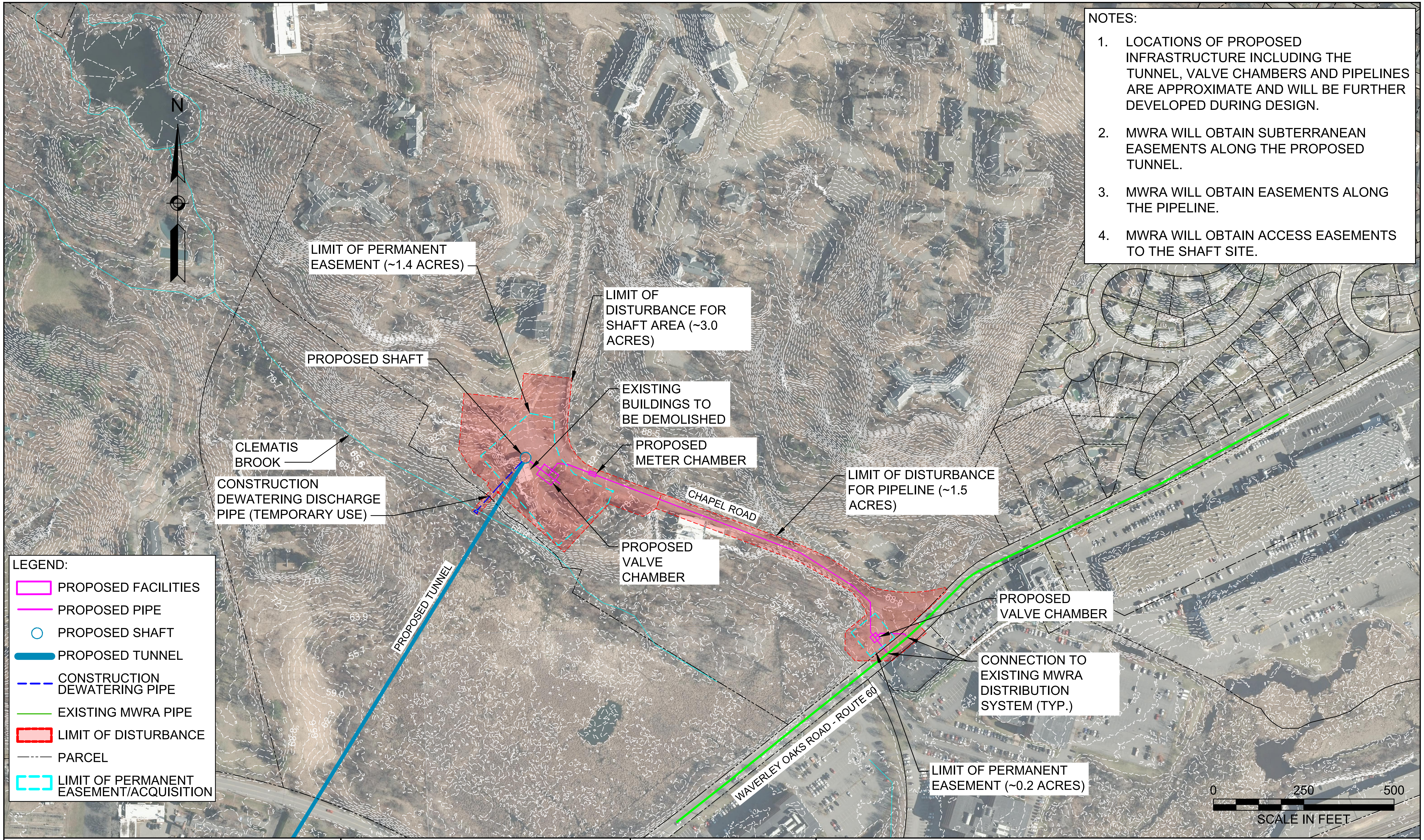
The Fernald Property is situated on a broad north-south trending hill within the Cedar Hill Reservation. Ground surface elevations generally decrease from north to south across the site. Clematis Brook traverses the site, flowing in a southeasterly direction towards a wetland on the north side of Waverly Oaks Road (Route 60), which forms the southern boundary of the site. The proposed construction shaft would be located near the top of the hill on the west side of Chapel Road, where the road bends to the north, approximately 1,000 feet from the intersection with Waverley Oaks Road.

Site access would be from Waverley Oaks Road to Chapel Road and to the shaft construction site. Temporary staging area for this site would be approximately 4.5 acres with approximately 1.6 acres reserved for MWRA permanent facilities.

Temporary construction facilities on this site would potentially include trailers, parking areas, on-site temporary excavated material storage area, a concrete batch plant, additional staging area for working adjacent to shaft construction, and a water treatment facility. It is anticipated that any excavated material generated would be disposed of off-site daily; however, excavated material storage areas for five days of storage would be reserved on site. Construction generated groundwater would be relatively minor and would be treated prior to its release to the adjacent wetland. Temporary power for the site would be provided through temporary services from the existing power grid by Eversource. For this DEIR alternative, it is assumed the shaft excavated diameter is approximately 30 feet in rock; with a 10-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-1** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the selected construction contractor.

The site would also include a proposed 120-inch piping connection to the proposed tunnel shaft riser that terminates in a capped stub to support a connection to a future North Tunnel extension. A below-ground valve chamber would be proposed between the tunnel shaft and the capped stub. A buried steel pipeline approximately 1,025 feet long would be proposed in Chapel Road between the valve chamber adjacent to the shaft and a valve chamber adjacent to Waverley Oaks Road. A pipe would exit the lower valve chamber and connect to the existing WASM3 in Waverley Oaks Road. As shown in **Figure 3.8-2**, final conditions at the site would include a fenced area at the Receiving Shaft with a paved driveway and parking area, landscaping, and some bollards. The concrete top of shaft structure would extend not more than 3 feet above ground surface. The valve chamber along Waverley Oaks Road would include a similarly fenced in area with paved surfaces, landscaping, some bollards, and a concrete top of the valve chamber structure that would extend not more than 3 feet above ground surface. All disturbed areas would be restored to preconstruction conditions for paved areas, and landscaping would be restored in accordance with any agreements with the property owners.

Page intentionally left blank



C:\cdmext\prussendn\d0725715\S-2 Fernald-Receiving Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith | in association with vhb | Jacobs | GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-1 Site Schematic
Fernald Property-Receiving Shaft
Alternatives 3, 4 & 10

Waltham, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank

NOTES:

1. MWRA WILL OBTAIN EASEMENTS ALONG THE PIPELINE.
2. TREES AND LANDSCAPING WILL BE INCLUDED TO OFFSET IMPACTS OF TREES BEING REMOVED AND WILL BE COORDINATED WITH COMMUNITIES AND PROPERTY OWNERS.
3. THE FINAL SITE WILL BE FENCED TO SECURE THE AREA AROUND THE TOP OF SHAFT AND VALVE CHAMBERS.
4. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
5. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.
6. MWRA WILL OBTAIN ACCESS EASEMENTS TO THE SHAFT SITE.

C:\cdmext\prussendn\0731719\S-2 Fernald-Receiving Shaft-05.2022-FC-DL-1W1FYY2.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
Green International Affiliates, Inc.

Figure 3.8-2 Final Conditions Schematic
Fernald Property-Receiving Shaft
Alternatives 3, 4 & 10

Waltham, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank

3.8.4.2 Tandem Trailer Launching and Park Road East Connection

Use of the Tandem Trailer site for launching would always include a connection tunnel to the Hultman Aqueduct via a large connection shaft located at the Park Road East site. In addition, the existing tandem trailer lot would have to be reconfigured to facilitate continued operation of the tandem trailer activities as well as the required tunnel launching activities.

Tandem Trailer Launching

Tandem Trailer would serve as a TBM launch shaft for Alternatives 3 and 4. It would connect to Park Road East by a connector tunnel. Tandem Trailer site is a mostly paved clearing in what is otherwise a wooded area between Route 30 to the north and west and I-90/I-95 interchange connector ramps to the south and east. The property is under the care, custody, and control of MassDOT and is currently used as parking for 34 tandem trailers and a temporary storage area. The site is bordered by uplands to the north and west (beyond Route 30). The topography is relatively flat to the south and east and generally slopes downwards towards Seaverns Brook, which borders the south side of the site, and the Charles River, which is located approximately 1,000 feet to the east.

Site access would be from I-95 South ramp or South Avenue (Route 30) to the shaft site. Temporary staging area for this site would be approximately 4 acres overall, 3.3 acres in the vicinity of the shaft with approximately 0.2 acres reserved for MWRA permanent facilities. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, power facilities, a concrete batch plant, workshops, additional staging area for working adjacent to shaft construction, and a water treatment facility. There is also a proposed temporary parking area of approximately 0.7 acres for workers along the I-95 to I-90 Westbound ramp south of Seaverns Brook. The generated excavated material would be disposed offsite daily; however, excavated material storage areas for 5-days of storage would be reserved on site. Construction-generated groundwater would be collected on site and treated prior to its release to Seaverns Brook. For this DEIR, it is assumed the shaft excavated diameter is approximately 40 feet in rock; with a 10-foot steel-lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. Temporary power requirements for tunnel construction at the TBM launch site would require a dedicated new service to support the activities on site. New direct bury feeds to a proposed on-site substation from Eversource would be provided. **Figure 3.8-3** shows a schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

As shown in **Figure 3.8-4**, final conditions at the site would include a fenced area at the Launch Shaft with a paved driveway and parking area, some bollards and a concrete top of shaft structure that would extend no more than 3 feet above ground surface. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with MassDOT and the Town of Weston.

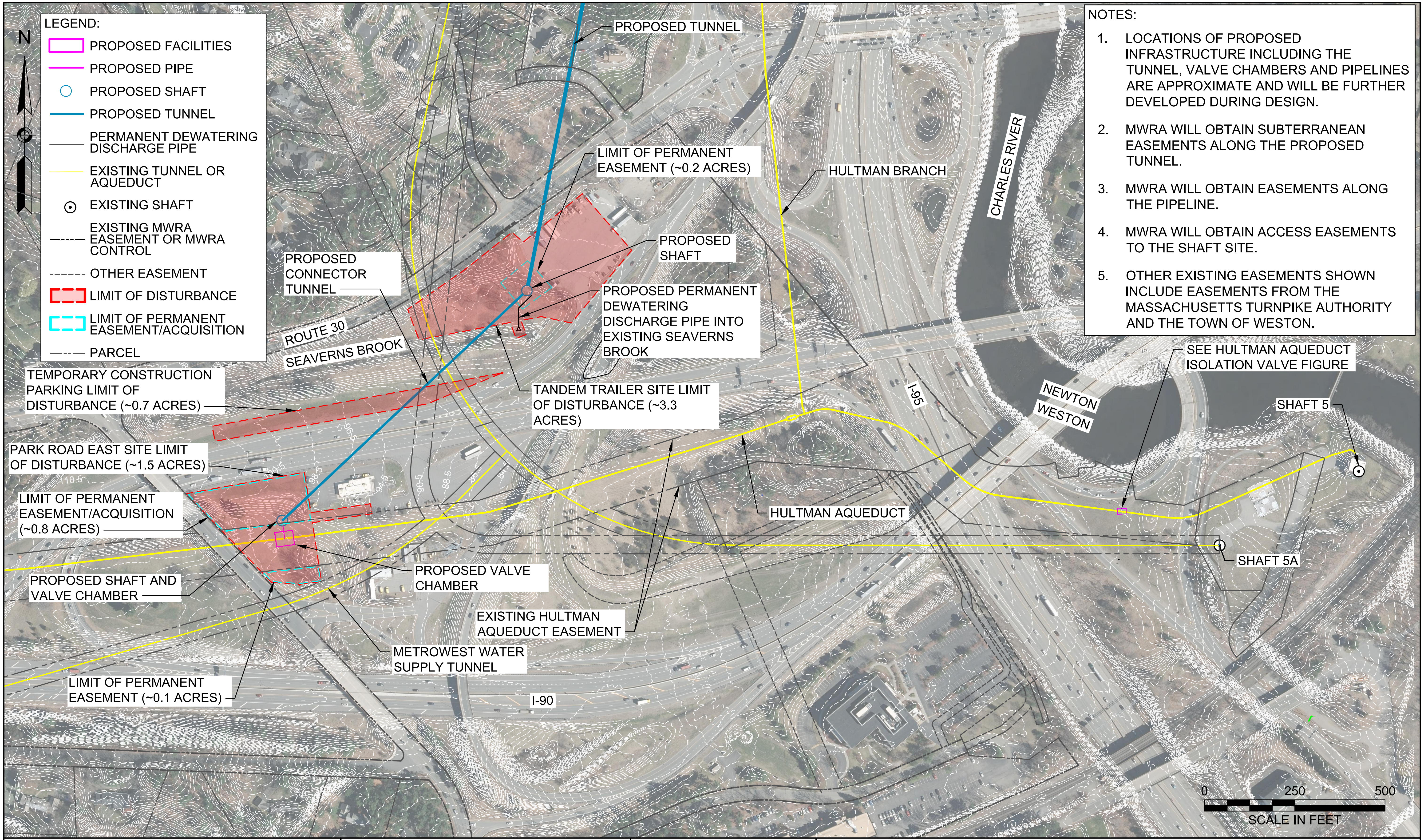
Park Road East Connection

Park Road East Connection would serve as a large connection shaft, which provides near surface pipeline connection and valving to the existing Hultman Aqueduct for Alternatives 3 and 4. Park Road East is located with the existing ramp system of the I-90/I-95 interchange. It is bounded by Park Road to the west and by I-90 and its ramps and access roads on the remaining sides. A MassDOT facility is located on the east side of the site. The Hultman Aqueduct crosses the site. The site consists of gently rolling grassy terrain with some trees. The ground surface elevation generally decreases to the south and east towards the Charles River.

Site access would be from an I-90 off ramp to the shaft construction site. Its temporary construction site would be approximately 1.5 acres with an added permanent easement of approximately 0.9 acres for MWRA facilities. This added easement would abut the portion of the site currently under the care, custody and control by MWRA for the Hultman Aqueduct. Temporary construction facilities on this site would include trailers, parking areas, and staging area for working adjacent to shaft construction. The generated excavated material would be disposed offsite daily. Construction-generated groundwater would be minor and would be collected on site and treated prior to its release to a local storm drainage system. For this DEIR, it is assumed the shaft excavated diameter would be approximately 13 feet in rock with a 10-foot steel-lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-3** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

The Park Road East site would include 120-inch-diameter piping up through the tunnel shaft from the North Tunnel, then into 120-inch-diameter surface piping that would connect into the existing Hultman Aqueduct. The proposed 120-inch surface pipeline connects to the Hultman Aqueduct within a valve chamber constructed over the Aqueduct and within the MWRA's existing easement. The valve chamber would contain valves and accommodate the connection of the shaft surface piping to the Aqueduct. The top of shaft and valve structure roof slabs would be no more than 3 feet above ground.

Final conditions at the site, shown in **Figure 3.8-4**, would include a fenced area at the large connection shaft site with a paved driveway, a few parking spaces, some bollards, and a concrete top of shaft structure that would extend no more than 3 feet above ground surface. Disturbed areas would be restored to preconstruction conditions for paved areas and landscaping would be restored in accordance with any agreements with MassDOT.



NOTES:

1. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
2. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.
3. MWRA WILL OBTAIN EASEMENTS ALONG THE PIPELINE.
4. MWRA WILL OBTAIN ACCESS EASEMENTS TO THE SHAFT SITE.
5. OTHER EXISTING EASEMENTS SHOWN INCLUDE EASEMENTS FROM THE MASSACHUSETTS TURNPIKE AUTHORITY AND THE TOWN OF WESTON.

C:\cdmext\prussendn\d0725715\S-6.1 Tandem Trailer and Park Road East-Launch Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

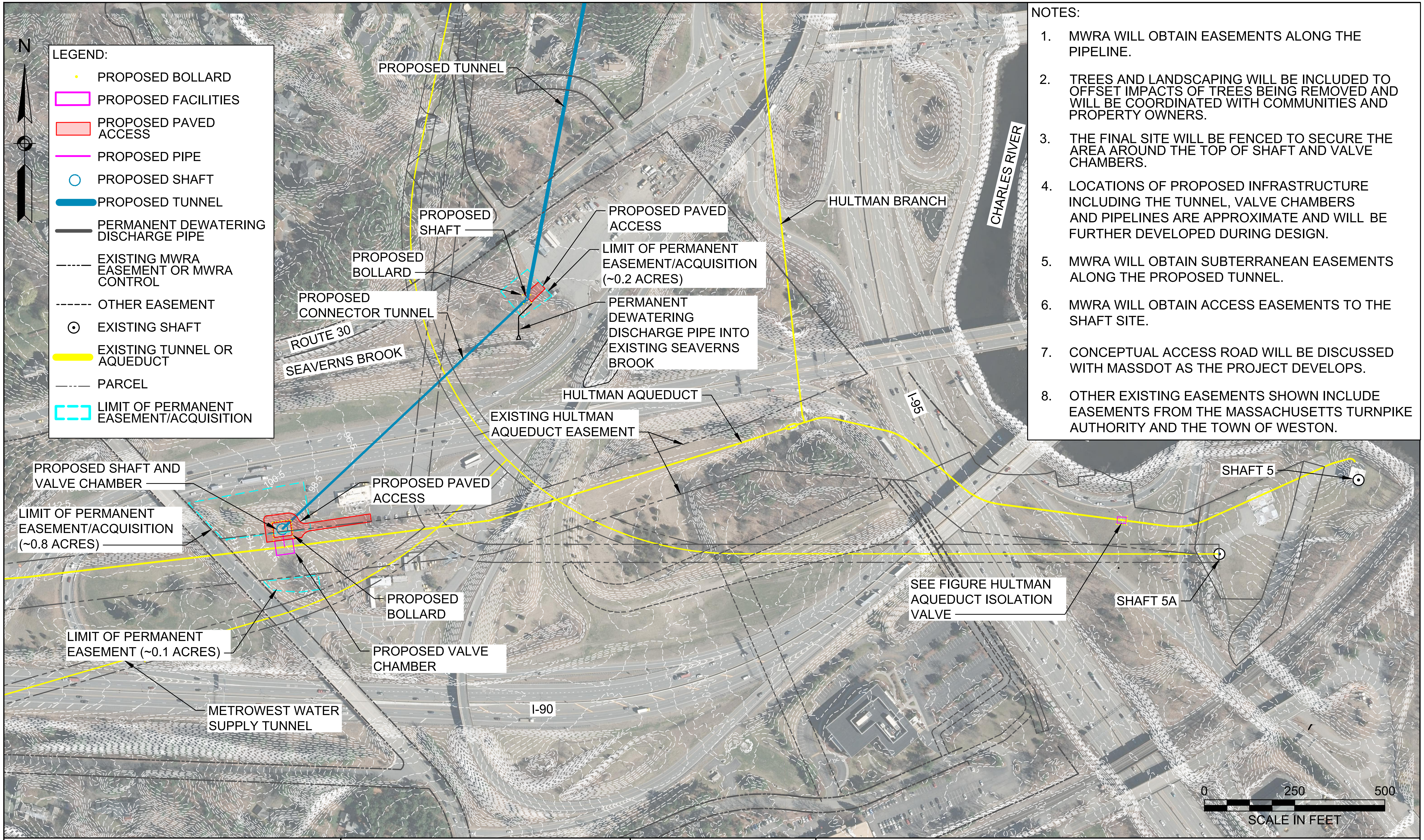
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-3 Site Schematic
Tandem Trailer and Park Road East-Launching Shaft
Alternatives 3 and 4

Weston, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank



NOTES:

1. MWRA WILL OBTAIN EASEMENTS ALONG THE PIPELINE.
2. TREES AND LANDSCAPING WILL BE INCLUDED TO OFFSET IMPACTS OF TREES BEING REMOVED AND WILL BE COORDINATED WITH COMMUNITIES AND PROPERTY OWNERS.
3. THE FINAL SITE WILL BE FENCED TO SECURE THE AREA AROUND THE TOP OF SHAFT AND VALVE CHAMBERS.
4. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
5. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.
6. MWRA WILL OBTAIN ACCESS EASEMENTS TO THE SHAFT SITE.
7. CONCEPTUAL ACCESS ROAD WILL BE DISCUSSED WITH MASSDOT AS THE PROJECT DEVELOPS.
8. OTHER EXISTING EASEMENTS SHOWN INCLUDE EASEMENTS FROM THE MASSACHUSETTS TURNPIKE AUTHORITY AND THE TOWN OF WESTON.

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

in association with

Figure 3.8-4 Final Conditions
Tandem Trailer and Park Road East-Launching Shaft
Alternatives 3 and 4

Weston, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-6.1 Tandem Trailer and Park Road East-Launch Shaft-05.2022-FC.dwg
PLOTTED: October 3, 2022

This page intentionally left blank

3.8.4.3 Bifurcation Launching

Bifurcation would serve as a TBM launch shaft site for Alternative 3. It would connect to the existing Hultman Aqueduct by near surface pipeline and a new valve chamber. The Bifurcation site is located within the existing ramp system of the I-90/I-95 interchange. The western portion and perimeter of the site have been generally cleared for highway construction, while the central and eastern portions of the site generally remain wooded. The gently rolling topography is dominated by the grassy remnants of embankments from previous ramp configurations.

Site access would be from I-90 West to the shaft construction site. Temporary staging area for this site would be approximately 12.2 acres with approximately 1.5 acres abutting the portion of the parcel under the care, custody and control of MWRA for the Hultman Aqueduct as well as a portion of the parcel for the MWWST easement. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, power facilities, a concrete batch plant, workshop, additional staging area for working adjacent to shaft construction, and a water treatment facility. The generated excavated material would be disposed offsite daily; however, excavated material storage areas for 5 days of storage would be reserved on site. Construction-generated groundwater would be collected on site and treated prior to its release to Seaverns Brook. New direct bury feeds to a proposed on-site substation from Eversource would be provided. For this DEIR, it is assumed the shaft excavated diameter is 40 feet in rock with a 10-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-5** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

Bifurcation site piping would include 120-inch-diameter piping up through the tunnel shaft from the South Tunnel, then into 120-inch-diameter surface piping that would connect into the existing Hultman Aqueduct. A 120-inch-diameter surface pipe would leave the shaft and travel through an isolation valve chamber containing a 120-inch butterfly valve. The proposed surface pipeline would connect to the Hultman Aqueduct within a valve chamber constructed over the Aqueduct. The valve chamber would accommodate valves and the connection of the shaft surface piping to the Aqueduct.

As shown in **Figure 3.8-6**, final conditions at the site would include a fenced area at the launch shaft site with a paved and parking area, some bollards and a concrete top of shaft structure that would extend not more than 3 feet above ground surface. The valve vault along the Hultman Aqueduct would include a similarly fenced area with paved surfaces, landscaping, some bollards, and a concrete top of the valve chamber structure that would extend not more than 3 feet above ground surface. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with MassDOT.

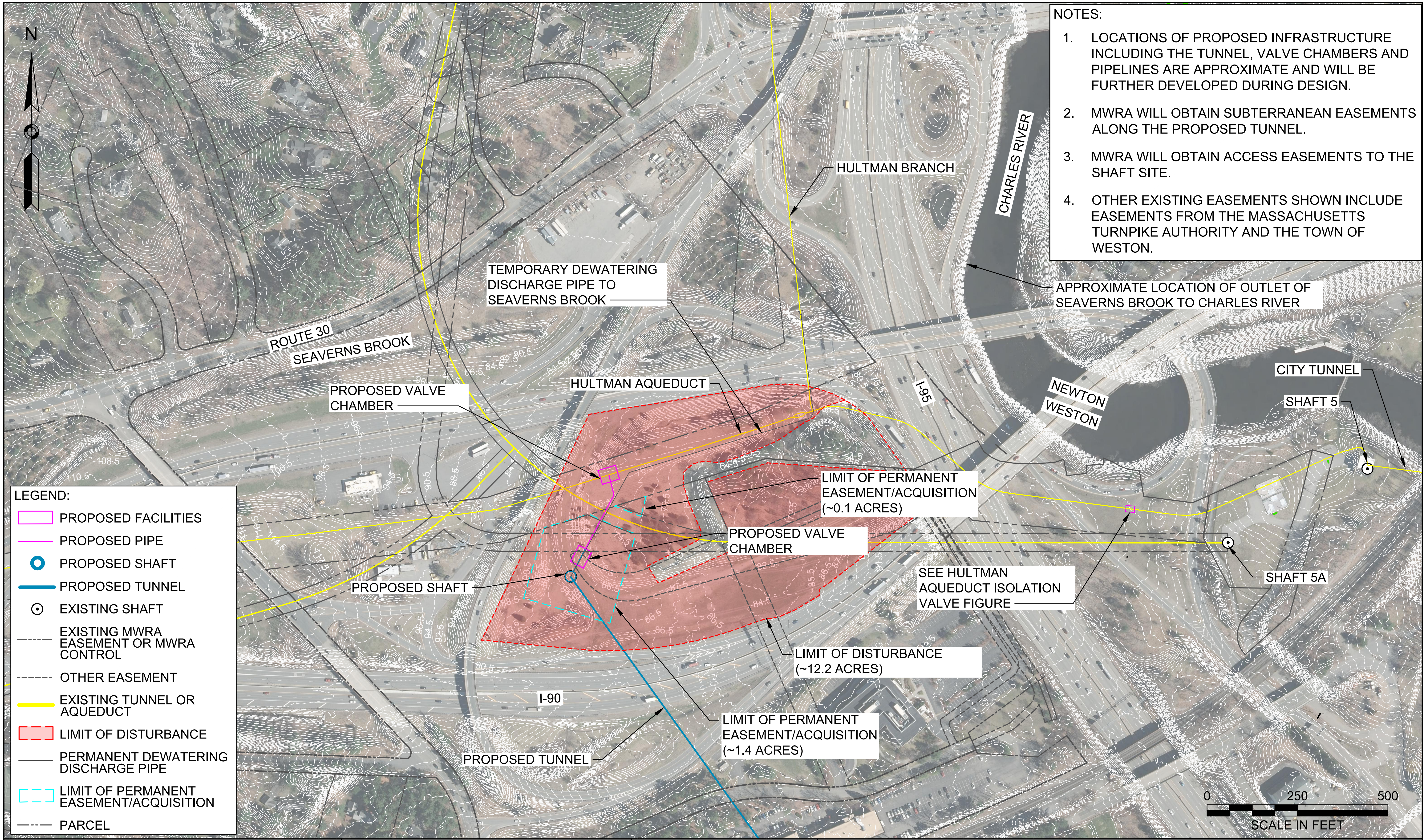
3.8.4.4 Park Road West Receiving

For Alternative 4, Park Road West would serve as a TBM receiving shaft site and near surface pipeline connection and valve chamber to the existing Hultman Aqueduct. Park Road West is located within the existing ramp system of the I-90/I-95 interchange. It is bounded by Park Road to the east and by the I-95S to I-90W ramp and I-90W on the remaining sides. The Hultman Aqueduct crosses the site. The site consists of flat, grassy terrain with some trees. There is a steep drop to I-90 on the southern boundary of the site, where a rock cut was made for road construction.

Site access would be from Park Road to the shaft construction site. Temporary staging area for this site would be approximately 2.7 acres with approximately 1.1 acres, abutting a portion of the parcel under the care, custody and control of MWRA for the Hultman Aqueduct, reserved for the new MWRA permanent facilities. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, additional staging area for working adjacent to shaft construction, and water treatment facility. The generated excavated material would be disposed of off-site daily as there is minimal room for on-site storage areas. Construction generated groundwater would be relatively small and would be treated prior to its release to the adjacent I-90 W swale. For this DEIR, it is assumed the shaft excavated diameter is approximately 30 feet in rock with a 10-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-7** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

Park Road West Receiving would include a tunnel shaft from the South Tunnel that would connect to the existing Hultman Aqueduct. A 120-inch-diameter steel surface pipe would leave the shaft and travel through an isolation valve chamber containing a 120-inch butterfly valve. The proposed 120-inch surface pipeline would connect to the Hultman Aqueduct within a valve chamber constructed over the Aqueduct. The valve chamber would accommodate valves and the connection of the shaft surface piping to the Aqueduct.

As shown in **Figure 3.8-8**, final conditions at the site would include a fenced area at the large connection shaft and valve chamber site with a paved driveway and parking areas, some bollards and the concrete top of shaft structure and valve chamber which would extend no more than 3 feet above ground surface. Disturbed areas would be restored to preconstruction conditions for paved areas and landscaping would be restored in accordance with any agreements with MassDOT.



C:\cdmext\prussendn\d0725715\S-6.2 Bifurcation-Launch Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

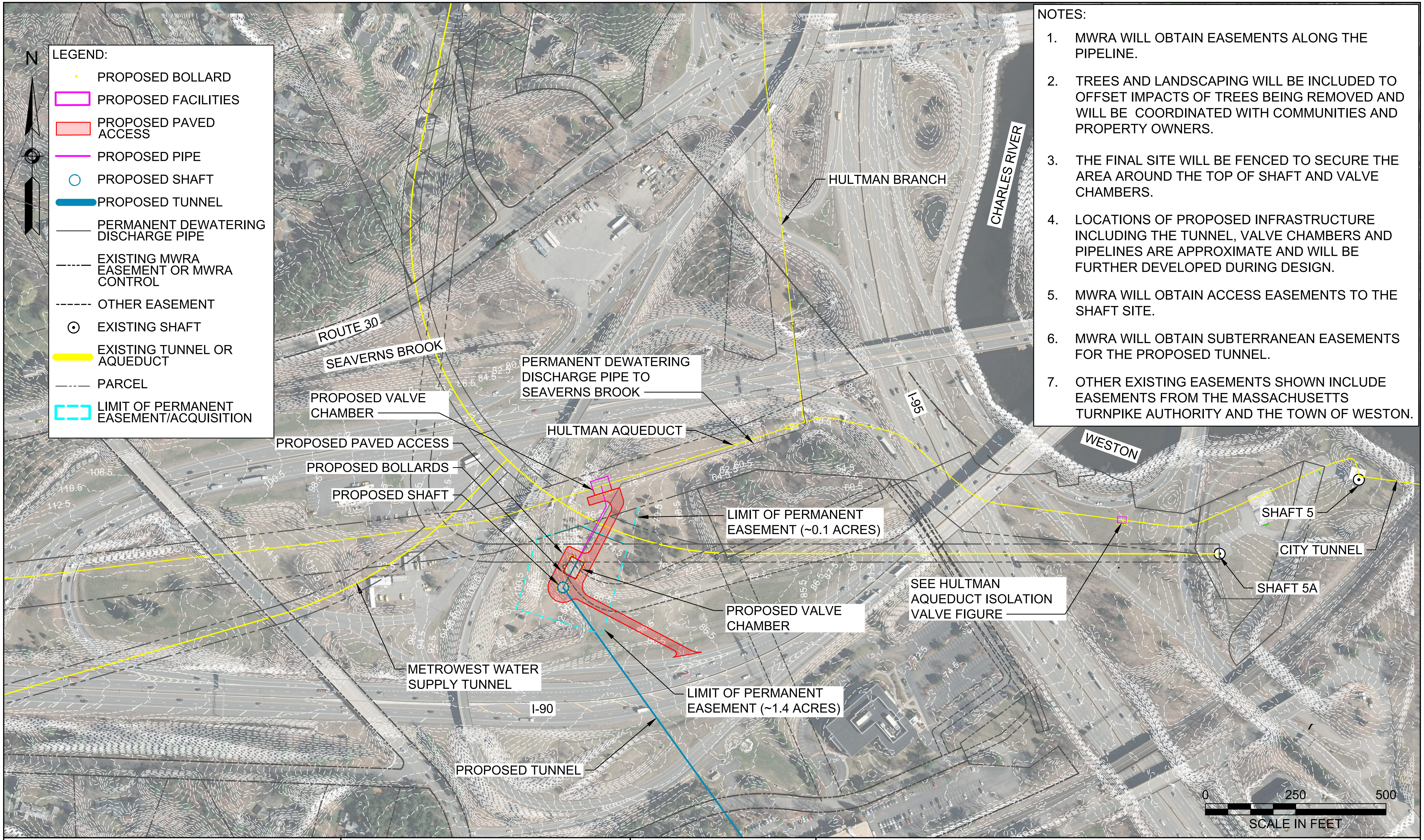
CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Figure 3.8-5 Site Schematic
Bifurcation-Launching Shaft
Alternative 3

MassGIS Ortho Imagery 2019

This page intentionally left blank



C:\cdmext\prussendn\d0731719\S-6.2 Bifurcation-Launch Shaft-05.2022-FC-DL-1W1FYY2.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

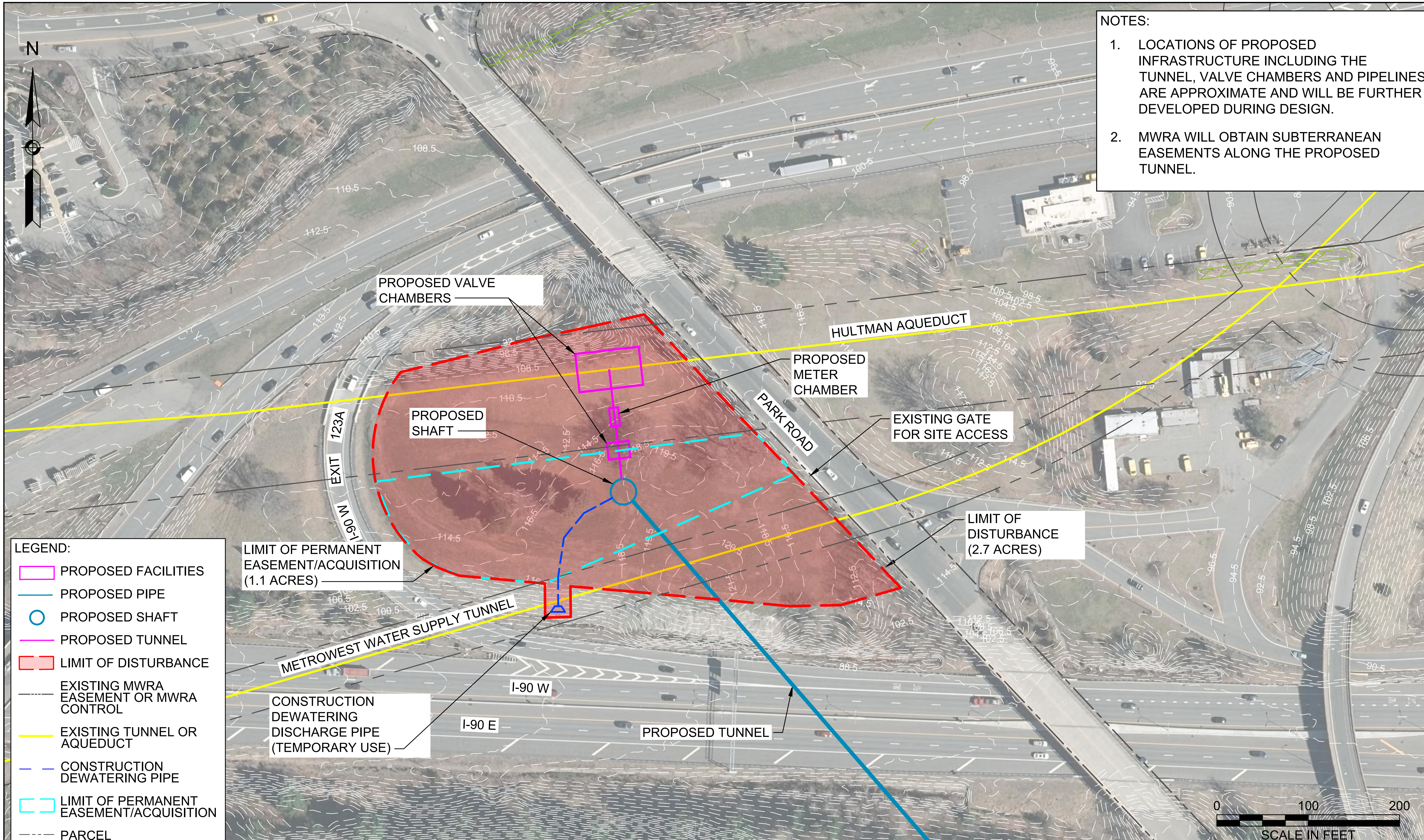
CDM Smith | in association with vhb | Jacobs | GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-6 Final Conditions Schematic
Bifurcation-Launching Shaft
Alternative 3

Weston, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

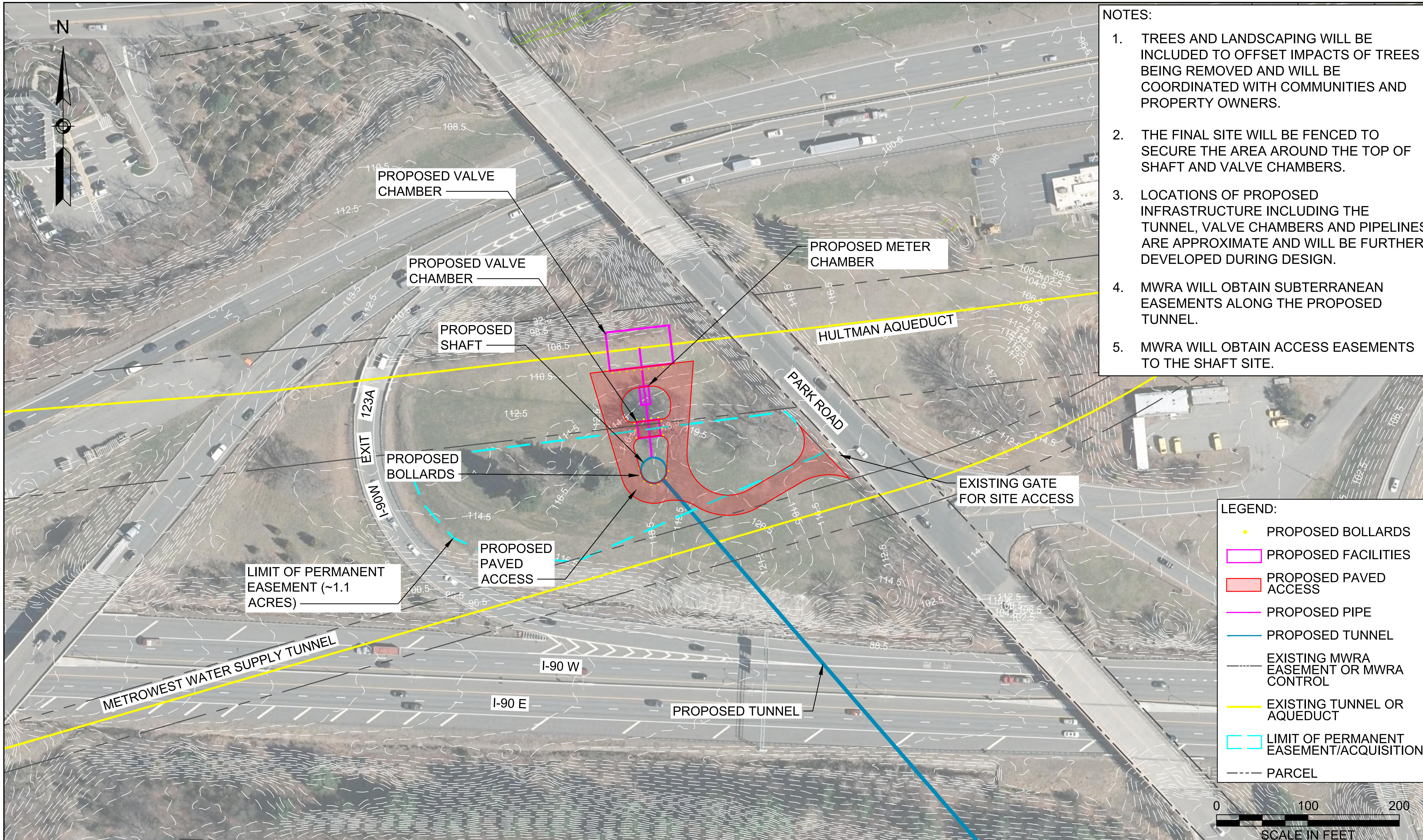
Figure 3.8-7 Site Schematic
Park Road West-Receiving Shaft
Alternative 4

Weston, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0725715\S-36 Park Road West-Receiving Shaft-05.2022.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



NOTES:

1. TREES AND LANDSCAPING WILL BE INCLUDED TO OFFSET IMPACTS OF TREES BEING REMOVED AND WILL BE COORDINATED WITH COMMUNITIES AND PROPERTY OWNERS.
2. THE FINAL SITE WILL BE FENCED TO SECURE THE AREA AROUND THE TOP OF SHAFT AND VALVE CHAMBERS.
3. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
4. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.
5. MWRA WILL OBTAIN ACCESS EASEMENTS TO THE SHAFT SITE.

LEGEND:

- PROPOSED BOLLARDS
- PROPOSED FACILITIES
- PROPOSED PAVED ACCESS
- PROPOSED PIPE
- PROPOSED TUNNEL
- EXISTING MWRA EASEMENT OR MWRA CONTROL
- EXISTING TUNNEL OR AQUEDUCT
- LIMIT OF PERMANENT EASEMENT/ACQUISITION
- PARCEL

Metropolitan Water Tunnel Program

MWRA Contract No. 7159 Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-8 Final Conditions Schematic
Park Road West-Receiving Shaft
Alternative 4

Weston, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-36 Park Road West-Receiving Shaft-05.2022-FC-DL-1W1FYY2.dwg
PLOTTED: October 3, 2022

This page intentionally left blank

3.8.4.5 Park Road West Large Connection

For Alternative 10, Park Road West would serve as a large connection (2 shafts one for North Tunnel and one for South Tunnel) for contractor support and a near-surface pipeline connections and valve chambers to the existing Hultman Aqueduct. Site access would be from Park Road to the shaft construction site. Temporary staging area for this site would be approximately 2.7 acres with approximately 1.1 acres, abutting a portion of the parcel under the care, custody and control of MWRA for the Hultman Aqueduct, reserved for the new MWRA permanent facilities. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, additional staging area for working adjacent to shaft construction, and a water treatment facility. The generated excavated material would be disposed offsite daily as there is minimal room for on-site storage areas. Construction generated groundwater would be relatively small and would be treated prior to its release to the adjacent I-90W swale. For this DEIR, it is assumed the shafts excavated diameters are approximately 13 feet in rock with 10-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-9** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

The Park Road West Large Connection would include two tunnel shafts; the westerly shaft would support a separated North Tunnel and serve as the large connection shaft for the contractor while the easterly shaft would support a separated South Tunnel. A 120-inch-diameter surface pipe would leave each shaft and travel through an isolation valve chamber containing a 120-inch butterfly valve. Each of the two proposed surface pipelines would connect to the Hultman Aqueduct within separate valve chambers constructed over the Aqueduct, with each chamber accommodating valves and the connection to the shaft surface piping.

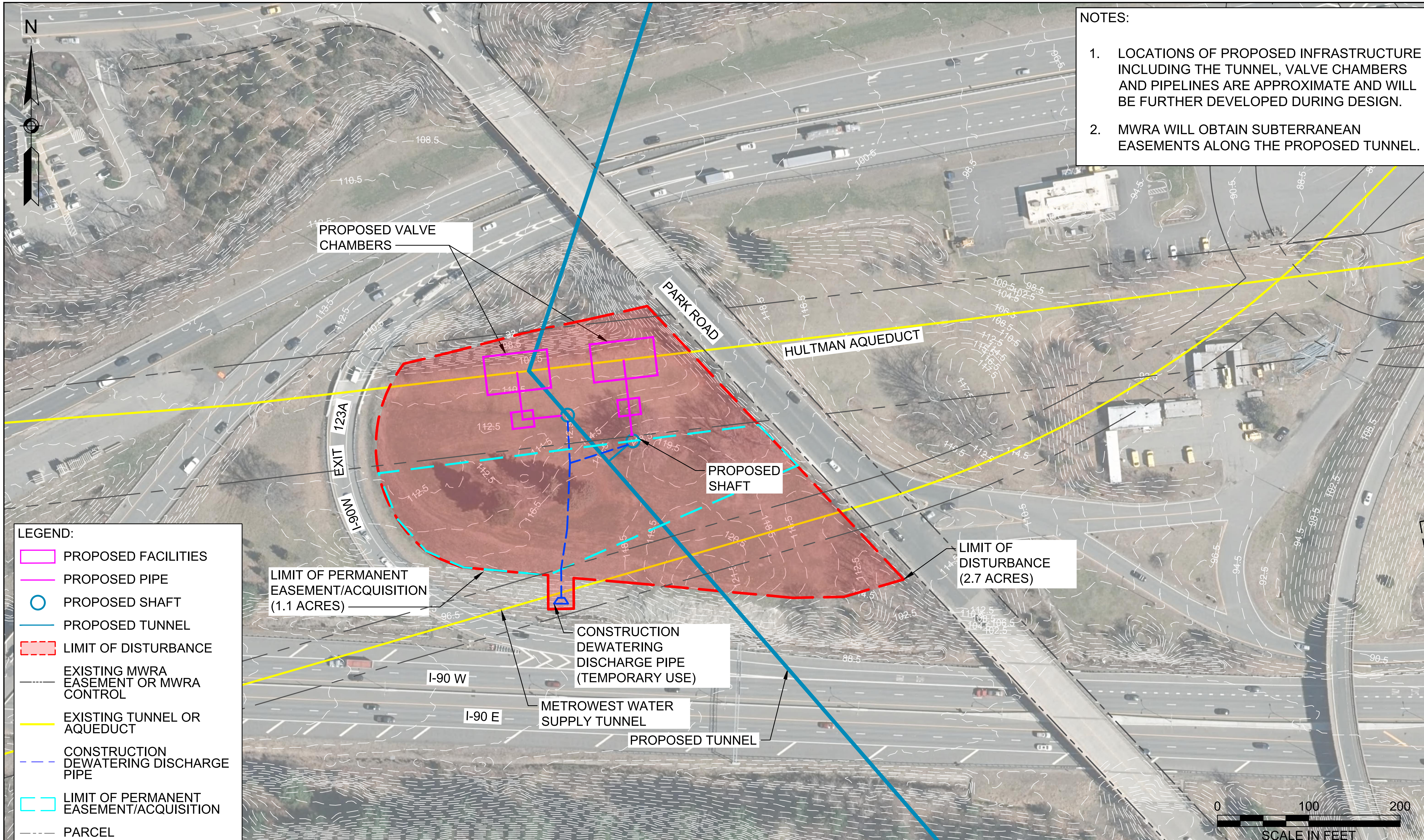
Final conditions at the site, shown in **Figure 3.8-10**, would include a fenced area at the connection shafts and valve chambers with a paved driveway and parking area, some bollards and the concrete top of shaft structure and valve chamber would extend not more than 3 feet above ground surface. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with MassDOT.

3.8.4.6 Highland Avenue Northwest Receiving

For Alternative 3, Highland Avenue Northwest serves as a TBM receiving shaft site with no near surface connections. The Highland Avenue Northwest site is encircled by the on-ramp connecting Highland Avenue westbound traffic to I-95 South. The site consists of grassy terrain with few trees. The ground surface elevation slopes gently away from the roads towards the center of the site.

Site access is from Highland Avenue to the shaft construction site. Temporary staging area for this site is approximately 5.6 acres for Alternative 3 with no MWRA permanent facilities on this site. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, additional staging area for working adjacent to shaft construction, and a water treatment facility. The generated excavated material would be disposed offsite daily; however, excavated material storage areas for 5 days of storage would be reserved on site. Construction generated groundwater would be collected on site and treated prior to its release to Charles River through a new microtunneled pipeline to the Northeast cloverleaf to connect into new near surface pipelines constructed as part of the Highland Avenue Northeast construction. For this DEIR, it is assumed the shaft excavated diameter is approximately 30 feet in rock without steel lining as the shaft would be backfilled to grade. **Figure 3.8-11** for Alternative 3 shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

Final conditions at the site would be returned to preconstruction conditions as there are no permanent facilities at this site.



C:\cdmext\prussendn\d0725715\S-34 Park Road West-Double Connection-03.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

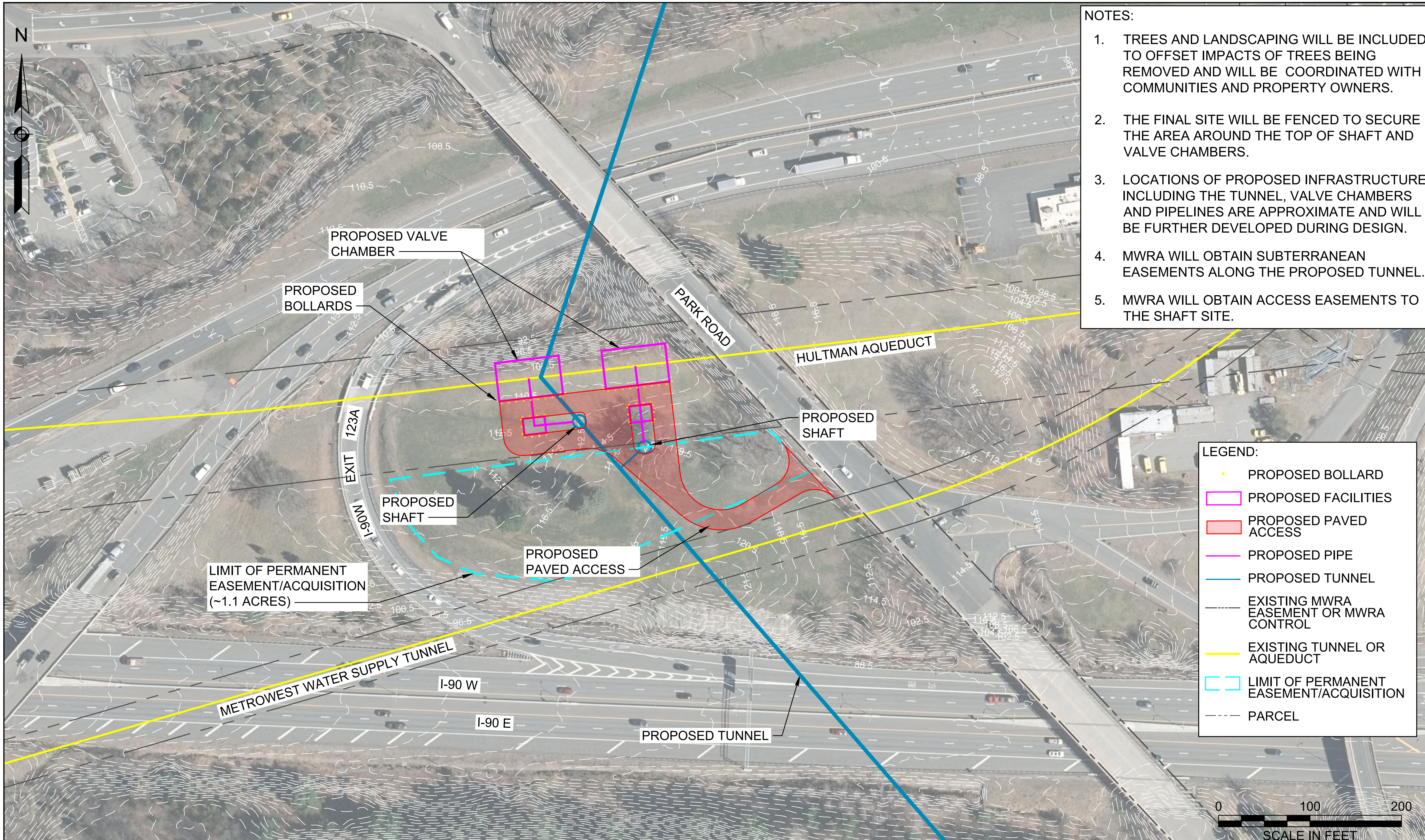
CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-9 Site Schematic
Park Road West-Double Connections
Alternative 10

Weston, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank



NOTES:

1. TREES AND LANDSCAPING WILL BE INCLUDED TO OFFSET IMPACTS OF TREES BEING REMOVED AND WILL BE COORDINATED WITH COMMUNITIES AND PROPERTY OWNERS.
2. THE FINAL SITE WILL BE FENCED TO SECURE THE AREA AROUND THE TOP OF SHAFT AND VALVE CHAMBERS.
3. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
4. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.
5. MWRA WILL OBTAIN ACCESS EASEMENTS TO THE SHAFT SITE.

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

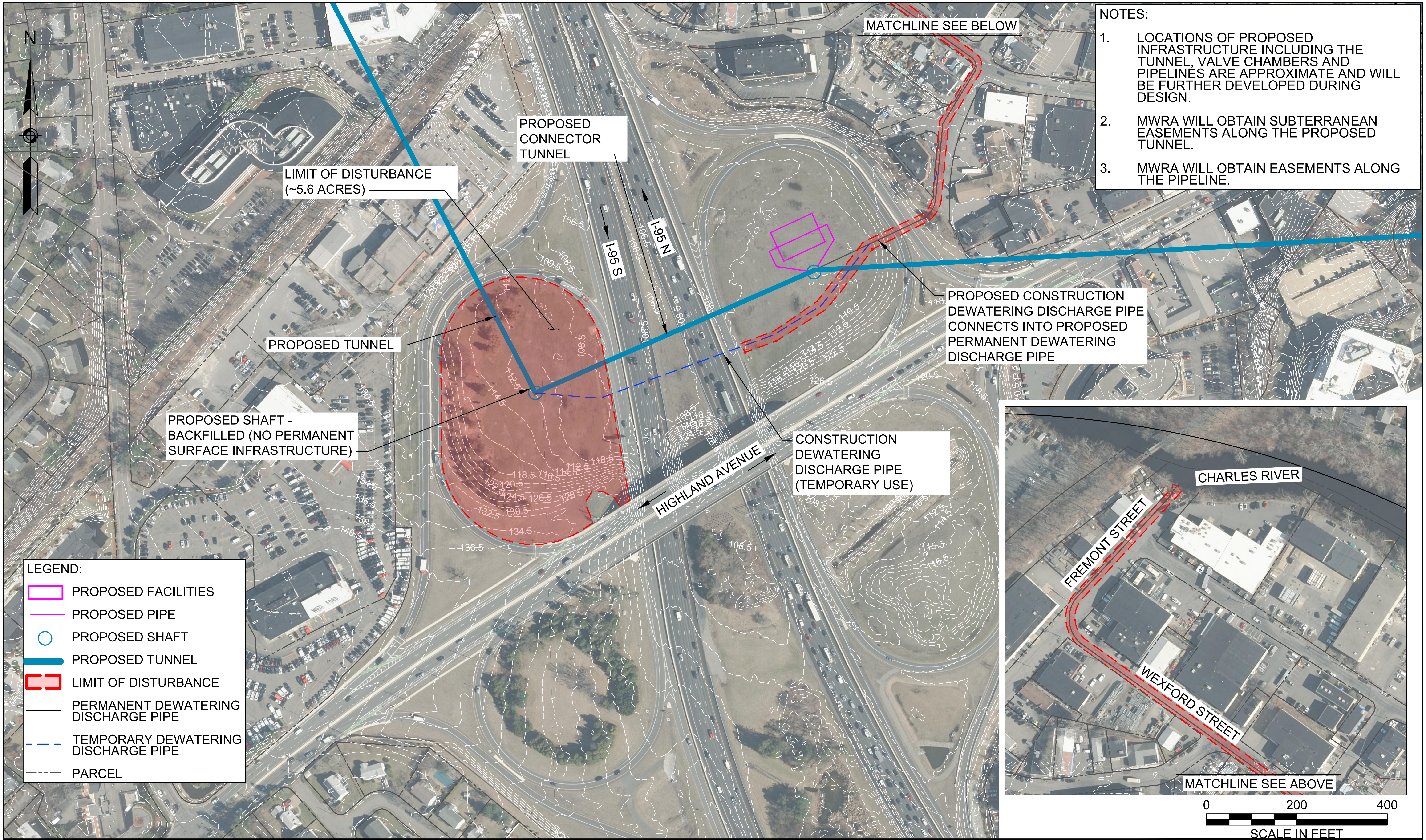
Figure 3.8-10 Final Conditions Schematic
Park Road West-Double Connections
Alternative 10

Weston, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-34 Park Road West-Double Connection-03.2022-FC-DL-1W1FYY2.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



C:\cdmext\prussendn\0725715\S-10 Highland Avenue Northwest-Receiving Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith | in association with vhb | Jacobs | Green International Affiliates, Inc.

Figure 3.8-11 Site Schematic
Highland Avenue Northwest-Receiving Shaft
Alternative 3

Needham, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank

3.8.4.7 Highland Avenue Northwest/Southwest Launching

For Alternatives 4 and 10, Highland Avenue Northwest/Southwest site serves as a TBM launch shaft site with no near surface connections for any alternative. Highland Avenue Northwest is encircled by the "on-ramp" connecting Highland Avenue westbound traffic to I-95 South. Highland Avenue Southwest includes the space inside the ramp to the south that connects I-95 South to Highland Avenue eastbound traffic. The site consists of grassy terrain with few trees. The ground surface elevation slopes gently away from the roads towards the center of the site. The Southwest cloverleaf consists of a relatively flat grassed area with a few trees.

Site access is from Highland Avenue to the shaft construction site. Temporary staging area for this site is approximately 5.6 acres (Northwest cloverleaf) and 3.1 acres (Southwest cloverleaf) for Alternatives 4 and 10 with no MWRA permanent facility on this site. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, power facilities (Alternatives 4 and 10), mobile concrete mix plant (Alternatives 4 and 10), workshop (Alternatives 4 and 10), additional staging area for working adjacent to shaft construction, and a water treatment facility. The generated excavated material would be disposed offsite daily; however, excavated material storage areas for 5 days of storage would be reserved on site. Construction generated groundwater would be collected on site and treated prior to its release to Charles River through a new microtunneled pipeline to the Northeast cloverleaf to connect into new near surface pipelines. New direct bury feeds to a proposed on-site substation from Eversource would be provided (Alternatives 4 and 10). For this DEIR, it is assumed the shaft excavated diameter is 40-feet in rock (Alternatives 4 and 10) without steel lining as the shaft would be backfilled to grade**. Figure 3.8-12** for Alternatives 4 and 10 shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

Final conditions at the site would be returned to preconstruction conditions as there are no permanent facilities at this site (See **Figure 3.8-13**).

3.8.4.8 Highland Avenue Northeast/Southeast Launching

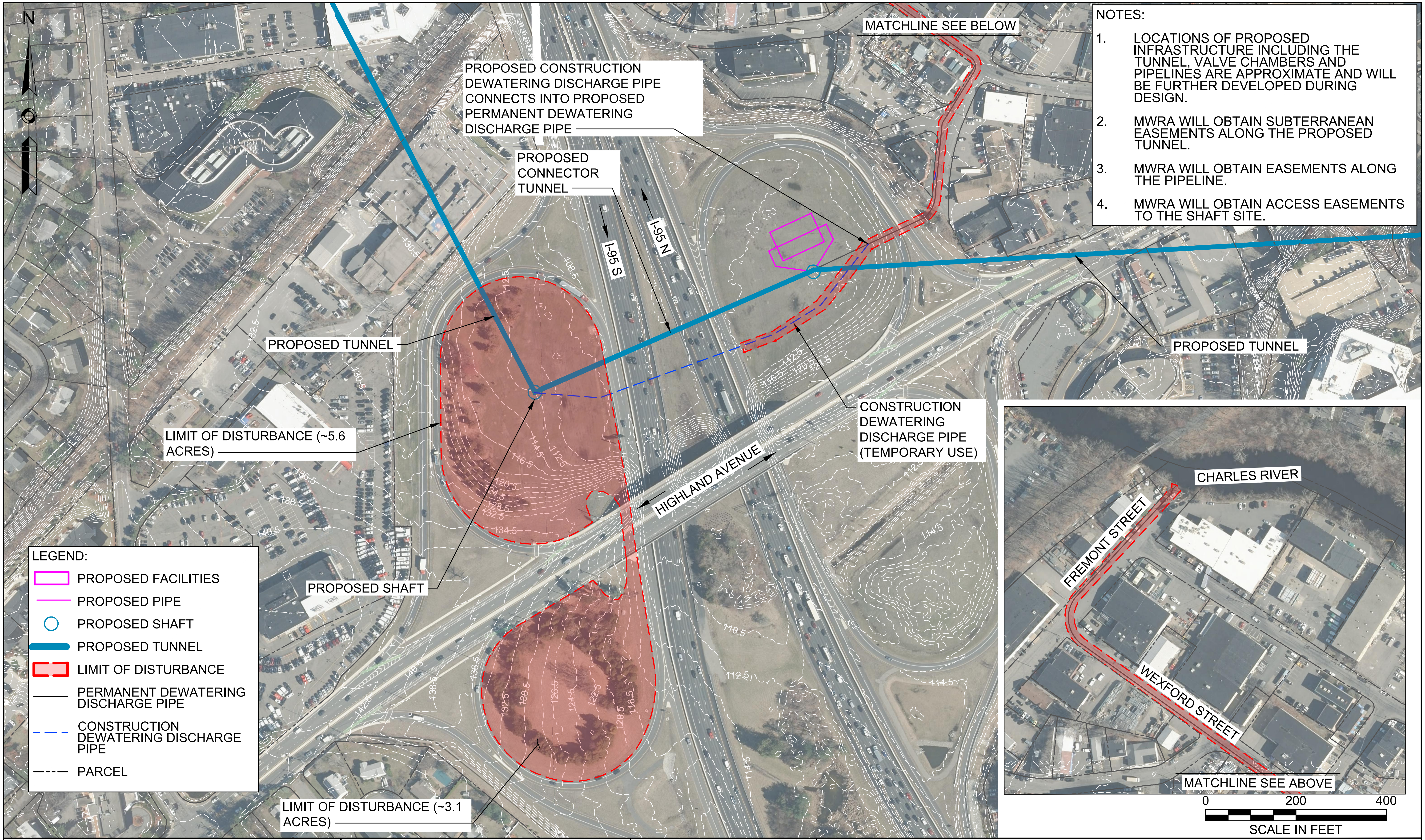
Highland Avenue Northeast/Southeast would serve as a TBM launch shaft site for all Alternatives. Highland Avenue Northeast/Southeast is encircled by the on-ramp connecting I-95 North to Highland Avenue westbound traffic. Highland Avenue Southeast includes the space inside the ramp to the south that connects Highland Avenue eastbound traffic to I-95 North. The site consists of generally flat grassy terrain with few trees. The Southeast cloverleaf includes generally grassed areas and a drainage feature that bisects the cloverleaf from east to west.

Site access would be from I-95 to the shaft construction site. Temporary staging area for this site would be approximately 4.8 acres (Northeast cloverleaf) and 4.7 acres (Southeast cloverleaf) with a MWRA permanent facility of approximately 1.5 acres (Northeast cloverleaf) on this site. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, power facilities, a concrete batch plant, workshop, additional staging area for working adjacent to shaft construction, and a water treatment facility. The generated excavated material would be disposed offsite daily; however, excavated material storage areas for 5 days of storage would be reserved on site. Construction-generated groundwater would be collected on site and treated prior to its release to Charles River through new near surface pipelines. New direct bury feeds to a proposed on-site substation from Eversource would be provided. For this DEIR, it is assumed the shaft excavated diameter is 40 feet in rock with permanent surface facilities and two 10-foot finished diameter permanent steel pipes in the shaft. **Figure 3.8-13** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

Highland Avenue Northeast would include piping up through the tunnel shaft then into a chamber containing a valve with piping that loops back down the shaft to the tunnel below. The valve in the buried chamber could be closed to isolate the South Tunnel into two segments.

A new permanent dewatering pipeline is proposed to manage temporary construction related groundwater and provide a means to dewater the tunnel in the future for maintenance related activities. The pipeline consists of approximately 1,750 feet of new 24-inch to 30-inch pipe, depending on alternative, from the Highland Avenue Northwest cloverleaf across the I-95N entrance ramp onto Brook Road to Wexford Street to Fremont Street with a new headwall and discharge into the Charles River. Temporary staging areas for this activity would be 1.2 acres with a permanent easement of 1.2 acres for the pipeline.

As shown in **Figure 3.8-14,** final conditions at the site would include a fenced area at the launch shaft site with a paved and parking area, some bollards and the valve chamber and concrete top of shaft structure that would extend no more than 3 feet above ground surface. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with MassDOT.



C:\cdmext\prussendn\d0725715\S-10.1 Highland Avenue Northwest-Launch Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

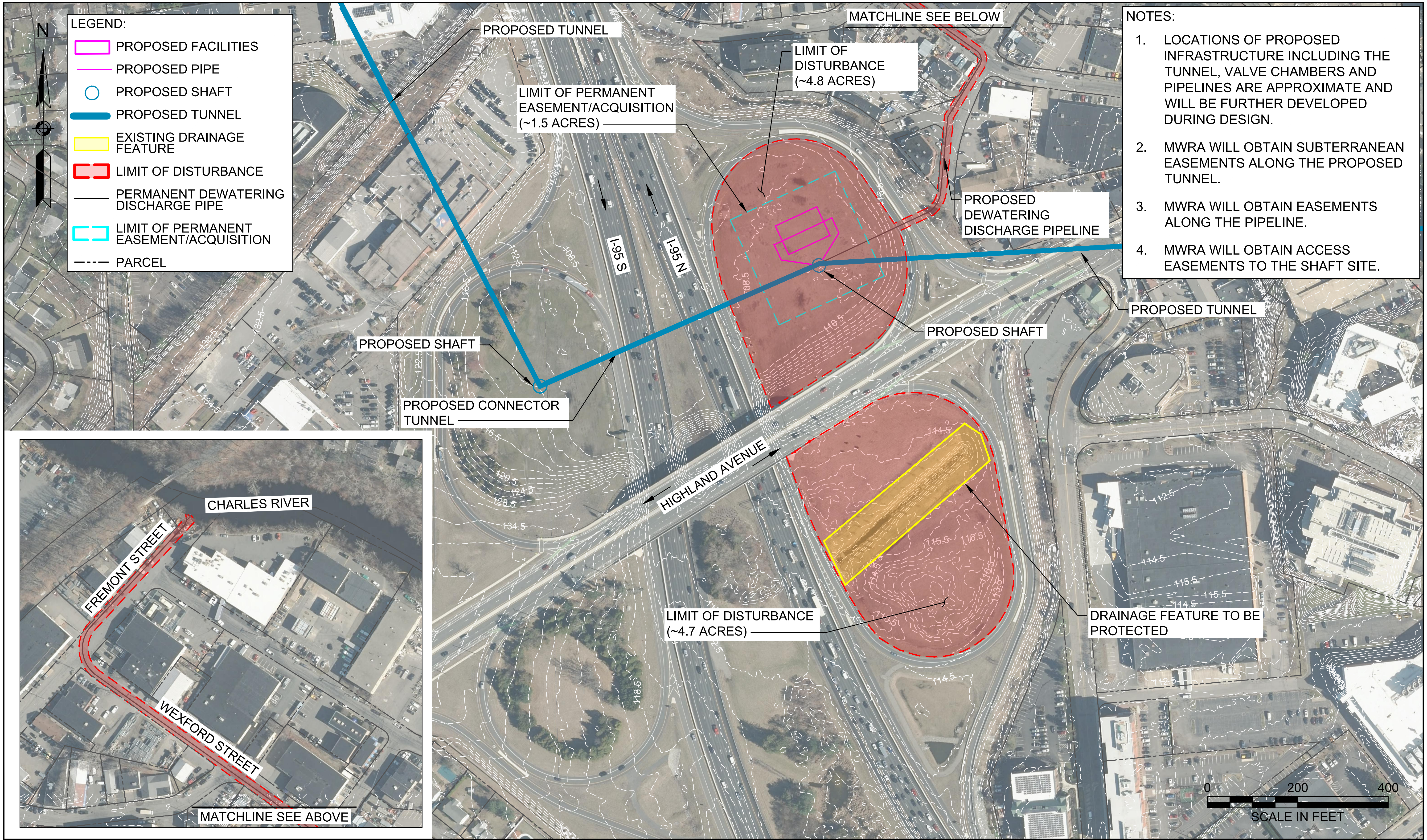
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Needham, MA

Figure 3.8-12 Site Schematic
Highland Avenue Northwest/Southwest-Launching Shaft
Alternatives 4 and 10

MassGIS Ortho Imagery 2019

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith
in association with
vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-13 Site Schematic

Highland Avenue Northeast/Southeast-Launching Shaft

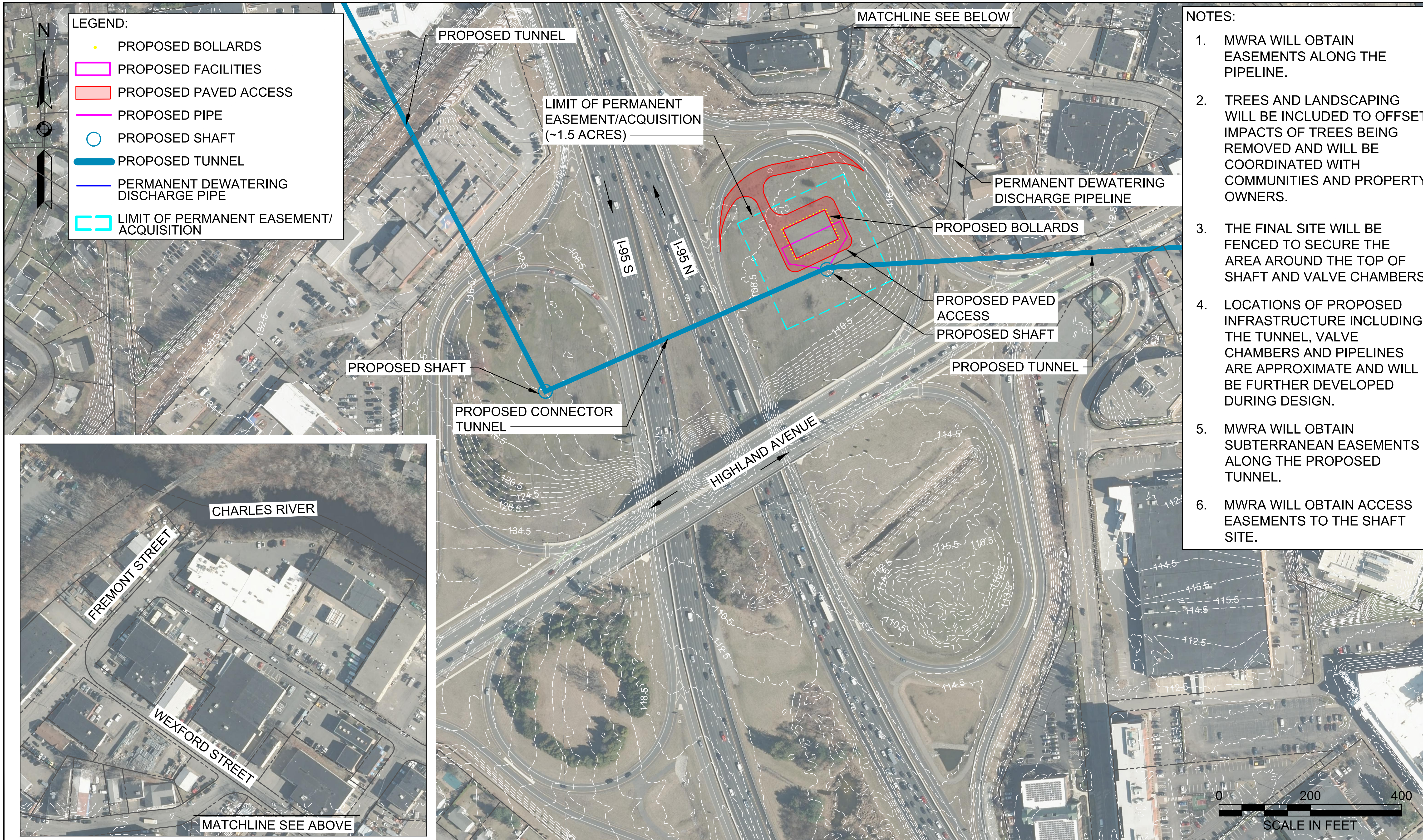
Alternatives 3, 4 & 10

Needham, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0725715\S-10 Highland Avenue Northeast-Launch Shaft-05.2022.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

in association with
CDM Smith
vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-14 Final Conditions Schematic
Highland Avenue Northeast-Launching Shaft
Alternatives 3, 4 & 10

Needham, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-10 Highland Avenue Northeast-Launch Shaft-05.2022-FC.dwg
PLOTTED: October 3, 2022

This page intentionally left blank

3.8.4.9 American Legion Receiving

American Legion would serve as a TBM receiving shaft site and near surface pipeline connection point to the existing MWRA transmission lines near the existing Shaft 7C area for all alternatives. American Legion is located in a cleared wooded area that currently serves as a storage space for landscaping materials. The site is owned by the Commonwealth of Massachusetts but under the care of DCR and currently occupied by a landscaping contractor, Landscape Express. The site is bounded by St. Michael Cemetery to the west, the Judge John J. Connelly Youth Center to the north, Landscape Express to the east, and the American Legion Highway to the south. The shaft site is located in a topographic low. It is surrounded by higher topography on all sides, including Forest Hills to the north, Wellington Hill to the south, and Mount Hope further to the west. The ground surface elevations at the site slope from a highpoint at the northeast of the site down towards the southwest of the site, although the ground surface within the cleared area itself is relatively flat.

Site access would be from Canterbury Street to the shaft construction site. Temporary staging area for this shaft site would be approximately 3 acres with approximately 1.5 acres reserved for MWRA permanent facilities. Temporary construction facilities on this site would include trailers, parking areas, on-site temporary excavated material storage area, a concrete batch plant, additional staging area for working adjacent to shaft construction, and a water treatment facility. The generated excavated material would be disposed offsite daily; however, excavated material storage areas for 5 days of storage would be reserved on site. Construction-generated groundwater would be relatively small and would be treated prior to its release to the adjacent wetland. For this DEIR, it is assumed the shaft excavated diameter is 30 feet in rock with a 10-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-15** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

This site would include a proposed 90-foot-long, 120-inch-diameter buried steel piping connection to the proposed tunnel shaft riser that terminates in a capped stub to support a future South Tunnel extension to the east-southeast. A below-ground 3-way valve chamber is proposed between the tunnel shaft and the capped stub. A buried pipeline approximately 2,500 feet long is proposed from the valve chamber to convey flow east across the DCR property to various MWRA surface pipes at 2 locations. Temporary staging areas for this activity would be approximately 2 acres with a permanent easement of 2 acres for the pipeline. The top of the tunnel shaft and larger valve chamber structure roof slabs are expected to be no more than 3 feet above ground, while the top of the smaller 3-way valve vault structure roof slab is expected to be flush with the paved parking lot. We anticipate that crossing the American Legion Highway would be constructed with a trenchless method.

As shown in **Figure 3.8-16,** final conditions at the site would include a fenced in area at the shaft site with a paved driveway, a parking area, some bollards and the concrete top of shaft structure and large valve chamber that would extend not more than 3 feet above ground surface. Other disturbed areas would be restored to preconstruction conditions for paved areas and landscaping would be restored in accordance with any agreements with property owners.

3.8.5 Connection and Isolation Valve Sites

Common to all three alternatives would be six connection shafts that would enable the deep tunnel system to connect to the MWRA or local municipal distribution systems. The six connections include School Street and Cedarwood Pumping Station in Waltham, Hegarty Pumping Station in Wellesley, St. Mary Street Pumping Station in Needham, Newton Street Pumping Station in Brookline, and Southern Spine Mains in Boston. An isolation valve on the Hultman Aqueduct in Weston would also be common to all three alternatives.

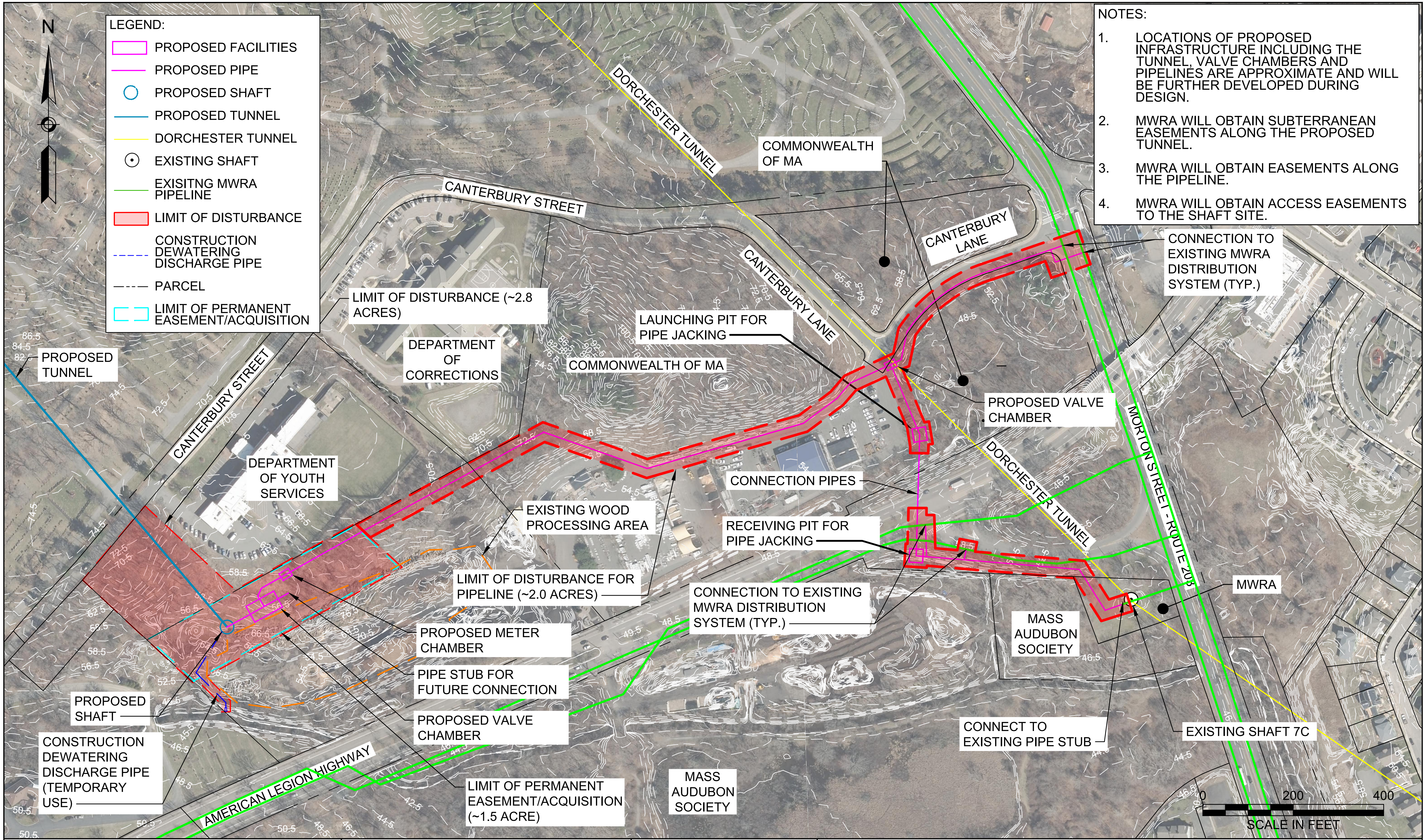
3.8.5.1 School Street Connection

School Street Connection would serve as an intermediate shaft connection and provides a near surface pipeline connection point to MWRA's Lexington Street pumping station in Waltham for all alternatives. The School Street site is located on a razed area that served as a parking lot for a restaurant, at the Northeast corner of School Street and Macks Court, near Downtown Waltham. The site is in a mixed use residential/commercial area surrounded by small businesses and single and multi-family residential buildings. This 0.34-acre site was purchased by the MWRA specifically for this project for the purposes of constructing a connection shaft. The site is relatively flat, sloping gently to the south towards School Street.

Site access would be from School Street (in Waltham) to the shaft construction site. Temporary construction facilities on this site would include a trailer, parking area, and staging area for working adjacent to shaft construction. It is expected the daily generated excavated material would be disposed offsite daily. Construction generated groundwater is expected to be relatively small and would be managed onsite. For this DEIR, it is assumed the shaft excavated diameter is approximately 9 feet in rock with a 6-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface**. Figure 3.8-17** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

School Street Connection supports the surface connections to the Lexington Street Pumping Station. A 36-inch steel connection pipe and isolation gate valve are proposed within a chamber to be constructed over the top of the shaft and would include a 36-inch gate valve. The top of the roof slab for the completed buried chamber is expected to be not more than 3 feet above ground. The new 36-inch pipeline, approximately 550 feet long would convey water from the School Street shaft to Common Street where it would connect into the existing 24-inch water main piping. Temporary staging areas for this activity would be 0.3 acres with a permanent easement of approximately 0.3 acres for the pipeline.

Final conditions at the site, shown in **Figure 3.8-18** would include a fenced area of the connection shaft site with a paved driveway and parking area, landscaping, some bollards, and the concrete top of shaft structure that would extend not more than 3 feet above ground surface. Disturbed areas would be paved and landscaped in accordance with MWRA operational needs and any agreements with the City of Waltham.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

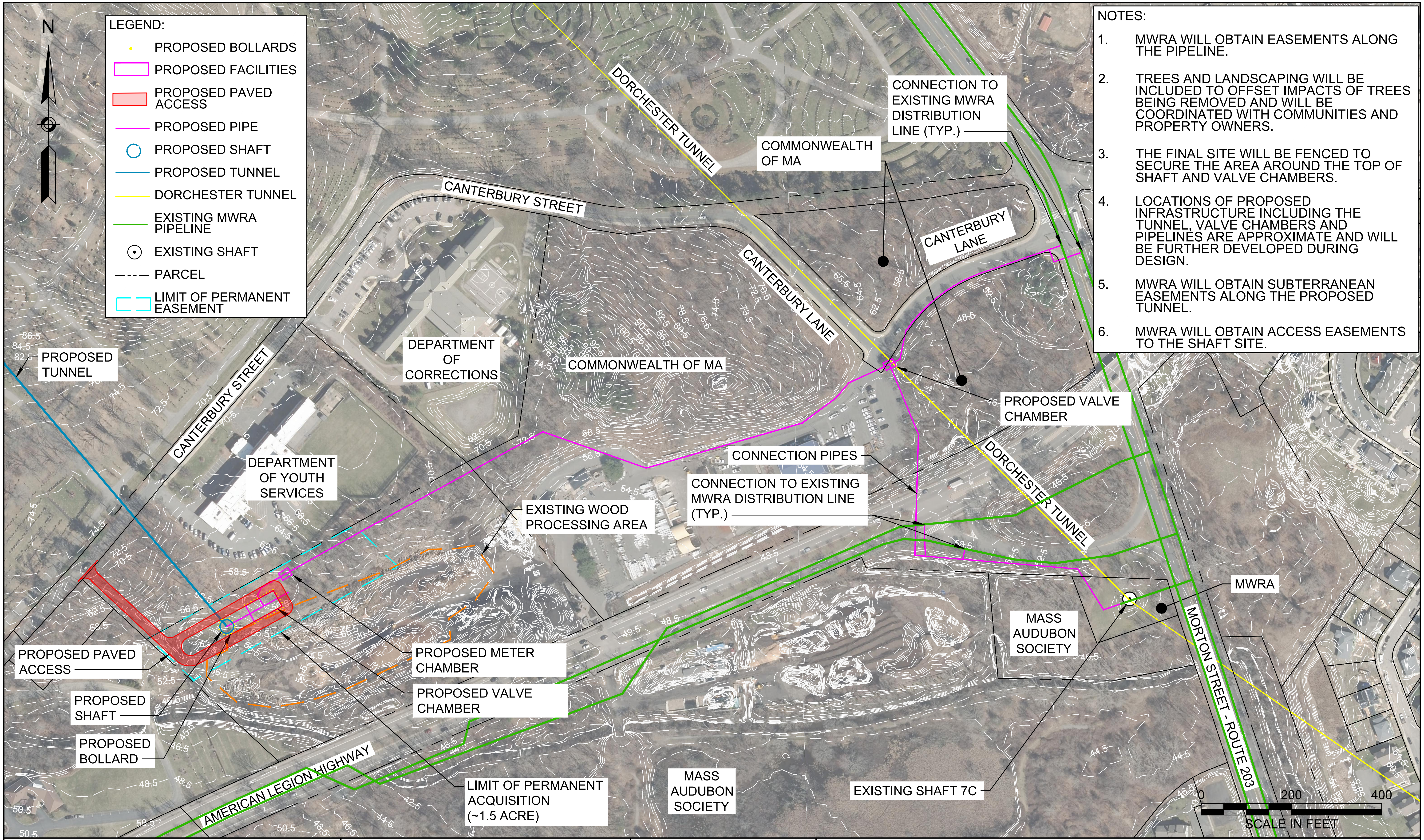
Boston, MA

Figure 3.8-15 Site Schematic
American Legion-Receiving Shaft
Alternatives 3, 4 & 10

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0725715\S-15.2 American Legion-Receiving Shaft-05.2022.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

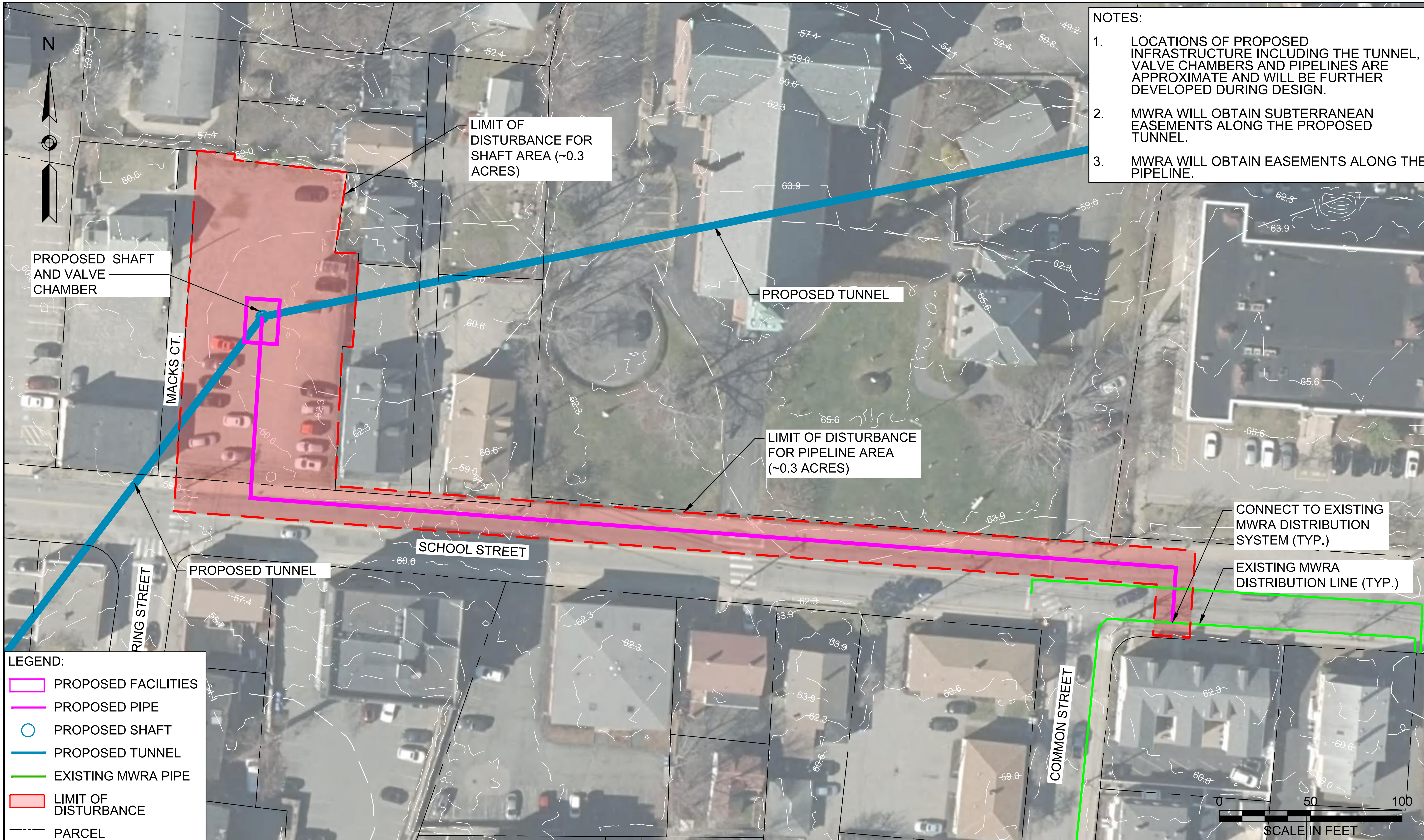
Boston, MA

Figure 3.8-16 Final Conditions Schematic
American Legion-Receiving Shaft
Alternatives 3, 4 & 10

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-15.2 American Legion-Receiving Shaft-05.2022-FC.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



C:\cdmext\prussend\d0725715\S-35 School Street-Connection Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

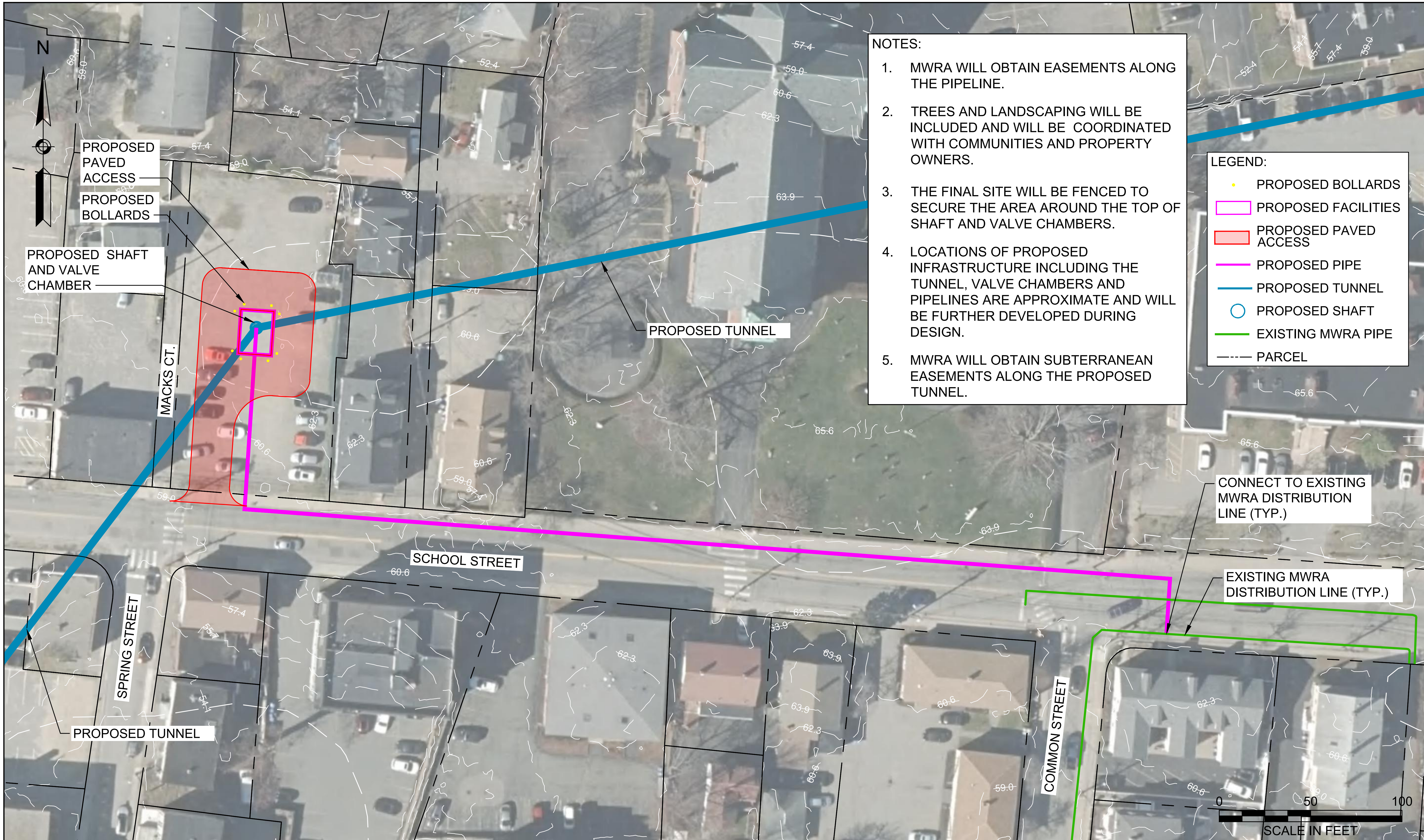
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, MA

Figure 3.8-17 Site Schematic
School Street-Connection Shaft
Alternatives 3, 4 & 10

MassGIS Ortho Imagery 2019

This page intentionally left blank



C:\cdmext\prussendn\d0731719\S-35 School Street-Connection Shaft-05.2022-FC.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN International Affiliates, Inc.

Figure 3.8-18 Final Conditions Schematic
School Street-Connection Shaft
Alternatives 3, 4 & 10

Waltham, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank

3.8.5.2 Cedarwood Pumping Station Connection

Cedarwood Pumping Station would serve as an intermediate shaft connection site and provides a near surface pipeline connection point to Cedarwood Pumping Station in Waltham for all alternatives with no construction in public ways. The Cedarwood Pumping Station site is located on the south side of Stanley Elementary School in southwestern Waltham. The site is currently owned and operated by the City of Waltham. The site is located in a wooded area that abuts MWRA's existing easement for WASM3, and bounded by a wetlands area and the MBTA Fitchburg Line to the southeast. The site gently slopes downward to the southeast towards wetlands and rail line.

Site access would be from South Street (in Waltham) through the existing driveway to Cedarwood Pumping Station, to the shaft construction site. The temporary construction area would be approximately 0.3 acres plus approximately 0.4 acres for access to South Street with a permanent easement or acquisition of approximately 0.1 acres for the new MWRA facilities. Temporary construction facilities on this site would include a trailer, parking area, and staging area for working adjacent to shaft construction. It is expected the daily generated excavated material would be disposed offsite daily. Construction generated groundwater is expected to be relatively small and would be managed onsite. For this DEIR, it is assumed the shaft excavated diameter is approximately 9 feet in rock with a 6-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-19** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

The Cedarwood Pumping Station site would include a proposed connection pipe and isolation gate valve within a buried chamber to be constructed over the top of the shaft. The proposed 180-foot-long, buried piping would extend from the proposed shaft within the chamber to an existing suction supply pipeline extending from WASM 3 before the existing revenue meter vault.

Final conditions at the site would include a fenced area at the connection shaft site with a paved driveway and parking area, landscaping, some bollards, and the concrete top of shaft structure that would extend not more than 3 feet above ground surface. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with the City of Waltham (See **Figure 3.8-20**).

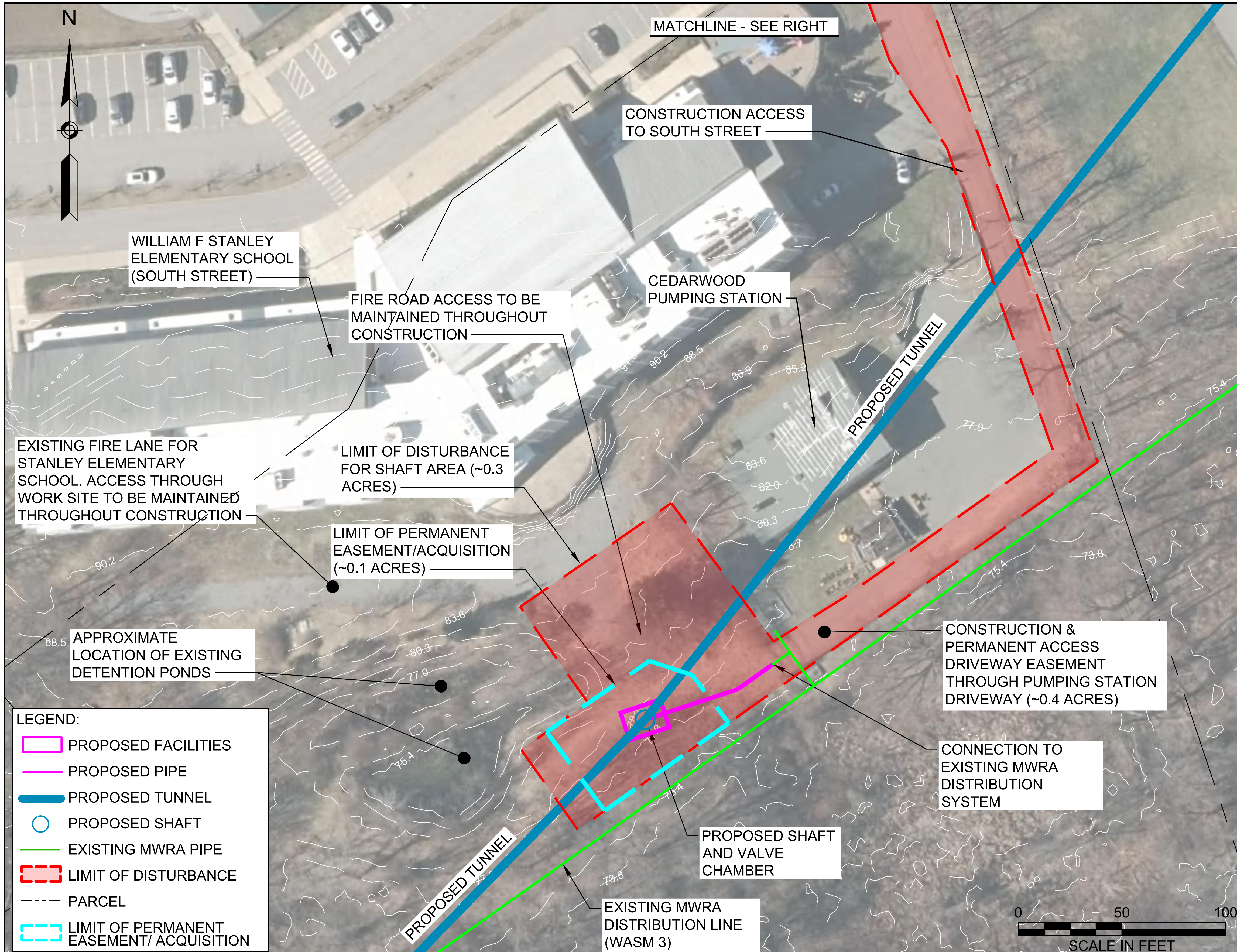
3.8.5.3 Hegarty Pumping Station Connection

The Hegarty Pumping Station site would serve as an intermediate shaft connection site and provides a near surface pipeline connection point to the existing Hegarty Pumping Station in Wellesley for all alternatives with limited construction in public ways. Hegarty Pumping Station is located in a wooded area off Barton Road in the Town of Wellesley and is owned and operated by the Town of Wellesley. The site is bounded by a baseball field and a basketball court to the west, Barton Road to the south, Hegarty Pumping Station to the east, and I-95 to the north. Rosemary Brook and a small wetland area are located on the east side of Hegarty Pumping Station. The proposed connection shaft itself is located in a wooded area on the west side of the site that is slightly elevated from Barton Road. The ground surface topography has a steeper slope from the west to Barton Road and the pumping station access road and then gently slopes from west to east, towards Rosemary Brook.

Site access would be from Barton Road to the shaft construction site. Its temporary construction site is approximately 0.3 acres for shaft and pipeline construction with a permanent easement or acquisition of approximately 0.1 acres for MWRA facilities. Temporary construction facilities on this site would include a trailer parking area, and staging area for working adjacent to shaft construction. It is expected the daily generated excavated material would be disposed offsite daily. Construction generated groundwater is expected to be relatively small and would be managed onsite. For this DEIR, it is assumed the shaft excavated diameter is approximately 9 feet in rock with a 6-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-21** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

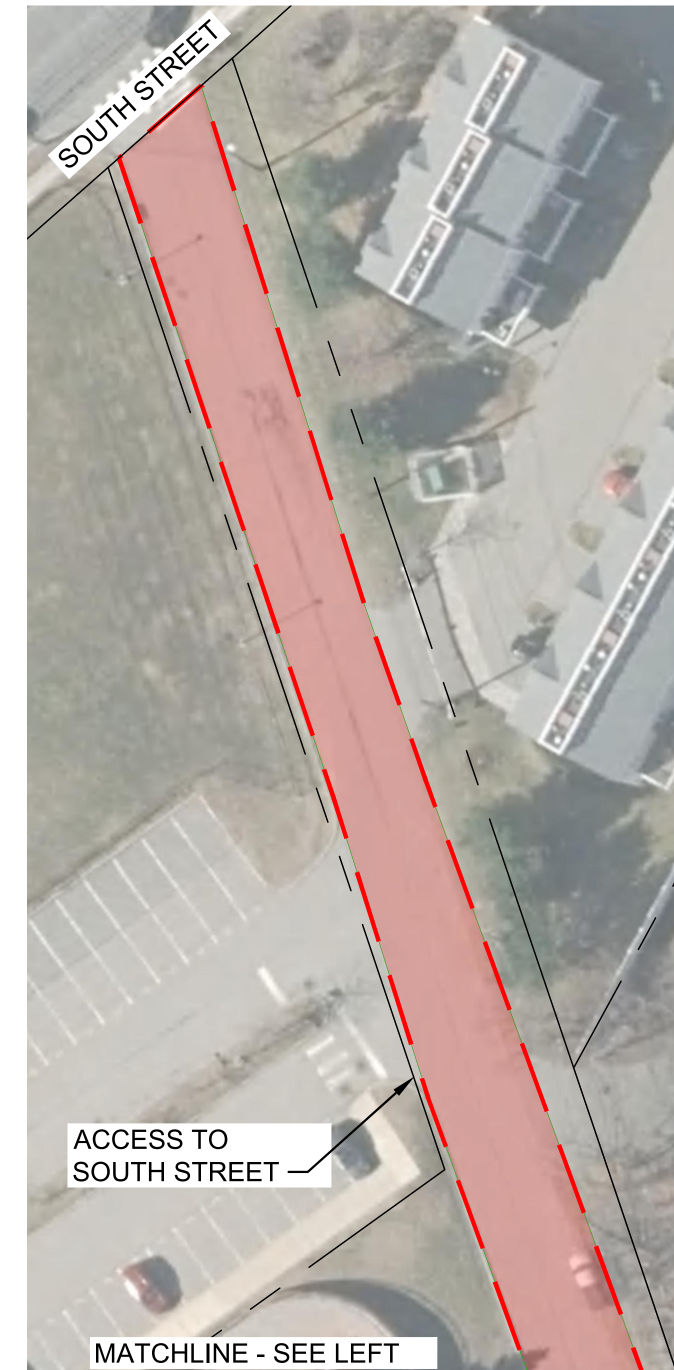
Hegarty Pumping Station would include a connection pipe and isolation gate valve within a buried chamber to be constructed over the top of the shaft. The proposed 200-foot-long buried piping would extend from the proposed shaft within a new chamber and connect to the existing pumping station.

Final conditions at the site would include a fenced area at the connection shaft site with a paved driveway and parking area, landscaping, a retaining wall, some bollards, and the concrete top of shaft structure that would extend no more than 3 feet above ground surface. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with agreements with the Town of Wellesley (See **Figure 3.8-22**).



NOTES:

1. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
2. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.
3. MWRA WILL OBTAIN EASEMENTS ALONG THE PIPELINE.
4. MWRA WILL OBTAIN ACCESS EASEMENTS TO THE SHAFT SITE.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

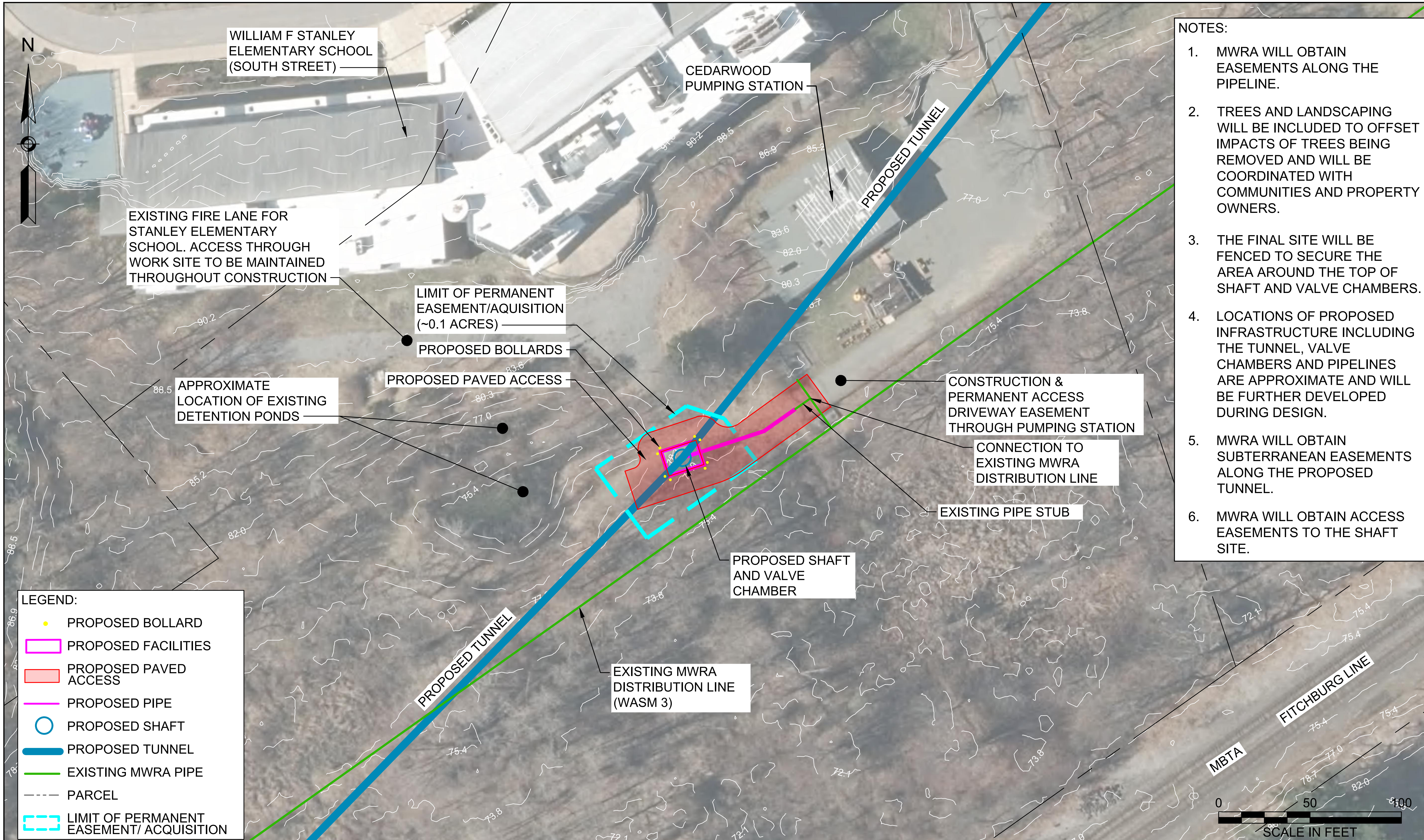
Figure 3.8-19 Site Schematic
Cedarwood Pumping Station-Connection Shaft
Alternatives 3, 4 & 10

Waltham, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0725715\S-5 Cedarwood Pumping Station-Connection Shaft-05.2022.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb, Jacobs, Green International Affiliates, Inc.

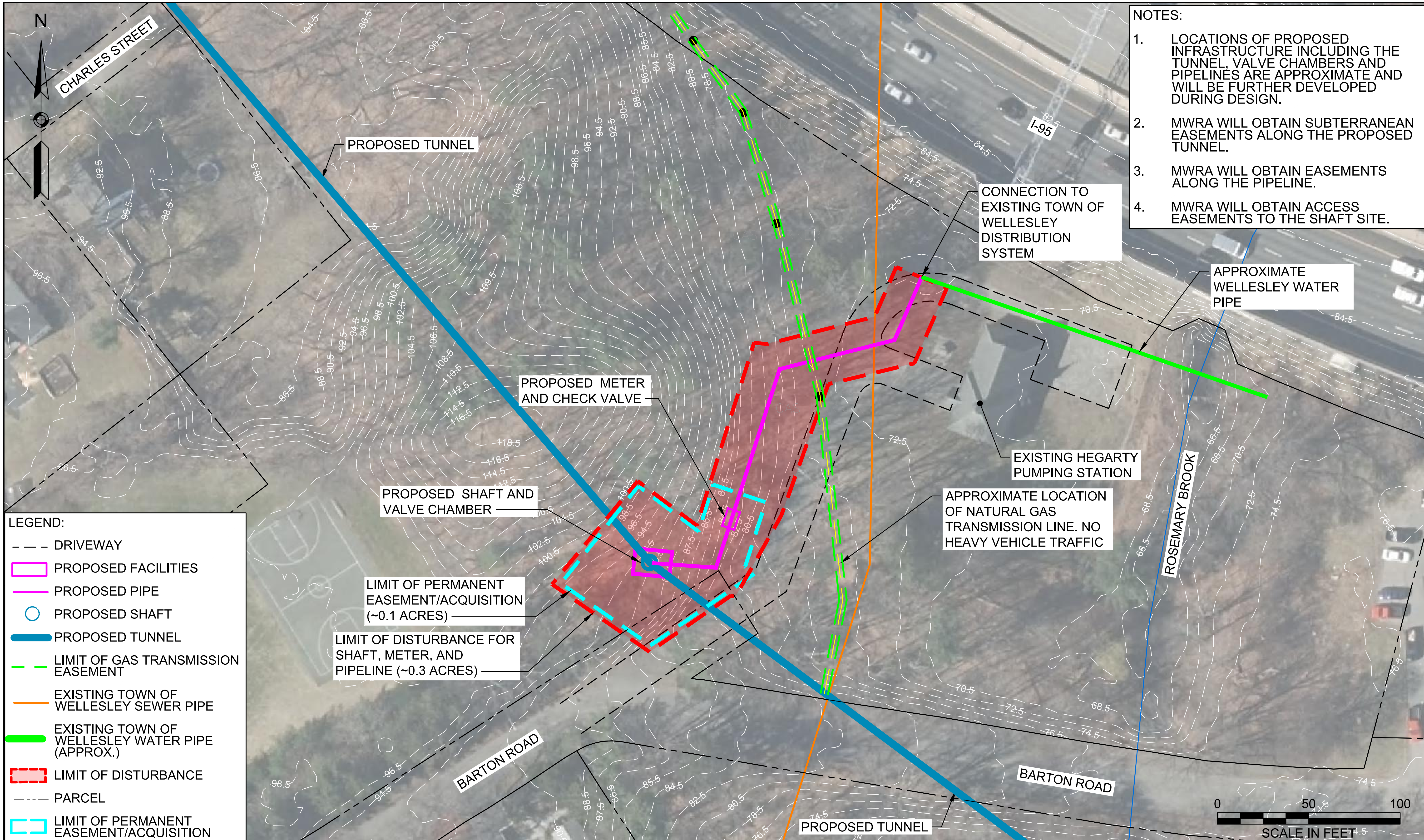
Figure 3.8-20 Final Conditions Schematic
Cedarwood Pumping Station-Connection Shaft
Alternatives 3, 4 & 10

Waltham, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-5 Cedarwood Pumping Station-Connection Shaft-05.2022-FC.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



C:\cdmext\prussendn\d0725715\S-8 Hegarty Pumping Station-Connection Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

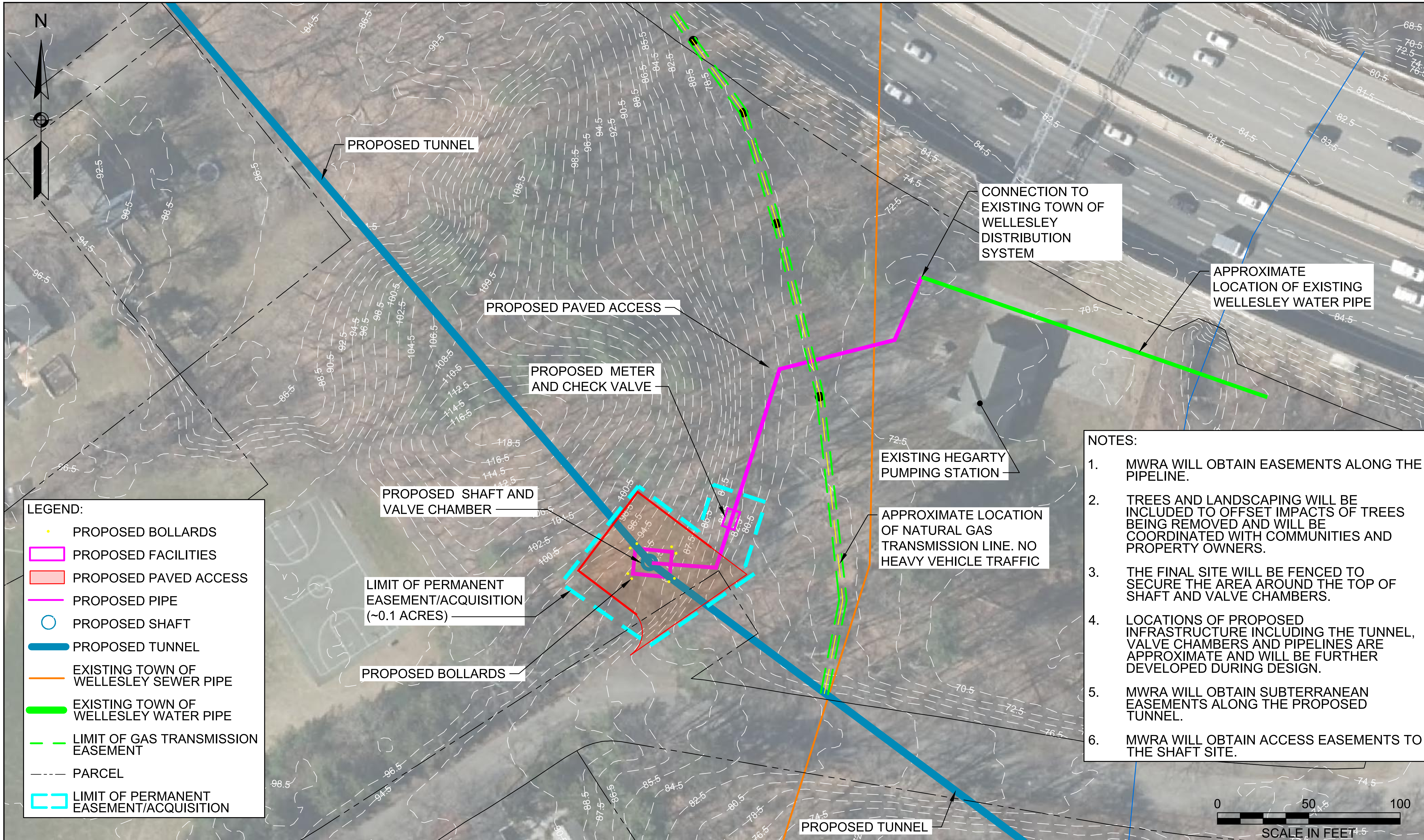
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-21 Site Schematic
Hegarty Pumping Station-Connection Shaft
Alternatives 3, 4 & 10

Wellesley, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank



C:\cdmext\prussendn\d0731719\S-8 Hegarty Pumping Station-Connection Shaft-05.2022-FC.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

Figure 3.8-22 Final Conditions Schematic
Hegarty Pumping Station-Connection Shaft
Alternatives 3, 4 & 10

Wellesley, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank

3.8.5.4 St. Mary Street Pumping Station Connection

St. Mary Street Pumping Station would serve as an intermediate shaft connection site and provides a near surface pipeline connection point to the existing MWRA transmission line along St. Mary Street for all alternatives with limited impacts to the public way. St. Mary Street Pumping Station is located in a suburban neighborhood in the Town of Needham and is owned and operated by the Town. The shaft site abuts the Sudbury Aqueduct and is owned by the MWRA. The shaft site is bounded by single-family residences to the north, the Sudbury Aqueduct to the south, I-95 to the east, and St. Mary Street to the west. St. Mary Street Pumping Station is located on the west side of St. Mary Street. The ground surface topography is generally flat with the exception of the man-made embankment covering the Sudbury Aqueduct. Overhead utilities run across the western edge of the site (on the east side of St. Mary Street).

Site access would be from St. Mary Street to the shaft construction site. Temporary construction facilities on this site include a trailer, parking lot, and staging area for working adjacent to shaft construction and are expected to take approximately 0.2 acres. It is expected the daily generated excavated material would be disposed offsite daily. A temporary construction staging area at the St. Mary Street Pumping Station owned by the Town of Needham and connections in St. Mary Street to Section 80 would have a temporary construction impact of 0.4 acres. Construction generated groundwater is expected to be relatively small and would be managed onsite. For this DEIR, it is assumed the shaft excavated diameter is 9 feet in rock with a 6-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-23** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

St. Mary Street Pumping Station site would include a 48-inch connection pipe and isolation butterfly valve within a buried chamber to be constructed over the top of the shaft. The approximately 120-foot-long, proposed branch pipe would cross into St. Mary Street and connect to the Section 80 pipeline with a new three-way valve configuration. A new 48-inch steel pipe connection at the tee would be proposed to connect to the nearby Sudbury Aqueduct for flushing.

Final conditions at the site would include a fenced area at the connection shaft site with a paved driveway and parking area, landscaping, some bollards, and the concrete top of shaft structure that would extend not more than 3 feet above ground surface. Disturbed staging areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with the Town of Needham (See **Figure 3.8-24**).

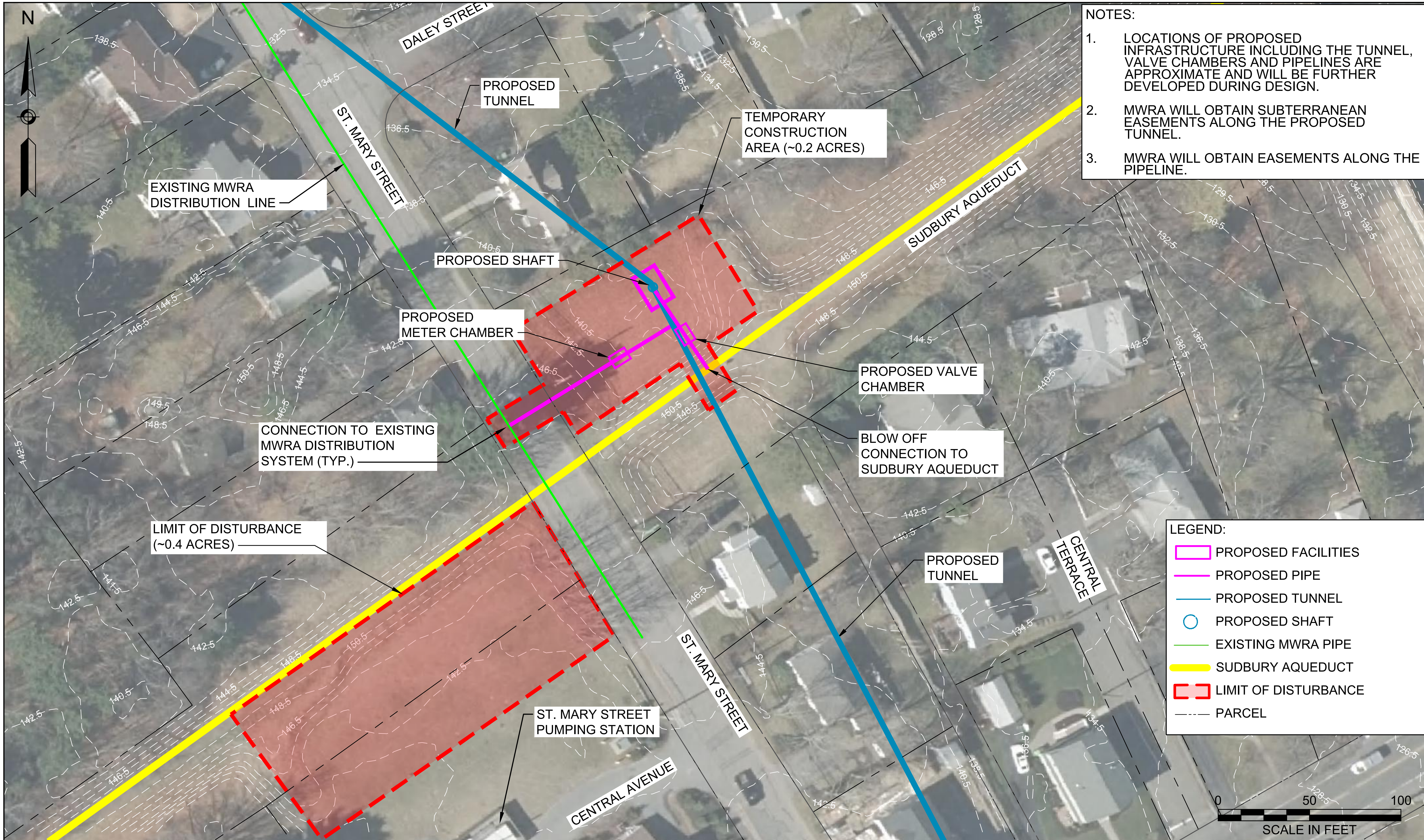
3.8.5.5 Newton Street Pumping Station Connection

Newton Street Pumping Station would serve as an intermediate shaft connection site and provides a near surface pipeline connection point to the existing Newton Street Pumping Station in Brookline for all alternatives with no construction in public ways. The Newton Street Pumping Station site is an active MWRA pumping station located in the Town of Brookline. The site itself is on a limited area of flat terrain that rises steeply to the north. The site is bounded by condominiums to the north and west, by a local (residential) road to the east (Fairgreen Place) and by Newton Street to the south.

Site access would be from Newton Street to the shaft construction site. This site is owned by MWRA. Temporary construction facilities on this site would include a trailer, parking area, and staging area for working adjacent to shaft construction in an approximately 0.3 acre area. It is expected the daily generated excavated material would be disposed offsite daily. Construction generated groundwater is expected to be relatively small and would be managed onsite. For this DEIR, it is assumed the shaft excavated diameter is 9 feet in rock with a 6-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-25** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

Newton Street Pumping Station would include a 48-inch connection pipe and isolation butterfly valve within a buried chamber to be constructed over the top of the shaft. The proposed 75-foot-long, 48-inch diameter buried piping extends from the proposed shaft within the chamber, then reduces to 30-inch diameter and terminates in a connection to the pump station suction pipeline on the north side of the pumping station with a three-way valve configuration. The top of shaft/valve structure roof slab is expected to be not more than 3 feet above ground.

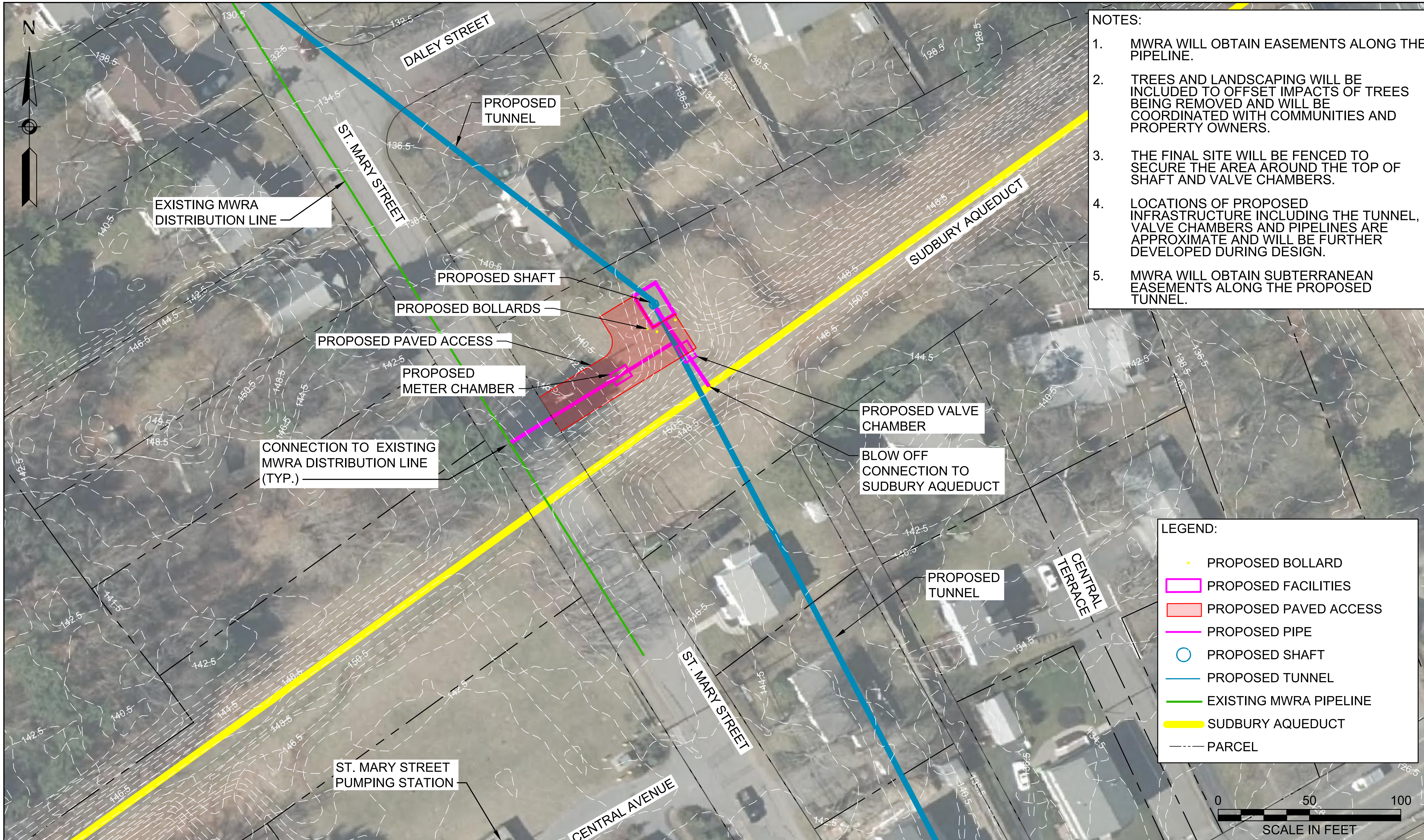
Final conditions at the site would extend the existing fenced area at the connection shaft site with an extension to the paved driveway and parking area, landscaping, some bollards, and the concrete top of shaft structure. Disturbed areas would be restored to pre-construction conditions. **Figure 3.8-26**.



C:\cdmext\prussend\d0725715\S-9 St. Mary Street Pumping Station Site Concept-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program	MWRA Contract No. 7159 Draft Environmental Impact Report	CDM Smith in association with vhb; Jacobs; Green International Affiliates, Inc.	**Figure 3.8-23** Site Schematic St. Mary Street Pumping Station-Connection Shaft Alternatives 3, 4 & 10 Needham, MA MassGIS Ortho Imagery 2019

This page intentionally left blank



NOTES:

1. MWRA WILL OBTAIN EASEMENTS ALONG THE PIPELINE.
2. TREES AND LANDSCAPING WILL BE INCLUDED TO OFFSET IMPACTS OF TREES BEING REMOVED AND WILL BE COORDINATED WITH COMMUNITIES AND PROPERTY OWNERS.
3. THE FINAL SITE WILL BE FENCED TO SECURE THE AREA AROUND THE TOP OF SHAFT AND VALVE CHAMBERS.
4. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
5. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

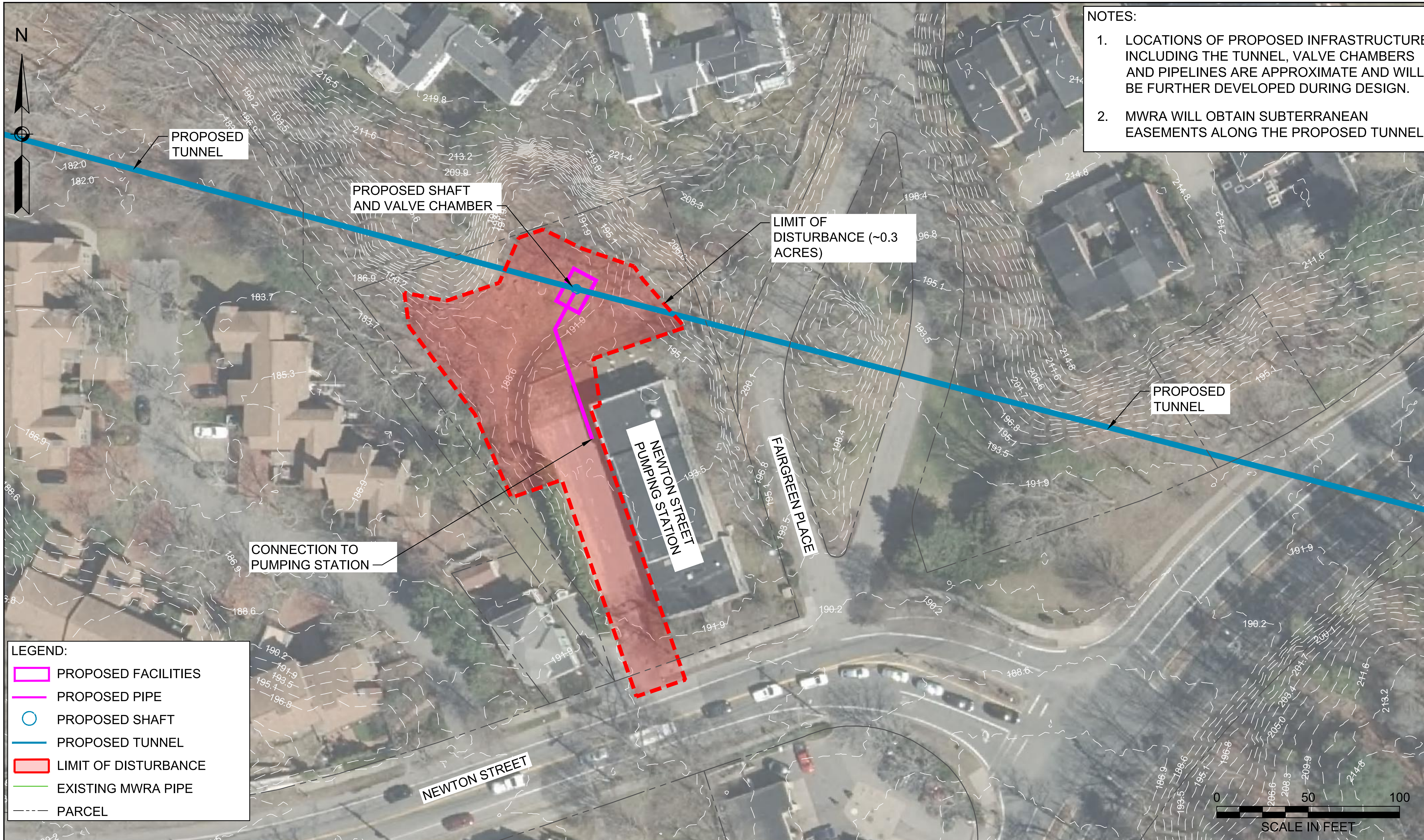
Figure 3.8-24 Final Conditions Schematic
St. Mary Street Pumping Station-Connection Shaft
Alternates 3, 4 & 10

Needham, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-9 St. Mary Street Pumping Station Site Concept-05.2022-FC-DL-1W1FYY2.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



NOTES:

1. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
2. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE PROPOSED TUNNEL.

C:\cdmext\prussendn\d0725715\S-11 Newton Street Pumping Station-Connection Shaft-05.2022.dwg
PLOTTED: October 3, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

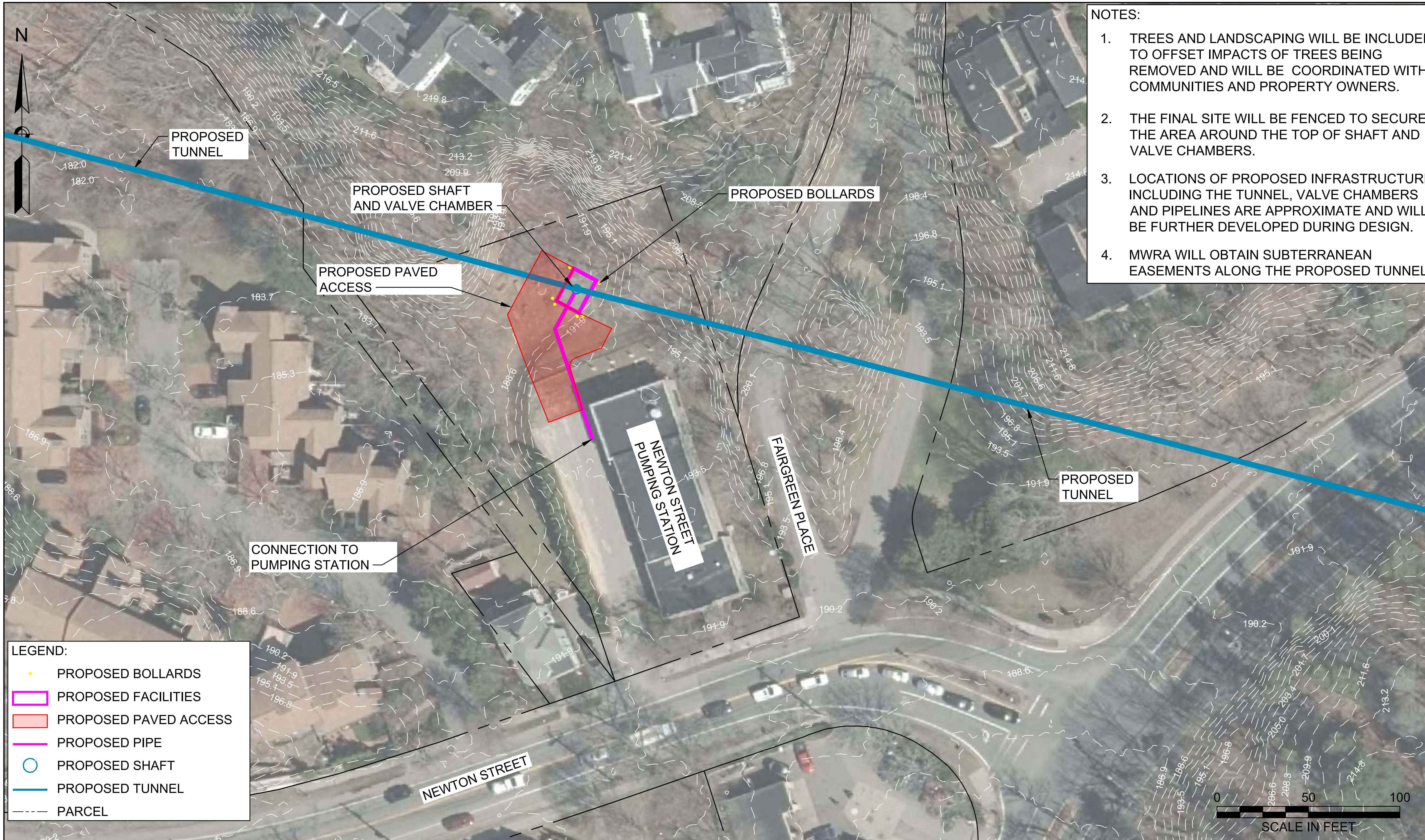
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-25 Site Schematic
Newton Street Pumping Station-Connection Shaft
Alternatives 3, 4 & 10

Brookline, MA

MassGIS Ortho Imagery 2019

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Figure 3.8-26 Final Conditions Schematic
Newton Street Pumping Station-Connection Shaft
Alternatives 3, 4 & 10

Brookline, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-11 Newton Street Pumping Station-Connection Shaft-05.2022-FC.dwg
PLOTTED: October 3, 2022

This page intentionally left blank

3.8.5.6 Southern Spine Mains Connection

Southern Spine Mains Connection would serve as an intermediate shaft connection site and provides a near surface pipeline connection point to the existing MWRA transmission lines with limited impacts to the Arborway for all alternatives. The site is under the care, custody, and control of DCR. The Southern Spine Mains site is located along the Arborway in an undeveloped area along the west side of the Arborway near the intersection with Washington Street in the City of Boston. The site is bounded by the Arborway (Route 203) to the north and east, a wooded area of the William A. Hinton State Laboratory Institute property to the west, and a grassy area between the Arborway, Washington Street and South Street to the south. The ground surface topography slopes gently downward from west to east towards the Arborway.

Site access would be from the Arborway to the shaft construction site through an existing retaining wall. The temporary construction site is approximately 0.5 acres with a permanent easement or acquisition of approximately 0.2 acres for MWRA facilities. Temporary construction facilities on this site would include a trailer, parking area, and staging area for working adjacent to shaft construction. It is expected the daily generated excavated material would be disposed offsite daily. Construction generated groundwater is expected to be relatively small and would be managed onsite. For this DEIR, it is assumed the shaft excavated diameter is 9 feet in rock with 6-foot steel lined finished diameter; concrete backfill would be placed between the steel lining and the excavated shaft surface. **Figure 3.8-27** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

Southern Spine Mains would include a 48-inch connection pipe and isolation butterfly valve within a buried chamber to be constructed over the top of the shaft. The approximately 150- foot long pipes would convey flow to the existing transmission mains. The top of shaft/valve structure roof slab is expected to be not more than 3 feet above ground.

Final conditions at the site would include a fenced area at the connection shaft site with a paved driveway and parking area, a retaining wall, landscaping, some bollards, and the concrete top of shaft structure. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with DCR and the City of Boston **Figure 3.8-28**.

3.8.5.7 Hultman Aqueduct Isolation Valve

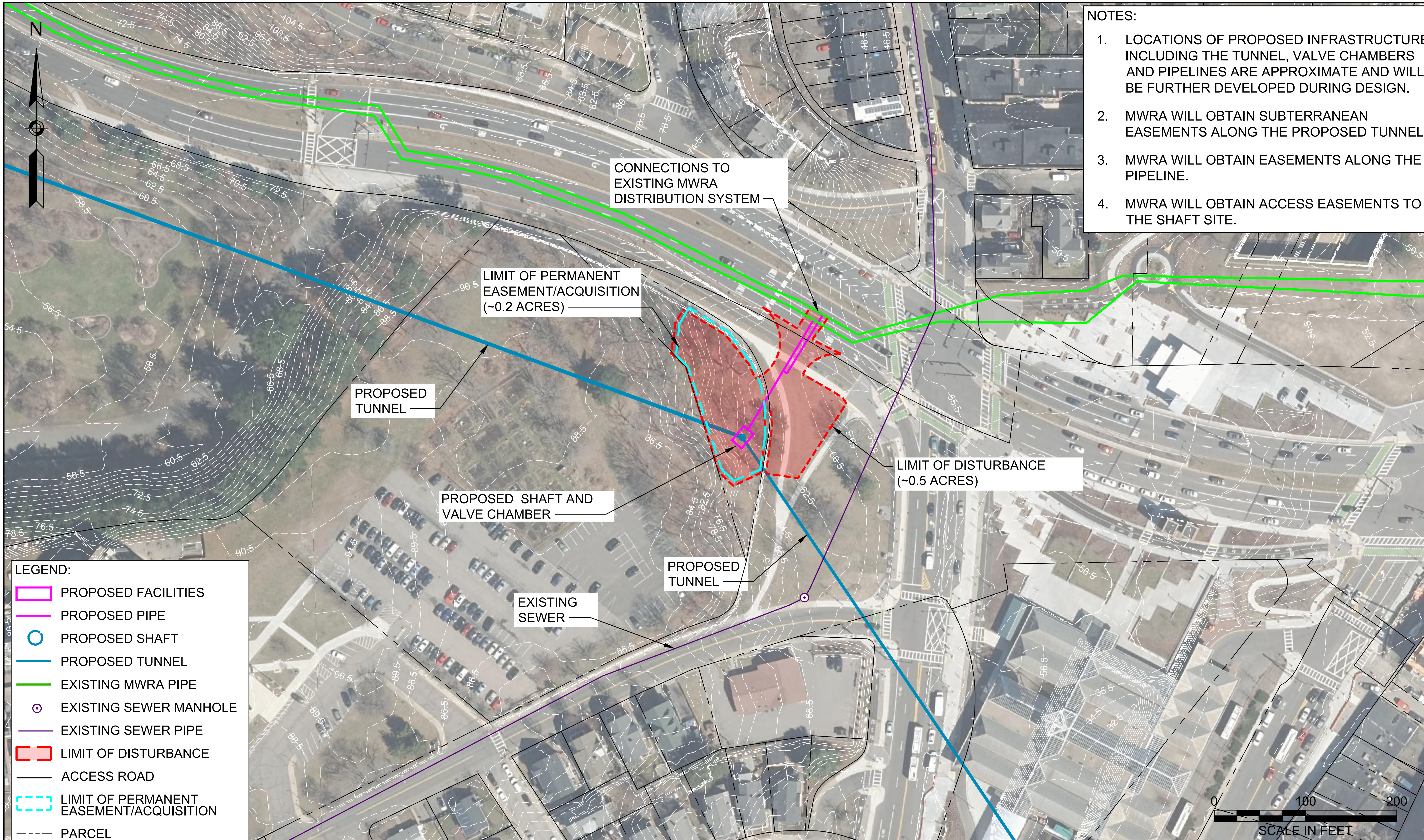
An isolation valve would be installed on the existing Hultman Aqueduct in Weston on the east side of I-95 within a grassed island area under all DEIR Alternatives. The overall parcel is under the care, custody, and control of MassDOT but MWRA has an existing easement for the Hultman Aqueduct. The Hultman Aqueduct Isolation Valve would be located in the existing easement and constructed to allow isolation of the Hultman Aqueduct if needed for future repairs. The isolation valve is located just east of the Hultman Branch line that connects to the MetroWest Tunnel Shaft W and is just west of the interconnection of Shaft 5A with the Hultman Aqueduct. Thus, if the isolation valves on the Hultman Aqueduct at the Shaft

5/5A site become inaccessible, such as in a flooded vault situation, this new redundant isolation valve could shut down all supply to the Hultman Aqueduct from Shaft 5A to the new North and South Tunnels.

Site access would be from an onramp of I-95 to the shaft construction site. The temporary construction site is approximately 0.2 acres within the existing MWRA easement. Temporary construction facilities on this site would include a trailer, parking area, and staging area for working adjacent to vault construction. It is expected the minor daily generated excavated material would be disposed offsite daily. Construction generated groundwater is expected to be relatively small and would be managed onsite. **Figure 3.8-29** shows schematic staging layout of this site. Actual site layout and construction logistics may vary as they would be planned and designed by the contractor for this project.

The area would be excavated and a new section of 10-foot-diameter steel pipe with a butterfly valve in a cast in place concrete structure would be constructed and connected outside the structure to the existing pipe with reducers.

Final conditions at the site would include a concrete vault structure that would extend approximately no more than 3 feet above ground surface. Disturbed areas would be restored to pre-construction conditions for paved areas and landscaping would be restored in accordance with any agreements with MassDOT (See **Figure 3.8-30**).



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

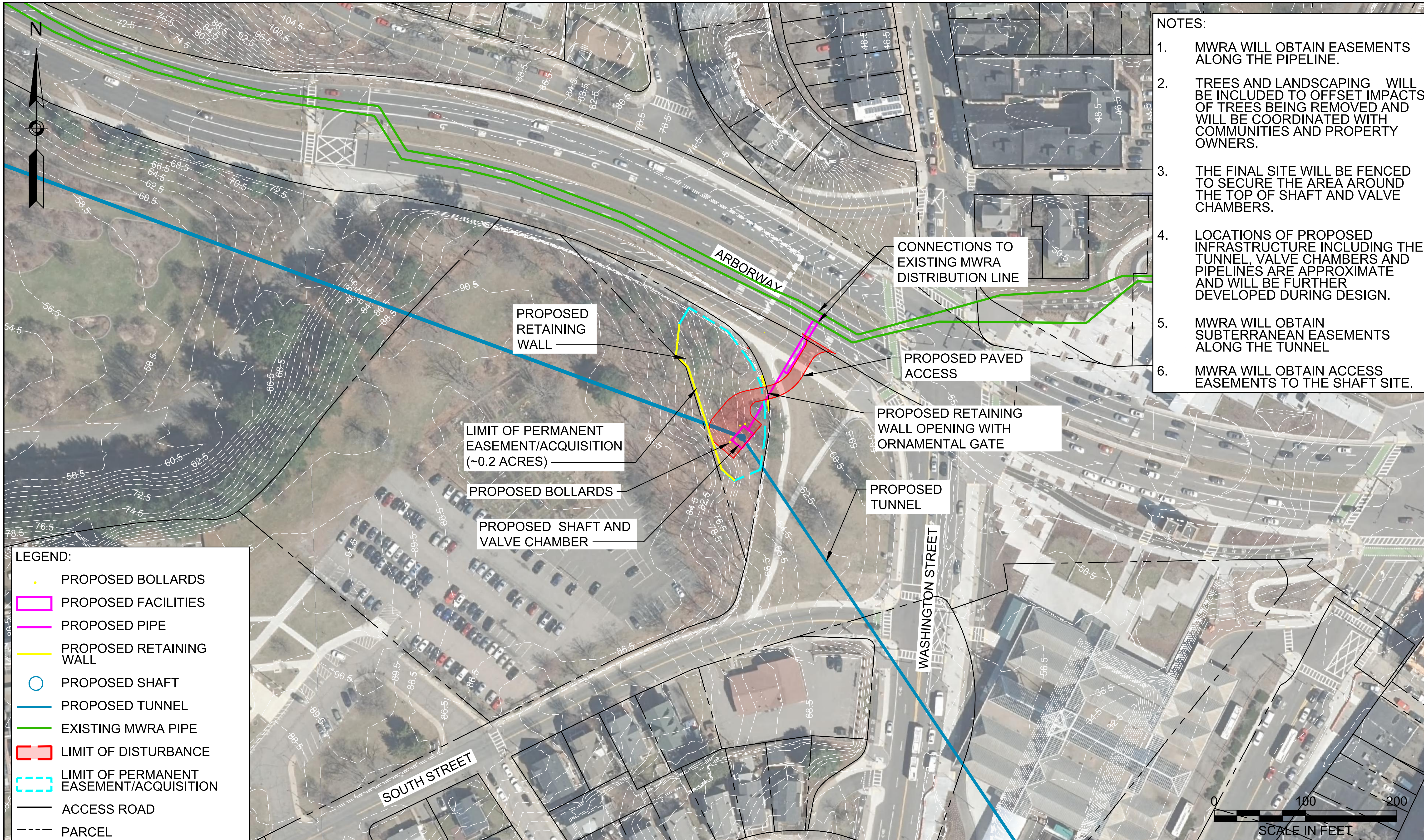
Boston, MA

Figure 3.8-27 Site Schematic
Southern Spine Mains-Connection Shaft
Alternatives 3, 4 & 10

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0725715\S-12a Southern Spine Mains-Connection Shaft - 05.2022 .dwg
PLOTTED: October 3, 2022

This page intentionally left blank



NOTES:

1. MWRA WILL OBTAIN EASEMENTS ALONG THE PIPELINE.
2. TREES AND LANDSCAPING WILL BE INCLUDED TO OFFSET IMPACTS OF TREES BEING REMOVED AND WILL BE COORDINATED WITH COMMUNITIES AND PROPERTY OWNERS.
3. THE FINAL SITE WILL BE FENCED TO SECURE THE AREA AROUND THE TOP OF SHAFT AND VALVE CHAMBERS.
4. LOCATIONS OF PROPOSED INFRASTRUCTURE INCLUDING THE TUNNEL, VALVE CHAMBERS AND PIPELINES ARE APPROXIMATE AND WILL BE FURTHER DEVELOPED DURING DESIGN.
5. MWRA WILL OBTAIN SUBTERRANEAN EASEMENTS ALONG THE TUNNEL
6. MWRA WILL OBTAIN ACCESS EASEMENTS TO THE SHAFT SITE.

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

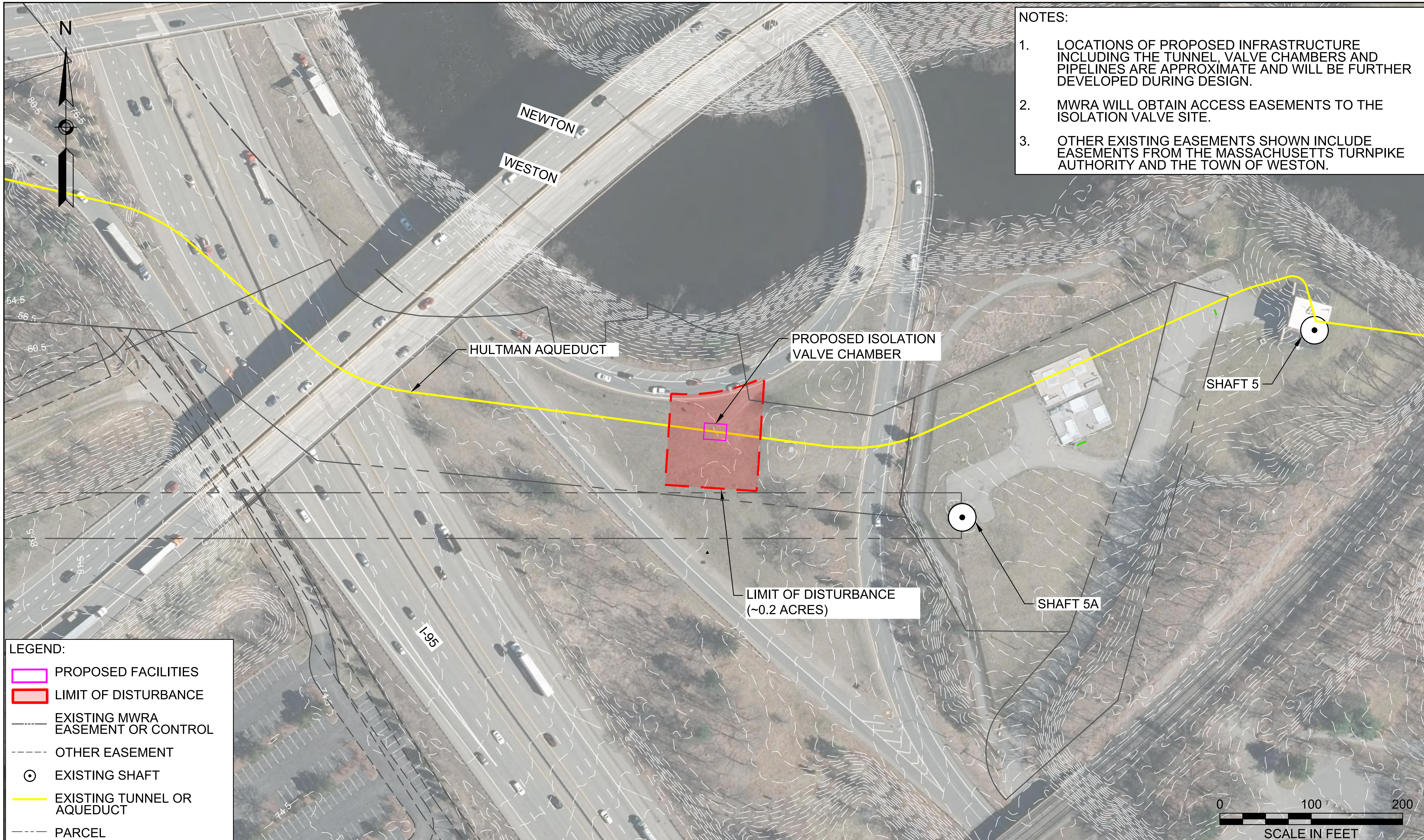
Boston, MA

Figure 3.8-28 Final Conditions Schematic
Southern Spine Mains-Connection Shaft
Alternatives 3, 4 & 10

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0731719\S-12a Southern Spine Mains-Connection Shaft - 05.2022-FC.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

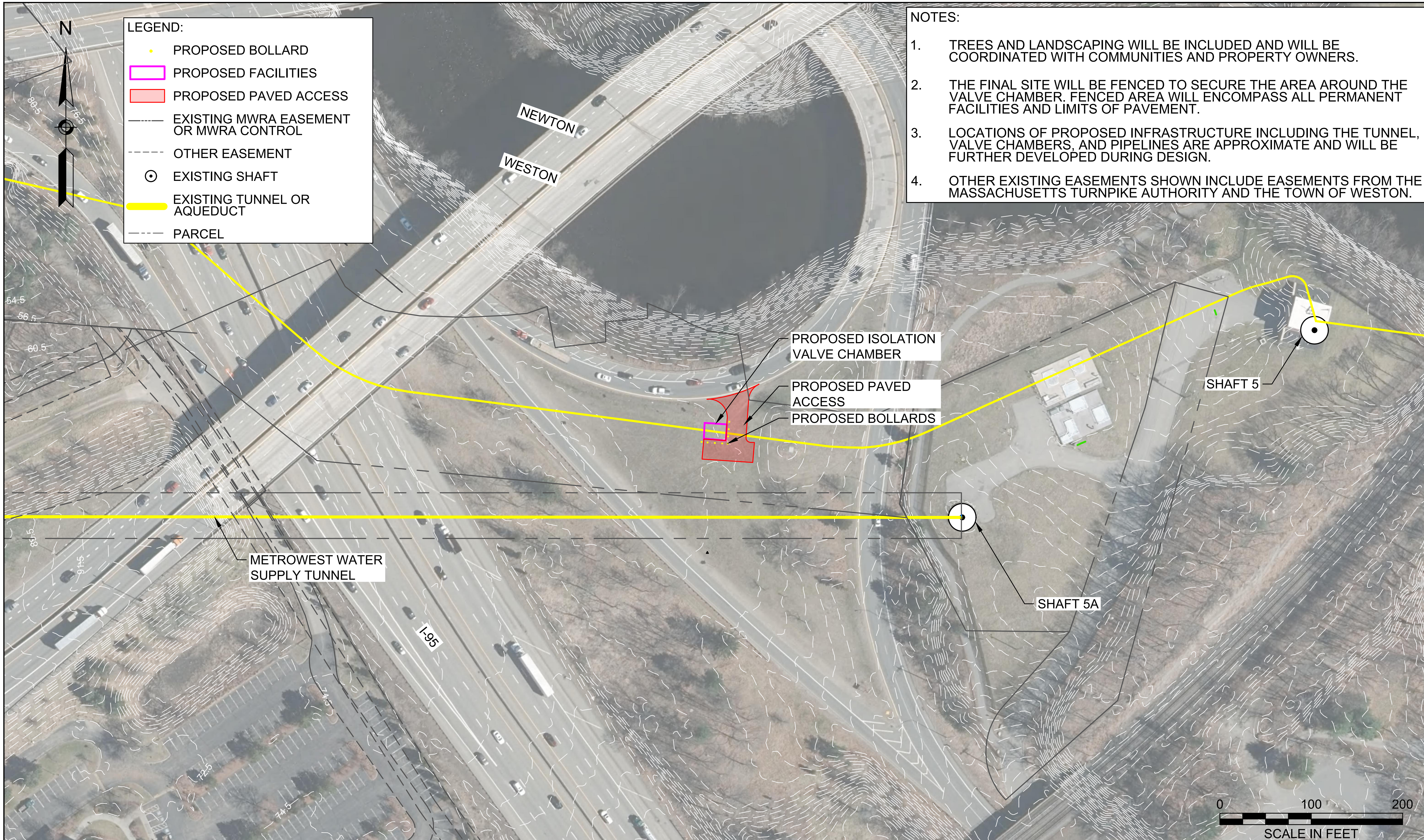
Weston, MA

Figure 3.8-29 Site Schematic
Hultman Aqueduct Isolation Valve
Alternatives 3, 4 and 10

MassGIS Ortho Imagery 2019

C:\cdmext\prussendn\d0725715\S-6.3 Hultman Aqueduct Isolation Valve.dwg
PLOTTED: October 3, 2022

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

Figure 3.8-30 Final Conditions Schematic
Hultman Aqueduct Isolation Valve
Alternative 3

Weston, MA

MassGIS Ortho Imagery 2019

C:\cdmext\prussend\d0731719\S-6.3 Hultman Aqueduct Isolation Valve-FC-DL-1W1FYY2.dwg
PLOTTED: October 3, 2022

This page intentionally left blank

3.9 Selecting the Preferred Alternative

As discussed previously, the Alternatives Analysis process was conducted in progressively more detail as the number of alternatives narrowed. This section documents the evaluation of the three remaining alternatives: Alternative 3, Alternative 4 and Alternative 10. These remaining alternatives were screened in more detail against the same categories that were used to narrow down the alternatives from 10 to three. The evaluation criteria included engineering/constructability, land availability, environmental, social/community, operations, cost and schedule. The geotechnical investigations, survey and field work supporting the technical studies discussed in detail **Chapter 4, Existing Conditions and Environmental Assessment** also informed the process to select the Preferred Alternative and two back-up alternatives.

3.9.1 Engineering/Constructability Considerations

Alternative 3, Alternative 4, and Alternative 10 were evaluated with the following engineering/ constructability considerations:

- Availability of utilities
- Launch shaft groundwater discharge location
- Flushing/disinfection and dewatering options
- Proximity to highways
- Proximity to geologic faults
- Tunnel segment length
- Proximity to sensitive existing Infrastructure

All three alternatives have comparable characteristics for availability of utilities, flushing/disinfection and dewatering options, proximity to highways and proximity to sensitive existing infrastructure. Common to all three alternatives would be six connection shafts that would enable the deep tunnel system to connect to the MWRA or local municipal distribution systems. The six connections include School Street and Cedarwood Pumping Station in Waltham, Hegarty Pumping Station in Wellesley, St. Mary Street Pumping Station in Needham, Newton Street Pumping Station in Brookline, and Southern Spine Mains in Boston. An isolation valve on the Hultman Aqueduct in Weston would also be common to all three alternatives. Therefore these sites did not factor into selection of the preferred alternative.

3.9.1.1 Groundwater Discharge

Alternatives 3 and 4 include the option for groundwater discharge locations to Seaverns Brook near the I-90/I-95 interchange in Weston and the Charles River from the I-95/Highland Avenue interchange in Needham as described in more detail in **Chapter 4, Section 4.6, Wetlands and Waterways**. Alternative 10 includes only one groundwater discharge location at the Charles River from the I-95/Highland Avenue interchange in Needham.

3.9.1.2 Geologic Features

All three alternatives would cross the same geologic features including faults along their alignments. The Northern Boundary Fault would be crossed by all three alternatives in the area of Recreation Road in Weston. Alternatives 4 and 10 would approach the fault from the southeast from Highland Avenue Northwest Launching after approximately 4 miles of excavation with a TBM. The contractor may have more challenging logistics if ground conditions warrant changing the excavation to drill and blast to navigate this geologic feature. Alternative 3 would approach the fault from the northwest from Bifurcation Launching within the first 1,000 feet of excavation and a contractor would have more flexibility to cross the fault with a lengthened starter tunnel constructed using drill and blast or excavated with the TBM without impacting other segments of work.

3.9.1.3 Tunnel Segments

The three DEIR Alternatives vary in tunnel segment length as shown in **Table 3.9-1**.

Table 3.9-1 Tunnel Segment Lengths

Alternative	North Tunnel Segment 1		South Tunnel Segment 2		South Tunnel Segment 3	
	Description	**Length (miles)**	**Description**	**Length (miles)**	**Description**	**Length (miles)**
3	Tandem Trailer to Fernald Property	4.5	Bifurcation to Highland Avenue Northwest	3.3	Highland Avenue Northeast to American Legion	6.8
4	Tandem Trailer to Fernald Property	4.5	Highland Avenue Northwest to Park Road West	3.3	Highland Avenue Northeast to American Legion	6.8
10[1]	Highland Avenue Northwest to Park Road West to Fernald Property			8.3	Highland Avenue Northeast to American Legion	6.8

Note: 1. One TBM would mine the tunnel for both Segment 2 and Segment 1.

Alternatives 3 and 4 have essentially the same Tunnel Segment lengths at 4.5, 3.3 and 6.8 miles respectively. Alternative 10 has longer Tunnel Segment lengths at 8.3 and 6.8 miles and is the longest tunnel overall. Segment 3 is the same length for all alternatives and thus is not a differentiating factor among the alternatives. The shorter Tunnel Segments 1 and 2 for Alternatives 3 and 4 provide additional flexibility and less overall risk for tunnel construction. Alternative 4 has the additional benefit of a potential Value Engineering option later in the design phase to combine the Highland Avenue Launching sites.

Based on these engineering/constructability considerations, Alternative 4 is the Preferred Alternative, followed by Alternative 3 and then Alternative 10.

3.9.2 Land Availability Considerations

Alternative 3, Alternative 4, and Alternative 10 were evaluated considering the following land availability factors:

- Space and right-of-way for construction
- Space and right-of-way for permanent facilities
- Possibility of precluding other beneficial uses.

The three DEIR Alternatives are comparable when considering space and rights-of-way for permanent facilities and possibility for precluding other beneficial uses, since all proposed sites can accommodate permanent facilities and property access negotiations are well underway. None of the proposed sites would adversely impact other potential beneficial uses.

However, MassDOT Project No. 606783 in Weston is a risk regarding land availability for the Bifurcation site. Currently it is anticipated that the land would be available after the MassDOT construction is completed. The current MassDOT schedule is for construction to occupy that site from 2023 through 2027. Any delays in schedule would impact the availability of access to Bifurcation Launching for Alternative 3.

Based on these land availability considerations Alternatives 4 and 10 are preferred, and Alternative 3 is a backup.

3.9.3 Environmental Considerations

Each alternative was evaluated according to the presence of the following environmental factors:

- Wetlands
- State and Federal Listed Endangered Species
- Article 97 Lands
- Massachusetts Contingency Plan (MCP) sites

The DEIR all have comparable impacts for State and Federal Listed Endangered Species, Article 97 Lands and Mass Contingency Plan sites as described in more detail in **Chapter 4 Existing Conditions and Environmental Assessment, Section 4.8 Hazardous Materials**. All three alternatives 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 10 would have fewer impacts compared to the other two Alternative since there are two launching sites (Highland Avenue Northwest and Highland Avenue Northeast) versus three launching sites for Alternatives 3 (Tandem Trailer, Bifurcation and Highland Avenue Northeast) and Alternative 4 (Tandem Trailer, Highland Avenue Northwest and Highland Avenue Northeast) as described in more detail in **Chapter 4, Section 4.6 Wetlands and Waterways**.

Based on these Environmental considerations, Alternative 10 is the Preferred Alternative, and Alternatives 3 and 4 are tied as backups.

3.9.4 Social/Community Considerations

Each alternative was evaluated according to the presence of the social/community considerations:

- Cultural Resources (adverse effects on National Register of Historic Places)
- Community Impacts (adverse effects on use of local parks, playgrounds, bus routes, schools or other community resources)
- Environmental Justice
- Traffic Disruption
- Construction Period Impacts from Air and Noise

The three DEIR alternatives have comparable relative impacts to cultural resources, community impacts, Environmental Justice, Traffic Disruption and Construction Period Impacts from Air and Noise as described in more detail in **Chapter 2, Outreach and Environmental Justice; Chapter 4, Section 4.10 Transportation**, **Section 4.11 Air and Green House Gas**, and **Section 4.12 Noise and Vibration**.

Based on these social/community considerations, Alternatives 3, 4 and 10 are comparable.

3.9.5 Operational Considerations

Each alternative was evaluated against the following operational considerations

- Flexibility of Operations
- Maintenance Provisions

The DEIR Alternatives are comparable to one another regarding flexibility of operations and making provision for maintenance activities. Each alternative includes the necessary valving to isolate critical sections of MWRA infrastructure including dedicated connections to the Hultman Aqueduct for the North Tunnel and the South Tunnel, the Hultman Aqueduct Isolation Valve and the Highland Avenue Northeast Isolation Valve. Maintenance considerations have been coordinated with MWRA Operations personnel and included in the sizing and layout of all permanent facilities to facilitate the proactive and safe maintenance of these critical infrastructure elements.

Based on these operational considerations, Alternatives 3, 4 and 10 are comparable.

3.9.6 Cost Considerations

As the overall depth of the tunnels and components included in each Alternative are very similar the approach to include cost as a consideration was to use the relative cost differential for major components that differed between the alternatives. Each alternative was evaluated against the following cost considerations:

- Relative Cost Differential for TBM Electric Service
- Number of Shafts
- Construction Duration
- Tunnel Length

- Excavation Efficiency

3.9.6.1 Differential Cost of Electrical Service

The cost to deliver a new electrical service to each TBM Launching site was estimated for Tandem Trailer Launching, Bifurcation Launching, Highland Avenue Northwest Launching and Highland Avenue Northeast Launching sites. Through ongoing discussions with Eversource, construction cost estimates were developed that include the necessary ductbank improvements, additional conductors and on-site utility grade switchgear for each location.

Alternative 10 includes launching at Highland Avenue Northwest and Highland Avenue Northeast and is the base cost option. Alternative 4 includes launching at Tandem Trailer, Highland Avenue Northwest and Highland Avenue Northeast with the additional site adding $13 million more than the base cost option. Alternative 3 includes launching at Tandem Trailer, Bifurcation and Highland Avenue Northeast with the additional site adding $18 million more than the base cost option.

3.9.6.2 Number of Construction Shafts

The total number of shafts was also an area of cost differential among the 3 alternatives. Through an evaluation of prior similar projects and recently bid tunneling projects, construction cost estimates were developed for each type of shaft. Alternative 10 includes 2 Launching Shafts, 2 Receiving Shafts, 2 Large Connection Shafts and 6 Connection Shafts (12 shafts) and is the base cost option. Alternatives 3 and 4 include 3 Launching Shafts, 3 Receiving Shafts, 1 Large Connection Shaft and 6 Connection Shafts (13 shafts) with the additional shaft adding $32M more than the base cost option.

3.9.6.3 Construction Duration

The total project construction duration was also an area of cost differential among the 3 alternatives. Construction durations for the 3 DEIR alternatives were estimated based on assumptions related to several key factors including tunnel segment procurement readiness (i.e., when a tunnel segment would be sufficiently designed, necessary permits obtained, and land acquired to allow for procurement to proceed), construction packaging, construction phasing and sequencing, and tunnel construction excavation and lining rates. Construction duration would continue to be evaluated as design progresses.

Alternatives 3 and 4 have the same overall estimated project construction duration of approximately 7 years, and that is the base cost option. The value of each additional month of project construction duration was estimated at $2 million /month to cover the additional costs of Engineering Services, Construction Management Services and MWRA staff. Alternative 10 has an overall estimated project construction duration of approximately 7 years and 6 months for an additional cost of $12 million over the base cost option.

3.9.6.4 Tunnel Length

The total length of tunnel was also an area of cost differential among the 3 alternatives. Through an evaluation of prior similar projects and recently bid tunneling projects, construction cost estimates were developed for similar sized tunnels. Alternatives 3 and 4 are essentially the same length at approximately 14.5 miles and are considered the base cost option. Alternative 10 at approximately 15 miles includes an additional half mile of tunnel at an additional cost of $35 million.

3.9.6.5 Excavation Efficiency

The overall excavation efficiency was also an area of cost differential among the three alternatives. Excavation efficiency reduces as the tunnel segments get longer as the systems needed to support the TBM excavation operations and final concrete operations including materials, people and equipment all need to travel longer to and from the launching shaft. For this analysis it is assumed that efficiency begins to reduce after approximately 5 miles of tunnel length. For Segment 3 all Alternatives have the same configuration of Highland Avenue Northeast Launching and American Legion Receiving so that segment does not result in a cost differentiator. For Segment 2 Alternative 3 has the Bifurcation Launching and Highland Avenue Northwest Receiving and Alternative 4 has essentially the reverse with Highland Avenue Northeast Launching and Park Road West Receiving at approximately 3.3 miles. For Segment 1 Alternatives 3 and 4 have the same configuration with Tandem Trailer Launching and Fernald Property Receiving at approximately 4.5 miles. Alternative 10 combines the tunnel excavation operation for Segment 2 and Segment 1 with a configuration of Highland Avenue Northwest Launching to Park Road West Large Connection to Fernald Property Receiving at approximately 8.3 miles. This 8.3-mile tunnel drive would begin to reduce excavation efficiency after approximately 5 miles at an added cost of $25 million.

These relative cost differentials among the alternatives are summarized in **Table 3.9-2.**

Table 3.9-2 Cost Comparison

	Alternative		
Category	**3**	**4**	**10**
TBM Electrical Service	$18 million	$13 million	$0
Number of Shafts	$32 million	$32 million	$0
Duration	$0	$0	$12 million
Tunnel Length	$0	$0	$35 million
Excavation Efficiency	$0	$0	$25 million
Totals	$50 million	$45 million	$72 million

Note – All Costs are Construction Only in 2022 Dollars.

Based on these cost considerations, Alternative 4 is preferred, and Alternatives 3 and 10 are backups in that order.

3.9.7 Schedule Considerations

Each alternative was evaluated against the following schedule considerations:

- Timing to Tunnel(s) in Service
- Flexibility of Implementation

Alternatives 3 and 4 have an overall estimated construction duration of 7 years where the South Tunnel would be operation in approximately 6 years and the North Tunnel in 7 years. Alternative 10 has an overall estimated construction duration of 7.5 years where the South Tunnel would be in operation in 7.5 years and the North Tunnel in 7.25 years after the beginning of construction for each tunnel. The exact timing and sequence of these alternatives are yet to be determined at this early stage of development. The overall assumptions for durations and sequence are outlined in **Chapter 4, Section 4.3 Analysis Conditions** and **Section 4.4 Construction Methodology**.

Alternative 3 has the flexibility of contract packaging as there are three distinct tunnel segments namely, North Tunnel Segment 1 (Tandem Trailer to Fernald Property), South Tunnel Segment 2 (Bifurcation to Highland Avenue Northwest) and South Tunnel Segment 3 (Highland Avenue Northeast to American Legion) which could be packaged as two or three construction packages with two or three TBMs.

Similarly, Alternative 4 has the flexibility of contract packaging as there are three distinct tunnel Segments, North Tunnel Segment 1 (Tandem Trailer to Fernald Property), South Tunnel Segment 2 (Highland Avenue Northwest to Park Road West) and South Tunnel Segment 3 (Highland Avenue Northeast to American Legion) which can be packaged as two or three construction packages with two or three TBMs. Alternative 4 has the added potential of combining the Highland Avenue Northwest and Northeast launch shaft sites if a contractor sees that as beneficial.

Alternative 10 has the least flexibility in contract packaging compared to the other two Alternatives, as tunnel Segments 1 and 2 are included in the same tunnel drive and this combination would put both the North Tunnel and South Tunnel on the critical path schedule with limited contract packaging options.

Based on these schedule considerations, Alternatives 3 and 4 are preferred, and Alternative 10 is the backup.

3.9.8 Recommended Preferred Alternative

These category summaries of preferred and backup by Alternative are presented in **Table 3.9-3**.

Table 3.9-3 Summary of Evaluation Criteria and Recommended Preferred Alternative

Criteria	Alternative 3	Alternative 4	Alternative 10
Engineering/Constructability	Backup	Preferred	Backup
Land Availability	Backup	Preferred	Preferred
Environmental	Backup	Backup	Preferred
Social/Community	NA	NA	NA
Operations	NA	NA	NA
Cost	Backup	Preferred	Backup
Schedule	Preferred	Preferred	Backup
Overall Evaluation	**Backup**	**Preferred**	**Backup**

All three Alternatives provide the required hydraulic, redundancy and operational features to meet the Authority's goals. Alternative 4 is rated as preferred in four categories (engineering/constructability, land availability, cost differential and schedule). Alternative 10 is rated as preferred in two categories (land availability and environmental) and Alternative 3 is rated as preferred in one category (schedule).

Based on the flexibility offered in the engineering/constructability, land availability, cost differential and contract packaging flexibility, Alternative 4 is identified as the Preferred Alternative.

4 Existing Conditions and Environmental Assessment

4.1 Introduction

This chapter of the Draft Environmental Impact Report (DEIR) discusses the existing conditions and impact assessment for the Metropolitan Water Tunnel Program (the Program) proposed by the Massachusetts Water Resources Authority (MWRA or the Authority). Additionally, the Program's construction methodology is described. The following is evaluated, per the Secretary of Energy and Environmental Affairs (EEA) Certificate (Secretary's Certificate) on the Environmental Notification Form (ENF) and Draft Environmental Impact Report (DEIR) scope:[1]

- A comprehensive analysis of the Program’s potential impacts
- A review of the Program's construction period impacts and mitigation relative to noise, air quality and transportation
- Measures to avoid, minimize, and mitigate impacts
- An inventory of construction equipment that would be in use during construction and potential air quality impacts associated with construction period mobile emissions; and
- Construction period materials management plans, including management of contaminated materials.

Development of the Program alternatives went through a rigorous screening process, which led to identification of launching, receiving and connecting sites that aimed to avoid and minimize impacts. As described in the ENF, options including operational changes, rehabilitation, surface pipelines, and deep rock tunnels were evaluated for their ability to meet water demand and system reliability and resilience. From that screening tier, deep rock tunnels emerged at the preferred option. MWRA developed 28 preliminary alternative tunnel alignments (15 southern segments and 13 northern segments) that were evaluated against engineering, high-level social and environmental, operational and cost factors.

As described in **Chapter 3, Alternatives**, the options were narrowed to 10 candidate DEIR alternatives with specific locations for launching, receiving and connecting sites that were specifically identified for their ability to avoid and minimize impacts. The 10 candidate DEIR alternatives were further narrowed to three alternatives, Alternatives 3, 4, 10 (the DEIR alternatives) which were analyzed in this DEIR. This assessment evaluated temporary and permanent impacts to environmental resources within or adjacent to launching, receiving, and connection sites, and the conceptual alignments. The preliminary tunnel alignment routes assessed in this DEIR will be reevaluated as design progresses and final tunnel alignment routes are determined. A summary of key findings is provided in **Section 4.2**, followed by detailed assessment of environmental categories. Environmental categories include:

---

1 The Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form: “Massachusetts Water Resources Authority, Metropolitan Water Tunnel Program,” May 7, 2021.

- Rare Species and Wildlife Habitat (**Section 4.5**)
- Wetlands and Waterways (**Section 4.6**)
- Cultural and Historical Resources (**Section 4.7**)
- Hazardous Materials (**Section 4.8**)
- Land Use (**Section 4.9**)
- Transportation (**Section 4.10**)
- Air Quality and Greenhouse Gas Emissions (**Section 4.11**)
- Noise and Vibration (**Section 4.12**)
- Community Resources and Open Space (**Section 4.13**)

Environmental Justice communities and Authority outreach efforts are covered in **Chapter 2**. Water Supply is addressed in **Chapter 5**, and Climate Change considerations are covered in **Chapter 6**.

4.2 Summary of Findings

This section describes the key findings of the environmental impacts discussed within this chapter. Impacts by resource have briefly been summarized in **Table 4.2-1.** The schedule and methodology assumptions used in these analyses are based on a conservative approach to construction means and methods, use of construction equipment and associated impacts as outlined in **Section 4.3 Analysis Conditions**.

The Metropolitan Water Tunnel Program is in the early phases of preliminary design. Construction packaging and phasing (i.e., which tunnel segment is constructed first) will be determined as the Program advances through the design phase. 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 DEIR 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 actual timing of activities and equipment selected by the successful contractor may vary but are not anticipated to exceed impacts identified below. Detailed findings are provided in the remainder of this chapter.

Table 4.2-1 Summary of Environmental Impacts

Environmental Resource	Permanent/ Construction Impact	Impact Description	Site
Rare Species and Wildlife Habitat **Section 4.5**	Construction	Potential incidental take of federally- listed Northern Long-Eared Bat (*Myotis septentrionalis*; NLEB) due to tree clearing	All sites
		Changes in wildlife habitat characteristics due to construction activities	All sites
Wetlands and Waterways **Section 4.6**	Permanent	Impacts to state-regulated Riverfront Areas (RA) due to top-of-shaft and/or valve structures and associated pavement	Fernald Property, Hegarty Pumping Station, Tandem Trailer, and Hultman Aqueduct Isolation Valve
		Impacts to state-regulated Bank, and Land Under Waterway (LUW) and ferally-regulated waterways (WW) for rip rap splash pads at dewatering discharge locations	Fernald Property, Tandem Trailer, Bifurcation, Highland Avenue and American Legion.
		Impacts to Bordering Land Subject to Flooding (BLSF) for rip rap splash pads at dewatering discharge locations	Tandem Trailer, Bifurcation, and Highland Avenue
	Construction	Temporary impacts to state regulated Bordering Vegetated Wetland (BVW) and federally jurisdictional Vegetated Wetlands (VW) due to a near-surface pipeline for a connection to existing water supply infrastructure	American Legion
		Temporary impacts to state regulated BVW and federally jurisdictional VW due to a near-surface pipeline for dewatering discharge	Fernald Property
		Impact to state-regulated RAs due to construction staging	Fernald Property, Tandem Trailer, Bifurcation, American Legion, Hegarty Pumping Station, and Hultman Aqueduct Isolation Valve
	Potential Construction	Potential impacts to wetlands, surface waters on or adjacent to site to due to erosion or sedimentation	All sites
		Potential impact to surface water quality due to pollutants in tunnel dewatering discharges, disinfection, and flushing	Fernald Property, Tandem Trailer and Park Road East, Bifurcation, Park Road West, Highland Avenue, and American Legion,
		Potential for groundwater drawdown due to tunnel inflows temporarily impacting surface water levels and wells	All sites

Table 4.2-1 Summary of Environmental Impacts

Environmental Resource	Permanent/ Construction Impact	Impact Description	Site
Cultural Resources **Section 4.7**	Permanent	Proposed demolition of three buildings that contribute to the significance of a historic district	Fernald Property
Hazardous Materials **Section 4.8**	Potential Construction	Potential of discovery of contaminated soil or groundwater during construction, however the Project would have a positive impact by reducing exposure to surrounding receptors	All sites
Land Use **Section 4.9**	Permanent	Permanent easements and land takings, that would be fenced off and partially revegetated, including the acquisition of properties protected under the Executive Office of Energy and Environmental Affairs (EEA) Article 97 Land Disposition Policy	Fernald Property, Tandem Trailer and Park Road East, Park Road West, Bifurcation, Highland Ave Northeast, American Legion, Cedarwood Pumping Station, Hegarty Pumping Station, and Southern Spine Mains
	Construction	Change in land use and vegetation removal to accommodate construction and staging areas and temporary easements	All sites
Transportation **Section 4.10**	Construction	Most traffic impact would be from construction activities at the shaft sites due to construction worker transport	All sites; most impacted: Tandem Trailer, Bifurcation, Highland Avenue Northwest, Highland Avenue Northeast
		Maximum traffic impacts would occur where there is a shift change during the peak evening hour, these sites are adjacent to highways and would not have a significant impact on local roadways	Tandem Trailer, Bifurcation, Highland Avenue Northwest, Highland Avenue Northeast
		Surface piping would require traffic management measures including lane closure, sidewalk closures, and detours	Impacting: Fernald Property, American Legion and School Street Low/Moderate Impact: All other sites
		Some study intersections of local roadways would be impacted by construction activities during the peak evening hour. Specific impacted intersections are documented in Section 4.10 and Chapter 7, Mitigation.	Intersection of River Road and South Avenue (Weston), Intersection of I-95 NB off-ramp at South Avenue and Park Road at South Avenue (Weston), The intersection of South Street at Weston Street (Waltham)(depends on alternative)
Air Quality and Greenhouse Gas Emissions **Section 4.11**	Construction	Emissions not expected to be significant and will generally at occur at different times, at a variety of geographically diverse sites, which would limit potential impacts	All sites

Table 4.2-1 Summary of Environmental Impacts

Environmental Resource	Permanent/ Construction Impact	Impact Description	Site
Noise and Vibration **Section 4.12**	Construction	Exceedance of Housing and Urban Development (HUD) or Massachusetts Department of Environmental Protection (MassDEP) nighttime noise limits would occur at some sites prior to mitigation	Tandem Trailer, American Legion, School Street, Cedarwood Pumping Station, Hegarty Pumping Station, St. Mary Street Pumping Station, and Newton Street Pumping Station
Community Resources and Open Space **Section 4.13**	Permanent	Acquisition of sites protected under the EEA Article 97 Land Disposition Policy would be required at some sites after a 2/3 vote by the state legislature	American Legion, Hegarty Pumping Station, and Southern Spine Mains
		Subsurface 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	Various properties along tunnel alignments

4.2.1 Rare Species and Wildlife Habitat

Key findings on impacts of the Program as they relate to rare species and wildlife habitat are summarized below:

- No state-listed rare species are mapped in the vicinity of Program sites and therefore would not be impacted during construction or in the Final Condition.
- There would be temporary alterations of wildlife habitat, including potential Northern Long-Eared Bat (NLEB) habitat regulated under the federal Endangered Species Act (ESA), due to the construction of the DEIR Alternatives. Adherence to applicable time-of-year restrictions on tree clearing would avoid incidental take of NLEB. Habitat impacts would be mitigated through restoration of the disturbed areas after completion of work.
- Permanent and temporary impacts to wildlife habitats are not anticipated to adversely affect the overall Program-area wildlife populations.
- In the Final Condition, 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.
- Dewatering will be conducted in accordance with applicable permits and therefore no impacts are anticipated.

4.2.2 Wetlands and Waterways

Key findings of impacts of the Program as they relate to wetland resources are summarized below. **Table 4.2-2** provides a summary of wetland impacts by municipality for each DEIR Alternative.

- There would be no permanent impacts to state-regulated BVW or federally jurisdictional vegetated wetlands (VW) due Program construction or operation.
- Program construction would require temporary impacts to BVW and VW at the Fernald Property due to a dewatering discharge pipe and at American Legion for a pipeline connection to the existing water supply infrastructure. The affected wetland areas would be restored within the same footprint after installation of the pipelines.
- The Program would require permanent impacts to state-regulated wetland resources within Riverfront Areas (RA), 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 upon completion of construction.
- There would be temporary impacts to RA 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. The impacted areas would be restored and revegetated upon completion of construction
- The Program would require impacts to Bordering Land Subject to Flooding (BLSF) for rip rap splash pads at dewatering discharge locations (Tandem Trailer or Bifurcation and Highland Avenue), depending on the DEIR Alternative. Compensatory flood storage volume would be provided at appropriate elevations within the same floodplains.
- During construction, there would be the potential for wetlands and surface waters on or adjacent to construction sites to be impacted by erosion and sedimentation from disturbed areas. Implementation of appropriate Best Management Practices (BMPs) in accordance with the Stormwater Pollution Prevention Plan (SWPPP) to be prepared by the contractors under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) would avoid and minimize wetland and surface water impacts.
- During construction, there would be the potential for water quality in surface waters to be impacted by pollutants in tunnel dewatering discharges and in discharges related to tunnel cleaning, disinfection, and flushing. 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 Program. These standards and requirements would be included in contract documents so that construction-period discharges would not adversely impact surface water quality.
- During construction, there would be the potential for groundwater drawdown due to tunnel inflows to temporarily impact water levels in surface waters and wells. Grouting of water-bearing rock features in advance of the tunnel boring machine (TBM) excavation activities and after its passage would reduce groundwater inflows to avoid and minimize impacts of groundwater drawdown. If

necessary, alternative water supplies would be provided as described in the Water Supply Contingency Plan in Appendix J.

- No impacts to surface or groundwater resources would be anticipated in the Final Conditions.
- 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 in accordance with the Stormwater Management Standards.
- Groundwater withdrawal volumes associated with dewatering are estimated to vary between less than 100,000 GPD up to an estimated 8 MGD, triggering the need for a WM03 Water Management Withdrawal Permit.
- No impacts to water quality are anticipated in the Final Conditions. Stormwater runoff from impervious surfaces at launching and receiving shaft sites and connection and isolation valve sites would be treated and managed in accordance with the MassDEP Stormwater Management Standards.

Table 4.2-2 Summary of Wetland Impacts by Municipality

Sites by Municipality	Resource Area(s) Affected	Alternative 3			Alternative 4			Alternative 10		
		Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)
Waltham										
Fernald Property	BVW/VW (sf)	116	0	116	116	0	116	116	0	116
	Bank (lf)	8	11	19	8	11	19	8	11	19
	LUW/WW (sf)	289	91	380	289	91	380	289	91	380
	RA (sf)	115,352	12,310	127,662	115,352	12,310	127,662	115,352	12,310	127,662
School Street	None	0	0	0	0	0	0	0	0	0
Cedarwood Pumping Station	None	0	0	0	0	0	0	0	0	0
SUBTOTAL WALTHAM	**BVW/VW (sf)**	**116**	**0**	**116**	**116**	**0**	**116**	**116**	**0**	**116**
	Bank (lf)	**8**	**11**	**19**	**8**	**11**	**19**	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**	**289**	**91**	**380**	**289**	**91**	**380**
	RA (sf)	**115,352**	**12,310**	**127,662**	**115,352**	**12,310**	**127,662**	**115,352**	**12,310**	**127,662**

Table 4.2-2 Summary of Wetland Impacts by Municipality

Sites by Municipality	Resource Area(s) Affected	Alternative 3			Alternative 4			Alternative 10		
		Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)
Weston										
Tandem Trailer/ Park Road East	Bank (lf)	8	26	34	8	26	34	0	0	0
	BLSF (sf)	300	368	300	618	0	300	0	0	0
	LUW/WW (sf)	652	368	1,020	652	368	1,020	0	0	0
	RA (sf)	105,722	1,685	107,407	105,722	1,685	107,407	0	0	0
Bifurcation	Bank (lf)	8	26	34	0	0	0	0	0	0
	BLSF (sf)	250	368	618	0	0	0	0	0	0
	RA (sf)	33,987	0	33,987	0	0	0	0	0	0
	LUW/WW (sf)	652	368	1,020	0	0	0	0	0	0
Park Road West	None	0	0	0	0	0	0	0	0	0
Hultman Aqueduct Isolation Valve	RA (sf)	7,837	2,989	10,826	7,837	2,989	10,826	7,837	2,989	10,826
SUBTOTAL WESTON	**Bank (sf)**	**8**	**26**	**34**	**8**	**26**	**34**	**0**	**0**	**0**
	BLSF (lf)	**550**	**736**	**1,286**	**300**	**368**	**668**	**0**	**0**	**0**
	LUW/WW (sf)	**1,304**	**736**	**2,040**	**652**	**368**	**1,020**	**0**	**0**	**0**
	RA (sf)	**147,546**	**4,674**	**152,220**	**113,559**	**4,674**	**118,233**	**7,837**	**2,989**	**10,826**
Wellesley										
Hegarty Pumping Station	RA (sf)	5,757	157	5,914	5,757	157	5,914	5,757	157	5,914
SUBTOTAL WELLESLEY	**RA (sf)**	**5,757**	**157**	**5,914**	**5,757**	**157**	**5,914**	**5,757**	**157**	**5,914**

Table 4.2-2 Summary of Wetland Impacts by Municipality

Sites by Municipality	Resource Area(s) Affected	Alternative 3			Alternative 4			Alternative 10		
		Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)
Needham										
Highland Avenue Sites	Bank (lf)	8	26	34	8	26	34	8	36	44
	BLSF (sf)	1,340	660	2,000	1,340	660	2,000	1,340	660	2,000
	LUW/WW (sf)	652	368	1,020	652	368	1,020	1,034	726	1,760
	RA (sf)	4,322	0	4,322	4,322	0	4,322	4,322	0	4,322
St. Mary Street Pumping Station	None	0	0	0	0	0	0	0	0	0
SUBTOTAL NEEDHAM	**Bank (lf)**	**8**	**26**	**34**	**8**	**26**	**34**	**8**	**36**	**44**
	BLSF (sf)	**1,340**	**660**	**2,000**	**1,340**	**660**	**2,000**	**1,340**	**660**	**2,000**
	LUW/WW (sf)	**652**	**368**	**1,020**	**652**	**368**	**1,020**	**1,034**	**726**	**1,760**
	RA (sf)	**4,322**	**0**	**4,322**	**4,322**	**0**	**4,322**	**4,322**	**0**	**4,322**
Brookline										
Newton Street Pumping	None	0	0	0	0	0	0	0	0	0
SUBTOTAL BROOKLINE	**None**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 4.2-2 Summary of Wetland Impacts by Municipality

Sites by Municipality	Resource Area(s) Affected	Alternative 3			Alternative 4			Alternative 10		
		Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)	Temporary Impacts (sf/lf)	Permanent Impacts (sf/lf)	Total Impacts (sf/lf)
Boston										
American Legion	BVW/VW (sf)	1,558	0	1,558	1,558	0	1,558	1,558	0	1,558
	Bank (lf)	8	11	19	8	11	19	8	11	19
	LUW/WW (sf)	289	91	380	289	91	380	289	91	380
	RA (sf)	845	0	845	845	0	845	845	0	845
Southern Spine Mains	None	0	0	0	0	0	0	0	0	0
SUBTOTAL BOSTON	**BVW/VW (sf)**	**1,558**	**0**	**1,558**	**1,558**	**0**	**1,558**	**1,558**	**0**	**1,558**
	Bank (lf)	**8**	**11**	**19**	**8**	**11**	**19**	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**	**289**	**91**	**380**	**289**	**91**	**380**
	RA (sf)	**845**	**0**	**845**	**845**	**0**	**845**	**845**	**0**	**845**
GRAND TOTAL FOR ALTERNATIVE	**BVW/VW (sf)**	**1,674**	**0**	**1,674**	**1,674**	**0**	**1,674**	**1,674**	**0**	**1,674**
	Bank (sf)	**32**	**74**	**106**	**32**	**74**	**106**	**24**	**58**	**82**
	BLSF (sf)	**1,890**	**1,396**	**3,286**	**1,640**	**1,028**	**2,668**	**1,340**	**660**	**2,000**
	LUW/WW (sf)	**2,534**	**1,286**	**3,820**	**1,882**	**918**	**2,800**	**1,612**	**908**	**2,520**
	RA (sf)	**273,822**	**17,141**	**290,963**	**239,835**	**17,141**	**256,976**	**134,113**	**15,456**	**149,569**

RA – Riverfront Area, BLSF – Bordering Land Subject to Flooding, BVW – Bordering Vegetated Wetlands, VW – Vegetated Wetlands, LUW/WW- Land Under Waterbodies and Waterways.

4.2.3 Cultural and Historic Resources

Key findings of the section on impacts of the Program as they relate to cultural and historic resources are listed below.

- The only listed or eligible property that would be expected to be impacted by permanent direct adverse effects related to the Program is the Walter E. Fernald State School (WLT.AB). Three buildings that contribute to the significance of the district (along with three to five noncontributing buildings) are proposed for demolition. The contributing buildings—a stucco shed (ca. 1920; WLT.742), a barn foundation (ca. 1900; WLT.927), and a woodshed (ca. 1920; no assigned Massachusetts Historical Commission [MHC] number)—are located at the southern perimeter of the campus, distant from its historic core.
- There are no anticipated construction period impacts to any of the listed or eligible properties within the Area of Potential Effects (APE).
- No permanent indirect adverse effects would be expected at any of the listed or eligible properties.
- Gray & Pape, Inc. completed an archaeological assessment of launching, receiving, connection, and isolation valve sites associated with the Program. The assessment used historical and archaeological research and walkover surveys to understand the history of land use and existing conditions at each site. Due to extensive landscape disturbance at each site, the assessment concluded that none of the sites were archaeologically sensitive and recommended no further archaeological investigation. The Authority will prepare an Inadvertent Discovery Plan, should there be an unanticipated finding of archaeological resources during construction. The MHC will review the report results and concur with the findings or request additional information.

4.2.4 Hazardous Materials, Materials Handling, and Recycling

Key findings on impacts of the Program as they relate to hazardous materials, materials handling, and recycling are listed below. A summary table of the existing conditions at each respective DEIR Alternative site, and the associated impacts, is provided in **Table 4.2-3**.

- The Program would likely have a positive effect on confirmed areas of soil and groundwater contamination within the Program Study Area, since environmental media (i.e., soil and groundwater) that would otherwise remain undisturbed would be appropriately managed to minimize exposures to surrounding receptors.
- Reuse of as much excavated soil as possible, including impacted soil with concentrations below the applicable Massachusetts Contingency Plan (MCP) standards, would be the preferred option and would limit the impacts associated with off-site disposal, including vehicle emissions and fuel consumption.
- Remediation of soil that cannot be reused would most likely consist of soil excavation and off-site disposal at approved and licensed sites to be identified by the contractor.

Table 4.2-3 Summary of Hazardous Materials Existing Site Conditions and Construction Period Impacts by Site

Proposed Site	Alternative	Existing Conditions		Construction Period Impacts	
		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 and Receiving Sites					
Fernald Property	All	10	9	Yes	Yes
Tandem Trailer and Park Road East	3 and 4	3	1	No	Yes
Bifurcation Site	3	5	3	Yes	Yes
Park Road West (Receiving Site and Large Connection Site)	4 and 10	2	0	No	No
Highland Avenue Northwest Site	3	7	5	Yes	Yes
Highland Avenue Northwest/Southwest Site	4 and 10	8	6	Yes	Yes
Highland Avenue Northeast/Southeast Site	All	5	4	Yes	Yes
American Legion	All	0	0	No	No
Connection 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.

4.2.5 Land Use

Key findings on impacts of the Program as they relate to Land Use are listed below. **Table 4.2-4** provides a summary comparison of the land use characteristics associated with the three DEIR Alternatives, including the proposed change in impervious surface compared to existing conditions, temporary construction area limits of disturbance (LOD), permanent easements or land acquisition, and estimated Article 97 land disposition anticipated to be required.

- Proposed shaft chambers and connecting pipelines would be underground structures.
- Proposed sites would be located on state- or municipality-owned land.
- The relocation of residential units would not be required, and proposed sites would be located away from residential uses and protected and recreational open spaces, to the extent feasible.
- Permanent above-ground features, such as concrete slabs and concrete vaults or top of shafts, would not extend more than 3 feet above finished grade.
- Areas temporarily disturbed during construction would be restored to pre-construction conditions and landscaping would be restored.
- The Program may require the removal of public shade trees as defined in Massachusetts General Law Chapter 87; potential public shade trees will be identified pending advancement of site design and 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 the necessary requirements for public hearings and public notification in accordance with Chapter 87, as well as Chapter 40, Section 15C (the "Scenic Roads Act"), where applicable.
- Trees removed during construction would be replaced where required and as appropriate. Fencing and proper signage would be installed surrounding shaft areas, where appropriate.

Existing protected open space areas protected by Article 97 of the Article of Amendment to the Constitution of the Commonwealth of Massachusetts (Article 97) through EEA Article 97 Land Disposition Policy[2] would be avoided to the greatest extent practicable. Three sites may require the disposition of land protected under Article 97:[3]

- The Hegarty Pumping Station (Ouellet Park) (Article 97 status to be determined)
- Southern Spine Mains (Southwest Corridor Park/Arborway I)
- The American Legion (Morton Street Property)

Three additional sites have resources that are protected under Article 97 but 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 the MWRA:

2 Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Article 97 Land Disposition Policy, February 19, 1998.

3 Per the Article 97 Land Disposition Policy, "an Article 97 land disposition is defined as a) any transfer or conveyance of ownership or other interests; b) any change in physical or legal control; and c) any change in use, in and to Article 97 land or interests in Article 97 land owned or held by the Commonwealth or its political subdivisions, whether by deed, easement, lease or any other instrument effectuating such transfer, conveyance or change."

- Park Road East (Hultman Aqueduct)
- Bifurcation launching site (Hultman Aqueduct)
- St. Mary Street Pumping Station connection site (Sudbury Aqueduct)

For more on Article 97, see **Section 4.2.9**.

Table 4.2-4 Summary Comparison of Land Use Impacts by Alternative

Land Use Characteristics	Alternative 3	Alternative 4	Alternative 10
Proposed change in impervious surface cover	2.7 acres	2.4 acres	2.3 acres
Estimated total temporary construction area limits of disturbance	46 acres	40 acres	34 acres
Estimated permanent easements or land acquisition required to support the shaft and valve chambers (excluding the tunnel alignment, access and pipeline easements, and existing MWRA-owned lands or lands with an existing MWRA easement)	Minimum of 9	Minimum of 9	Minimum of 7
Estimated total permanent easement or acquisition area (excluding the underground tunnel alignment and excluding existing MWRA-owned lands or lands with an existing MWRA easement)	11 acres	11 acres	10 acres
Total shaft sites	13	13	12
Total launching, receiving, and large connection sites	6	6	5
Total connection and isolation valve sites	7	7	7
Article 97 Properties (not under the care, custody, and control of the MWRA) within construction area limits of disturbance (LOD)	3 Ouellet Park (within Hegarty Pumping Station site), Southwest Corridor Park/Arborway I (within Southern Spine Mains site), and Morton Street Property (within American Legion site)	3 Ouellet Park (within Hegarty Pumping Station site), Southwest Corridor Park/Arborway I (within Southern Spine Mains site), and Morton Street Property (within American Legion site)	3 Ouellet Park (within Hegarty Pumping Station site), Southwest Corridor Park/Arborway I (within Southern Spine Mains site), and Morton Street Property (within American Legion site)
Estimated Article 97 land disposition area within the proposed Hegarty Pumping Station site (Ouellet Park under care, custody, control of the Town of Wellesley [Article 97 status TBD]), Southern Spine Mains site (Southwest Corridor Park/Arborway I under care, custody, control of the Commonwealth of Massachusetts Department of Conservation and Recreation (DCR)), and American Legion site (Morton Street Property under care, custody, control of the DCR)	3.8 acres (0.1 acres of Ouellet Park, 0.2 acres of Southwest Corridor Park, and 3.5 acres of the Morton Street Property)	3.8 acres (0.1 acres of Ouellet Park, 0.2 acres of Southwest Corridor Park, and 3.5 acres of the Morton Street Property)	3.8 acres (0.1 acres of Ouellet Park, 0.2 acres of Southwest Corridor Park, and 3.5 acres of the Morton Street Property)

4.2.6 Transportation

Key findings on impacts of the Program as they relate to transportation are listed below. Average daily truck trips and worker trips were calculated for each alternative and are summarized in **Table 4.2-5**.

- 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; sensitive receptors, defined as properties/locations that may be impacted by construction of the Program, 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.
- Truck trips are defined as heavy vehicle trips to and from the sites for activities such as hauling muck or transporting construction equipment. Construction worker trips represent workers traveling to and from the sites for their work shifts.
- For the DEIR 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 end of their workday shifts.
- 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 therefore not expected to cause a significant traffic impact to nearby local roadways.
- Surface piping would be required at many of the shaft sites. Construction of these 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. Work at these locations could require short-term detours along roadways functionally classified as arterials. Where possible, trenchless construction methods will be used.
- All other surface piping locations are anticipated to result in low or moderate traffic impacts.
- 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 the additional traffic due to construction may increase the 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.
- The schedule and methodology assumptions are based on a conservative approach to construction means and methods, use of construction equipment and associated impacts. The actual timing of activities and equipment selected by the successful contractor may vary but should not exceed the impacts presented herein.

Table 4.2-5 Summary of Maximum Daily Truck Trips and Construction Worker Trips

	Alternative 3	Alternative 4	Alternative 10
Maximum expected overall number of daily truck trips of one quarter of a year considering all sites	402	408	312
Sites most heavily impacted by construction activities (quantity and duration)	Highland Avenue Northeast (156 truck trips per day for seven quarters) and Tandem Trailer sites (156 truck trips per day for five quarters)	Highland Avenue Northwest (158 truck trips per day for three quarters) Highland Avenue Northeast (156 truck tips per day for seven quarters) and Tandem Trailer sites (156 truck trips per day for five quarters)	Highland Avenue Northeast (156 truck trips per day for seven quarters) and Tandem Trailer sites (156 truck trips per day for nine quarters)
Sites with most construction worker trips and truck trips	126 construction worker trips (63 arriving, 63 departing) and 20 truck trips (10 arriving and 10 departing) are expected to be generated by each of the Tandem Trailer, Bifurcation, and Highland Avenue Northeast sites during the evening peak hour	126 construction worker trips (63 arriving, 63 departing) and 20 truck trips (10 arriving and 10 departing) are expected to be generated by each of the Tandem Trailer, Highland Avenue Northeast, and Highland Avenue Northwest sites during the evening peak hour	126 construction worker trips (63 arriving, 63 departing) and 20 truck trips (10 arriving and 10 departing) are expected to be generated by each of the Highland Avenue Northeast and Highland Avenue Northwest sites during the evening peak hour.
Study intersections most heavily impacted by truck trips and construction worker trips	Intersection of River Road and South Avenue (Weston): additional 168 trips in the evening peak hour (2,800 existing trips) Intersection of I-95 NB off-ramp at South Avenue and Park Road at South Avenue (Weston): 146 additional trips during the evening peak hour (2.500 existing trips)	Intersection of River Road and South Avenue (Weston): additional 227 trips in the evening peak hour (2,800 existing trips)	The intersection of South Street at Weston Street (Waltham): 66 trips during the evening peak hour (1,400 existing trips)

4.2.7 Air Quality and Greenhouse Gases

Key findings on impacts of the Program as they relate to air quality and greenhouse gases (GHGs) are listed below. Average daily truck trips and worker trips were calculated for each alternative, along with construction equipment use and emissions of NOx, VOC, and GHG were estimated. The emission totals are summarized in **Table 4.2-6**.

- Construction period emissions were quantified using guidelines from the MEPA GHG Policy, Massachusetts Department of Environmental Protection (MassDEP) guidance, and emissions models from the U.S. Environmental Protection Agency (USEPA). Emissions were quantified for off-road construction equipment, construction trucks, and construction employee trips. Construction emissions were quantified by location and time based on currently estimated schedules and equipment lists planned for the Program.

- Emissions in the peak year for each alternative are expected to be similar in intensity, although they would occur at different timeframes during construction among the three DEIR Alternatives.
- Emissions from all DEIR Alternatives are not expected to be significantly different from each other and would generally occur from a variety of geographically diverse sites, limiting potential impacts.
- Based on emissions levels, locations, and timeframe, criteria pollutant air quality impacts for all alternatives are expected to be relatively minor, and well below state and federal air quality impact thresholds. Mitigation measures, as described in **Section 4.11.7**, will also be implemented to reduce emissions.

Table 4.2-6 Summary of Peak Rolling 12-Month Emissions (tons/year)

Alternative	NO_x Emissions	VOC Emissions	GHG Emissions
Alternative 3	33.8	2.5	6,287
Alternative 4	33.8	2.5	6,286
Alternative 10	33.4	2.6	6,150

Based on currently estimated construction schedule, phasing, and equipment needs.

4.2.8 Noise and Vibration

Key findings on impacts of the Program as they relate to noise and vibration are listed below. **Table 4.2-7** summarizes whether construction noise levels would occur and potentially exceed tolerance levels prior to mitigation during the daytime and/or nighttime at each Program site for each DEIR Alternative.

- Construction period noise and vibration effects were evaluated using guidance from the Federal Transit Administration's (FTA) "Transit Noise and Vibration Impact Assessment Manual" (FTA, 2018).
- The construction noise and vibration impact assessment included similar construction activities at the sites for all three DEIR Alternatives. The additional traffic due to construction activities would not substantially increase traffic noise compared to existing conditions. A doubling of traffic volumes is necessary to cause a 3-decibel increase in noise; a 3-decibel increase in noise is generally the smallest change in noise that humans can perceive. Since the additional traffic due to construction activities would not double the existing traffic, there would be no noise impact due to mobile construction sources.
- The construction activities involve equipment such as excavators, cranes, bulldozers, front-end loaders, and air compressors. Equipment on site would be similar regardless of the type of site; as such construction noise emissions would be similar across all construction sites even though the tunnel shaft construction methods would vary.
- 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, it has been assumed a worst-case condition where there would be three construction shifts at

construction shafts: one from the morning to the afternoon, one from the afternoon to evening, and one from the evening to the night, work at the connection shafts will be only performed during one shift (from the morning to the afternoon). The evening to night shift typically would not include truck traffic or equipment hauling and would be characterized by ventilation and pumping activities. Construction noise levels would typically range as follows:

  - During the first shift of construction (daytime) maximum noise levels would range from 45 to 84 dBA[4] (Leq[5]) at the closest noise receptors.
  - During the second shift (afternoon/evening), maximum construction noise levels would typically range from 37 to 78 dBA (Leq) at the closest noise receptors since a subset of construction equipment would be used.
  - During the third shift (evening/night), maximum construction noise levels would typically range from 28 to 70 dBA (Leq) at the closest noise receptors, due to the operation of the shaft/tunnel pump system and ventilation fans.
  - Over a typical 24-hour period, construction noise emissions would range from 86 to 96 dBA (Ldn) at 50 feet.

- Prior to mitigation, five of the connection sites would exceed the U.S. Housing and Urban Development (HUD) or MassDEP noise limits, for all three DEIR Alternatives.
- 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 vibration allowed to minimize the potential for impact due to human annoyance or any 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 Regulation (527 CMR 13.00) to minimize the risk of impact due to structural damage or the risk adversely impacting architectural feature of surrounding building. As such, no vibration impacts are anticipated as a result of the construction activities at the sites for the three DEIR Alternatives, however the contract documents will require installation of monitoring instruments and limits for vibration to ensure all construction activities are within the anticipated limits.
- As a state authority, the MWRA is not required to comply with state agency or municipal noise ordinances; however, the Authority will seek to minimize noise and vibration impacts to comply with state and municipal ordinances to the extent that is feasible and practicable.

4 A-weighted sound levels are used to assess community noise impacts since they approximate the way humans hear sound.

5 The Leq sound level is a single value that represents the same acoustic energy as the fluctuating levels that exist over a given period of time.

Table 4.2-7 Summary of Noise and Vibration Impacts by Site and Alternative – Prior to Mitigation

Program Site	Town/City	Alternative 3	Alternative 4	Alternative 10
Launching and Receiving Sites				
Fernald Property (Receiving)[1]	Waltham	No Anticipated Impact	No Anticipated Impact	No Anticipated Impact
Tandem Trailer/Park Road East (Launching)	Weston	**Day**	**Day**	N/A
Bifurcation (Launching)	Weston	No Anticipated Impact	N/A	N/A
Park Road West (Large Connection)	Weston	N/A	No Anticipated Impact	No Anticipated Impact
Highland Avenue Northwest/Southwest (Launching)	Needham	No Anticipated Impact	No Anticipated Impact	No Anticipated Impact
Highland Avenue Northeast/ Southeast (Launching)	Needham	No Anticipated Impact	No Anticipated Impact	No Anticipated Impact
American Legion (Receiving)	Boston	**Day**	**Day**	**Day**
Connection and Isolation Valve Sites				
School Street	Waltham	**Day**	**Day**	**Day**
Cedarwood Pumping Station	Waltham	**Day**	**Day**	**Day**
Hegarty Pumping Station	Wellesley	**Day**	**Day**	**Day**
St. Mary Street Pumping Station	Needham	**Day**	**Day**	**Day**
Newton Street Pumping Station	Brookline	**Day**	**Day**	**Day**
Southern Spine Mains	Boston	No Anticipated Impact	No Anticipated Impact	No Anticipated Impact
Hultman Aqueduct Isolation Valve	Weston	No Anticipated Impact	No Anticipated Impact	No Anticipated Impact

1 Work at receiving locations and connection sites would not be 24/7

4.2.9 Community Resources and Open Space

Key findings on impacts of the Program as they relate to community resources and open space are summarized below:

- Construction period impacts on community resources and open space within the Study Area of sites are due to changes in traffic, air quality and GHG emissions, and noise as described in respective sections.
- Construction period and permanent impacts would result from the use of open space for launching, receiving, connection, and isolation valve sites. Some of these sites are protected under the EEA Article 97 Land Disposition Policy. Sites located on land protected by Article 97 would require a two-thirds vote by the state legislature for the disposition to occur after the Authority has proven there is no other alternative to using this site and identified compensatory land. Sites with open space or community resources impacted by the Program are listed in **Table 4.2-8**.

Table 4.2-8 Required Easements or Land Acquisition of Community Resources and Open Space

Site- Location	Open Space/ Community Resource Name	Open Space/ Community Resource Owner	Temporary Easement Area/ Construction Area Limits of Disturbance (acres)	Permanent Easement or Acquisition Area (acres)	Article 97 Protection
Launching and Receiving Sites					
Fernald Property- Waltham	Fernald Property	City of Waltham	4.5	3.1 easement	No
American Legion- Boston	Morton Street	Commonwealth of Massachusetts under care, custody, control of DCR	3.5	2.0 easement, 1.5 acquisition	Yes
Connection and Isolation Valve Sites					
Southern Spine Mains- Boston	Southwest Corridor Park/ Arborway I	Commonwealth of Massachusetts under care, custody, control of DCR	0.5	0.2 acquisition	Yes
Hegarty Pumping Station- Wellesley	Ouellet Park	Town of Wellesley	0.3	0.1 acquisition	TBD

Additionally, is assumed that subsurface easements would be needed for properties protected by Article 97 that the tunnel alignment travels underneath. The subsurface easement would not extend to the land surface. These easements are not anticipated to require Article 97 land dispositions but would still need a two-thirds vote of the Massachusetts State Legislature. The properties assumed to be protected by Article 97 that are located within an approximately 1,000-foot-wide corridor centered around the preliminary tunnel alignment (subject to final design) are summarized **Table 4.2-9**.

Table 4.2-9 Potential Article 97 Properties Along Preliminary Tunnel Alignment Requiring Easements by Alternative

Property Name	Location	Property Owner/ Maintainer (if applicable)	Alternative 3	Alternative 4	Alternative 10
Cornelia Warren Field	Waltham	City of Waltham	X	N/A	X
Waltham Agricultural Fields	Waltham	City of Waltham	X	X	X
Thompson Playground (Article 97 status unknown)	Waltham	City of Waltham	X	X	X
Bobby Connors Playground	Waltham	City of Waltham	X	X	X
Charles River Reservation I	Waltham, Weston	Commonwealth of Massachusetts/DCR	X	X	X
City of Cambridge Water (Article 97 status unknown)	Weston	City of Cambridge	X	X	X
River Road	Weston	Town of Weston	X	X	X
Summer Road	Weston	Town of Weston	X	X	X

Table 4.2-9 Potential Article 97 Properties Along Preliminary Tunnel Alignment Requiring Easements by Alternative

Property Name	Location	Property Owner/ Maintainer (if applicable)	Alternative 3	Alternative 4	Alternative 10
River Street	Weston	Town of Weston	X	X	X
Loring Road Covered Tanks	Weston	Commonwealth of Massachusetts/ MWRA	X	X	X
Doublet Hill Conservation Area	Weston	Town of Weston	N/A	N/A	X
Fitzgerald Well	Weston	Town of Weston	X	X	N/A
Hultman Aqueduct	Weston	Commonwealth of Massachusetts/ MWRA	X	X	X
Nickerson Well	Weston	Town of Weston	X	N/A	N/A
Leo J. Martin Memorial Golf Course	Weston, Newton	City of Newton	X	X	X
Hamilton Park/Lower Falls Playground (Article 97 status unknown)	Newton	City of Newton	X	X	X
Charles River Reservation II	Wellesley, Newton	Commonwealth of Massachusetts/DCR	X	X	X
Cochituate Aqueduct Trail	Wellesley	Town of Wellesley	X	X	X
Schofield Tennis Courts	Wellesley	Town of Wellesley	N/A	X	X
Ouellet Park	Wellesley	Town of Wellesley	X	X	X
Wellesley Water Supply Land	Wellesley	Town of Wellesley	X	X	X
Hurd Brook CR (Article 97 status unknown)	Newton	Sun Life Assurance Company of Canada	X	X	X
Sudbury Aqueduct	Needham	Commonwealth of Massachusetts/DCR	X	X	X
Chester F Mills Field (Article 97 status unknown)	Needham	Town of Needham	X	X	X
Riverside Terrace (Article 97 status unknown)	Needham	Town of Needham	X	X	X
Charles River Reservation III	Newton	Commonwealth of Massachusetts/DCR	X	X	X
Goddard Christina Conservation Area	Newton	City of Newton	X	X	X
Nahanton Park (Article 97 status unknown)	Newton	City of Newton	X	X	X
Gables Condominium CR (Article 97 status unknown)	Newton	Green Company Inc.	X	X	X
Baldpate Meadow	Newton	City of Newton	X	X	X
Skyline Park (Article 97 status unknown)	Brookline	Town of Brookline	X	X	X
Robert T. Lynch Memorial Golf Course	Brookline	Town of Brookline	X	X	X

Table 4.2-9 Potential Article 97 Properties Along Preliminary Tunnel Alignment Requiring Easements by Alternative

Property Name	Location	Property Owner/ Maintainer (if applicable)	Alternative 3	Alternative 4	Alternative 10
Newton Street Parcel	Brookline	Town of Brookline	X	X	X
Arnold Arboretum	Boston	City of Boston	X	X	X
Arborway	Boston	Commonwealth of Massachusetts/DCR	X	X	X
Southwest Corridor Park	Boston	Commonwealth of Massachusetts/DCR and MBTA	X	X	X
Total			**34**	**33**	**34**

" Article 97 status unknown" indicates the Article 97 status of the property was listed as unknown by MassGIS and deed research. As design progresses, the properties listed unknown along the alignment will be confirmed through coordination with the appropriate agencies and municipalities.

CR - Conservation Restriction

DCR - Department of Conservation and Recreation

MBTA - Massachusetts Bay Transportation Authority

4.3 Analysis Conditions

The impact analysis for this DEIR considers Existing Conditions, the anticipated construction period, and the Final Condition to set the context for the Program.

4.3.1 Program Construction Schedule Assumptions

The Metropolitan Water Tunnel Program is in the early phases of preliminary design. Construction packaging and phasing (i.e., which tunnel segment is constructed first) will be determined as the Program advances through the design phase. 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 DEIR impact assessment is based on conservative (i.e., worst case, most impactful) construction sequencing. Durations of construction activities and equipment usage were estimated to occur concurrently, resulting in conservative (higher) peak cumulative impacts that were assessed.

To identify potential peak cumulative impacts, estimates of equipment usage and worker activities were identified on a quarterly basis for the duration of the construction activities. These conservative assumptions include:

- Construction of the launching and receiving shaft sites would occur at the same time and not sequentially.
- All connection shaft sites would be constructed at the same time.
- All surface piping connections would be constructed at the same time.

It is important, however, to note the following:

- 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.
- It is highly unlikely that the assumed concurrent activities would happen at the same time in all instances. Rather, the peak periods would likely be distributed with lesser degrees of impact over a longer duration.
- It is also highly unlikely that the activities would occur during the exact year or quarter projected for the cumulative impact analysis. These would vary based on construction packaging and sequencing within a construction package.

In addition to sequencing and timing of activities, a conservative approach was chosen for finished tunnel diameter. The tunnel diameter will be finalized through the design phase and will be no smaller than 10 feet and no larger than 12 feet, with an assumed bored diameter up to 15 feet. This DEIR impact assessment is based on conservative assumptions of either 10-foot or 12-foot diameter depending on the impact being assessed. For example, a 15-foot bored diameter with a 10-foot finished diameter is a conservative estimate for trucking and concrete operations. A 12-foot finished diameter is conservative to estimate the water volumes that need to be handled for disinfection and flushing and the associated discharge estimates to receiving waters.

The MWRA is committed to maintaining an open dialogue with municipal stakeholders and residents as design is advanced and it is expected that coordination of temporary construction impacts would be ongoing through design and construction. As demonstrated in **Section 4.2, Summary of Findings**, the analysis shows that even at peak periods, impacts are not significant and would be possible to mitigate.

4.3.2 Analysis Periods

Program construction is estimated to take approximately 8 to 12 years and is planned to occur over the 2027 to 2040 timeframe. The Authority expects that the proposed new deep rock tunnel system will be placed into service by or around 2040 and that the system will have a useful life of more than 100 years. The completion of each Program Element will depend on its construction phasing and packaging. For the purposes of the DEIR assessment, the following analysis periods were assumed:

Existing Conditions – current conditions as determined through readily available data and site visits in 2020 through 2022

Construction Period Conditions – estimated period of construction of 8 to 12 years beginning as early as 2027; specific construction activity would vary depending on the location

Final Condition – completion of final condition varies depending on location; water supply tunnel is commissioned and in operation around 2040

The anticipated duration of construction of activities at each stage of the process is provided in the introduction to **Section 4.4.9, Construction Activity Durations**.

4.4 Construction Methodology

This narrative describes the various steps to construct the new tunnel and associated surface connections. With some noted exceptions, this narrative is oriented towards the general activities associated with constructing any of the alternatives. The schedule and methodology assumptions are based on a conservative approach to construction means and methods, use of construction equipment, and associated impacts. The narratives below provide a general listing of typical construction equipment that may be present for the anticipated work. The exact means and methods will be selected by the contractor. The actual timing of activities may vary but should not exceed the anticipated impacts presented herein. Additional information regarding the assumptions underpinning the DEIR analysis are listed in **Chapter 4, Section 4.3, Analysis Conditions.**

4.4.1 Site Access Control, Site Preparation, Tree Clearing & Installation of Erosion Control Measures

The first activity for any site would be mobilization to the site by the contractor. All construction sites would be enclosed with temporary chain link fence to provide a clear delineation of construction areas, prevent trespassing, and enhance safety of the general public. Suitable signage and lockable gates would identify the project, warn against unauthorized access, and provide access to adjacent public roadways. Where practical, roadways on site would be laid out to minimize the need for vehicles to reverse or back out onto public ways.

Site preparation activities would include installation of erosion-control measures, as described in the NPDES Stormwater Pollution Prevention Plan, which would be prepared by the contractor prior to construction. Installation of the erosion-control measures would include limited vegetation clearing within the construction area. Upon installation of the erosion-control measures, additional clearing of trees and shrubs would be completed within the limits of the staging area, as designated on the construction plans that would be developed during final design. Some regrading activities to establish flat areas for storage of supplies and equipment, and for directing runoff to the appropriate areas for management, would occur. Certain areas (such as unimpacted jurisdictional wetlands) would be off limits for clearing and would be cordoned off to prevent impacts, but most of the designated construction areas would be disturbed for each site. Similar provisions would be included for cultural, historical, or other types of resources, as necessary for impact avoidance.

Other activities at this stage would include the installation of site trailers, temporary utilities, and parking areas. Typical construction equipment for these activities would include a bulldozer, an excavator, and dump trucks.

4.4.2 Shaft Excavation

Construction for the tunnel program includes two types of shafts—construction shafts that facilitate the launching and receiving activities associated with tunnel excavation, including TBM activities, drilling, and blasting operations and tunnel egress, and smaller-diameter connection shafts that facilitate connections to the existing MWRA water systems and/or local municipal water systems in each community.

Thirteen shafts would be excavated to tunnel level for Alternatives 3 and 4, while 12 such shafts are required for Alternative 10. The shaft excavation method used at each site is a function of the required shaft size, the soil and groundwater conditions at the site, and contractor preferences. For the purposes of this discussion, the shaft excavation methods are grouped into construction shafts, which are anticipated to be 30 to 40 feet inside diameter in rock and slightly larger in overburden (soil above the rock), and smaller-diameter connection shafts, which are anticipated to be 5 to 12 feet inside diameter in rock and slightly larger in overburden.

For all permanent shafts, following completion of tunnel excavation, a permanent mortar-coated steel liner would be installed from tunnel level to ground surface level, and the annular space between the liner and the shaft excavation walls backfilled with a cementitious grout or concrete. The excavated shape and size of the shafts mentioned above and throughout have been assumed to be circular, however the selected shape and size may vary depending on the contractor's preference as circular, elliptical, and rectangular shafts are possible.

4.4.2.1 Launching and Receiving Shafts

Construction shafts would include excavation through the overburden to reach the rock and excavation through the rock to the proposed tunnel elevation. The overburden and rock would require different construction techniques depending on the depth and type of overburden and elevation of the groundwater table.

Excavation in Overburden

At the construction shafts, overburden soils and groundwater will need to be supported during excavation of the shafts to the top of rock. A relatively "watertight" support of excavation (SOE) wall must be installed. In areas where the groundwater table is below the top of rock, a non-watertight SOE option may be possible.

A watertight SOE wall system may consist of a secant pile wall, a slurry wall, or a cutter-soil mix (CSM) wall system, depending on the depth to the top of rock and contractor's preference. The secant pile method of construction is the most likely and is described below; the slurry wall and CSM wall construction impacts would be similar.

A secant pile wall is made up of individual pile columns that interlock to form a continuous wall.

The secant piles would be drilled through the weathered, weaker rock and socketed into competent rock. Once the SOE wall installation is complete, the soil inside the confines of the wall would be dewatered and excavated using conventional excavation equipment (e.g., backhoes, loaders, and clamshell buckets) down to the level of rock.

Excavation in Rock

The rock would be excavated using drill and blast techniques to excavate the rock in short vertical lifts. The shaft excavation diameter in the rock will be several feet smaller in diameter than the overburden excavation diameter. Typically blast holes are drilled using equipment powered hydraulically or by compressed air. The number and location of blast holes and the sequence and timing of detonation would be controlled by the contractor to reduce overbreak and to comply with noise and vibration commitments and permit requirements. Construction contract documents would require implementation of appropriate mitigation measures such as the use of "blast mats" to control fly rock and mitigate noise propagation. Following each blast, the blasted rock would be removed and hoisted to the surface. This process is continued until the shaft reaches the desired tunnel elevation, with excavation material removal by crane and clamshell, a lowered excavator, and excavated material box or other methods as may be selected by the contractor and transported offsite for disposal or reuse.

Groundwater would enter into the shaft primarily through discontinuities in the rock mass or at the soil/rock interface. If necessary to meet contract-stipulated limits of groundwater inflow, the contract may implement grouting of the discontinuities the rock mass for a limited distance from the shaft. The water would be collected in a sump at the bottom of the shaft, pumped to the surface, then treated and disposed of in accordance with the groundwater management plan (see **Chapter 4, Section 4.6, Wetlands and Waterways** and **Chapter 5, Water Supply**).

Typical construction equipment for these activities would include cranes, hydraulic drills, pneumatic rock drills, mechanical splitters, excavators, loaders, bulldozers, dump trucks, vibrating compactors, impact hammers, welders, compressors, concrete trucks, concrete pump trucks, boom trucks, portable compactors, dewatering pumps, generators, settlement tanks, batch plants, grout systems, ventilation support systems, utility trucks, pickup trucks, and other equipment. Typical shift durations would include two shifts 5 days/week for tunnel excavation at launching shafts and one shift 5 days/week for other operations at both the launching and receiving shafts.

4.4.2.2 Connection Shafts

Common to all three alternatives are six smaller diameter connection shafts, which would generally be constructed using conventional excavation methods (e.g., backhoes, loaders and clamshell buckets) to install SOE for the initial excavation through the soil. The rock excavation down to the tunnel elevation would be performed through a drilling operation. There are various methods available, including drilling upward from the tunnel with a raisebore method (bottom-up), drilling downward from the ground surface to the tunnel horizon, controlled drilling and blasting (top-down), and/or a combination of these methods. The use of controlled drilling and blasting is unlikely for the connection shafts with the exception of the large connection shafts at Park Road East and Park Road West.

If the contractor selects a bottom-up construction method, the excavated material and any groundwater inflow originating from discontinuities in the rock would drop to the tunnel level where it would be removed through one of the larger construction shafts, minimizing the amount of excavated material and groundwater removed at the surface at the connection shaft site.

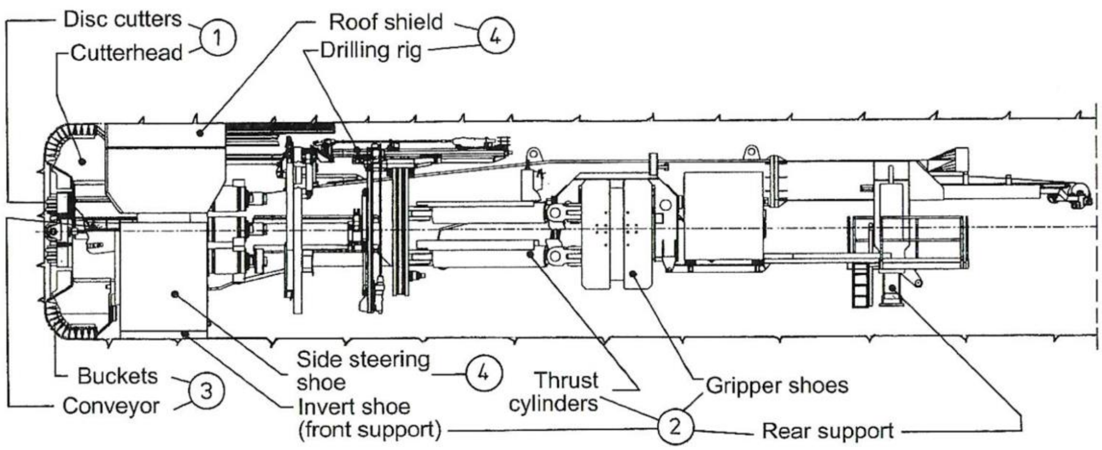
Top-down drilling methods may be needed as a means to advance the shaft through deeper overburden soils and rock. These methods generally include installing a temporary casing through the overburden through various methods (driving, vibration, or auguring) and removing the overburden inside the casing through mechanical means and continuing to advance the casing deeper until it reaches rock. Excavated material from these top-down methods are removed at the surface at the individual connection site. Once the excavation has reached rock, the contractor would either continue to drill through the rock from the top down to the tunnel elevation or revert to the raisebore method described previously. Not all of the construction methods described above would be used at each site, each site will be evaluated individually for suitable conditions as well as the potential impacts to sensitive receptors. Groundwater would be managed at each site as described in **Chapter 4, Section 4.6, Wetlands and Waterways** and **Chapter 5, Water Supply**.

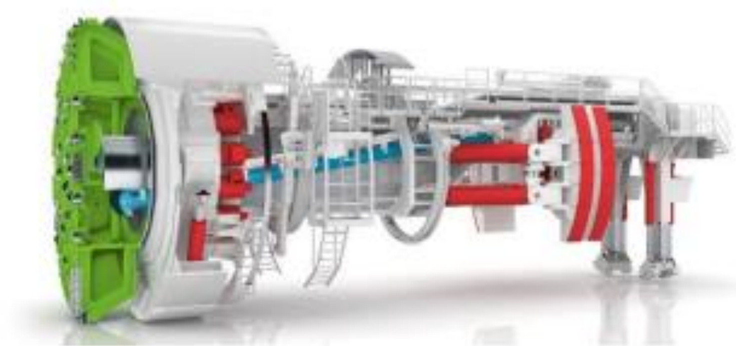
These connection shafts may also be used as additional access points during construction to facilitate other activities, including concrete lining operations, providing additional tunnel ventilation, and providing emergency egress points for workers. Typical construction equipment for these activities would include cranes, hoist, fans, concrete trucks, concrete pump trucks, boom trucks, portable compactors, dewatering pumps, utility trucks, and pickup trucks. Typical shift durations would include one shift 5 days/week for operations at connection shafts.

4.4.3 Tunnel Construction

The tunnels would likely be excavated by electric-powered TBMs for all alternatives. A TBM typically consists of a cutter head (approximately 15 feet in diameter), followed by several hundred feet of trailing gear. Arrangements will be made with the local electric utility company, Eversource, to secure sufficient power supply. **Figure 4.4-1** illustrates a typical TBM used in the tunnel excavation process.

Figure 4.4-1 Components of a Tunnel Boring Machine (TBM)





Both images courtesy of Herrenknect; www.herrenknecht.com

The general sequence of tunnel construction activities is as follows:

1. **Launching Shaft.** A TBM launching shaft would be constructed from the surface (as described above). The size of the shaft, approximately 40 feet in diameter in rock, would allow for the necessary construction staging operations—including TBM delivery, personnel access, excavated material disposal using conveyor belt or excavated material cars, tunnel ventilation, groundwater discharge, lining operations and other construction equipment and material delivery. The shaft site would be enclosed by fencing and a gate at the entrance. The shaft would be open at the surface level to permit materials and workers to enter and exit the tunnel. Cranes and other construction machinery would be located alongside each shaft. The launching shaft is necessary for inserting tunneling equipment and removing the excavated material and groundwater and would also be the location where ventilation fan plants and emergency egress for the tunnel would be located.

   TBM launching shafts proposed for this Program include:

   Alternative 3 – Tandem Trailer site, Bifurcation site, and Highland Avenue Northeast site
   Alternative 4 – Tandem Trailer site, Highland Avenue Northwest site, and Highland Avenue Northeast site
   Alternative 10 – Highland Avenue Northwest site and Highland Avenue Northeast site

2. **Starter and Tail Tunnel.** Once the TBM launching shaft is completed, the TBM starter and tail tunnel would be constructed, by drill-and-blast method, to facilitate TBM launching. The length of the starter or tail tunnel would be sized to accommodate the trailing gear that supports the TBM operation. The TBM would then be brought to the launch shaft and lowered into the ground in pieces, where the pieces are assembled at the start of the tunnel.

   The direction of TBM excavation differs depending on the DEIR Alternative, as shown on **Figures 3.6-3, 3.6-4** and **3.6-10** in **Chapter 3, Alternatives** and described below:

   Alternative 3 – For the north tunnel alignment, TBM excavation starts from the Tandem Trailer site in Weston and excavates to the Fernald Property site in Waltham (Alternative 3 Segment 1 [North Tunnel]); for the south tunnel alignment, TBM excavation starts from the Bifurcation site in Weston and excavates to the Highland Avenue Northwest site in Needham (Alternative 3 Segment 2 [South Tunnel]); and TBM excavation starts from the Highland Avenue Northeast site in Needham south and mines to the American Legion site in Boston (Alternative 3 Segment 3 [South Tunnel]).
   Alternative 4 - For the north tunnel alignment, TBM excavation also starts from the Tandem Trailer site in Weston and excavates to the Fernald Property site in Waltham (Alternative 4 Segment 1 [North Tunnel]); for the south tunnel alignment, TBM excavation starts from Highland Avenue Northwest site in Needham north and excavates to the Park Road West site in Weston (Alternative 4 Segment 2 [South Tunnel]); and TBM excavation also starts from Highland Avenue Northeast site in Needham south and excavates to the American Legion site in Boston (Alternative 4 Segment 3 [South Tunnel]).

Alternative 10 - For the north tunnel alignment and one segment of the south tunnel alignment, TBM excavation starts from the Highland Avenue Northwest site in Needham and excavates to the Fernald Property site in Waltham (Alternative 10 Segment 1[North Tunnel and South Tunnel]) a plug will be added to this tunnel drive to segregate the South Tunnel from the North Tunnel; for the south tunnel alignment, similar to Alternatives 3 and 4, TBM excavation starts from the Highland Avenue Northeast site in Needham south and excavates to the American Legion site in Boston (Alternative 10 Segment 3 [South Tunnel]).

3. **Tunnel Excavation**. Excavation of the tunnel would start when the TBM and its trailing gear are in position. Tunnel excavation would continue until the TBM reaches the receiving shaft. As the TBM advances, probing and grouting ahead of the excavation face would be performed where necessary to control groundwater infiltration. During tunnel excavation, and depending upon ground conditions encountered, ground supports internal to the tunnel would be required. In certain geologic conditions, drilling and blasting may be used or become necessary to advance the tunnel.

   The excavated material would be collected and transported through a conveyor belt system or excavated material cars and crane to the temporary storage area at the ground surface. The contractor would be responsible for finding suitable locations for reuse or appropriate disposal of excavated material from the tunnel excavation activities (see **Chapter 4, Section 4.8 Hazardous Materials, Materials Handling, and Recycling**). Groundwater collected during tunnel excavation would be pumped to the surface into a groundwater and construction water treatment facility, and subsequently discharged to a permitted receiving waterbody (see **Chapter 4, Section 4.6 Wetlands and Waterways**).

4. **TBM Receiving Shaft.** TBM receiving shafts would be constructed prior to the arrival of the TBMs. The size of the shaft, approximately 30 feet in diameter in rock, would allow for the necessary construction staging operations, including drilling and blasting for shaft excavation, TBM removal, personnel access, tunnel ventilation, groundwater discharge, lining operations, and other construction equipment and material delivery. The shaft site would be enclosed by fencing and a gate at the entrance. The shaft would be open at the surface level to permit materials and workers to enter and exit the tunnel. Cranes and other construction machinery would be located alongside each shaft. Once TBM excavation reaches the TBM receiving shaft site, the TBM would be disassembled and removed from the TBM receiving site.

   TBM receiving shafts proposed for this study include:

   Alternative 3 – Fernald Property site, Highland Avenue Northwest site, and American Legion site
   Alternative 4 – Fernald Property site, Park Road West site, and American Legion site
   Alternative 10 – Fernald Property site, Park Road West site (Large Connection), and American Legion site

5. **Tunnel Lining.** Tunnel final lining would be constructed next, using formwork to install cast-in-place concrete. To further increase the lining’s watertightness and structural capacity, grouting would be performed after concrete is placed immediately around the tunnel. In locations along the tunnel where ground conditions are not suitable for concrete lining alone, a mortar-coated steel lining will

be installed. Final lining could be sequenced in a number of ways, depending on the concrete batch plant location, accessibility to delivery points, and the contractor's preferred method of concrete delivery (e.g., pumping or rail cars). For this DEIR, it was assumed that lining would occur at the TBM launching shaft with the potential for additional simultaneous lining operations at the receiving shaft and connection shafts.

The contractor may also elect to install small-diameter drop holes (12 to 18 inches in diameter) at intermediate points between connection points to reduce tunnel construction schedule and manage the working time of the concrete. A maximum of 8 drop holes may be required by a contractor trying to space access points at approximately 1-mile intervals; these would remain active during normal working hours for up to 3 months and be plated at the end of each day.

For the long tunnel alignment reach of Alternative 10, the contractor may elect to have the lining installation process start from the mid-point of the tunnel in the Park Road West shaft and place concrete lining toward the TBM launching and receiving shafts simultaneously. In this case, two concrete operations may be ongoing simultaneously. Similarly for Alternatives 3, 4 and 10, the South Tunnel Segment 3 from the Highland Avenue Northeast site to the American Legion site, there is the potential to have lining operations ongoing from both the launching and receiving shafts. As the exact sequence of work is unknown at this time, assumptions have been used based on other similar projects; these provide a conservative estimate of impacts.

Although most of the tunnel would likely be excavated using a TBM, the contractor may choose to use the drill and blast method for portions of the tunnel through challenging ground conditions, shorter tunnel segments, and blasting pockets for maintenance activities as examples. These activities could occur at launching shafts, receiving shafts, connection shafts and anywhere along the tunnel alignment.

4.4.4 Connection to existing MWRA or Municipal Distribution Systems and Valve Chambers

Construction of the valve chambers, pipelines, and connections at a given site would likely begin as tunnel and shaft construction activities near completion.

A series of other valves and chambers are proposed as part of the water supply infrastructure to enhance the flexibility and redundancy of the distribution system connections at the connection shafts. An isolation valve on the Hultman Aqueduct and an isolation valve on the proposed south tunnel at Highland Avenue Northeast site are proposed to provide needed flexibility in the operation of the major transmission systems.

SOE systems (e.g., soldier piles and timber lagging, sheet-piles, trench boxes) would be installed during excavation/trenching activities to support construction of the valve chambers and pipelines. Excavated materials that could be reused for backfilling would be stockpiled onsite, while unsuitable materials would be trucked offsite by the contractor and disposed of appropriately. Suitable materials required for support or backfilling of the pipe trenches and structures would be trucked to the site and stockpiled as necessary.

Once the SOE systems are in place for the valve chambers, forms and steel reinforcement would be placed for the valve chamber floors and walls. Concrete would be delivered via concrete trucks and placed into the forms and along the floors directly from the trucks or via concrete pump trucks. Before the concrete roof is formed and placed, interior piping and valves would be installed in the structure. After completion of the chamber construction, the final piping connections would be made outside the structure, and the structure would be backfilled with a combination of re-used onsite material and imported material.

Trenching, installation, and backfilling to grade of the pipelines would proceed concurrently during construction of the valve chambers. Based upon the site geology, there is a potential need for rock removal to accommodate the valve chambers and pipelines at some locations. Depending on the location and depth, rock removal would be accomplished by drilling and blasting (similar to shaft construction) or mechanical means such as hammering to the required extents and depths. In select locations, some sections of new pipe may need to be installed using trenchless pipe installation.

During construction of the pipelines and connections, existing utilities within the pipeline pathway may need to be relocated to accommodate the new infrastructure; these would be determined during final design.

All work within roadways would be coordinated with the local municipality, 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 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. More detailed information on traffic impacts is included in **Chapter 4, Section 4.10, Transportation**.

For the near-surface structures and pipelines, construction equipment would be similar to equipment found at a typical utility construction site and would likely include excavators, dump trucks, front end loaders, backhoes, crane trucks, utility trucks, cement trucks and cement pump trucks, vibratory rollers, portable compactors, dewatering pumps and generators, settlement tanks, and trench support systems.

4.4.5 Excavated Material Removal/Transportation

The majority of construction vehicles in and out of a shaft construction site would be dump trucks hauling excavated materials to off-site locations for disposal or re-use. The amount of excavated material removal and trucking would vary considerably by site and depend on the depth of excavation, type of ongoing construction activity, and the method selected by the contractor. Launching shafts would have the most activity, as these would be the primary areas for management of the excavated material from the tunnel excavation operations. Receiving shafts would have substantial activity during the construction and excavation of the shaft. Connection shafts would have the least amount of excavate removal activity, primarily during the support of excavation activities and in some cases during top-down drilling activity, based on ground conditions. The valve chamber and surface pipeline construction would have typical daily trucking activity associated with removing unsuitable fill and replacing it with suitable backfill materials. Details on the number of trucks by site are included in **Chapter 4, Section 4.10 Transportation**.

4.4.6 Construction Dewatering

Dewatering would likely be required within the shaft at all connection shaft sites during overburden removal, at each of the TBM receiving and launching sites, and within areas of excavation during installation of pipelines and valve chambers. Dewatering within connection shaft sites and pipelines and valve chambers installation would be directed into appropriate erosion control measures (i.e., sedimentation basins, silt bags, settling tanks) and then discharged into existing onsite drainage channels or constructed surface pipes, which ultimately would discharge into wetlands and surface waters. Where drainage channels and surface waters are not present nearby, discharges may be directed into the municipal storm sewer system.

Groundwater infiltration would primarily be removed, treated, and released to a surface waterbody at TBM launching sites during tunnel excavation operations and during the starter and tail tunnel construction, as shown in **Table 4.4-1**. TBM receiving shafts would need dewatering once excavation from the surface to the tunnel elevation breaches the groundwater level. Where connection shafts are excavated from the bottom to the top (raisebore), dewatering would be minimal since inflows will drain to the tunnel below. However, where top-down methods are used, some dewatering may be needed and discharged on site, to a surface waterbody, or to a municipal storm sewer system.

Table 4.4-1 Primary Dewatering Discharge Site During Construction

Alternative 3		Alternative 4		Alternative 10	
Launching Site	**Receiving Water**	**Launching Site**	**Receiving Water**	**Launching Site**	**Receiving Water**
Tandem Trailer	Seaverns Brook	Tandem Trailer	Seaverns Brook	Highland Avenue Northwest	Charles River
Bifurcation	Seaverns Brook	Highland Avenue Northwest	Charles River	Highland Avenue Northeast	Charles River
Highland Avenue Northeast	Charles River	Highland Avenue Northeast	Charles River		

Additional details on the site drainage, dewatering, and groundwater management are provided in **Chapter 4, Section 4.6 Wetlands and Waterways** and **Chapter 5, Water Supply**.

4.4.7 Tunnel Commissioning

The final tunnel system would consist of a north tunnel, approximately 4.5 miles long, and a south tunnel, approximately 10 miles long, for a total tunnel system length of approximately 14.5 miles. Between the end points of the south tunnel, one intermediate tunnel isolation valve location is proposed at the Highland Avenue Northeast site.

Thus, the proposed finished tunnel system could be isolated with these valves into three distinct segments shown on **Figure 4.4-2.** These segments are:

North Tunnel Segment 1	North Tunnel, between the Park Road East or Park Road West Sites and the Fernald Property
South Tunnel Segment 2	South Tunnel, between the Bifurcation or Park Road West Sites and the Highland Avenue Northeast Site
South Tunnel Segment 3	South Tunnel, between the Highland Avenue Northeast Site and the American Legion Site

In addition, a new isolation valve will be installed on the Hultman Aqueduct at a site just west of the existing Shaft 5A site. The isolation valve is common to all DEIR Alternatives.

4.4.7.1 Tunnel Flushing and Disinfection

The approach to disinfection, startup, and commissioning would address each segment independently; a three-segment approach is assumed for this discussion.

The total volume of an assumed 12-foot-diameter tunnel system, excluding vertical shafts, would be approximately 66 million gallons (MG). The tunnel system would be disinfected before being placed into service, so that all bacteriological testing requirements would be met. In addition, the tunnel system would be flushed after the disinfection process until the water quality is acceptable for use by customers, based on Authority and MassDEP requirements.

Tunnel Inspection and Cleaning. After the physical construction of the tunnels, shafts, and connecting piping are complete, the first step toward commissioning would begin with a thorough inspection and cleaning of the tunnel. It is anticipated that this would be done by deploying personnel within the tunnel to clean it, possibly using power washers. Any dirt or debris would be carried by the wash water to the low points where it would be pumped out, then treated to remove solids, dechlorinated and pH adjusted, and then discharged in accordance with the groundwater management plan (**see Chapter 4, Section 4.6 Wetlands and Waterways** and **Chapter 5, Water Supply)**. The volume of water to be collected and discharged would be relatively minor in this step.

Pressure Testing and Tunnel Disinfection. The next step in the process would be to pressure test and disinfect the tunnel. These operations would have very minimal impact on any regulated resource areas as they involve the introduction of water for hydrostatic testing and chlorinated water for disinfection that would be treated to remove chlorine before discharge.

Tunnel Flushing. Once disinfection is complete, the tunnel system would be flushed to achieve the goal of bringing the water quality in the tunnel in line with all potable water requirements. First, the tunnel disinfection water would be displaced with potable water to push out highly chlorinated water until only the typical 2 parts per million (ppm) of chloramines would remain in the tunnel. It is assumed that it would take up to four exchanges of the complete volume of the tunnel, which equates to approximately 264 MG, to accomplish the goal. Four exchanges may be necessary because the highly chlorinated disinfection water in the tunnel would mix and diffuse into the newly introduced potable flushing water.

For the disinfection and flushing operations, the system will be run as follows to discharge the water to the receiving waters of the Charles River (Seaverns Brook). Discharge may also possibly be to MWRA offline Weston or Chestnut Hill Reservoirs after these operations are complete and will be subject to future permit requirements. As discussed above, it is assumed that the finished tunnel system will be divided into three segments for flushing operations (Note Alternative 10 will be excavated as two segments but flushed as three) to individually perform disinfection and flushing for each segment in the following directions:

North Tunnel Segment 1, from the Fernald Property to the Hultman Aqueduct
South Tunnel Segment 2, from the Hultman Aqueduct to the Highland Avenue Northeast site
South Tunnel Segment 3, from the American Legion Site to Highland Ave Northeast site

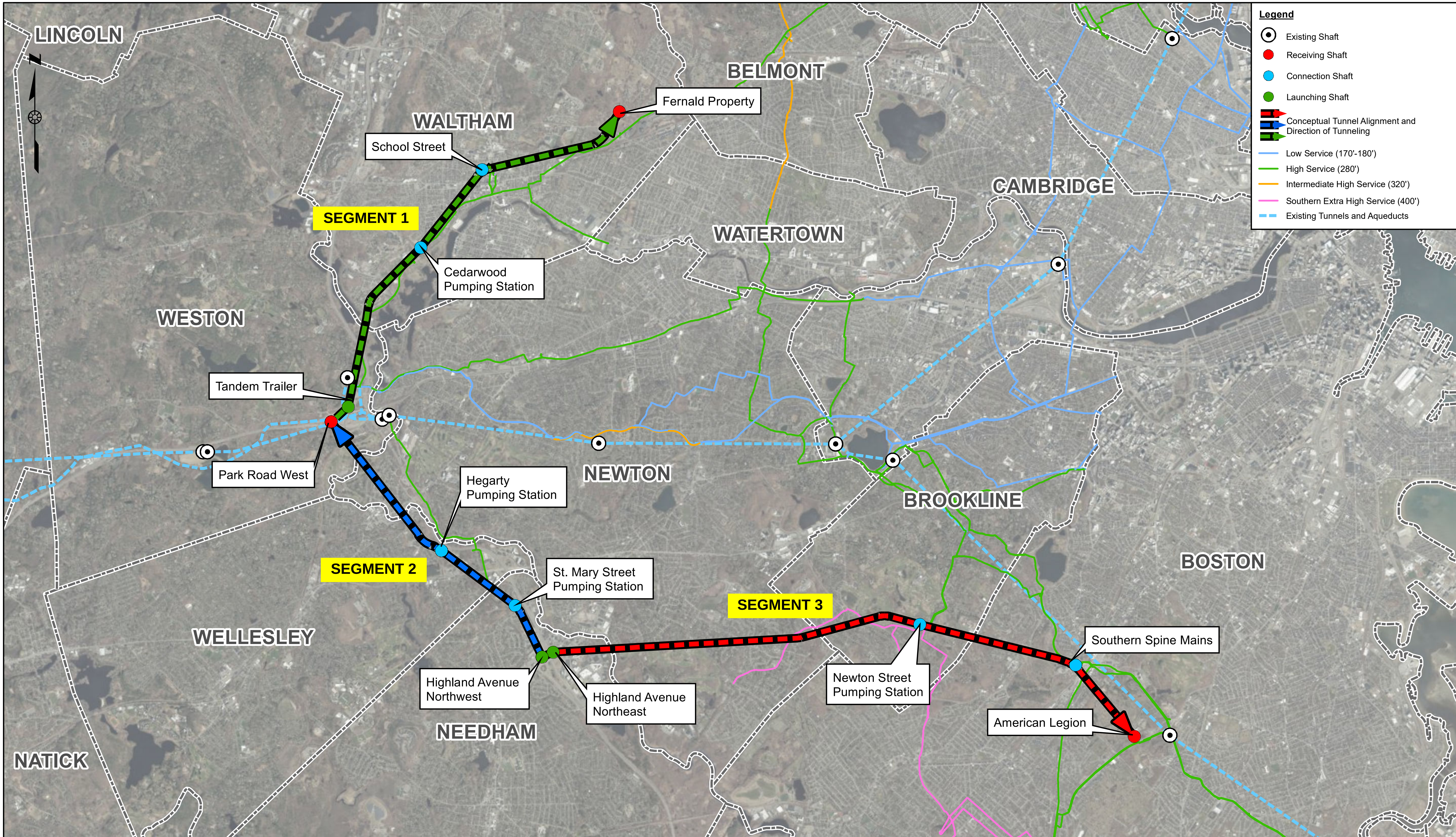
There are multiple locations where disinfection, flushing, dechlorination, and pH adjustment could be initiated and where spent tunnel water could be discharged that will be subject to future permit requirements.

After these activities are complete, the tunnel system is ready for service and can be put into use by the Authority.

4.4.8 Site Restoration and Final Conditions

Upon completion of the tunnel, near-surface valve chambers, and surface connection piping, and the tunnel is disinfected and put in service the contractor would demobilize all equipment and restore and landscape all disturbed areas. Permanent fencing would be installed around the perimeter of the shaft/valve chamber sites. Loam and seed would be placed in all disturbed off-road areas. Other landscaping elements would be installed, as agreed to with each municipality. The shaft sites would each include an area of pavement within the fenced limits sized to provide parking for maintenance vehicles. Where needed, paved access roads would extend from the nearest public way to the shaft site. Construction of the new shaft/valve chamber and paved areas would add a minor amount of impervious area, resulting in an additional peak stormwater runoff, which would be managed on site refer to **Chapter 4, Section 4.6 Wetlands and Waterways** and **Chapter 5, Water Supply**.

Each valve chamber and top of shaft structure would have access hatches on the roof for inspection and maintenance. The roof of the valve chambers and top of shaft structures typically extend not more than 3 feet above the existing ground surface. The MWRA would mow grassed areas and maintain each site as necessary as a part of its normal operations. **Figure 4.4-3** through **Figure 4.4-5** show examples of an existing valve chamber and top-of-shaft structures from the MWRA MetroWest Water Supply Tunnel, which are very similar to those proposed for this Program.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159 Draft Environmental Impact Report

CDM Smith in association with vhb Jacobs Green International Affiliates, Inc.

0 2,400 4,800 7,200 Feet

SCALE IN FEET
SCALE: 1" = 5,000'

Figure 4.4-2 Commissioning Segments

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

Figure 4.4-3 Valve Chamber - MetroWest Water Supply Tunnel, Weston

Figure 4.4-4 Top of Shaft Structure Metrowest Water Supply Tunnel, Weston

Figure 4.4-5 Top of Shaft and Valve Structure at Connection Site, Metrowest Water Supply Tunnel, Weston

4.4.9 Construction Activity Durations

Depending on the alternative and its specific launching, receiving, and connection sites, durations for the construction activities may vary. **Table 4.4-2** provides the range of estimated timeframes for the major construction activities.

Table 4.4-2 Estimated Duration of Construction Activities

Construction Activity	Estimated Duration[1]
Site Access Control, Site Preparation	3 – 6 months
Launching and Receiving Shaft Excavation	6 – 12 months
Connection Shaft Excavation	1 – 3 months
Tunnel Boring Machine Excavation (underground)	12 – 36 months
Tunnel Concrete Lining	15 – 24 months
Shaft Permanent Lining	3 – 6 months
Site Piping and Valve Chamber Construction	6 – 12 months
Connection to Distribution System	3 – 6 months
Site Restoration	3 – 6 months

1 Depending on site and tunnel segment

4.5 Rare Species and Wildlife Habitat

The following section describes the existing conditions of rare species and wildlife habitat identified at each of the Program sites, as well as any anticipated construction-phase impacts and the proposed Final Condition for those sites. For the purpose of this assessment, the term "rare species and wildlife habitat" refers to plant and animal species and their habitats, including rare, threatened, and endangered species and their critical habitat. Avoidance, minimization, and mitigation measures, which would be implemented in the construction and operation phases of the Program to protect potential and identified rare species and wildlife habitat, are described at the end of this section.

As requested by the Secretary's Certificate on the ENF for the Program, the DEIR should describe temporary and permanent impacts to rare species habitats. Consideration is also given to potential impacts to trees.

4.5.1 Resource Definition

The federal Endangered Species Act (ESA) of 1973[1] defines a Threatened species as "any species which is likely to become an Endangered species within the foreseeable future throughout all or a significant portion of its range." The ESA defines an Endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range." The ESA also regulates "candidate" species, which are defined as "plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the [ESA], but for which development of a proposed listing regulation is precluded by other higher priority listing activities." The ESA protects species that are listed as Threatened or Endangered on a national basis.

State-listed (rare) species are protected under the Massachusetts Endangered Species Act (MESA) of 1990,[2] and are classified as Threatened, Endangered, or Special Concern species. A Threatened species is one that is likely to become endangered in Massachusetts in the foreseeable future, and an Endangered species is one that is in danger of extinction throughout all or a significant portion of its range within Massachusetts. Special Concern species are those species that biological research has documented to have suffered a decline that could threaten the species if the decline continues unchecked, or those that occur in such small numbers or with such a restricted distribution that they could easily become Threatened within the Commonwealth.

4.5.2 Regulatory Framework

The federal and state definitions of "Threatened" and "Endangered" species and the regulations that govern their protection provide a framework for identifying and minimizing impacts on resources potentially associated with the Program. These definitions and regulations are defined in the following section.

1 Endangered Species Act of 1973, (16 U.S.C. 1531 et seq., as amended) United States Fish and Wildlife Service

2 Massachusetts Endangered Species Act of 1990 (321 CMR 10.00: M.G.L. c. 131A.), Natural Heritage Endangered Species Program.

4.5.2.1 Federal Endangered Species Act

The ESA of 1973 (16 USC 1531 et seq., as amended) authorizes the determination and listing of species as Threatened and Endangered and prohibits unauthorized taking, possession, sale, and transport of Endangered species. Section 7 of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or to modify their critical habitat. Critical habitat is defined by the ESA as "specific geographic areas that contain the physical or biological features that are essential to the conservation of the species and that may require special management considerations or protection." Candidate species receive no statutory protection under the ESA. The ESA is administered by the U.S. Fish and Wildlife Service (USFWS).

4.5.2.2 Massachusetts Endangered Species Act

Massachusetts enacted the MESA in 1990. The Act (M.G.L. Chapter 131A) and its regulations (321 CMR 10.00) prohibit the taking of any state-listed rare plants and animals unless specifically permitted for scientific, educational, or propagation purposes, or where a Conservation and Management Permit (CMP) is issued. State-listed species are regulated independently of federally listed species. Take includes protection of rare species habitat, and is defined in 321 CMR 10.02 as:

"In reference to animals, means to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat."

The regulations (321 CMR 10.05) state that "All State Agencies shall review, evaluate, and determine the impact on Endangered, Threatened and Special Concern species or their habitats… and use all practicable means and measures to avoid or minimize damage to such species or their habitats." State agencies are responsible for demonstrating to the EEA that all practicable means and measures to protect rare species and their habitats have been incorporated into a project design. The Massachusetts Department of Fish and Wildlife's (DFW) Natural Heritage and Endangered Species Program (NHESP) is the agency responsible for ensuring compliance with MESA. A proposed project that would result in a take requires a CMP from the NHESP.

4.5.2.3 Massachusetts Wetlands Protection Act

The Massachusetts Wetlands Protection Act[3] (WPA) regulations state that proposed projects that alter Estimated Habitats of State-listed Rare Wetlands Wildlife must not have any short- or long-term adverse effects on the habitat of the local population of that species. The regulations only apply to proposed projects occurring in a wetland resource area that would alter the habitat of a rare animal species and for which an occurrence has been entered into the official NHESP database. Rare plants are not regulated

3 310 CMR 10.00 et seq.

under the WPA. The NHESP maintains an atlas of Estimated Habitats for State-listed Rare Wetlands Wildlife species, which was last updated in August 2021[4]. For a more detailed description of the wetlands within and near the Program sites, see **Chapter 4, Section 4.6, Wetlands and Waterways.**

4.5.3 Methodology

The Study Area and methodology used to determine existing conditions and the impact assessment are described below.

4.5.3.1 Study Area

The Study Area included the launching, receiving, connection, and isolation valve sites that are part of the three DEIR Alternatives. On each site, the evaluation focused on the limit of disturbance (LOD) during construction as well as the Final Condition once the Program is complete and operational. The LOD for each of the proposed sites is shown on the accompanying Rare Species and Wildlife Habitat Figures (see **Figure 4.5-1** to **Figure 4.5-16**). Details on the proposed DEIR Alternatives can be found in **Chapter 3, Section 3.8, DEIR Alternatives.**

4.5.3.2 Existing Conditions Methodology

Terrestrial Wildlife Species

On-site inspections were completed at each site included in the three DEIR Alternatives. Existing habitats were characterized with respect to plant and animal species and habitats observed. Plants and wildlife observed or likely to occur at each site are described below under Existing Conditions.

Fisheries

Information on Study Area fisheries was obtained from readily available sources. All sites are within the Charles River Basin. A detailed survey of the fisheries within the basin was completed by the Charles River Watershed Association in 2003.[5.]

Federal Species

Habitats for federally listed species were identified by searching the USFWS Information for Planning and Conservation (IPaC)[6] online system. Based on the identified species, detailed field studies were completed at each site to determine the presence or absence of the federally listed species on site and characterize the nature and extent of existing habitat. The results of these studies are presented below under **Section 4.5.4, Existing Conditions**.

4 https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html

5 https://www.mass.gov/doc/assessment-of-fish-communities-and-habitat-in-the-charlse-river-watershed/download

6 https://IPaC.ecosphere.fws.gov/

Massachusetts Endangered Species Act

Sites included in the three DEIR Alternatives were reviewed to determine if they include listed species habitat polygon areas, as shown in the MassGIS NHESP Priority Habitats of Rare Species data layer or the NHESP Estimated Habitats of Rare Wetlands Wildlife data layer. If sites included a listed species habitat polygon, an Information Request would have been filed with the NHESP to obtain a list of state-listed species related to that particular property, and detailed field studies would have been required to determine presence or absence and characterize the nature and extent of habitats. None of the sites were found to include any listed species habitat polygons, so coordination with NHESP was not conducted.

4.5.3.3 Impact Assessment Methodology

In accordance with the ESA, the USFWS has published the 4(d) rule[7] to streamline review of projects that could potentially have adverse impacts on the northern long-eared bat (*Myotis septentrionalis;* NLEB), which is a species of federal concern. The rule has specific provisions for tree removal:

"Incidental take resulting from tree removal is prohibited if: 1) Occurs within 0.25-mile radius of known northern long-eared bat hibernacula or 2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot radius from the known maternity tree during the pup season (June 1 through July 31)."

Sites included in the three Alternatives were reviewed to characterize the nature and extent of existing potential NLEB habitat. The known locations of NLEB hibernacula (shelter) and maternity roost trees have been mapped statewide by NHESP[8], and these maps were consulted during the review. Site-specific information recorded for Program sites primarily included the dominant species of trees and other vegetation present on the sites, with particular attention to trees greater than or equal to 3 inches diameter at breast height (DBH) with cracked or exfoliating bark, broken limbs, cavities, or crevices that may serve as NLEB summer roosting habitat. When present, existing snags[9] were also noted.

7 Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-Eared Bat With 4(d) Rule, 80 FR 17974, April 2, 2015.

8 https://mass-eoeea.maps.arcgis.com/apps/Viewer/index.html?appid=de59364ebbb348a9b0de55f6febdfd52

9 A snag is a standing, dead, or dying tree, often missing a top or most of the smaller branches. In freshwater ecology it refers to trees, branches, and other pieces of naturally occurring wood found sunken in rivers and streams.

4.5.4 Existing Conditions

The USFWS IPaC online system indicates that the entire Commonwealth of Massachusetts is considered potential habitat for the federally-listed NLEB, and that much of the Commonwealth is suitable habitat for the federally-listed monarch butterfly (*Danaus plexippus*). Under the ESA, the NLEB is listed as Threatened, while the monarch butterfly is still a candidate species. Neither species have designated Critical Habitat in Massachusetts. None of the proposed launching, receiving, connection, or isolation valve sites include any identified Habitats for Rare Wetlands Wildlife, are located within a 0.25-mile radius of known NLEB hibernacula, or include mapped known NLEB maternity roost trees. However, one NHESP Priority Habitat/Estimated Habitat polygon was identified within 1,000 feet of the proposed tunnel alignment in Waltham. As a result of implementing mitigation measures to minimize potential groundwater drawdown during construction, no impacts to this mapped polygon would be anticipated. Additional information about the mitigation process can be found in **Chapter 4, Section 4.6.5, Wetlands and Waterways, Construction Period Impacts**, and the location of the polygon within the tunnel alignment can be found in **Chapter 4, Section 4.6,Wetlands and Waterways, Figure 4.6-19, Figure 4.6-30** and **Figure 4.6-41** for Alternatives 3, 4 and 10, respectively**.**

The existing fisheries are sites within the Charles River Basin. Study Area waterways are all Class B warmwater fisheries—with the exception of Seaverns Brook, which is designated by the Massachusetts Division of Marine Fisheries (DMF) as a coldwater fishery.[10] The Charles River is known to include at least 25 different fish species, with the most prevalent being bluegill (*Lepomis macrochirus*), redfin pickerel (*Esox americanus americanus*), largemouth bass (*Micropterus salmoides*), American eel (*Anguilla rostrata*), and redbreast sunfish (*Lepomis auritus*).

The following sections describe the existing environmental conditions at each of the proposed launching, receiving, connection and isolation valve sites.

4.5.4.1 Launching and Receiving Sites

Table 4.5-1 summarizes the presence or absence of key rare species and wildlife habitat at each of the launching and receiving sites. Additional information on each site is described below. **Figure 4.5-1** through **Figure 4.5-16** show the habitats associated with each site.

Fernald Property

The portion of the Fernald Property for the proposed site consists of approximately 4.5 acres of previously developed and lightly wooded upland adjacent to wetlands associated with Clematis Brook (see **Figure 4.5-1**). Wooded areas include mixed deciduous forest, including species such as Norway maple (*Acer platanoides*), white oak (*Quercus alba*), tree of heaven (*Ailanthus altissima*), red pine (*Pinus resinosa*), and black cherry (*Prunus serotina*). Several snags are also present on the site. Terrestrial wildlife included sightings and signs of turkey and small mammals common to suburban habitats, such as grey squirrel, red squirrel, and chipmunk. A variety of songbirds and one hawk were noted, but not identified

10 https://www.mass.gov/info-details/coldwater-fish-resources

by species. Signs of white-tailed deer were observed (see **Chapter 4, Section 4.6.4, Wetlands and Waterways Existing Conditions**).

The Massachusetts DFW NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that the NLEB and the monarch butterfly may be present within the Fernald Property. The construction staging area on the Fernald Property was found to include trees potentially suitable for NLEB summer roosting habitat.

Clematis Brook flows through the wetlands located to the south of the site. No detailed fisheries study was identified for the site, but a study conducted by DFW[11] reported the following species from Beaver Brook, which is immediately downstream: redfin pickerel, largemouth bass, yellow perch, swamp darter, pumpkinseed, banded sunfish, black crappie, brown bullhead, golden shiner, carp, white sucker, creek chubsucker, and American eel.

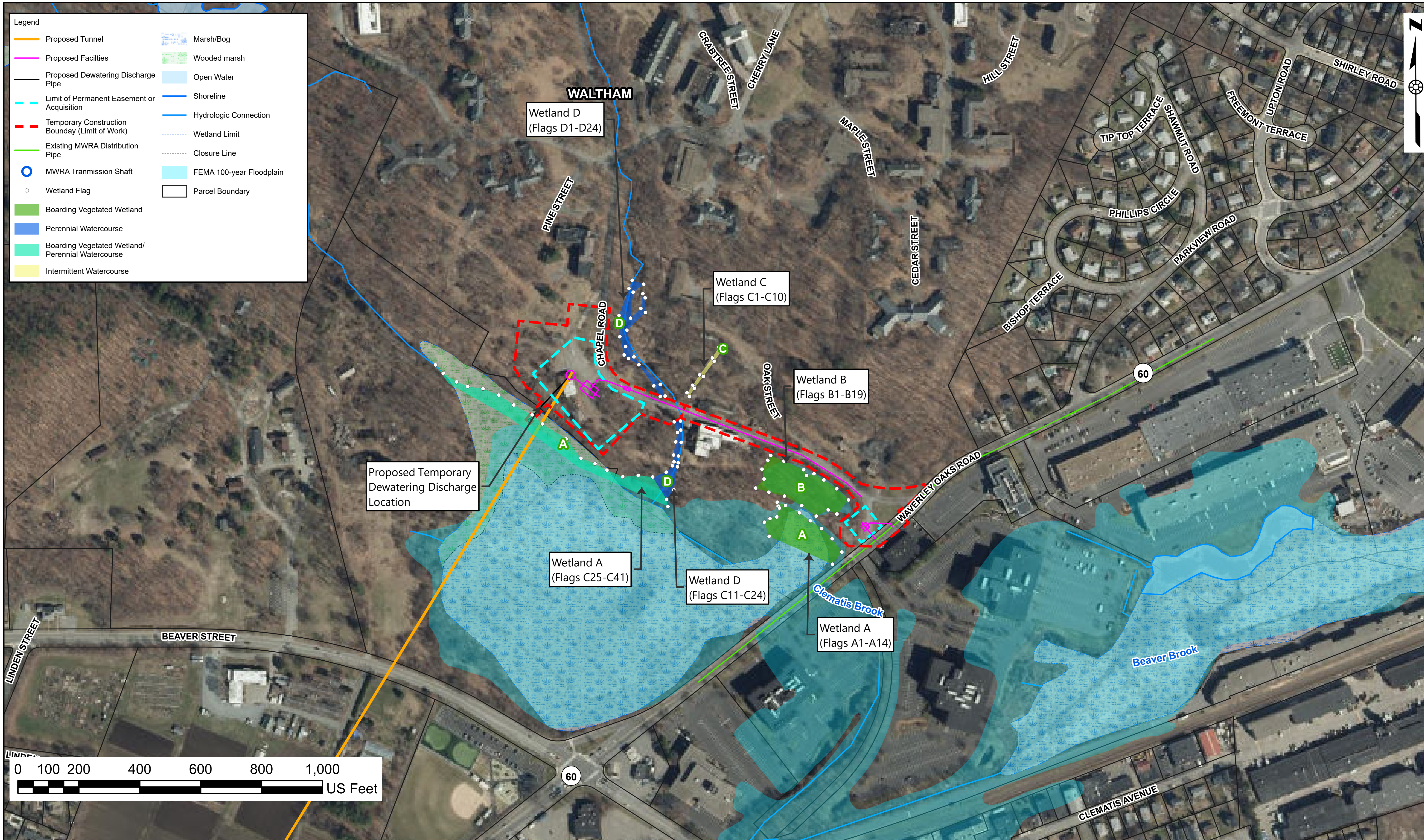
Table 4.5-1 Summary of Rare Species and Wildlife Habitat at Proposed Launching and Receiving Sites

Site	Municipality	Potential NLEB [2] Habitat Present	Snags and/or Suitable Trees Present	Within ¼ mile of Known Hibernacula and/or 150 ft of Known Maternity Roost	Potential Monarch Butterfly Habitat Present	Fisheries Habitat Present
Fernald Property	Waltham	X	X	-	X	Warmwater
Bifurcation	Weston	X	X	-	X	Coldwater
Tandem Trailer/Park Road East	Weston	X	X	-	X	Coldwater
Park Road West	Weston	X	-	-	X	None
Highland Avenue Northwest/Southwest	Needham	X	-	-	X	Warmwater
Highland Avenue Northeast/Southeast	Needham	X	-	-	X	Warmwater
American Legion	Boston	X[1]	X	-	X	Warmwater

1 Based on on-site observations

2 NLEB: Northern Long Eared Bat

11 2015- 2022 Open Space & Recreation Plan, City of Waltham Massachusetts, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

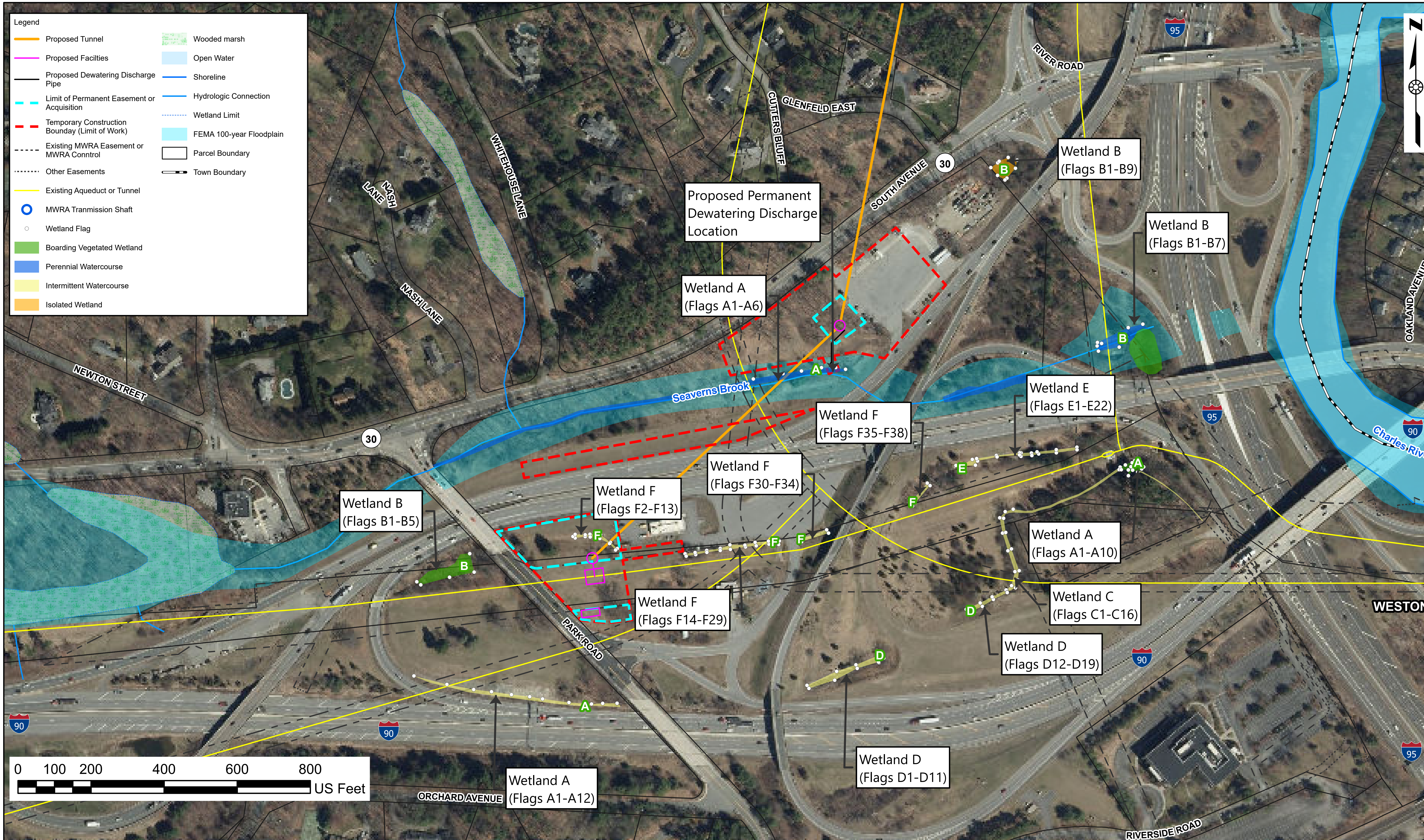
Waltham, MA

Rare Species and Wildlife Habitat Fernald Property Receiving

Figure 4.5-1

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

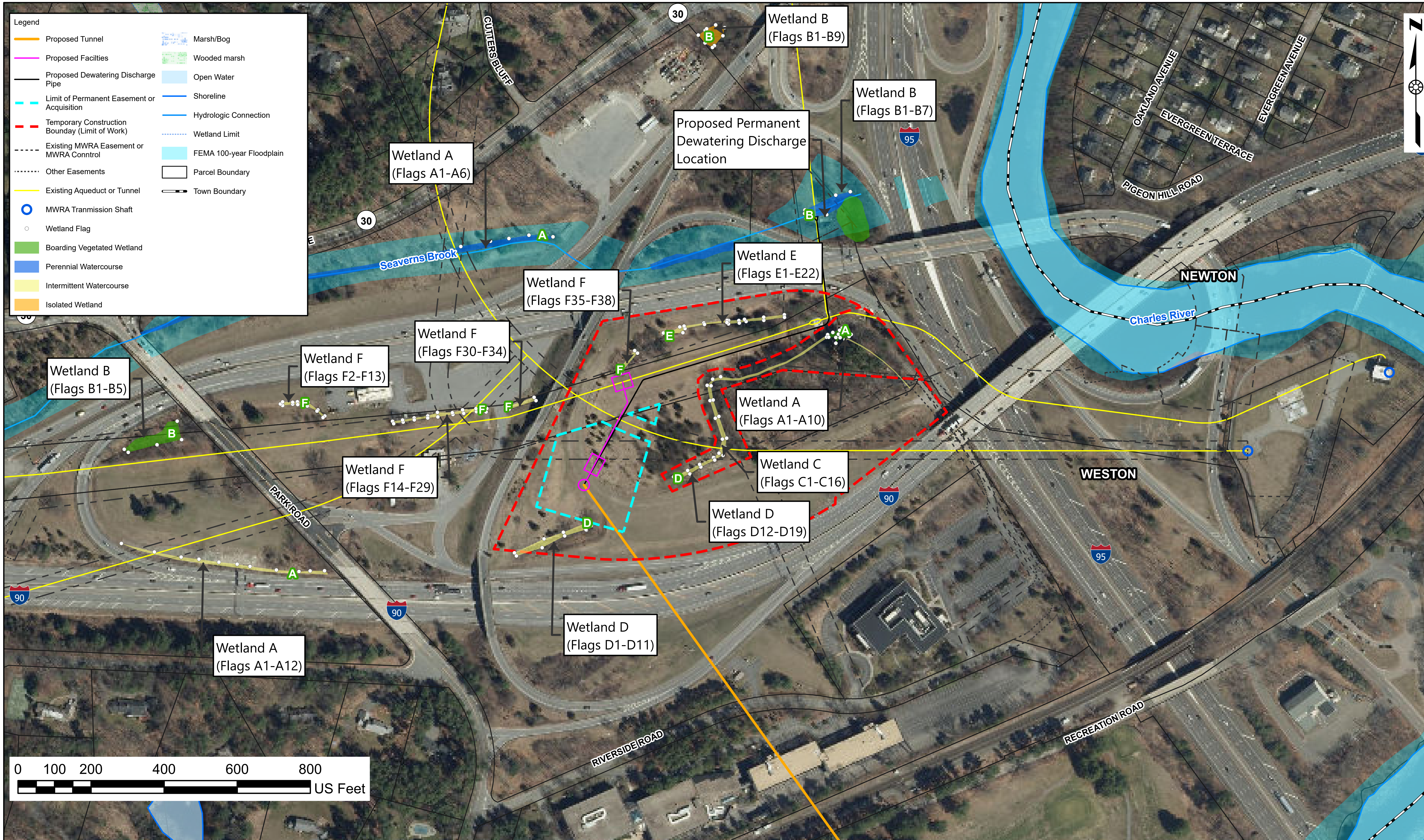
CDM Smith in association with vhb
Jacobs GREEN International Affiliates, Inc.

Rare Species and Wildlife Habitat
Tandem Trailer/Park Road East Launching
Figure 4.5-2

Weston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

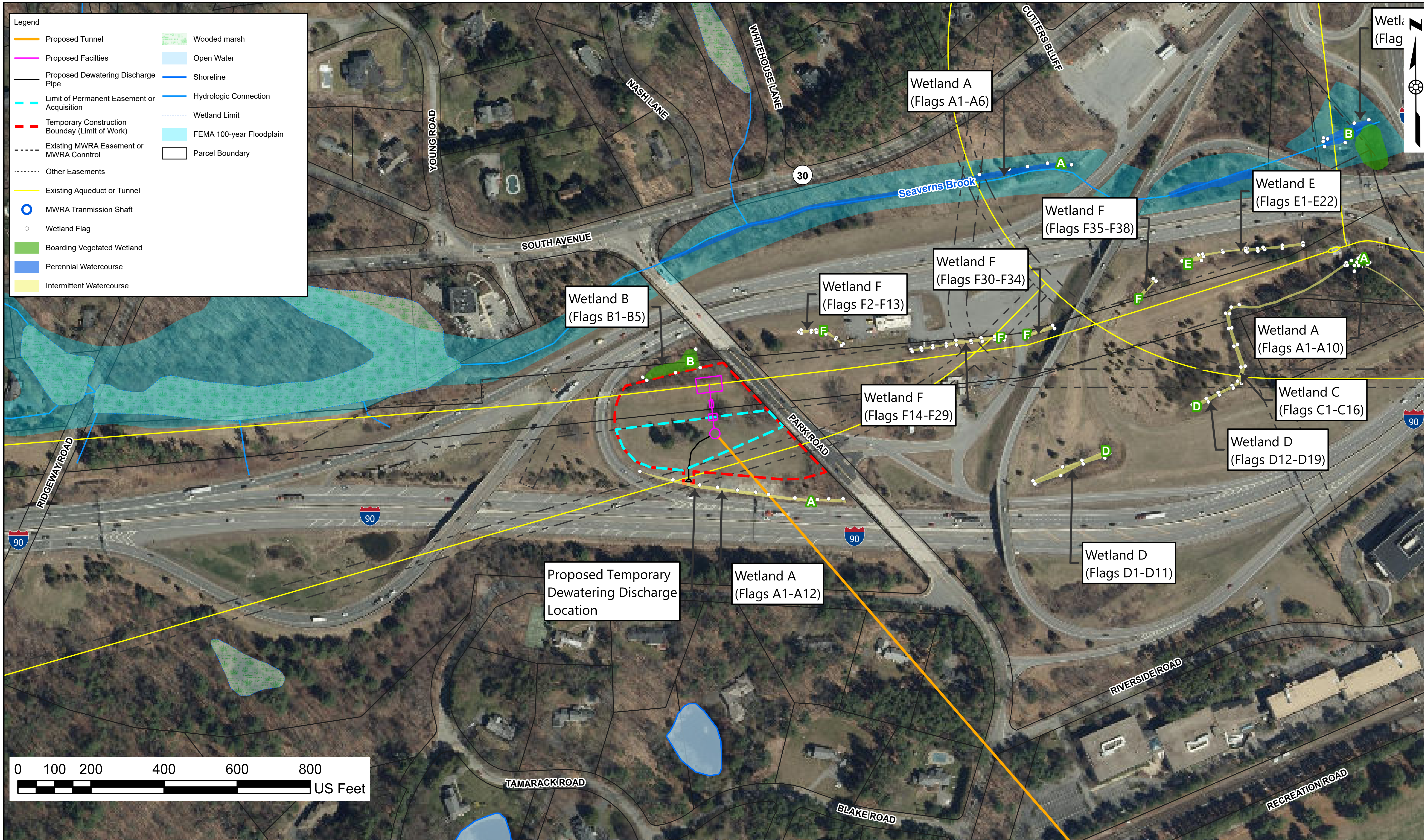
CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

Rare Species and Wildlife Habitat
Bifurcation Launching
Figure 4.5-3

Weston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

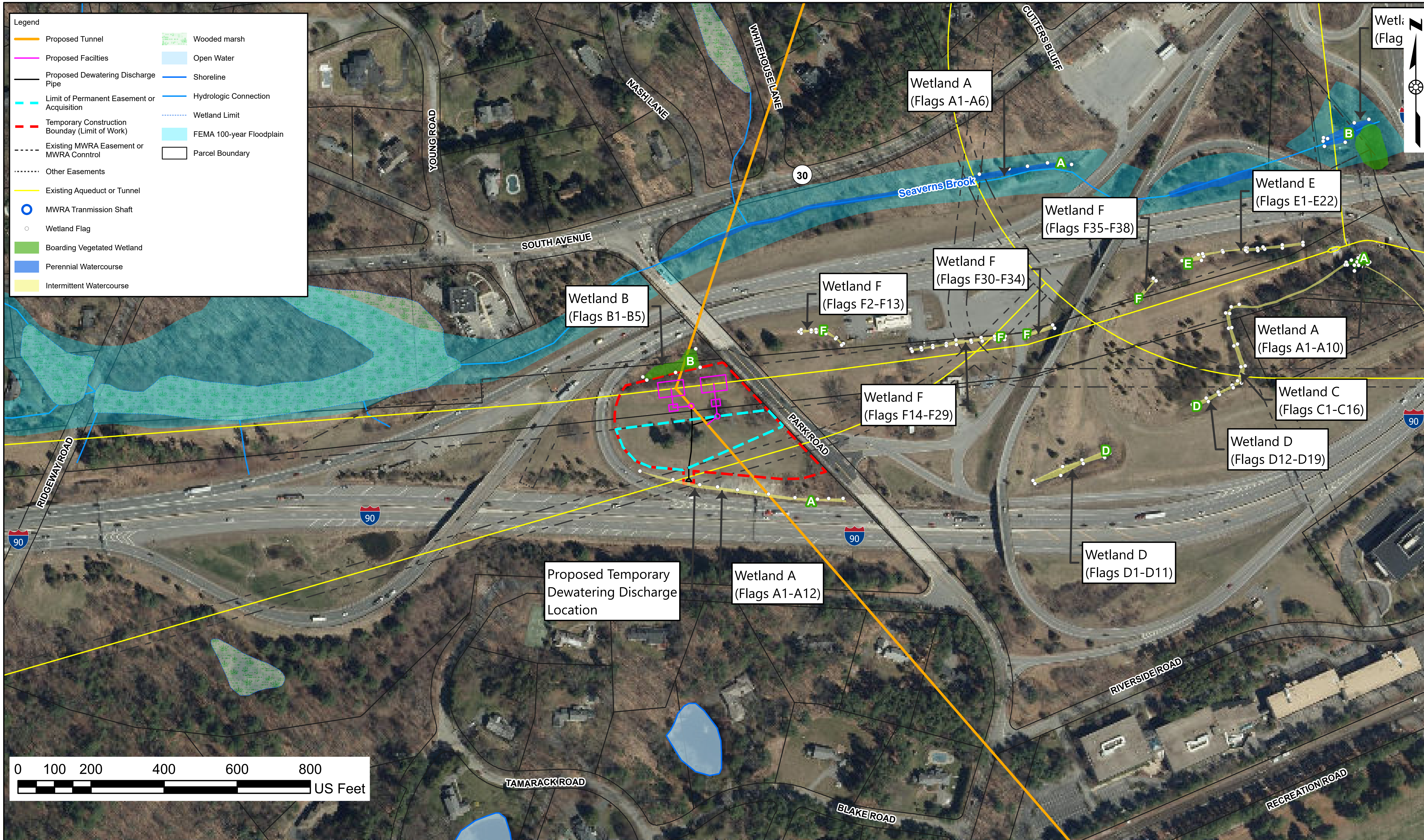
CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Rare Species and Wildlife Habitat
Park Road West Receiving
Figure 4.5-4

Weston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

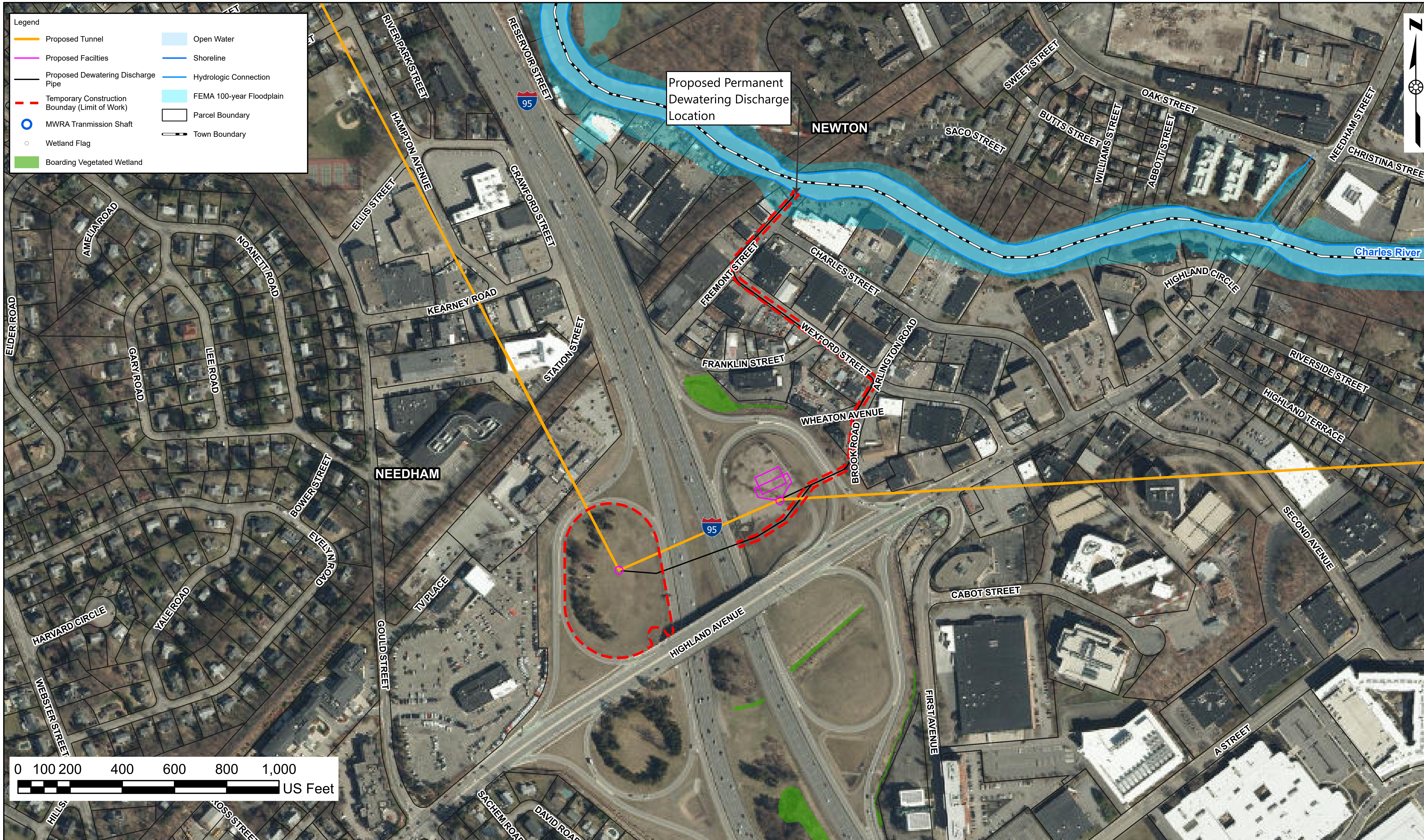
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Rare Species and Wildlife Habitat
Park Road West Large Connection
Figure 4.5-5

Weston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

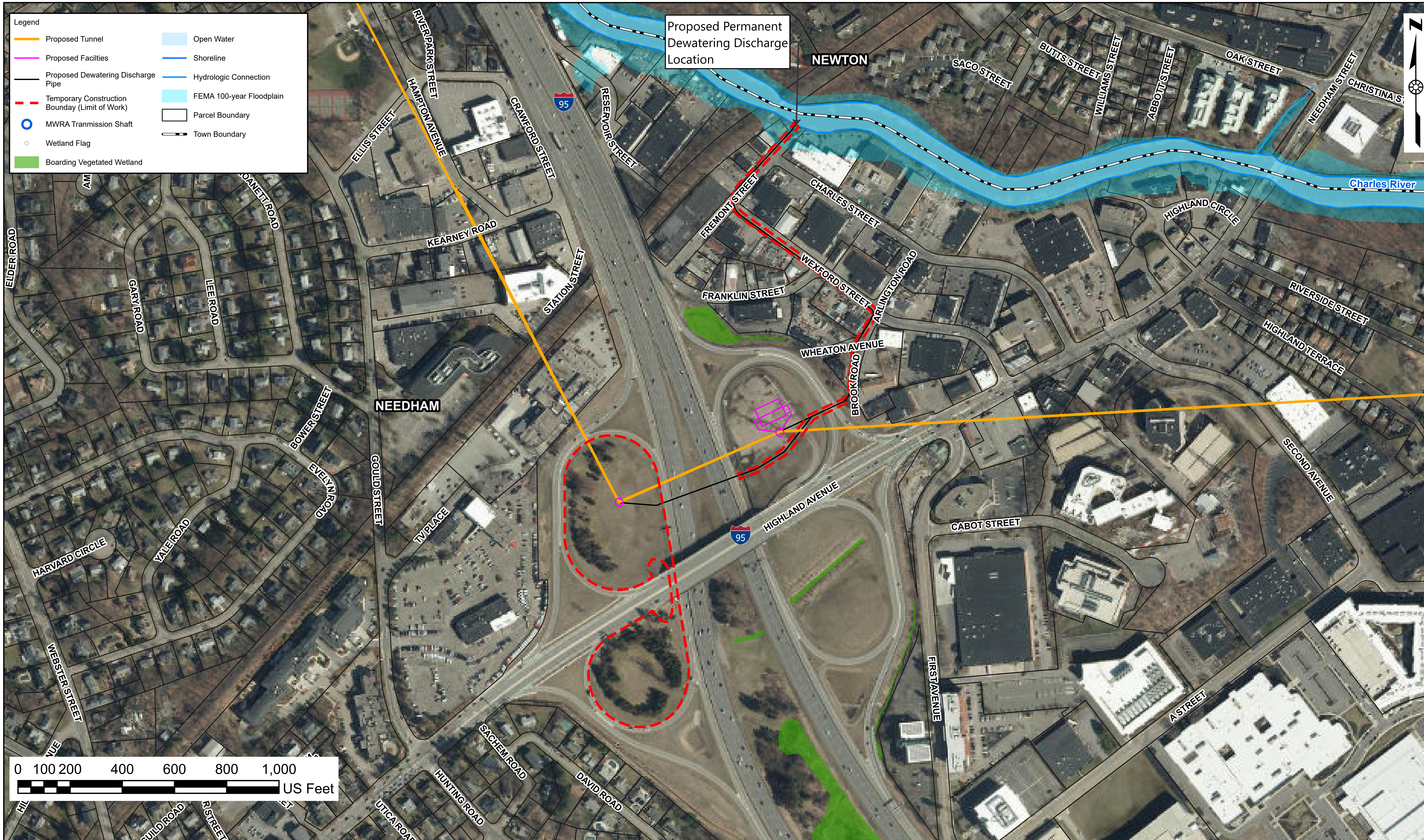
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Needham, MA

Rare Species and Wildlife Habitat
Highland Avenue Northwest Receiving
Figure 4.5-6

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

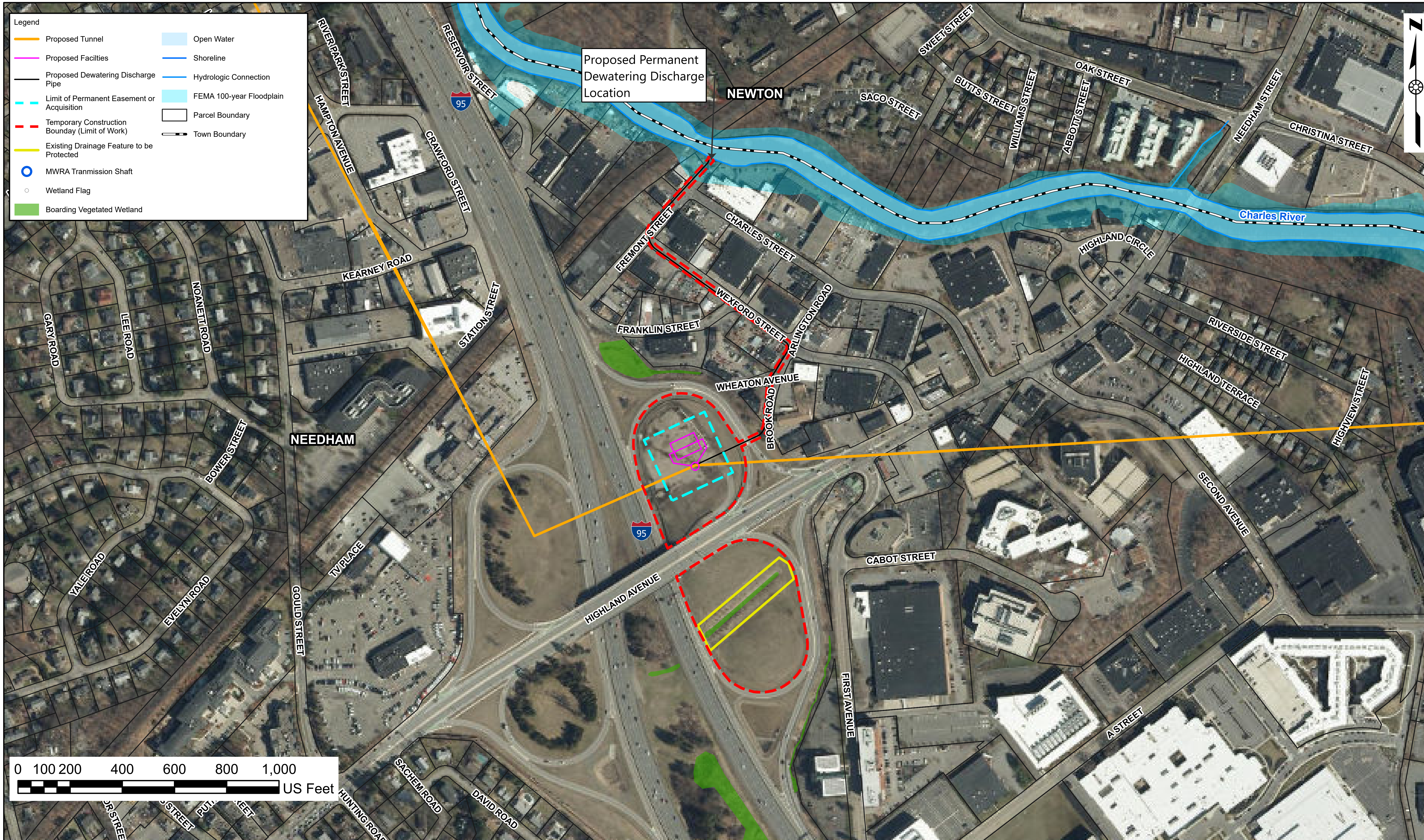
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Rare Species and Wildlife Habitat
Highland Avenue Northwest/Southwest Launching
Figure 4.5-7

Needham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

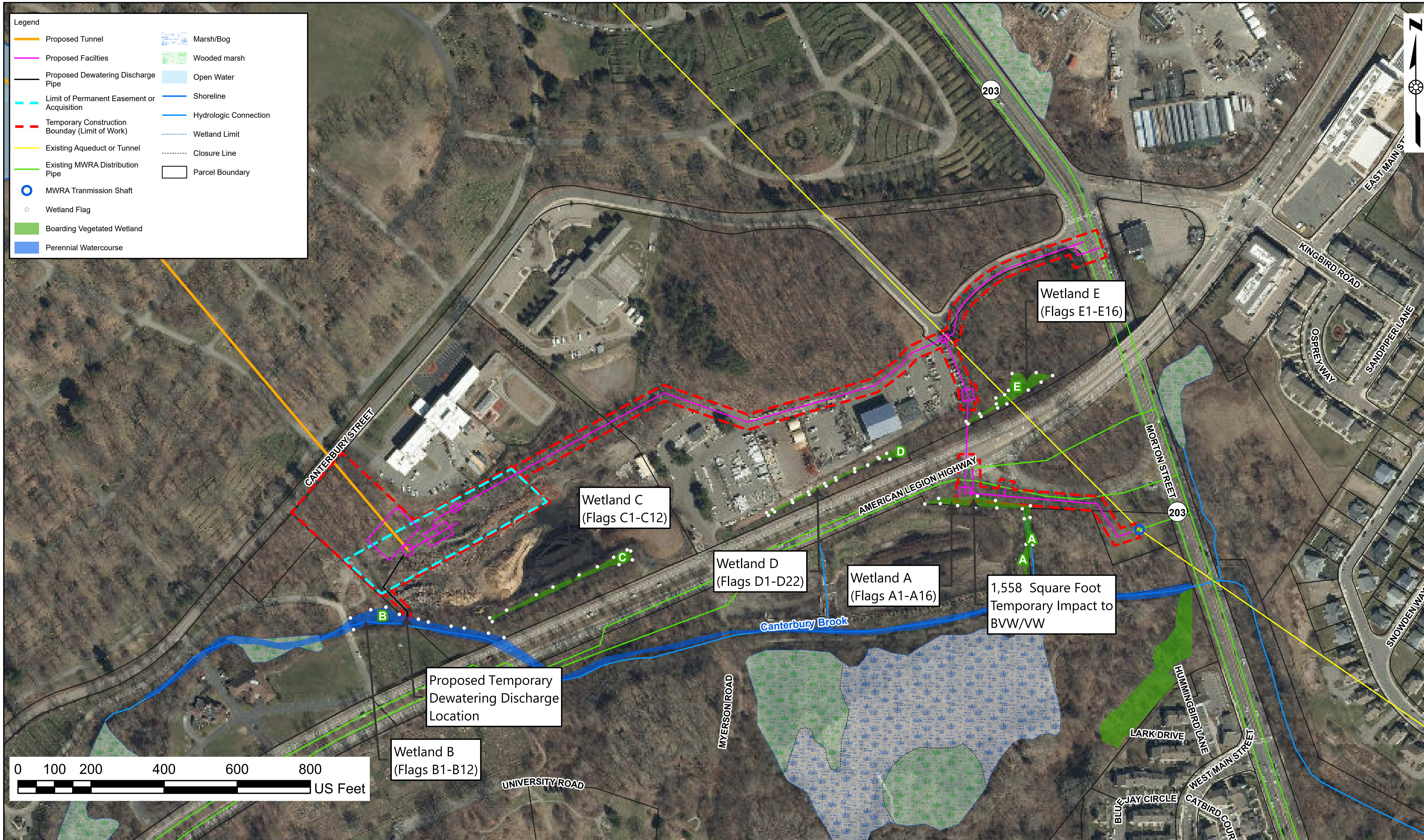
CDM Smith
in association with vhb
Jacobs
Green International Affiliates, Inc.

Rare Species and Wildlife Habitat
Highland Avenue Northeast/Southeast Launching
Figure 4.5-8

Needham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159 Draft Environmental Impact Report

Rare Species and Wildlife Habitat

American Legion Receiving

Figure 4.5-9

Boston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

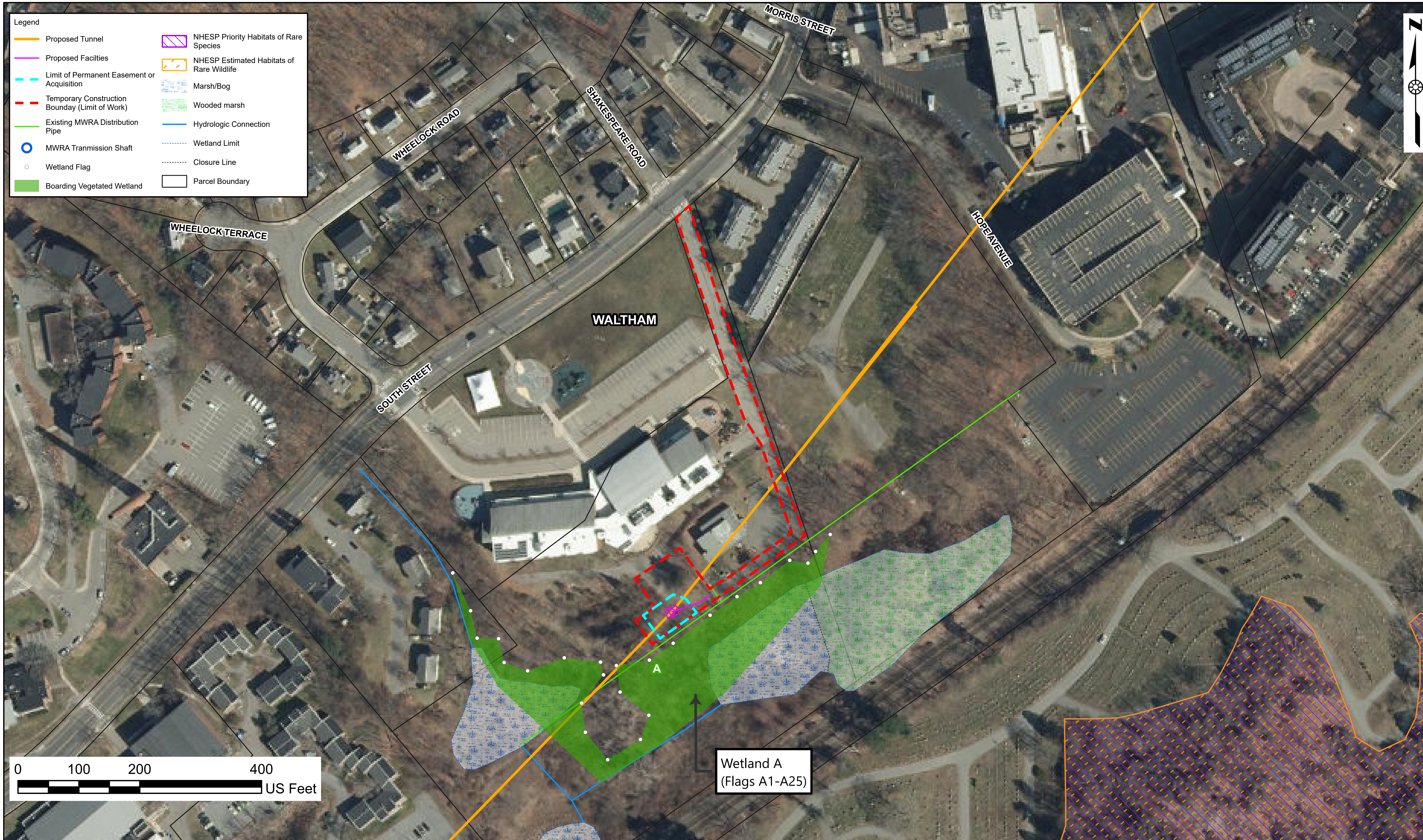
CDM Smith in association with vhb
Jacobs
Green International Affiliates, Inc.

Rare Species and Wildlife Habitat
School Street Connection
Figure 4.5-10

Waltham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Rare Species and Wildlife Habitat
Cedarwood Pumping Station Connection
Figure 4.5-11

Waltham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

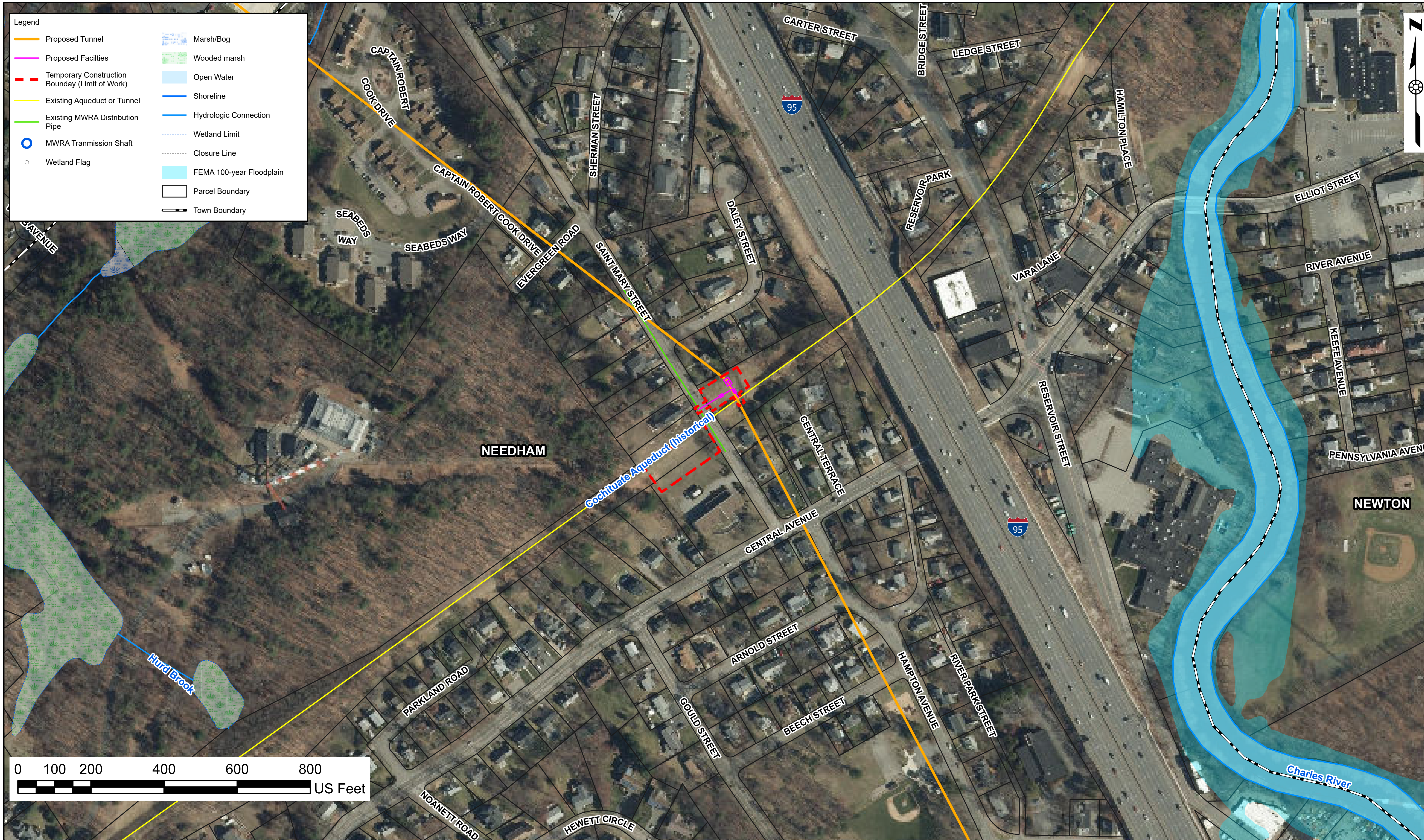
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wellesley, MA

Rare Species and Wildlife Habitat
Hegarty Pumping Station Connection
Figure 4.5-12

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

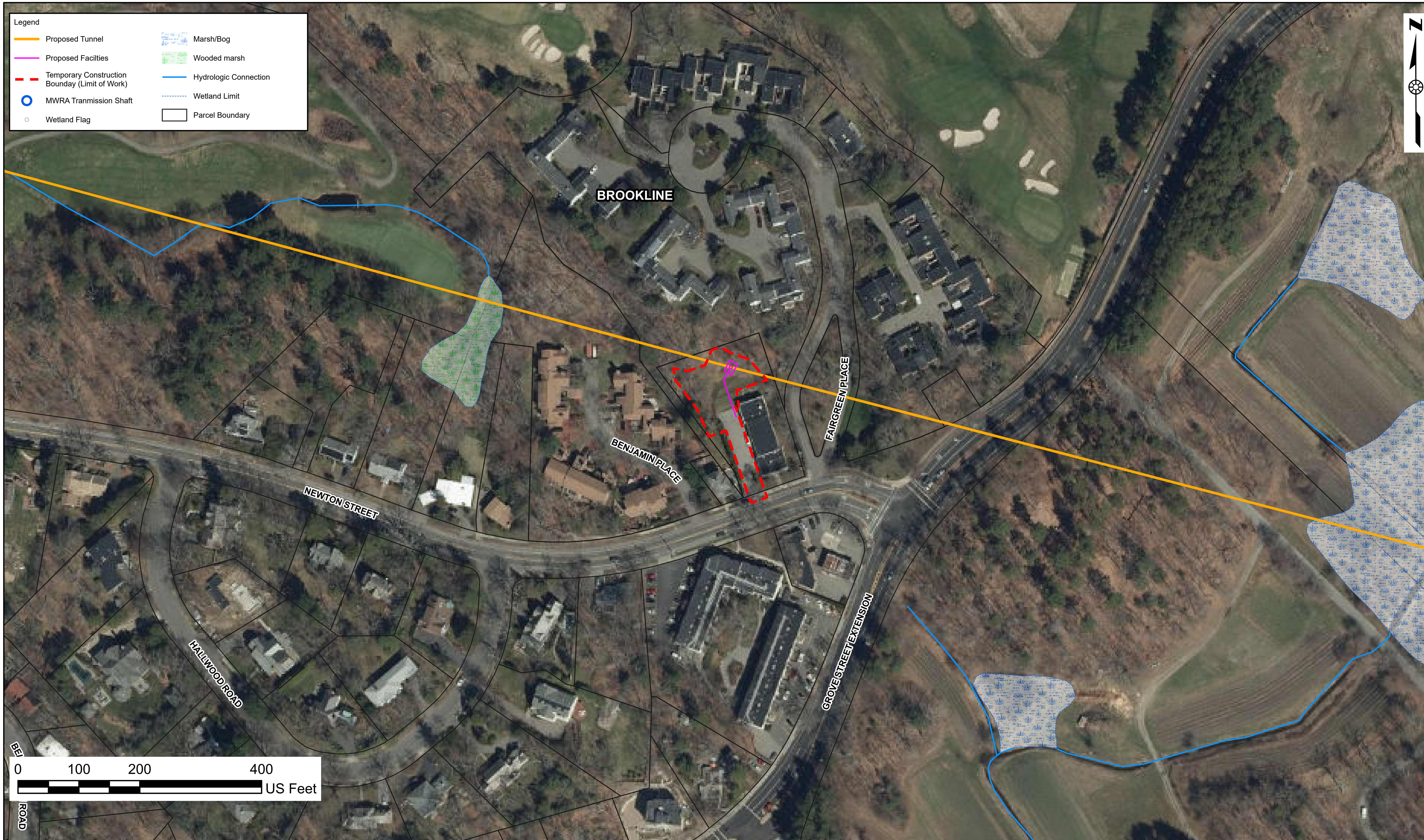
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Rare Species and Wildlife Habitat
St. Mary Street Pumping Station Connection
Figure 4.5-13

Needham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

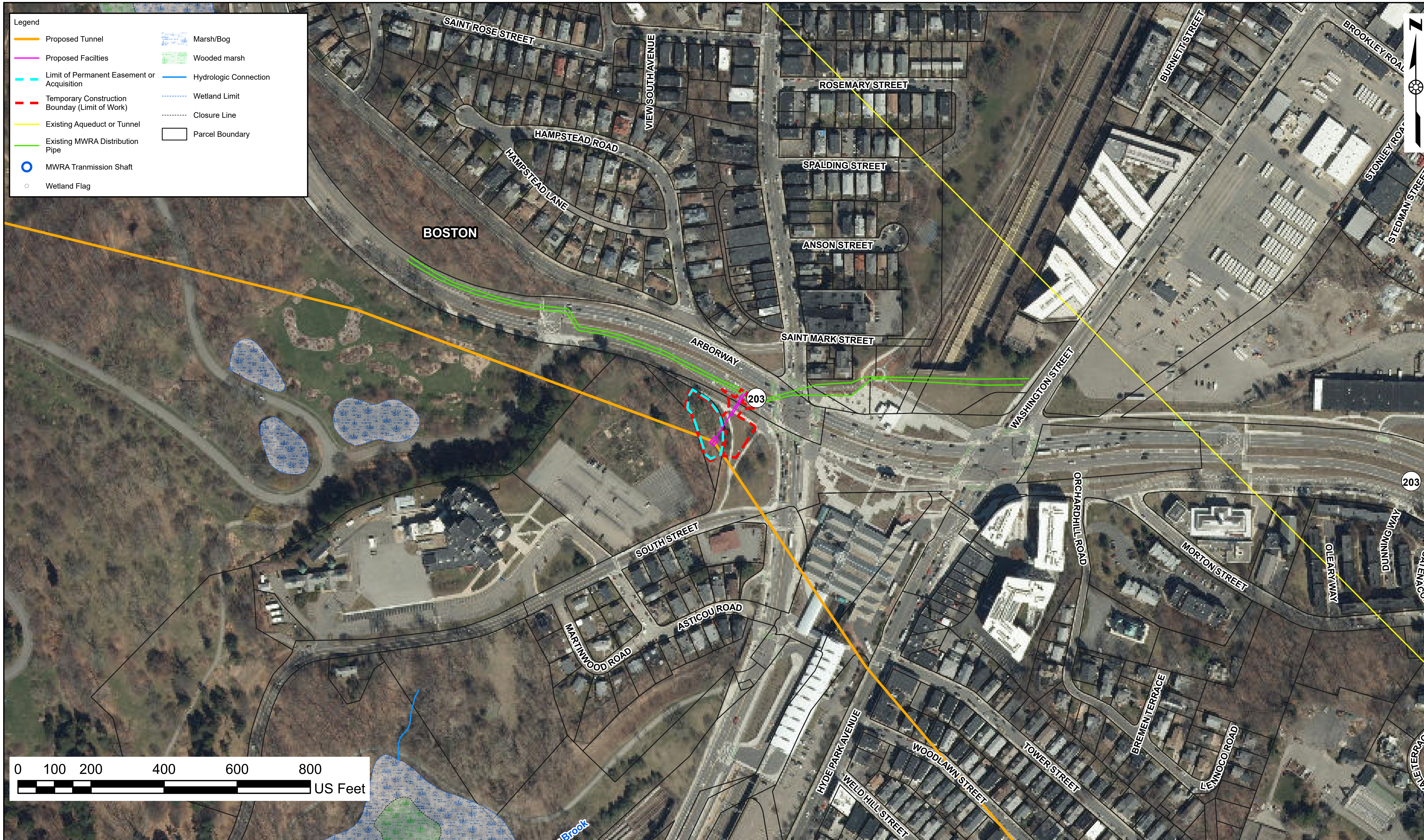
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Rare Species and Wildlife Habitat
Newton Street Pumping Station Connection
Figure 4.5-14

Brookline, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

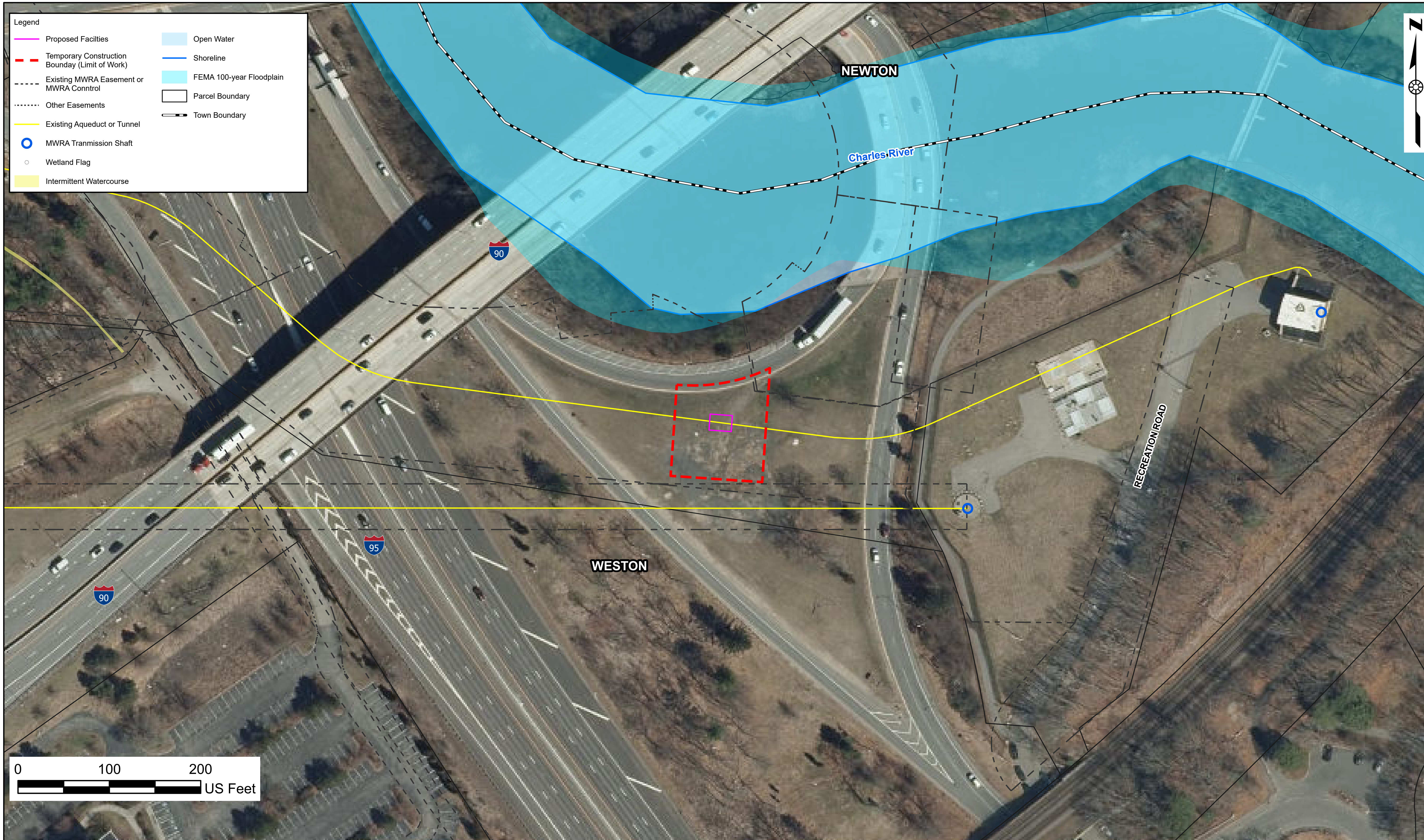
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Boston, MA

Rare Species and Wildlife Habitat
Southern Spine Mains Connection
Figure 4.5-15

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Rare Species and Wildlife Habitat
Hultman Aqueduct Isolation Valve
Figure 4.5-16

Weston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank

Tandem Trailer Launching /Park Road East

The Tandem Trailer site consists of approximately 4.0 acres of previously developed upland area adjacent to South Avenue, and ramps and roadways associated with the I-90/I-95 interchange (see **Figure 4.5-2**). The central portion of the site is occupied by an existing paved parking area accommodating tandem trailers and other equipment. A lightly wooded upland on the western side of the site includes such tree species as Norway maple, staghorn sumac (*Rhus hirta*), and red cedar (*Juniperus virginiana*). Stands of Japanese knotweed (*Fallopia japonica*) and several snags are also present in this area. Aside from several deer carcasses (apparently from animal-vehicle collisions) and unidentified avian species, wildlife was not directly observed. The western portion of the site, including the shaft location, would be expected to provide habitat for wildlife species common to urban and suburban habitats. Seaverns Brook, a coldwater fishery that originates from Schenck's Pond at the MWRA Norumbega Reservoir facility, is along the southwest side of the site. A 2007 study[12] conducted in Seaverns Brook within the limits of the Tandem Trailer site noted that the only fish species present was white sucker (*Catostomus commersonii*), a warmwater species, and that 7-day average of the daily maximum temperature was 25.5°C.

According to the WPA (310 CMR 10.04), coldwater fisheries are defined as:

"Waters in which the mean of the maximum daily temperature over a seven-day period generally does not exceed 68ºF (20ºC) and, when other ecological factors are favorable (such as habitat) are capable of supporting a year-round population of coldwater stenothermal aquatic life such as trout. Waters designated as coldwater fisheries by the Department in 314 CMR 4.00: Massachusetts Surface Water Quality Standards and waters designated as coldwater fishery resources by the Division of Fisheries and Wildlife are coldwater fisheries. Waters where there is evidence based on a fish survey that a coldwater fish population and habitat exist are also coldwater fisheries. Coldwater fish include but are not limited to brook trout (*Salvelinus fontanilis*), rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), creek chubsucker (*Erimyzon oblongus*) and fallfish (*Semotilus corporalis*)."

Therefore, the results of the temperature readings during the sampling indicated higher temperatures in the portion of Seaverns Brook within the Program Area than normally found in a coldwater fishery.

As noted above, the portion of Seaverns Brook on site was not determined to include coldwater fish species or provide suitable coldwater temperature conditions. A largely isolated wetland occurs in the northeast corner (see **Chapter 4, Section 4.6.4, Wetlands and Waterways, Existing Conditions**).

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species on the Tandem Trailer site. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within this site. The snags observed within the western portion of the site include cavities that are suitable for NLEB summer roosting habitat.

The Park Road East site includes approximately 1.5 acres of previously developed upland areas adjacent to Park Road, ramps and roadways associated with the I-90/I-95 interchange, and the Hultman Aqueduct (see **Figure 4.5-2**). Portions of the area around the aqueduct and roadways are largely mowed grassy

12 https://www.mass.gov/doc/20182020-integrated-list-of-waters-appendix-12-charles-river-watershed-assessment-and-listing-decision-summary/download

areas. The site's light tree cover includes such species as red and black oak (*Quercus rubra* and *Quercus velutina*, respectively), red maple (*Acer rubrum*), red cedar, white pine (*Pinus strobus*), dogwood (*Swida spp.*), black cherry, and several unknown recently planted ornamentals. Due to the disturbed nature of the site, it provides poor wildlife habitat. Songbirds were noted, but not identified by species. Signs of Canada geese were noted within the grassy areas. Wetlands on site include an intermittent stream associated with the highway drainage system (see **Chapter 4, Section 4.6.4, Wetlands and Waterways, Existing Conditions**).

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species on the Park Road East site. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within these sites; however, trees within the LOD were not observed to include exfoliating bark or cavities suitable for NLEB summer roosting habitat.

Bifurcation

The Bifurcation site consists of approximately 12.2 acres of previously developed land adjacent to ramps and roadways associated with the I-90/I-95 interchange and the Hultman Aqueduct (refer to **Figure 4.5-3**). Portions of the area around the aqueduct and roadways are largely mowed grassy areas. Other portions of the site include upland mixed-deciduous forest with white pine and shrub habitats, including species such as red, white, and black oak, scarlet oak (*Quercus coccinea*), red maple, sugar maple (*Acer saccharum*), white pine, red cedar, black locust (*Robinia pseudoacacia*), black cherry, chokecherry (*Prunus virginiana*), and species of hawthorn (*Crataegus spp*.). There is an intermittent stream in the center of the site, adjacent to which there are several shagbark hickory (*Carya ovata*) trees that had exfoliating bark. Terrestrial wildlife included sightings and signs small mammals such as grey squirrel and chipmunk. Songbirds and one hawk were noted, but not identified by species. Signs of white-tailed deer and Canada geese were noted. Wetlands on site include a forested wetland and intermittent streams associated with the highway drainage system (see **Chapter 4, Section 4.6.4, Wetlands and Waterways, Existing Conditions**).

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Bifurcation site. The site's construction staging area was found to include trees potentially suitable for NLEB summer roosting habitat.

Seaverns Brook, a coldwater fishery that originates from Schenck's Pond at the MWRA Norumbega Reservoir facility, flows along the north side of the site opposite I-90. As noted above, a portion of Seaverns Brook immediately upstream of the site was not determined to include coldwater fish species or provide suitable coldwater temperature conditions. The intermittent streams associated with the highway drainage system that flow through the site do not represent significant fisheries habitat.

Park Road West

The Park Road West site consists of approximately 2.7 acres of previously developed upland areas adjacent to Park Road and ramps and roadways associated with the I-90/I-95 interchange (see **Figure 4.5-4** for the Park Road West receiving site proposed in Alternative 4 and see **Figure 4.5-5** for the Park Road

West large connection site proposed in Alternative 10). A large portion of the site consists of a mowed grassy area. Several large trees exist in the central and western parts of the site, which includes species such as black oak, sugar maple, black locust, white pine, Norway spruce (*Picea abies*), and several small red cedars. Terrestrial wildlife was not directly observed. The disturbed nature of the site reduces its habitat value for most species. Songbirds were noted, but not identified by species. A forested wetland occurs along the northwest perimeter and an intermittent stream associated with the highway drainage system runs along the southern side, adjacent to an I-90 exit ramp (refer to **Chapter 4, Section 4.6.4, Wetlands and Waterways, Existing Conditions**).

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Park Road West site. The site was observed to include trees and snags that are potentially suitable for NLEB summer roosting habitat.

The intermittent stream associated with the highway drainage system that flows along the southern perimeter of the site does not represent significant fisheries habitat.

Highland Avenue Northwest/Southwest

The Highland Avenue Northwest and Southwest sites consist of approximately 5.6 acres and 3.1 acres, respectively, of previously developed upland areas adjacent to Highland Avenue and I-95 south, and ramps and roadways associated with the Highland Avenue/I-95 interchange (see **Figure 4.5-6** for the Highland Avenue Northwest receiving site proposed in Alternative 3; see **Figure 4.5-7** for the Highland Avenue Northwest/Southwest launching sites proposed in Alternatives 4 and 10). The Northwest interchange loop site consists almost exclusively of mowed grassy areas, with mature trees along the western edge of the site, including species such as red cedar, black oak, arborvitae (*Thuja occidentalis*), and white pine. The Southwest site consists of a large, mowed grassy area in the center of the site surrounded by a ring of mature trees at the periphery along the ramp, including species such as red cedar, arborvitae, red pine, white pine, and Norway spruce. The disturbed nature of the site and its surroundings reduces its habitat value for most species. Songbirds were noted, but not identified by species. No wetlands are present on the sites.

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Highland Avenue Northwest/Southwest sites. The site includes trees and snags that are potentially suitable for NLEB summer roosting habitat.

Highland Avenue Northeast/Southeast

The Highland Avenue Northeast and Southeast sites consist of approximately 4.8 acres and 4.7 acres, respectively, of previously developed upland areas adjacent to Highland Avenue and I-95 south, and ramps and roadways associated with the Highland Avenue/I-95 interchange (see **Figure 4.5-8**). The site is currently being used as a staging area for nearby construction. Other than the current staging and storage areas, the site is largely a mowed grassy area. The Highland Avenue Northeast site is also primarily a mowed grassy area. There is a non-jurisdictional drainage swale associated with highway drainage that runs through the center of the site. Both sites include a variety of immature trees (saplings) recently planted as a part of a MassDOT highway improvement project. The disturbed nature of the sites and their surroundings limits the habitat value for most species.

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Highland Avenue Northeast/Southeast sites. Due to their small sizes, however, none of the trees were identified as being potentially suitable for NLEB summer roosting habitat.

The intermittent channel associated with the highway drainage system that flows through the southeast cloverleaf site does not represent significant fisheries habitat.

American Legion

The American Legion site consists of approximately 5.4 acres of previously developed upland areas located between American Legion Highway and Canterbury Street (see **Figure 4.5-9**). Species on the site include yellow birch (*Betula alleghaniensis*), black cherry, Norway maple, tree of heaven, white pine, scarlet oak, American elm (*Ulmus americana*), black locust, bigtooth aspen (*Populus grandidentata*), and staghorn sumac. Five mature dawn redwood (*Metasequoia glyptostroboides*) trees were identified adjacent the south side of Canterbury Street along the surface pipeline routes for connections to existing MWRA facilities. The proposed staging area, which serves as the Landscape Express supply yard, is mainly made up of stockpiled landscaping materials and an area adjacent to the material stockpiles north to Canterbury Street. Canterbury Brook runs along the southern edge of the site before crossing underneath the American Legion Highway (see **Chapter 4, Section 4.6.4, Wetlands and Waterways**, for a description of existing conditions). Because much of the proposed construction site is in active use for commercial activities, the wildlife habitat value is greatly reduced. The most northerly portion of the site is less disturbed, and terrestrial wildlife included sightings and signs of small mammals common to suburban and urban habitats, such as grey squirrel, red squirrel, and chipmunk. A variety of songbirds were noted, but not identified by species. Signs of white-tailed deer were observed within the wooded areas adjacent to the pipeline route.

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that the monarch butterfly may be present within the American Legion site but did not include NLEB in the species list. On-site assessment observed that trees and snags that are potentially suitable for NLEB summer roosting habitat do occur within the LOD.

No detailed study on fisheries in Canterbury Brook was identified, but the brook would be expected to support warmwater fish such as bluegill, redfin pickerel, and redbreast sunfish.

4.5.4.2 Connection and Isolation Valve Sites

The rare species and wildlife habitat present at the connection and isolation valve site are summarized in **Table 4.5-2** and described below.

Table 4.5-2 Summary of Rare Species and Wildlife Habitat at Proposed Connection and Isolation Valve Sites

Site	Municipality	NLEB [1] Habitat Present	Snags and/or Suitable Trees Present	Within ¼ Mile of Known Hibernacula and/or 150 ft of Known Maternity Roost	Monarch Butterfly Habitat Present	Fisheries Habitat Present
School Street	Waltham	X	-	-	X	None
Cedarwood Pumping Station	Waltham	X	X	-	X	Warmwater
Hegarty Pumping Station	Wellesley	X	X	-	X	Warmwater
St. Mary Street Pumping Station	Needham	X	-	-	X	None
Newton Street Pumping Station	Brookline	X	X	-	X	None
Southern Spine Mains	Boston	X	X	-	X	None
Hultman Aqueduct Isolation Valve	Weston	X	-	-	X	None

[1] NLEB: Northern Long-Eared Bat

School Street

The School Street site is an approximately 0.6-acre previously developed gravel lot located at 167 School Street (see **Figure 4.5-10**). The site is located to the north of School Street and is otherwise bounded by other developed lots. No trees or wetlands are located on the School Street site. This site does not provide important wildlife habitat.

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the School Street site; however, no trees suitable for NLEB summer roosting habitat occur within the LOD. There is no fisheries habitat on site or nearby this site.

Cedarwood Pumping Station

The Cedarwood Pumping Station construction area consists of approximately 0.7 acres of forested upland area south of the Stanley Elementary School and north of the MBTA Commuter Rail Fitchburg Line. The near-surface WASM3 water transmission main traverses the site. (see **Figure 4.5-11**). Several large trees exist in the northern and southern parts of the site, including Norway maple, Norway spruce, American elm, and bigtooth aspen. Due to the disturbed nature of the site and its surroundings, it generally represents poor wildlife habitat. Several songbirds were noted, but not identified by species. Wetlands near the site include a forested wetland immediately adjacent to the south. A non-jurisdictional stormwater management area occurs immediately adjacent to the north of the site (see **Chapter 4, Section 4.6.4, Wetlands and Waterways, Existing Conditions**).

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Cedarwood Pumping Station site. The site includes several trees that are potentially suitable for NLEB summer roosting habitat.

The intermittent stream channels within the forested wetland adjacent to the site represent warmwater fish habitat.

Hegarty Pumping Station

The Hegarty Pumping Station site consists of approximately 0.3 acres of forested upland area southwest of I-95 southbound, east of recreational sports fields, and east and west of residential properties (see **Figure 4.5-12**). Barton Road bounds the site to the south. Several large trees exist in the central and western parts of the site, including species such as red and black oak, sugar maple, Norway spruce, and red pine. Terrestrial wildlife included sightings and signs of small mammals common to suburban areas such as grey squirrel and chipmunk. Songbirds were noted, but not identified by species. Wetlands nearby include Rosemary Brook and an associated vegetated wetland to the east of the site (see **Chapter 4, Section 4.6.4, Wetlands and Waterways, Existing Conditions**).

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Hegarty Pumping Station site. Trees that are potentially suitable for NLEB summer roosting habitat were observed on site.

Rosemary Brook flows within 100 feet of the site, providing warmwater fish habitat.

St. Mary Street Pumping Station

St. Mary Street Pumping Station site is composed of two small parcels of land, one east of St. Mary Street at approximately 0.2 acres and one west of St. Mary Street at approximately 0.4 acres in size. Both parcels are adjacent to residential properties west of I-95 southbound, the Sudbury Aqueduct, and Needham's Pumping Station. The parcels are bisected by St. Mary Street (see **Figure 4.5-13**). The lots are primarily mowed grassy areas with a few large trees in the eastern ends of each parcel. Tree species present include black cherry and black locust. Terrestrial wildlife was not directly observed. The developed nature of the site and surroundings reduces its habitat value for most species. Songbirds were noted, but not identified by species. No wetlands are located on or near the site.

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the St. Mary Street site; however, no trees suitable for NLEB summer roosting habitat occur within the LOD. There is no fisheries habitat on or near this site.

Newton Street Pumping Station

The connection shaft to the Newton Street Pumping Station would be located on 0.3 acres of a lightly wooded and paved upland area at 321 Newton Street (see **Figure 4.5-14**). An existing MWRA building and its associated surface parking lot occupy much of the property. Several large trees exist in the western portion of the site, including species such as tree of heaven, black oak, Norway maple, and American elm. No wetlands are located on or near the site.

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Newton Street Pumping Station site. The site includes trees that are potentially suitable for NLEB summer roosting habitat. There is no fisheries habitat on or near this site.

Southern Spine Mains

The Southern Spine site consists of 0.5 acres of lightly wooded upland (see **Figure 4.5-15**). The site is west of the walkways, mowed grass and landscaped areas adjacent to the Arborway. The wooded area includes species such as black oak, red oak, and red pine.

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that the monarch butterfly may be present within the Southern Spine site. The site includes trees that are potentially suitable for NLEB summer roosting habitat. There is no fisheries habitat on or near this site.

Hultman Aqueduct Isolation Valve

The Hultman Aqueduct Isolation Valve site consists of approximately 0.3 acres of previously developed land adjacent to ramps and roadways associated with the I-90/I-95 interchange and the Hultman Aqueduct (see **Figure 4.5-16**). The area is largely a mowed grassy area with several trees at the east/southeast edge of the site. Due to the disturbed nature of the site and surroundings, it does not provide important wildlife habitat.

No wetlands are present on site, but the Charles River is located within 100 feet north of the site on the opposite side of the I-90 exit ramp (see **Chapter 4, Section 4.6.4, Wetlands and Waterways, Existing Conditions**).

The Massachusetts DFW's NHESP has no records of the presence of Endangered, Threatened, or Special Concern species in the area. The USFWS IPaC online system indicates that NLEB and the monarch butterfly may be present within the Hultman Aqueduct Isolation Valve site; however, the site was not found to include any trees potentially suitable for NLEB summer roosting habitat within the construction area.

4.5.5 Construction-Period Impacts

The Massachusetts Environmental Policy Act (MEPA) requires "a detailed description and assessment of the negative and positive potential environmental impacts of the alternatives. The DEIR shall assess (in quantitative terms, to the maximum extent practicable) the direct and indirect potential environmental impacts from the Program that are within the Scope. The assessment shall include both short-term and long-term impacts for all phases of the Program (e.g., acquisition, development, and operation) and cumulative impacts of the Program, any other Programs, and other work or activity in the immediate surroundings and region."[13]

No direct impacts to state or federal threatened or endangered species are anticipated due to construction of the any of the Alternatives; however, there is the potential for an "incidental take" of NLEB habitat (regulated under the ESA) during periods of construction that include the clearing of vegetation within the LOD. The DEIR Alternatives were assessed for the presence of rare species and wildlife habitat within and adjacent to proposed shaft and connection sites, and the impacts associated with them. These assessments are described for each alternative on a site-by-site basis below.

Many of the wildlife species inhabiting project construction sites would be likely to avoid use of the sites due to additional disturbance associated with construction activities. The species identified are common to urban and suburban areas and would be expected to be able to find suitable habitats nearby.

Fisheries resources within or adjacent to all alternatives could potentially be impacted by turbidity due to sediment in construction site runoff or pollutants in dewatering discharges. Construction contract documents would require the preparation of a SWPPP required under the NPDES General Permit for Discharges from Construction Activities,[14] which will detail implementation of appropriate sedimentation and erosion controls during construction to avoid impacts on fisheries resources. (Refer to **Chapter 4, Section 4.6.5 Wetlands and Waterways, Construction-Period Impacts** for additional detail on the SWPPP.) Dewatering discharges from sites would be treated as necessary to meet minimum criteria for discharge to a Class B waterway and additional requirements of state and federal permits issued during final design. (Refer to **Chapter 4, Section 4.6.5 Wetlands and Waterways, Construction-Period Impacts** for additional detail on dewatering practices.) Because water will be close to ambient temperature after treatment and the average temperature within Seaverns Brook is 25.5°C[15], no impacts on coldwater fisheries or adjacent waterways are anticipated as a result of dewatering discharges.

Upon completion of construction at each site, altered areas outside the limits of the permanent easement would be restored to preconstruction conditions and revegetated. Site restoration plans would be developed during final design and would include replacement tree plantings as agreed to among the MWRA, site owners, and/or municipal officials. Site restoration and revegetation would reestablish wildlife habitats similar to preconstruction conditions. No significant long-term impact to wildlife species would be anticipated for any of the DEIR Alternatives.

Several launching and receiving sites, as well as connection and near surface pipeline construction sites, would require tree clearing, which has the potential for an incidental take of NLEB habitat under the ESA. Adverse impacts due to alteration of potential NLEB habitat would be minimized by clearing trees only

---

13 301 Code of Massachusetts Regulations, Title 11.00: MEPA Regulations (11 CMR 11.07(6)(h))

14 US Environmental Protection Agency. 2022. National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. US EPA, February 17, 2022, https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-permit.pdf

15 https://www.mass.gov/doc/20182020-integrated-list-of-waters-appendix-12-charles-river-watershed-assessment-and-listing-decision-summary/download

outside the applicable time-of-year restrictions and would be mitigated through restoration of the disturbed areas after completion of work. **Table 4.5-3** summarizes the acres of tree clearing that would be required for launching and receiving sites.

For each DEIR alternative, tree clearing impacts are further described below.

Table 4.5-3 Acres of Tree Clearing – Launching and Receiving Sites

Site	Alternative 3	Alternative 4	Alternative 10
Fernald Property	0.4	0.4	0.4
Tandem Trailer/ Park Road East	0.8/0.1	0.8/0.1	N/A
Bifurcation	6.1	N/A	N/A
Park Road West	N/A	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
Total Number of Acres of Tree Clearing for Alternative	11.4	5.5	4.6

N/A Not Applicable; indicating the site is not used in Alternative

4.5.5.1 Alternative 3

Fernald Property- Receiving

Proposed work during construction at the Fernald Property for Alternative 3 would include tree clearing within the LOD as shown in **Figure 4.5-1**. Most of the staging area is already cleared, however tree removal would be anticipated in the northeast portion of the site. Several trees within the construction staging area on the site are potentially suitable for NLEB summer roosting habitat. Several snags are also present in the southwest portion of the site.

Tandem Trailer/Park Road East- Launching

Proposed work during construction at the Tandem Trailers site for Alternative 3 would include tree clearing within the LOD in the southern portion of the site. The majority of the site is previously cleared, with the exception of a few trees lining the northwest side of the parcel. Several trees on the site within the construction staging area are potentially suitable for NLEB summer roosting habitat. Additionally, several snags are also present in the southern portion of the site.

Construction-period work at the Park Road East site for Alternative 3 would include tree removal at several locations. The majority of the site is made up of mowed, grassy areas with minimal trees present. Trees within the LOD were not observed to include exfoliating bark or cavities suitable for NLEB summer roosting habitat.

Bifurcation- Launching

Proposed construction-period work for Alternative 3 at the Bifurcation site would include tree clearing within the LOD as shown on **Figure 4.5-3**. The large, forested area adjacent to the intermittent stream would not be cut since no laydown areas are proposed in this location but clearing would be proposed in the west and southern portions. As described in **Section 4.5.5.1** above, several trees within the construction staging area are potentially suitable for NLEB summer roosting habitat.

Highland Avenue Northwest/Southwest- Receiving

Construction-period work at the Highland Avenue Northwest and Southwest site for Alternative 3 would include an area of tree removal in the northwest part of the northwest cloverleaf. The remainder of the site is made up of mowed, grassy areas with no trees present. These sites include trees and snags that are potentially suitable for NLEB summer roosting habitat.

Highland Avenue Northeast/Southeast- Launching

Construction-period work at the Highland Avenue Northeast and Southeast sites for Alternative 3 would include little to no tree removal, as there are only saplings present. The majority of the site is made up of mowed, grassy areas. No trees are present that are potentially suitable for NLEB summer roosting habitat.

American Legion- Receiving

Proposed work during the construction period at the American Legion site would include tree clearing within the LOD. Although the IPaC results indicate NLEB is not anticipated to be present at the American Legion site, as mentioned above, several trees observed on the site and along the proposed connection pipeline routes, including along Canterbury Lane and the connection from American Legion Highway to Morton Street, would be potentially suitable for NLEB summer roosting habitat.

4.5.5.2 Alternative 4

The following section describes the construction-period impacts by launching and receiving site in Alternative 4, many of which are the same as Alternative 3.

Fernald Property- Receiving

Proposed work and its impact on potentially suitable NLEB habitat during construction at the Fernald Property for Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.5.1**.

Tandem Trailer/Park Road East-Launching

Proposed work and its impact on potentially suitable NLEB habitat during construction at the Tandem Trailer and Park Road East Sites for Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

Park Road West Receiving

Construction-period work at the Park Road West site for Alternative 4 would include tree removal throughout the site. Several trees in the center and on the eastern edge of the parcel would be cut to accommodate staging areas. The remainder of the site is made up of mowed, grassy areas with minimal trees present. Trees and snags within the LOD were observed to be potentially suitable for NLEB summer roosting habitat.

Highland Avenue Northwest/Southwest- Launching

Proposed work and its impact on potentially suitable NLEB habitat during construction at the Highland Avenue Northwest and Southwest sites for Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.5.1**.

Highland Avenue Northeast/Southeast- Launching

Proposed work and its impact on potentially suitable NLEB habitat during construction at the Highland Avenue Northeast and Southeast sites for Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.5.1**.

American Legion- Receiving

Proposed work and its impact on potentially suitable NLEB habitat during construction at American Legion for Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.5.1**.

4.5.5.3 Alternative 10

The following section describes the construction period impacts by launching and receiving site in Alternative 10, many of which are the same as Alternatives 3 and 4.

Fernald Property- Receiving

Proposed work and its impact on potentially suitable NLEB habitat during construction at Fernald Property for Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.5.1**

Park Road West- Large Connection

Proposed work and its impact on potentially suitable NLEB habitat during construction at Park Road West for Alternative 10 would be the same as Alternative 4, as described in **Section 4.5.5.2**.

Highland Avenue Northwest/Southwest- Launching

Proposed work and its impact on potentially suitable NLEB habitat during construction at the Highland Avenue Northwest and Southwest sites for Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.5.1**.

Highland Avenue Northeast/Southeast- Launching

Proposed work and its impact on potentially suitable NLEB habitat during construction at the Highland Avenue Northeast and Southeast sites for Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.5.1**.

American Legion- Receiving

Proposed work and its impact on potentially suitable NLEB habitat during construction at American Legion for Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.5.1**.

4.5.5.4 Connection and Isolation Valve Sites

Connection sites are common to all three Alternatives. **Table 4.5-4** summarizes the tree clearing that would be required for each site, which has the potential for an incidental take of NLEB habitat under the ESA. Adverse impacts due to alteration of potential NLEB habitat would be minimized by clearing trees only outside the applicable time-of-year restrictions and would be mitigated over time through restoration of disturbed areas after work is complete.

Table 4.5-4 Acres of Tree Clearing – Connection and Isolation Valve Sites

Site	Alternatives 3, 4, & 10
School Street Connection	--
Cedarwood Pumping Station Connection	0.1
Hegarty Pumping Station Connection	0.2
St. Mary Street Pumping Station Connection	--
Newton Street Pumping Station Connection	0.1
Southern Spine Mains Connection	0.3
Hultman Aqueduct Isolation Valve	--
Total Number of Acres of Tree Clearing	0.7

School Street

Proposed construction-period work at the School Street site would not include tree clearing as the area is previously cleared.

Cedarwood Pumping Station

Proposed construction-period work at the Cedarwood Pumping Station would include tree clearing throughout portions of the site. As mentioned in **Section 4.5.4.2**, the site includes trees that are potentially suitable for NLEB summer roosting habitat.

Hegarty Pumping Station

Proposed construction-period work at the Hegarty Pumping Station would include tree clearing throughout northern portions of the site. As mentioned in **Section 4.5.4.2**, the site includes trees that are potentially suitable for NLEB summer roosting habitat.

St. Mary Street Pumping Station

Proposed construction-period work at the St. Mary Street Pumping Station site would not include tree clearing as the proposed staging areas are located in mowed, grassy areas.

Newton Street Pumping Station

Proposed construction-period work at the Newton Street Pumping Station would include a limited amount of tree clearing in the northern portions of the site. As mentioned in **Section 4.5.4.2**, the site includes trees that are potentially suitable for NLEB summer roosting habitat.

Southern Spine Mains

Proposed construction-period work at the Southern Spine site includes tree clearing within 0.3 acres of wooded area; the remainder is in existing mowed, grassy areas.

Hultman Aqueduct Isolation Valve

Proposed construction-period work at the Hultman Aqueduct Isolation Valve site would not include tree clearing as the proposed staging areas are in mowed, grassy areas.

4.5.6 Final Conditions

Final Conditions for proposed sites would include maintenance of vegetation within cleared areas (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 shafts, valve chambers, and parking areas would be located in a small, fenced-in areas. Proposed finished conditions are described for each alternative on a site-by-site basis below. None of the maintenance activities during tunnel operation would be anticipated to adversely affect wildlife populations, since the species identified are all common to urban and suburban areas and would be expected to be able to tolerate the anticipated minor levels of disturbance. None of the maintenance or inspection activities would be anticipated to adversely affect fisheries or water quality.

4.5.6.1 Alternative 3

This section describes the Final Conditions for Alternative 3.

Fernald Property

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.

Tandem Trailer/Park Road East

Final conditions for the Tandem Trailer site would include a paved access drive and top-of-shaft structure southwest of the existing paved area. A permanent buried dewatering pipe would be installed from the shaft to Seaverns Brook to allow for future, infrequent dewatering of the tunnel for maintenance. Tree planting and landscaping will be coordinated with MassDOT and community stakeholders during final design. Trees and plantings native to the area will be planted to mitigate the impact of tree removal required during construction.

Final conditions for the Park Road East site would include a paved access drive and parking area, stormwater management area, valve chamber, and top-of-shaft structure, all west of the existing paved area. Tree planting and landscaping will be coordinated with MassDOT and community stakeholders during final design. Trees and plantings native to the area will be planted to mitigate the impact of tree removal required during construction.

Bifurcation

Final conditions for the Bifurcation site would include a paved access drive and parking area, stormwater management area, two valve chambers, and top-of-shaft structure, all in the western half of the site. A permanent buried dewatering pipe would be installed from the shaft to Seaverns Brook to allow for future, infrequent dewatering of the tunnel for maintenance. Tree planting and landscaping will be coordinated with MassDOT and community stakeholders during final design. Trees and plantings native to the area will be planted to mitigate the impact of tree removal required during construction.

Highland Avenue Northwest/Southwest

In the finished condition, no permanent surface facilities are proposed for this site. The site would be restored to preconstruction contours and revegetated.

Highland Avenue Northeast/Southeast

Final conditions for the Highland Avenue site would include a paved access drive and parking area, stormwater management area, valve chamber, and top-of-shaft structure. A buried dewatering pipe would lead from the shaft structure to a flared end outlet structure at the Charles River to the east, providing a permanent drainage method for the tunnel during maintenance activities.

American Legion

Final conditions for the American Legion site would include a paved access drive off Canterbury Street, a stormwater management area, proposed top-of-shaft structure, and valve chamber. A buried pipe would run east from the site to connect to the MWRA' s existing Shaft 7C and its existing water transmission mains in Morton Street, with up to five smaller valve chambers for connections to existing transmission lines. Tree planting and landscaping will be coordinated with the property owner, municipalities, and community stakeholders during final design. Trees and plantings native to the area will be planted to mitigate the impact of tree removal required during construction.

4.5.6.2 Alternative 4

This section describes the Final Conditions for Alternative 4, many of which are the same as Alternative 3.

Fernald Property

Final conditions for the Fernald Property in Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

Tandem Trailer /Park Road East

Final conditions for the Tandem Trailer and Park Road East sites in Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

Park Road West Receiving

Final conditions for the Park Road West site would include a paved access drive, stormwater management area, two valve chambers, and a top-of-shaft structure. The paved access drive would connect to Park Road to the east. Tree planting and landscaping will be coordinated with MassDOT and community stakeholders during final design. Trees and plantings native to the area will be planted to mitigate the impact of tree removal required during construction.

Highland Avenue Northwest/Southwest Launching

Final conditions for the Highland Avenue Northwest and Southwest sites in Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

Highland Avenue Northeast/Southeast

Final conditions for the Highland Avenue Northeast and Southeast sites in Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

American Legion

Final conditions for the American Legion site in Alternative 4 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

4.5.6.3 Alternative 10

This section describes the Final Conditions for Alternative 10, many of which are the same as Alternative 3 and Alternative 4.

Fernald Property

Final conditions for the Fernald Property site in Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

Park Road West

Final conditions for the Park Road West site in Alternative 10 would be the same as Alternative 4, as described in **Section 4.5.6.2**.

Highland Avenue Northwest/Southwest

Final conditions for the Highland Avenue Northwest and Southwest sites in Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

Highland Avenue Northeast/Southeast

Final conditions for the Highland Avenue Northeast and Southeast sites in Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

American Legion

Final conditions for the American Legion site in Alternative 10 would be the same as Alternative 3, as described in **Section 4.5.6.1**.

4.5.6.4 Connection Sites and Isolation Valve

The Connection sites and isolation valve site are common to all three Alternatives.

School Street

Final conditions for the School Street site would include a curb cut and sidewalk with an ADA ramp, a top-of-shaft structure, removing areas of impervious pavement and replacing with loam and seed, and plantings at the School Street frontage based on community input. The buried pipe proposed to run east on School Street to connect to the existing MWRA transmission line would not be readily visible in the finished condition.

Cedarwood Pumping Station

Final conditions at Cedarwood Pumping Station would include a paved access drive and parking area, top-of-shaft structure, and stormwater management area. A connection pipe to the WASM 3 Distribution Pipe would also be constructed, but it would be buried and not readily visible on the surface. This connection pipe is proposed south of the existing pumping station and infrastructure. Site restoration and landscaping would be coordinated with the City of Waltham and community stakeholders during final design. Trees and plantings native to the area would be planted to mitigate the impact of tree removal required during construction.

Hegarty Pumping Station

Final conditions at Hegarty Pumping Station would include a paved access drive, top-of-shaft structure and stormwater management area, and a proposed meter chamber. A buried connection to the existing Wellesley pipeline is proposed to the northeast but would not be readily visible on the surface. This is proposed southwest of the existing pumping station infrastructure. Tree planting and landscaping would be coordinated with the Town of Wellesley and community stakeholders during final design. Trees and plantings native to the area would be planted to mitigate the impact of tree removal required during construction.

St. Mary Street Pumping Station

Final conditions at St. Mary Street Pumping Station would include a paved access drive and parking area, top-of-shaft structure, and stormwater management area. The two buried pipes to connect to the existing MWRA transmission line and the Sudbury Aqueduct would not be readily visible in the finished condition. The site would be revegetated when construction is complete.

Newton Street Pumping Station

Final conditions at Newton Street Pumping Station would include a paved access drive and parking area, top-of-shaft structure, and stormwater management area, all proposed north of the existing pumping station infrastructure. Tree planting and landscaping would be coordinated with the MWRA and community stakeholders during final design. Trees and plantings native to the area would be planted to mitigate the impact of tree removal required during construction.

Southern Spine Mains

Final conditions at Southern Spine Mains include a paved access drive and parking area that would connect to the Arborway, a top-of-shaft structure, a retaining wall on the western side, and connections to the existing MWRA transmission lines to the north. The connections are proposed on the northeast corner of the site. An ornamental gate for vehicle access is also proposed in this location within the retaining wall opening. Tree planting and landscaping would be coordinated with the property owner, municipality, and community stakeholders during final design. Trees and plantings native to the area would be planted to mitigate the impact of tree removal required during construction.

Hultman Aqueduct Isolation Valve

Final conditions at the Hultman Aqueduct Isolation Valve would include a valve chamber access hatch that would not be readily visible on the surface, a paved access drive, and a stormwater management area. The site would be revegetated when construction is complete.

4.5.7 Avoidance, Minimization, and Mitigation Measures

This section describes the avoidance, minimization, and mitigation measures the Program would pursue to offset the impacts described in **Section 4.5.5** Construction Period Impacts and **Section 4.5.6** Final Conditions. The avoidance, minimization, and mitigation measures would be the same across all three alternatives.

4.5.7.1 Construction Phase

Due to the statewide potential presence of NLEB habitat (regulated by the ESA), complete avoidance of threatened species habitat during the construction phase would not be feasible. The Program, however, incorporates efforts to minimize potential impacts to the species as detailed in the NRCS USFWS NLEB 4(d) Rule for minimizing incidental take and promoting conservation of NLEB. No work is proposed within 0.25 miles of a NLEB hibernacula or within 150 feet of a known maternity roost tree. Additionally, vegetation clearing would be limited, and when clearing is necessary, work would only be conducted outside the applicable time of year restriction. As required by the NLEB 4(d) Rule: “No tree removal is to occur from June 1 to July 31. Tree removal must not take place until NRCS confirms that ESA requirements for NLEB have been met.” In accordance with ESA, consultation with the USFWS would occur before construction during the final design and permitting phase.

Where tree removal would occur, special consideration would be given during final design to avoiding trees with notable cracks, cavities, sloughing, or deeply fissured bark—especially when within a riparian buffer.

As monarchs are a candidate species, the USFWS has not yet established any requirements for minimizing incidental take of monarchs.

4.5.7.2 Final Condition

None of the inspection or maintenance activities at any of the shaft or connection sites would have any potential to impact federal listed species. Normal operations would not involve additional tree removal that could affect NLEB.

4.6 Wetlands and Waterways

The Secretary's Certificate on the Environmental Notification Form (ENF) required the DEIR to include a comprehensive analysis of the Program's potential environmental impacts to wetlands and describe both temporary and permanent wetlands as described below:

- A description of the Program'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 historical resources and open space.
- A comprehensive analysis of the Program's potential environmental impacts (including but not limited to: wetlands/waterways; rare species habitat; cultural and historical resources; land alteration, impervious area, and stormwater management; and protected open space) and identify measures to avoid, minimize and mitigate said impacts. This should include a separate section or chapter that addresses each of these resources.
- Description of both temporary and permanent wetlands/waterways impacts associated with the Program.
- Identify any infrastructure that will be located within the floodplain and how the infrastructure was designed to mitigate flood impacts.

The following section describes the existing conditions for wetland and waterways resources identified at each of the proposed Launching, Receiving Connection and Isolation Valve sites and along the tunnel alignments that comprise the DEIR Alternatives. It also evaluates anticipated construction-phase impacts and the anticipated impacts under built conditions for those sites. Resources assessed include named surface waters such as rivers and lakes. Avoidance, minimization, and mitigation measures that have been employed during Program development or would be implemented in the construction and operation phases of the Program are also described. Information on the existing quality and usage of these resources is based on publicly accessible information.

4.6.1 Resource Definitions

Wetland resources in Massachusetts are regulated under federal, state, and municipal programs. The following section defines the resources evaluated in this section.

4.6.1.1 Federal Wetlands Definition

According to the federal definition, the term wetlands means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.[1] These areas are characterized by hydric soils, hydrophytic vegetation, and standing water or saturated soils. Vegetated Wetlands (VW) have a hydrologic connection to a waterway (WW) or other surface water. Isolated Vegetated Wetlands (IVW)

1 Code of Federal Regulations (CFR) Title 40, Part 120.2, Definition of Waters of the United States.

have no such hydrologic connection. All wetlands provide benefits, including flood, storage, storm protection, groundwater recharge, water filtration, and wildlife habitat.

4.6.1.2 State Wetlands Definition

According to the Massachusetts Wetlands Protection Act (WPA),[2] state-regulated wetlands include freshwater wetlands—which are wet meadows; marshes; swamps; bogs; areas where groundwater, flowing or standing surface water, or ice provide a significant part of the supporting substrate for a plant community for at least five months of the year; emergent and submergent plant communities in inland waters; and that portion of any bank that touches any inland waters.

Wetland Resource Areas, as defined in the WPA and its implementing regulations,[3] occurring within the Study Area include these inland resource areas:

- Bank
- Bordering Vegetated Wetlands (BVW)
- Land Under Waterbodies and Waterways (LUW)
- Bordering Land Subject to Flooding (BLSF)
- Isolated Land Subject to Flooding (ILSF)
- Riverfront Area (RA)

The following coastal resources are also regulated under the WPA, but do not occur within the Program area:

- Land Subject to Coastal Storm Flowage (LSCSF)
- Coastal Bank

This section provides a brief description of the Commonwealth's regulatory criteria defining each of these resources.

Bank: As defined in 310 CMR 10.54 (2)(a)&(c), a Bank is "... the portion of the land surface that normally abuts and confines a waterbody." This land surface "... may be partially or totally vegetated, or it may be comprised of exposed soil, gravel, or stone." "The upper boundary of a Bank is delineated as the first observable break in the slope or the mean annual flood level, whichever is lower." Bank is present between a perennial river, lake, or pond and the adjacent BVW or upland and within intermittent streams.

Stream: The WPA regulations define a stream as "a body of running water which moves within, into, or out of an Area subject to protection of the Act… Such a body of running water that does not flow throughout the year (i.e., intermittent) is a stream except for that portion upgradient of all bogs, swamps, wet meadows, and marshes." Accordingly, only those intermittent channels that convey water in response to a hydraulic gradient and those that are within or downgradient of Bordering Vegetated Wetlands contain the resource area Bank.

2 MGL, Chapter 131, Section 40.

3 310 CMR 10.00 et seq.

Bordering Vegetated Wetlands: As defined in 310 CMR 10.55(2)(a), "Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes." BVW boundaries are defined in 310 CMR 10.55(2)(c) as "... the line within which 50 percent or more of the vegetational community consists of wetland plants and saturated or inundated conditions exist."

Land Under Waterbodies and Waterways: Land under Waterbodies and Waterways "is the land beneath any creek, river, stream, pond, or lake. Said land may be composed of organic muck or peat, fine sediments, rocks, or bedrock. The boundary of LUW is the mean annual low water level" [310 CMR 10.56 (2)(a)&(c)].

Bordering Land Subject to Flooding: "Bordering Land Subject to Flooding is an area with low flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds, or lakes. It extends from the banks of these waterways and waterbodies; where a bordering vegetated wetland occurs, it extends from said wetland" [310 CMR 10.57(2)(a)]. "The boundary of Bordering Land Subject to Flooding is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm… determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed… under the Federal Emergency Mapping Agency…" [310 CMR 10.57(2)(c)].

Isolated Land Subject to Flooding: "Isolated Land Subject to Flooding is an isolated depression or closed basin without an inlet or outlet. It is an area that at least once a year confines standing water to a volume of one quarter-acre foot and an average depth of six inches" [310 CMR 10.57(1)(b)].

Riverfront Area: RA is "the area of land between a [perennial] river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away," except that the parallel line is located 25 feet away in Boston [310 CMR 10.58 (2)(a)3]. Riverfront Area occurs at all locations where the project crosses a perennial watercourse or is within 200 feet of a perennial watercourse. The regulatory presumptions regarding the intermittent or perennial nature state that "if a river or stream is shown as intermittent or not shown on the current United States Geological Survey (USGS) map, or more recent map provided by the MassDEP, an assertion that it is perennial must be supported by evidence…" [310 CMR 10.58(2)(1)(a)].

Vernal Pools: Vernal Pools are not regulated under the WPA as a wetland resource area. Vernal pool habitats, as defined in 310 CMR 10.04, are "confined basin depressions, at least in most years, holding water for a minimum of two continuous months during the spring and/or summer," and must be within a regulated wetland resource area to be protected under the WPA. Vernal Pool habitat includes the certified pool itself and all land within 100 feet of the pool that is also within a resource area. The presence of vernal pool habitat indicates that the wetland resource area provides important wildlife habitat.

4.6.1.3 Municipal Wetlands Definition

The MWRA's enabling legislation describes, and its practice has been, that the MWRA is not subject to local wetland bylaws that exceed the WPA. While the Program is exempt from local bylaws, the MWRA is committed to avoiding and minimizing any potential impacts to any wetland resource areas and intends to work with local conservation commissions and other municipal officials to ensure that the Program is designed and constructed in a manner that minimizes wetland impacts to the maximum extent feasible.

4.6.1.4 Surface Water

Surface water, which can include lakes, ponds, rivers, and streams, is an important natural resource that has a variety of uses including drinking water supplies, irrigation, industrial uses, and wildlife habitat. The quality of surface water is influenced by surficial geology, land use, and characteristics of source waters. The uses of water may be limited by its physical and chemical characteristics. Changes in temperature, pH, dissolved oxygen (DO) content, and pollutant concentrations due to anthropogenic effects may make surface waters unsuitable for certain uses.

4.6.2 Regulatory Framework

Wetland resources and waterways in Massachusetts are regulated under several federal and state programs, including the federal Clean Water Act (CWA) (Sections 402 and 404) and the Massachusetts Clean Waters Act (Massachusetts General Law (MGL) Chapter 21, §26-53). Other applicable regulations include the Massachusetts Section 401 Discharge regulations (314 CMR 9.00), and Surface Water Quality Standards (314 CMR 4.00). Some waterways are also regulated under Massachusetts Public Waterfront Act (MGL Chapter 91), which protects the public interest in tidelands, Great Ponds, and non-tidal rivers. The following section describes the regulatory framework applicable to the Program.

4.6.2.1 Clean Water Act of 1977

Water quality must be addressed to maintain compliance with the Federal Water Pollution Control Act, also known as the Clean Water Act (CWA). The CWA provides the authority to the USEPA to establish water quality standards (or to states to establish standards equal to or more stringent than USEPA standards), to control discharges into surface and subsurface waters, and to develop waste treatment management plans and practices. It requires states to monitor and classify waterbodies, establish goals, and publish lists of monitoring and classification results. The CWA gives states the authority and responsibility to publish water quality standards.[4]

Section 404 of the Federal Clean Water Act

Section 404 of the Clean Water Act requires a Department of the Army (DA) permit (administered by the U.S. Army Corps of Engineers (USACE) for the discharge of dredged or fill material into waters of the United States,[5] including adjacent wetlands. Consequently, the DEIR Alternatives would require a DA permit for the placement of any proposed structures (including rip rap splash pads) in waters of the U.S. The level of Section 404 DA permitting required depends on the nature and extent of the proposed impacts to jurisdictional resources. The Program area includes permanent and/or temporary impacts to federally regulated wetland resources within WW and VW Areas at the Fernald Property, Tandem Trailer or

4 U.S. Code. Title 33, Chapter 26 – *Water Pollution Prevention and Control*. (November 27, 2002).

5 Code of Federal Regulations (CFR) Title 33, Part 328.3(a), Definition of Waters of the United States.

Bifurcation, Highland Avenue and American Legion sites (depending upon the selected alternative). If impacts to jurisdictional resources exceed 1 acre, an Individual Section 404 Permit would be required. Since none of the DEIR Alternatives would result in the loss of more than 1 acre of Waters of the U.S., they are all eligible for permitting under the DA General Permits (GP) for Massachusetts. [6] The DEIR Alternatives would meet the requirements for the DA General Permits (GP) for the Commonwealth of Massachusetts for the placement of fill in freshwater wetlands under GP's 1 (Maintenance), 7 (Bank and Shoreline stabilization) and 9 (Utility Line Activities). Due to the proposed cumulative permanent and temporary impact to greater than 5,000 square-feet of federally jurisdictional wetlands and estimated presence of the northern long-eared bat (NLEB, *Myotis septentrionalis*) throughout the Commonwealth of Massachusetts and the proposed clearing of trees during construction, none of the DEIR Alternatives would be eligible for authorization through the filing of a Self-Verification Form and would require the filing of a Pre-Construction Notification under the GP. An application for a DA General Permit would be made for the Preferred Alternative during the final design and permitting phase by way of a Preconstruction Notification filing.

Any wetland filling is evaluated, in part, using the USEPA Guidelines for Specification of Disposal Sites for Dredged or Fill Material promulgated pursuant to Section 404(b) (1) of the Clean Water Act (Section 404(b)(1) Guidelines) and its implementing regulations at 40 CFR 230 et seq. The guidelines are intended to avoid unnecessary filling of waters and wetlands.

The guidelines are:

- No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have a less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that will minimize adverse effects of the discharge on the aquatic ecosystem.
- No discharge of dredged or fill material shall be permitted if it: (1) causes or contributes to violations of any applicable State water quality standard; (2) violates any applicable toxic effluent standard or prohibition under Section 307 of the CWA; (3) Jeopardizes the continued existence of species listed as threatened or endangered under the Endangered Species Act; or (4) Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under the Marine Protection, Research and Sanctuaries Act of 1972.
- No discharge of dredged or fill material shall be permitted which would cause or contribute to significant degradation of the waters of the United States.

Section 401 of the Clean Water Act

Section 401 of the Clean Water Act (33 U.S.C. 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the state in which the discharge originates or would originate that the discharge

6 https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/MA/PN-GPFinal-RevApril2018.pdf?ver=2018-07-31-142949-100

will comply with the applicable effluent limitations and water quality standards. In addition, the MassDEP is required to issue Water Quality Certifications for projects that result in discharge of fill to a wetland or waterbody, pursuant to the Massachusetts Clean Waters Act (M.G.L. c. 21 §§ 26 – 53). The DEIR Alternatives would require issuance of an Individual Section 401 Water Quality Certification (WQC) for Major Fill/Excavation and because they all would result in the loss of more than 5,000 square feet of wetlands subject to federal jurisdiction. All DEIR Alternatives would also require a Minor Dredge Project certification because they all would require dredging of less than 5,000 cubic yards but more than 100 cubic yards. See **Table 4.6-3, Table 4.6-5**, **and Table 4.6-7** in **Section 4.6.5 Construction Period Impacts** for a summary of impacts.

Section 303(d) of the Clean Water Act

Section 303(d) of the CWA also establishes the Total Maximum Daily Load (TMDL) program. A TMDL is the allowable load of a single pollutant from all point and non-point sources to a waterbody. Under the TMDL program, states establish priority rankings for their waterbodies and identify the uses for these waterbodies (e.g., drinking water supply, recreation). TMDLs can then be set for individual pollutants to ensure that the quality is adequate for the designated uses. The USEPA must approve or disapprove any TMDL established by the state. If the USEPA disapproves a TMDL, then the USEPA must set the TMDL itself.

If a project impacts a TMDL-listed waterbody, appropriate measures must be taken to control the discharge of the listed pollutant and meet the TMDL requirements. Some TMDLs may require additional measures (including stormwater treatment) to prevent an increase in pollutant loading to the receiving water.

4.6.2.2 Safe Drinking Water Act

The Safe Drinking Water Act authorizes the USEPA to set national health-based standards for drinking water to protect against both naturally occurring and human-made contaminants that may be found in drinking water.[7] If the project impacts a drinking water supply, appropriate mitigation measures must be provided to maintain compliance with the Safe Drinking Water Act. The Program will not require permitting under the Safe Drinking Water Act.

4.6.2.3 USEPA NPDES Construction General Permit

All Program DEIR Alternatives would require coverage under the 2022[8] National Pollutant Discharge Elimination System (NPDES) Construction General Permit[9] (CGP) pursuant to Section 402 of the CWA, which regulates erosion control, pollution prevention, and other stormwater management issues at construction sites that disturb 1 acre or more. This permit would require a Stormwater Pollution

7 U.S. Code. Title 42, Chapter 6A, Subchapter XII – *Safety of Public Water Systems*. (January 6, 2003).

8 The Program will obtain coverage under whichever version of the NPDES CGP is current at the time of construction.

9 US Environmental Protection Agency. 2022. National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. US EPA, February 17, 2022, https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-permit.pdf

Prevention Plan (SWPPP) that specifies proper erosion and sedimentation control for disturbed areas and other procedures aimed at minimizing the transport of sediment into nearby waters.

4.6.2.4 Chapter 91 Waterways License

The Massachusetts Public Waterfront Act (MGL Chapter 91) gives MassDEP jurisdiction over dredging, filling, construction, demolition, and changes in use within flowed tidelands, filled tidelands, Great Ponds (ponds covering more than 10 acres in their natural states), and any non-tidal navigable streams on which public funds have been expended.

A Chapter 91 license would be required for construction of rip rap splash pads to be installed permanently at dewatering discharge outfall locations. The proposed splash pads are further described in **Sections 4.6.5 and 4.6.6.**

4.6.2.5 National Wild and Scenic Rivers Act

The National Wild and Scenic Rivers Act (Public Law 90-542; 16 U.S.C. 1271 et seq.) was established to preserve the free-flowing conditions of rivers with outstanding natural, cultural, and recreational values. Designation of an entire river system, or segments of, is approved by Congress or the Secretary of the Interior. Rivers are then classified as one of the following:

- Wild: free of impoundments, generally inaccessible (except by trail), with primitive watersheds/shorelines unpolluted waters
- Scenic: free of impoundments, largely undeveloped watersheds/shorelines and accessible in places by roads
- Recreational: readily accessible by road or railroad with some development along their shorelines and some past impoundments or diversions. The administration of designated rivers is assigned to a federal or state agency

The National Wild and Scenic Rivers Act prohibits federal support for actions such as the construction of dams or any other instream activities that would harm the river's free-flowing condition, water quality, or Outstanding Resource Values (scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values).[10] However, it does not prohibit development near designated rivers; rather it encourages regional river management practices to protect the use and enjoyment of these rivers. New development on federal lands must be guided by land use and resource management objectives that are compatible with the river's classification

None of the rivers surrounding the Program sites have been designated as Wild and Scenic,[11] therefore none of the DEIR Alternatives would involve impacts to these resources.

10 National Wild and Scenic Rivers webpage: http://www.rivers.gov/, accessed 2/4/22.

11 Ibid

4.6.2.6 Section 10 of the Federal Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 requires a DA permit for all work or structures (except bridges) in, under, or over navigable waters of the United States.[12] In New England, for purposes of Section 10, navigable waters of the United States are those subject to the ebb and flow of the tide and a few of the major waterways used (presently or historically) to transport goods or services sold in interstate or foreign commerce. None of the DEIR Alternatives involve any work within any navigable waterways.

Pursuant to the General Bridge Act of 1946, 33 U.S.C. 525 et seq., the United States Coast Guard regulates bridges over waters regulated under Section 10. None of the DEIR Alternatives involve any work on bridges over or within waters regulated under Section 10.

4.6.2.7 Coastal Zone Management

Section 307(c) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)), requires any non-federal applicant for a federal license or permit to conduct an activity affecting land or water uses in the state's coastal zone to furnish a certification that the proposed activity will comply with the state's coastal zone management program. Generally, no permit will be issued until the state has concurred with the non-federal applicant's certification.

None of the DEIR Alternatives involve any work within the Coastal Zone.

4.6.2.8 Massachusetts Wetlands Protection Act

The WPA regulations establish performance standards for work proposed within each of the resource areas and require review of any work proposed within 100 feet of a wetland resource to determine if that work will result in the alteration of wetland resources. “Alteration” is defined to “include a change in vegetation, hydrology, or water quality of the wetland.” Authorization of activities in areas subject to the WPA would be obtained by filing a Notice of Intent with the local Conservation Commission in each applicable municipality during the final design and permitting phase. WPA Orders of Condition would be required for all DEIR Alternatives in Waltham, Weston, Wellesley, Needham and Boston. A WPA filing would not be required in Newton or Brookline, since no surface construction is proposed within wetlands or the 100-foot wetland buffer zone and tunnel excavation in these communities would be at a depth greater than 100 feet from the ground surface. As described in **Section 4.6.7.4, Compliance with Wetlands Protection Act Performance Standards**, all of the DEIR Alternatives would be able to meet all of the performance standards for all jurisdictional resources, with the exception of Riverfront Area. It is anticipated that the Program would be reviewed in pursuant to the Public Utility Limited Project in Accordance with 310 CMR 10.53(3)(d) and the work could be approved by the issuance of an Order of Conditions by each Conservation Commission. Alternatively, the Authority would file a Request for Variance pursuant to 310 CMR 10.05(10) at the appropriate time during final design, if needed.

12 Code of Federal Regulations (CFR) Title 33, Part 329.4, Definition of Navigable Waters of the United States.

4.6.2.9 Massachusetts Stormwater Management Standards and Regulations

The DEIR Alternatives would require work within Wetland Resource Areas and buffer zones as defined and regulated under the Massachusetts WPA. Programs that fall under the jurisdiction of the WPA must comply with the Massachusetts Stormwater Management Standards included in the WPA regulations (310 CMR 10). The Stormwater Management Standards define the requirements for proper stormwater management for new or re-development sites in the Commonwealth of Massachusetts. The water quality issues addressed by the standards include erosion control, peak discharge rates, groundwater recharge, total suspended solids (TSS) removal, wellhead protection, construction management, long-term maintenance, and illicit (non-stormwater) discharges to the stormwater management system.

MassDEP requires that all projects within regulatory jurisdiction must meet the Massachusetts Stormwater Standards, which aim to protect wetlands and water resources from pollution and impacts of development. The Stormwater Standards are incorporated into both the Massachusetts WPA and Section 401 Water Quality Certification for Discharge of Dredged or Fill Material regulations. The Massachusetts Stormwater Handbook, published in 2008 but currently being revised,[13] presents the 10 Stormwater Standards and their requirements.

The federal CWA authorizes the USEPA to address water pollution by regulating discharges to waters of the United States and to address stormwater runoff as a source of pollution to receiving waters through the NPDES program. The USEPA NPDES program provides regulations for stormwater discharges from three general categories of sources: industrial activities, construction activities, and MS4. During the design and construction, the Program would comply with permits such as the 2022 NPDES CGP, 2016 MS4 General Permit, and the new Dewatering and Remediation General Permit.

MWRA is committed to meeting state and federal requirements for stormwater and dewatering for the construction period and under Final Conditions.

4.6.3 Methodology

This section describes the efforts to document existing federal and state-defined wetlands and to identify and assess impacts to local surface waters on or adjacent to the proposed shaft construction and connection sites for the three DEIR Alternatives. Data collected in the field (including GPS locations of the delineated wetland edges and existing site conditions) was recorded using Geographic Information Systems (GIS) technology and mapping software on mobile tablet devices. Boundaries of field delineated wetland resources were also determined by ground survey and have been incorporated into the project mapping. A review was performed to identify existing water resources and their protection areas near the DEIR Alternatives. The data used in this review is identified below.

4.6.3.1 Study Area

The Study Area for wetland resources is defined as the areas within the Limit of Disturbance (LOD) for construction of each of the launching and receiving shafts sites and for construction of connection and isolation valves sites. Each has a 200-foot buffered area extending out from the LOD. The wetlands

13 A revised draft version of the Massachusetts Stormwater Handbook is anticipated to be released in 2022.

resources Study Area also includes a 1,000-foot-wide corridor that extends on either side of the proposed DEIR Alternative tunnel alignments. The corridor width was conservatively determined based on an estimate of 780 feet for the potential zone of tunnel influence for groundwater drawdown within rock at a depth of 450 feet without mitigation.[14]

4.6.3.2 Delineation Criteria for Vegetated Wetlands

Vegetated wetlands and waterways were identified and delineated using the methods and criteria established in the 1987 USACE Wetland Delineation Manual and the USACE 2012 Northcentral-Northeast Regional Supplement; the MassDEP wetland delineation guidance document entitled Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act (March 1995); and additional wetland delineation requirements specified in applicable municipal wetland bylaws and implementing regulations. Field investigators examined potential wetland resource areas by using these criteria at all Program sites. To document conditions in each identified wetland resource area, a representative observation point was selected and investigators completed field data sheets describing the upland and wetland characteristics of the observation point.

Wetland areas were delineated in the field between March 2022 and April 2022. Wherever wetland resource areas occurred, points to designate the boundaries were marked with colored flagging. Surveyed locations of wetlands flags were used to prepare the site maps, identifying the limits of jurisdictional wetland and waterway resources and associated buffer zones that may be affected by the Program. Hydrophytic vegetation, soils, and hydrology were assessed to determine the presence of wetlands. For additional details on methods and results for the wetland delineation, refer to **Appendix D, Wetlands and Waterways, Section D.1**.

Hydrophytic Vegetation

Visual estimates of species abundance were made for the upland and wetland plant communities at each Study Area and observation points, and the dominant species were determined and recorded by genus and species on field data sheets. Dominant species were determined separately for each vegetative stratum as trees, saplings/shrubs, herbs, and vines.

The wetland indicator status of each species was determined according to the "1988 National List of Plant Species That Occur in Wetlands: Region 1, Northeast," which is based on the federally approved list. According to the Regional Supplement, three separate procedures exist to determine whether an area has hydrophytic vegetation: the rapid test for hydrophytic vegetation, the dominance test, and the prevalence index. These procedures are discussed in detail in the Regional Supplement. All three methods were considered when evaluating site conditions.

14 DEIR tunnel alignments are preliminary and would be refined during final design.

Soils

Baseline soils information was determined from review of existing data, including the U.S. Department of Agriculture Natural Resources Conservation Resources Soils Survey of Middlesex and Norfolk/Suffolk counties of Massachusetts, and county and state lists of hydric soils.

During wetland investigation, soils were examined with a hand auger to determine if hydric soil characteristics were present. Auger holes were excavated to a depth that confirmed the presence of hydric soils in wetland areas, or that eliminated the possibility of hydric soils in uplands. The colors of the soil matrix and any redoximorphic features were described using Munsell® Soil Color Charts. Information describing the upland and wetland soil profiles was recorded on the field data sheets for each identified wetland.

Hydrology

Site hydrology was determined in the field based on properties such as soil saturation, inundation, oxidized root zones, manganese concretions, drainage patterns, and proximity to a perennial waterway. These indicators were observed on site and while excavating the auger holes described above. Hydrologic indicators were based on the 1987 USACE Corps Manual, the 2012 USACE Northcentral-Northeast Regional Supplement, and the 1995 Massachusetts State Manual.

4.6.3.3 Delineation Criteria for Other Wetlands Resource Areas

The following sections describe the criteria used to determine the boundaries of other wetlands resource areas, including Bank, LUW, BLSF, ILSF, RA, and Vernal Pools, as shown in project mapping.

Bank

Bank was delineated according to Massachusetts regulations (310 CMR 10.54). Waterbodies were identified, including perennial and intermittent streams and ponds, and Bank flags were hung at the first observable break in the slope or the mean annual flood level, whichever was lower.

Land Under Waterway

LUW was based on the delineation of Bank. In areas that contain a perennial stream or pond, LUW extends downgradient from Bank flags.

Bordering Land Subject to Flooding

BLSF (310 CMR 10.56) was not delineated in the field. The extent of this resource area is based on published Federal Emergency Management Agency (FEMA) flood elevations, which estimate the elevations to which water would flood during a 100-year storm event. Any area below this elevation adjacent to the Bank of a corresponding waterway or a BVW is considered BLSF. A measurement of BLSF is therefore a volume and not an area and includes evaluation of the topography as shown on the project mapping developed from aerial imagery. In locations where FEMA has not completed a detailed study to define the flood elevation (i.e., Zone A), the limits of the flood hazard area as shown on the Flood Insurance Rate Map panel were overlaid on project mapping.

Isolated Land Subject to Flooding

As with BLSF, ILSF (310 CMR 10.57) is estimated as a volume based on topographic information. ILSF areas were identified based on their ability to hold one quarter-acre foot of water at an average depth of 6 inches. ILSF was not identified on any of the DEIR Alternative sites.

Riverfront Area

Riverfront Area (310 CMR 10.58) was not delineated in the field. Measurement of these resource areas was based on the delineation of Bank. In areas that contain a perennial stream or pond, RA extends 200 feet upgradient from Bank flags, with the exception of areas in Boston where the RA extends 25 feet upgradient. Where a 200-foot Riverfront is identified, the area is divided into the 100 foot- Riverfront (first 100 feet from the bank) and 200-foot Riverfront (100 to 200 feet from the bank).

Vernal Pools

In association with wetland delineation field work (in March and April 2022), Vernal Pool identification studies were conducted to determine the mean annual boundary of any Vernal Pool depressions that occur within 1,000 feet of the DEIR Alternatives sites, as shown in the MassGIS NHESP Certified Vernal Pools data layer. Additionally, any isolated depressions on site were evaluated as Potential Vernal Pools by noting the presence of facultative or obligate species during the on-site studies. Facultative species are defined by the Natural Heritage and Endangered Species Program (NHESP) as “vertebrate and invertebrate species that frequently use vernal pools for all or a portion of their life cycle but are able to successfully complete their life cycle in other types of wetlands.” Obligate species are defined as “vertebrate and invertebrate species that require vernal pools for all or a portion of their life cycle and are unable to successfully complete their life cycle without vernal pools.” No certified Vernal Pools were identified within 1,000 feet of any of the proposed launching, receiving, connection and isolation valve sites, and no potential Vernal Pool depressions were identified that would support Vernal Pool species.

4.6.3.4 Surface Waters

The following data sources available on MassGIS were used in the review of surface water data:

- MassDEP Hydrography (1:25,000)
- MassDEP 2018/2020 Integrated List of Waters (305(b)/303(d))
- MassDEP Wetlands (2005)
- Outstanding Resource Waters
- NHESP Potential and Certified Vernal Pools
- Public Water Supplies
- Surface Water Supply Protection Areas (Zone A, B, C)

Additionally, available data from local municipalities was reviewed to collect more detailed information on the existing stormwater management systems surrounding the sites and their discharge points. Municipal data reviewed included Geographic Information System (GIS) web viewers, drainage basin maps, and stormwater management plans from the City of Waltham, Town of Weston, Town of Needham, Town of Brookline, and Boston Water and Sewer Commission.

4.6.4 Existing Conditions

All of the Program sites are located within the Charles River Watershed, which drains approximately 308 square miles through 23 towns and cities to the Boston Harbor. The Program sites are in the upper and middle Charles River basins, except the Southern Spine Mains and American Legion sites, which are in the lower basin. The Watertown Dam delineates the upper and middle basins of the Charles River from the lower basin. Program sites would discharge dewatering and stormwater runoff to the Charles River and its tributaries.

The Charles River Watershed has two nutrient-focused TMDLs. The upper and middle basins have goals of 65 percent reduction in total phosphorus (TP), and the lower basin has a goal of 62 percent reduction in TP. The Charles River also has a TMDL for bacteria that recommends measures to reduce pathogen/bacteria inputs to the river such as illicit connection of sewage to storm drains, failing sewer infrastructure, Combined Sewer Overflows, and storm water discharges (including sheet flow runoff).

4.6.4.1 Launching and Receiving Sites

The following section describes the existing wetland resources and waterways at the Launching and Receiving sites.

Table 4.6-1 summarizes the wetland conditions for each site.

Table 4.6-1 Wetland Resource Areas Summary – Launching and Receiving Sites

Site	Town/City	Wetland Flag Number[1]	Cowardin Type and Description[2]	Bank	LUW/ WW	BVW /VW	IVW	RA	BLSF	ILSF
Fernald Property	Waltham	A-1 to A-14	PEM - Clematis Brook (perennial stream) and BVW (marsh)	✓	✓	✓	-	✓	✓	-
		B-1 to B-19	PFO/PSS – IVW, which was likely BVW to Clematis Brook prior to development in the area	-	-	-	✓	-	✓	-
		C-1 to C-41	PFO - An intermittent drainage channel with BVW that drains into a culvert under Chapel Road and joins an unnamed stream then continues to the west along BVW bordering on Clematis Brook	✓	✓	✓	-	✓	✓	-
		D-1 to D-28	PFO - An unnamed perennial stream that also drains to a culvert under Chapel Road and flowed with the drainage from the C Series intermittent stream to Clematis Brook	✓	✓	✓	-	✓	-	-
Tandem Trailer/Park Road East	Weston	A-1 to A-6	PFO - Seaverns Brook (perennial stream)	✓	✓	-	-	✓	✓	-
		B-1 to B-9	PFO - An isolated wetland that could be characterized as a BVW to two roadway culverts that drain from significantly higher elevations	-	-	-	✓	-	-	-
		F-1 to F-38	PFO - Intermittent drainage channels with some BVW	✓	✓	✓	-	-	-	-
Bifurcation	Weston	B-1 to B-7	PFO - Seaverns Brook within a concrete channel with some BVW to the east	✓	✓	✓	-	✓	✓	-
		C-1 to C-16	PFO - An intermittent stream with asphalt side walls and BVW	✓	✓	✓	-	-	-	-
		D-1 to D-19	PFO - Drainage with a corrugated metal lined culvert (starts at D-11 and D-12)	-	✓	✓	-	-	-	-
		E-1 to E-22	PFO - Drainage channel to the north which drains to a culvert under I-90	✓	✓	-	-	-	-	-
Park Road West	Weston	A-1 to A-12	PFO -Intermittent stream and BVW.	✓	✓	✓	-	-	-	-
		B-1 to B-5	PFO - BVW to intermittent stream.	✓	✓	✓	-	-	-	-

Table 4.6-1 Wetland Resource Areas Summary – Launching and Receiving Sites

Site	Town/City	Wetland Flag Number[1]	Cowardin Type and Description[2]	Bank	LUW/ WW	BVW /VW	IVW	RA	BLSF	ILSF
Highland Avenue Northwest/ Southwest	Needham	None	-	-	-	-	-	-	-	-
Highland Avenue Northeast/ Southeast	Needham	A-1 to A-12	PSS/PEM - A drainage channel which is either non-jurisdictional based on the date of construction or could be considered an intermittent stream.	✓	✓	✓	-	-	-	-
American Legion	Boston	A-1 to A-16	PFO - An intermittent stream that drained to the east and then south	✓	✓	✓	-	-	-	-
		B-1 to B-12	PFO - An intermittent stream off the north side of the American Legion Highway and to the west starting near a cemetery and extending east to land that is currently occupied by the Landscape Express company	✓	✓	✓	-	-	-	-
		C-1 to C-12	PFO - A continuation of intermittent drainage from the west to the east	✓	✓	✓	-	-	-	-
		D-1 to D-22	PEM/PFO - A drainage channel east off the northern side of American Legion Highway and drained from the west to the east	✓	✓	✓	-	-	-	-
		E-1 to E-16	PFO - BVW to intermittent stream drainage	✓	✓	✓	-	-	-	-

1 Wetland Flags are identified in Figure 4.6-1 through Figure 4.6-16.

2 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub
Wetland Classifications: LUW/WW = Land Under Water, BVW = Bordering Vegetated Wetland, VW=Vegetated Wetland, IVW = Isolated Vegetated Wetland (federal only), RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding

Fernald Property

On April 7 and 8, 2022, wetland resource areas at the Fernald Property were inspected and field delineated (see **Figure 4.6-1**). Five locations were flagged with tapes labeled “Wetland Boundary” at the locations labeled A-1 to A-14, B-1 to B-19, C-1 to C-41, and D-1 to D-28.Soils, vegetation and hydrological indicators were examined at each location.

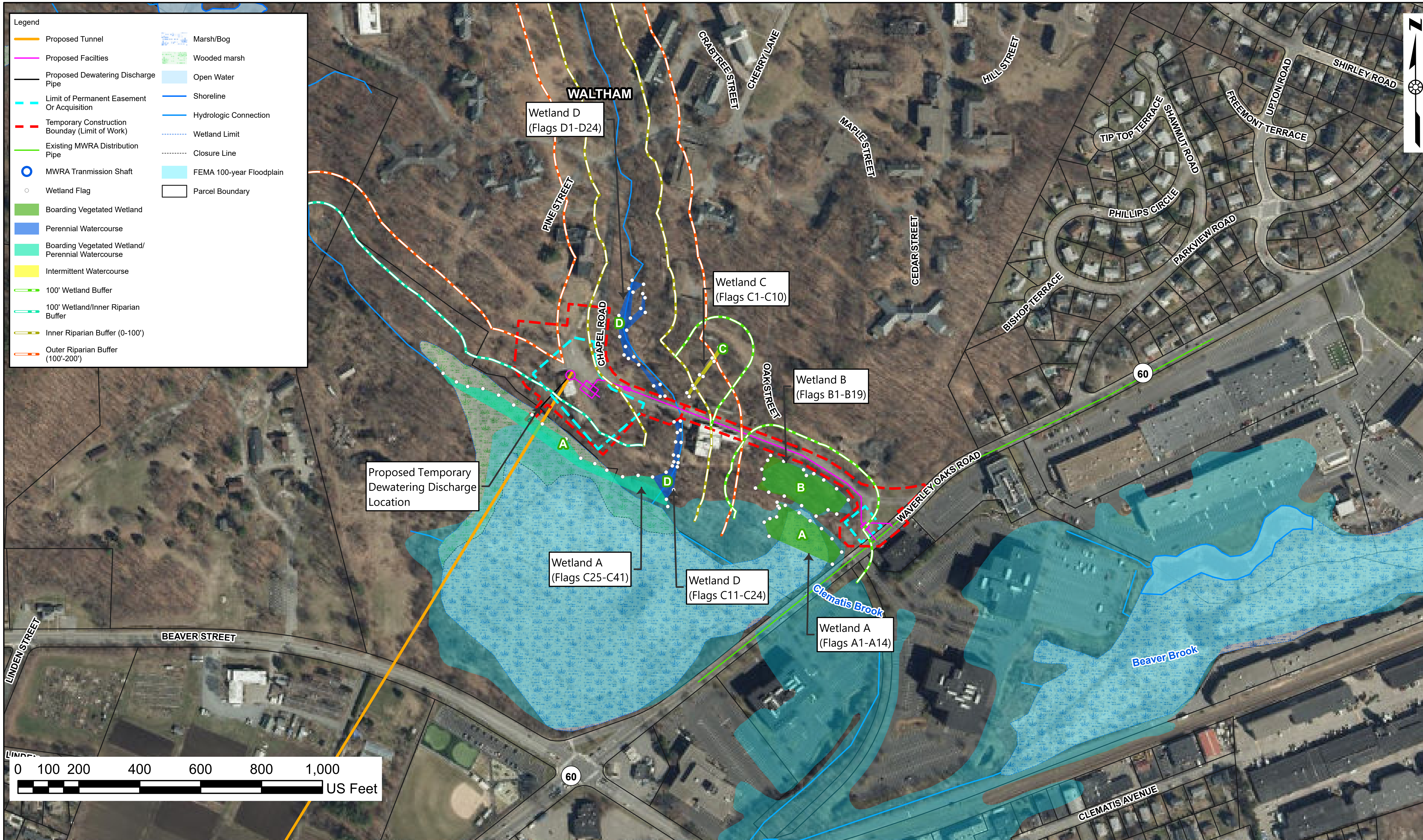
Location A is a marsh dominated by reeds (*Phragmites spp*.). The delineation started at the edge of Waverley Oaks Road at the outer edge of BVW, which was also the edge of the estimated mean annual high-water line to the Clematis Brook, a perennial stream. The delineation ended when the edge of the marsh was greater than 200 feet from the work area along Chapel Road. This BVW is contiguous with the separately delineated BVW (within proposed work area) to the northwest that consisted of tree and shrub BVW within wetland flags C-26 to C-41.

Location B was most likely BVW to Clematis Brook before the installation of railroad tracks adjacent to this part of the site. Today Location B is an isolated wetland with dominant plants, including red maple (*Acer rubrum*, facultative [FAC]), green ash (*Fraxinus pensylvanicum*, facultative wetland [FACW]), American elm (*Ulmus americana*, FACW), glossy buckthorn (*Frangula alnus*, FAC), and Tartarian honeysuckle (*Lonicera tartarica*, facultative upland [FACU]). While Location B meets the physical characteristics of “Isolated Land Subject to Flooding,” on April 7 and 8, 2022, portions of the surface of the land are wet, but there was no accumulation of surface water.

Location C is an intermittent drainage channel that flowed through some wetland vegetation, including American Elm, Red Maple, and Silky Dogwood (*Cornus amomum*, FACW) that started to the north of the former boiler building along Chapel Road and drained to a culvert at the former boiler building. The Location C series of flags continues to the west to Clematis Brook.

Location D (an unnamed tributary to Clematis Brook) was identified as Riverine, interpreted as perennial, from the U.S. Fish and Wildlife Service Wetlands Inventory map of the site. This stream system, the upper reaches of which appear to be a first-order stream, is identified as an intermittent stream on MassGIS and USGS maps of the site. Surface water was flowing in April when observations were made. Based on the location and characteristics the upper reaches of this stream are intermittent. Observations made later in the growing season (during the summer months) based on Massachusetts Wetlands Regulations criteria, when drought conditions are not present, could be used to confirm the flow regime of this stream. The Location D delineation included top of bank with some BVW, including Silky Dogwood, Red Maple, and Skunk Cabbage (*Symplocarpus foetidis*, obligate wetland [OBL]). The edge of these wetlands was considered the mean annual high-water line. The stream from Location D drained to a culvert at the former boiler building, which then combined with the culverted drainage from the C intermittent stream to the Clematis Brook BVW.

FEMA has identified a Zone A Special Flood Hazard Area within the BVW associated with Clematis Brook; that Area is considered BLSF.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159 Draft Environmental Impact Report

CDM Smith in association with vhb Jacobs Green International Affiliates, Inc.

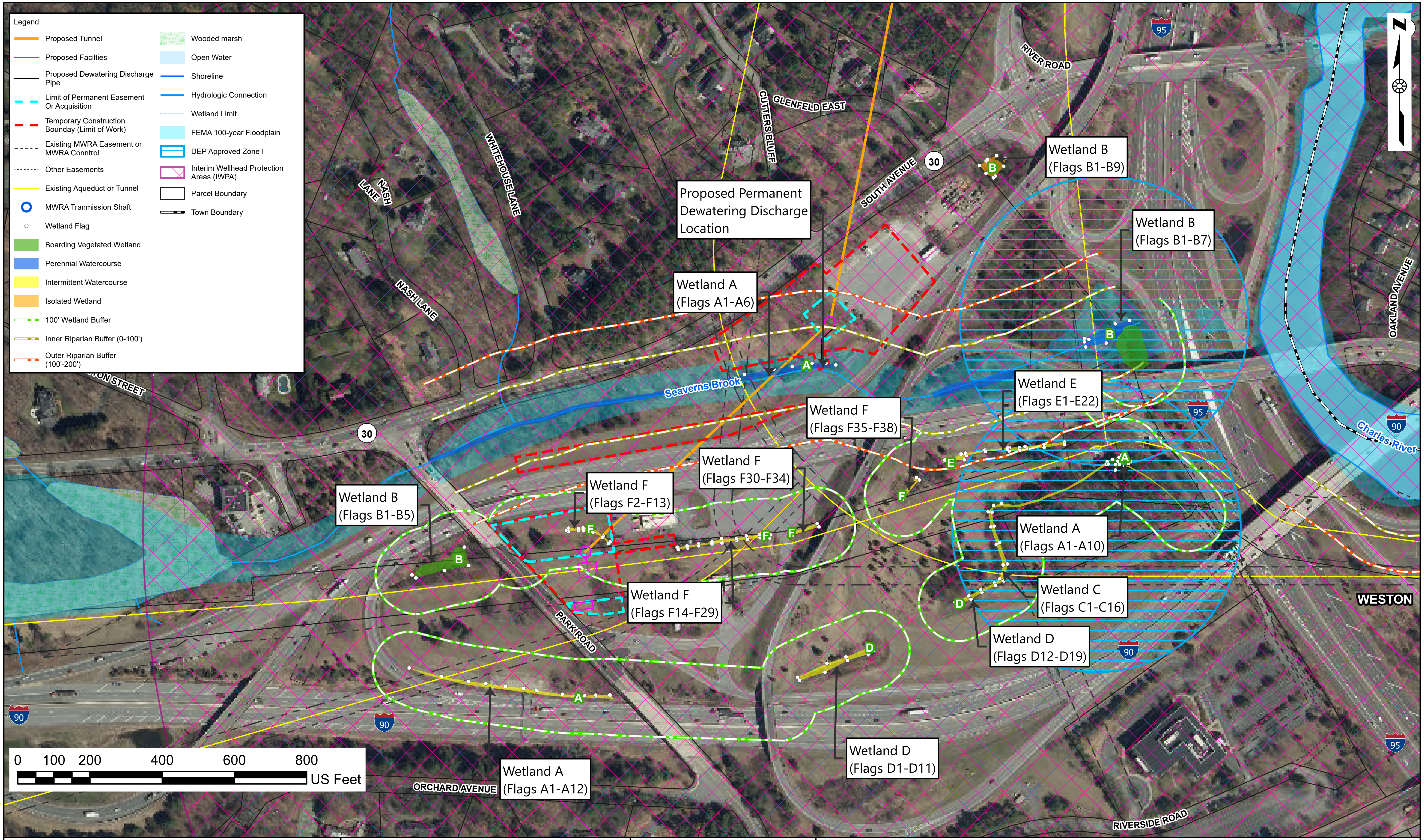
Waltham, MA

Wetlands and Waterways Fernald Property Receiving

Figure 4.6-1

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

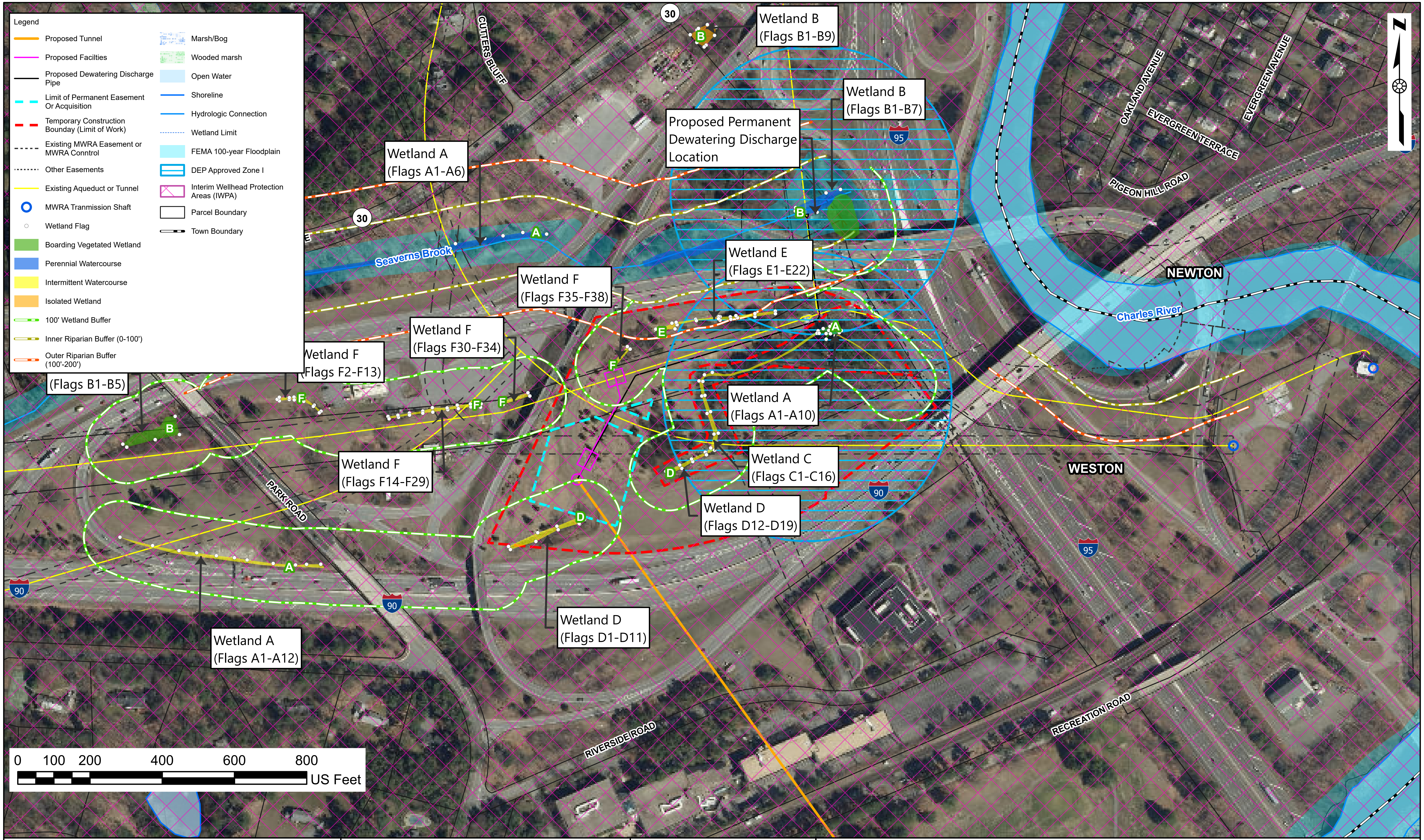
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetlands and Waterways
Tandem Trailer/Park Road East Launching
Figure 4.6-2

Weston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

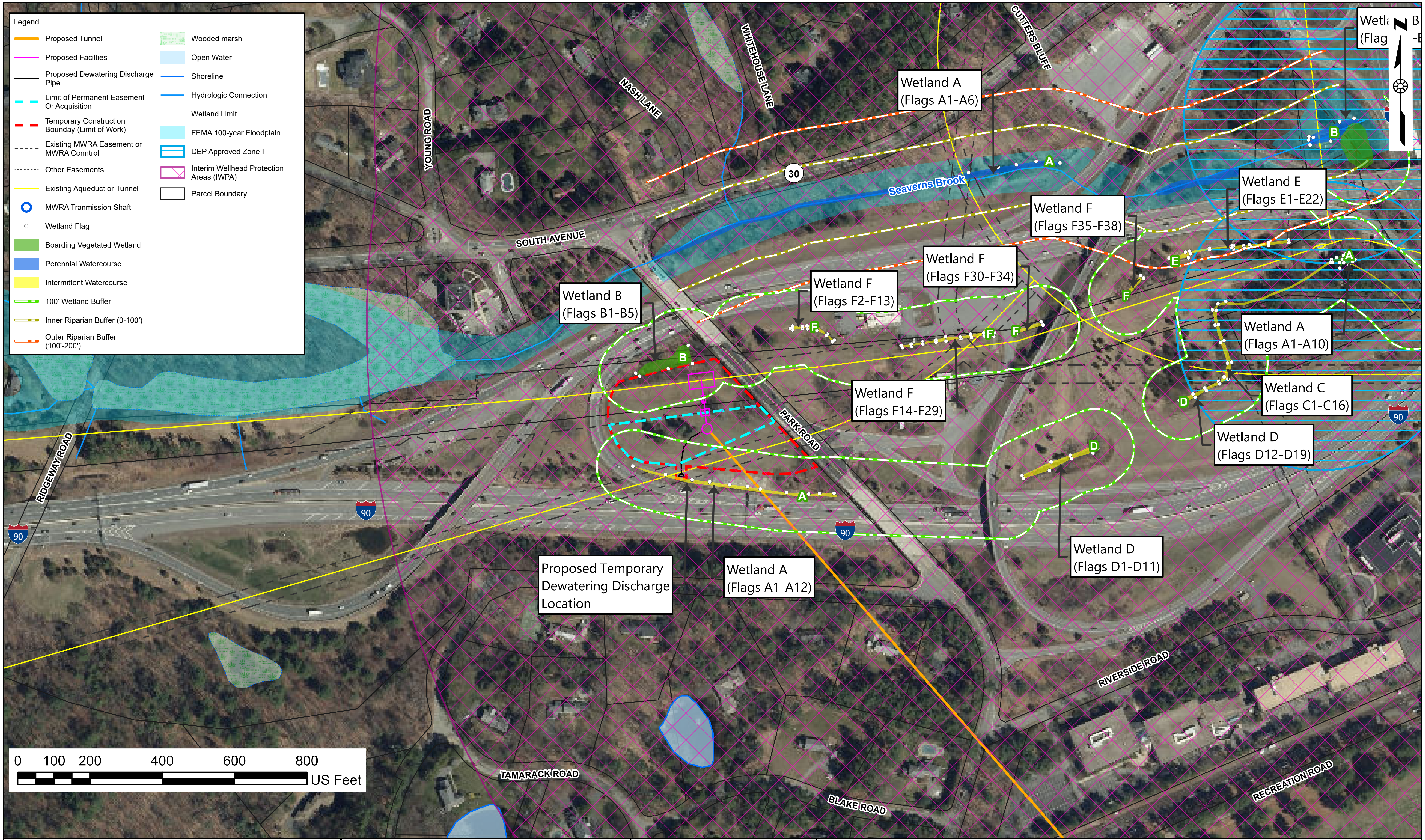
MWRA Contract No. 7159
Draft Environmental Impact Report

Wetlands and Waterways
Bifurcation Launching
Figure 4.6-3

Weston, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

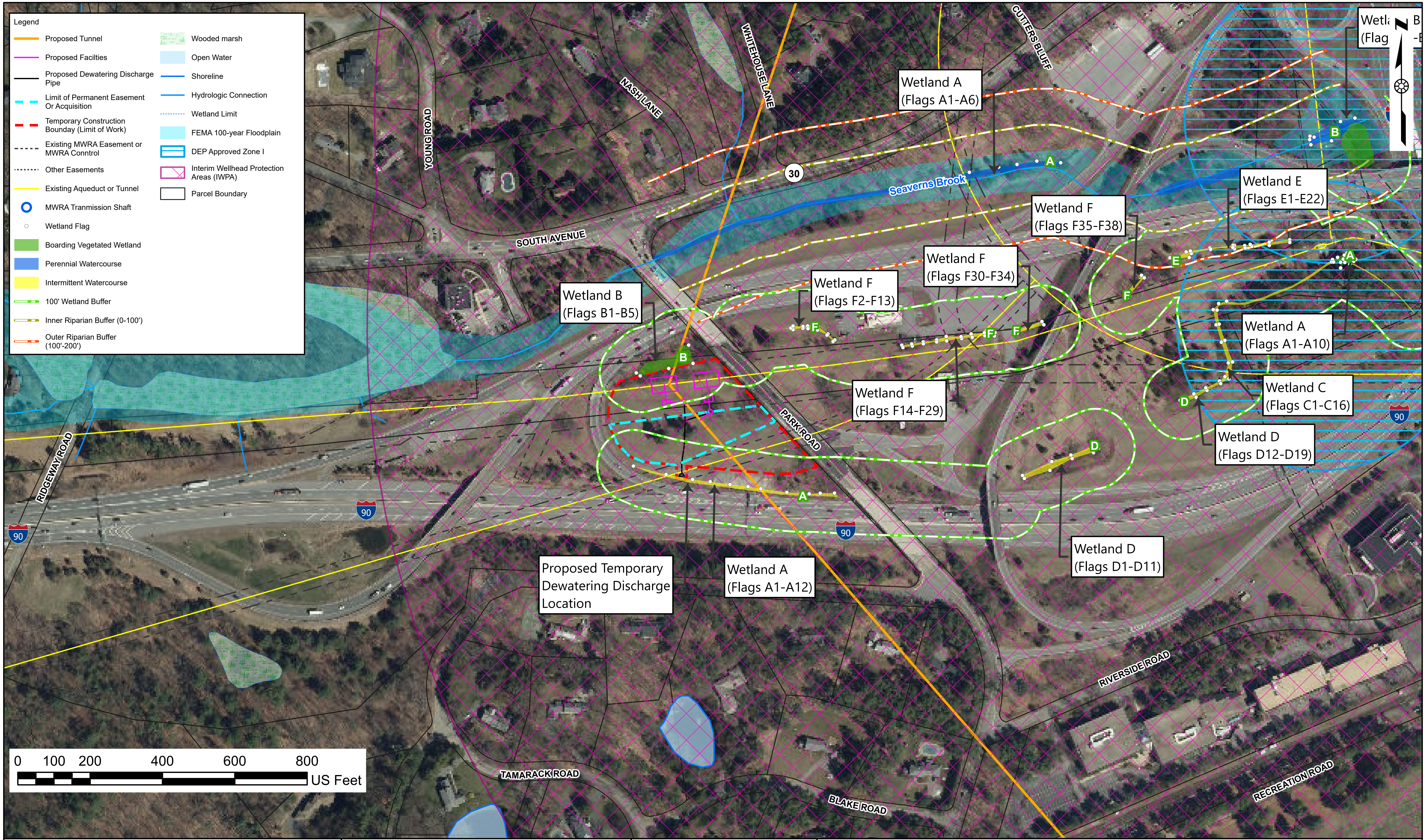
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Wetlands and Waterways
Park Road West Receiving
Figure 4.6-4

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

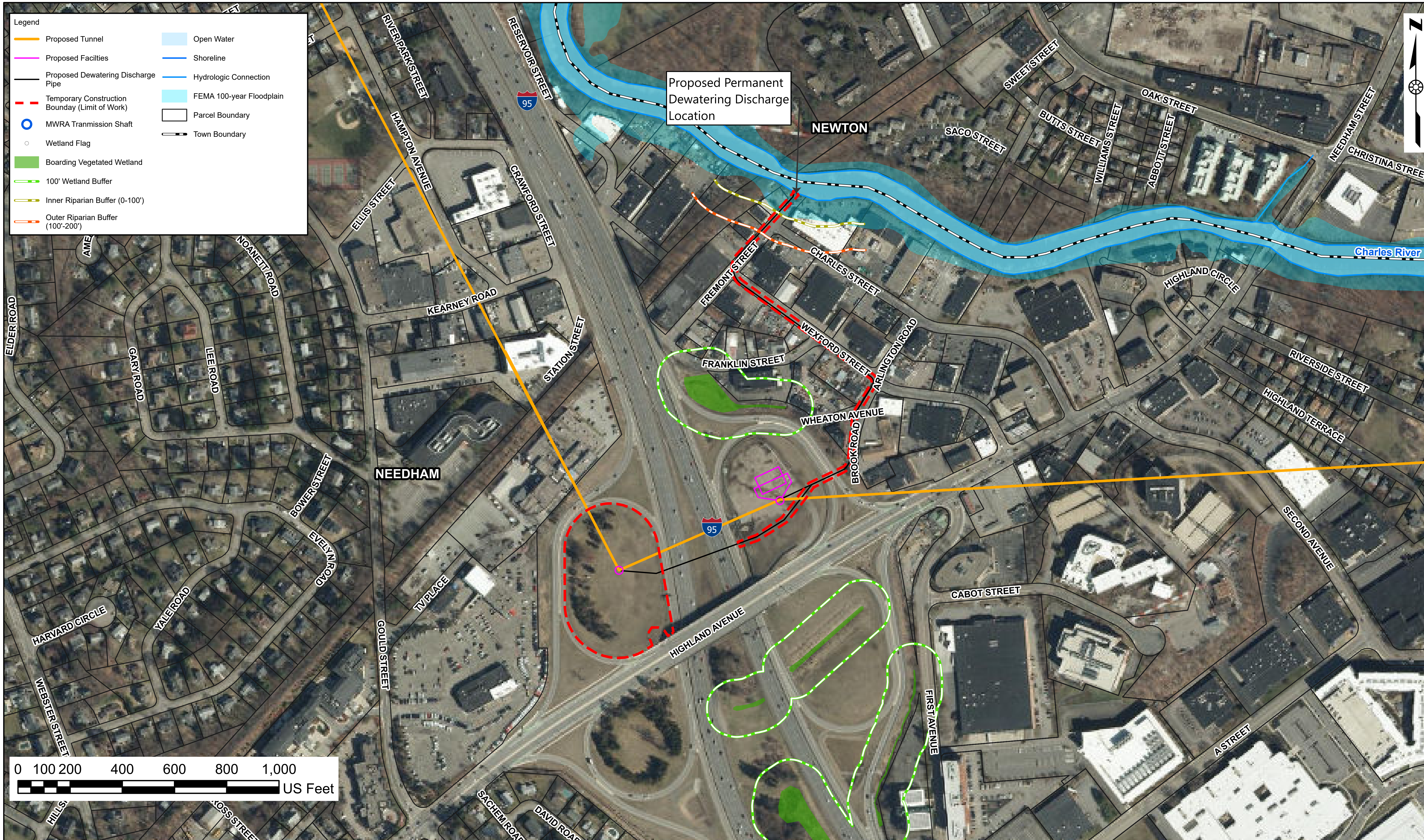
CDM Smith in association with vhb Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Wetlands and Waterways
Park Road West Large Connection
Figure 4.6-5

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

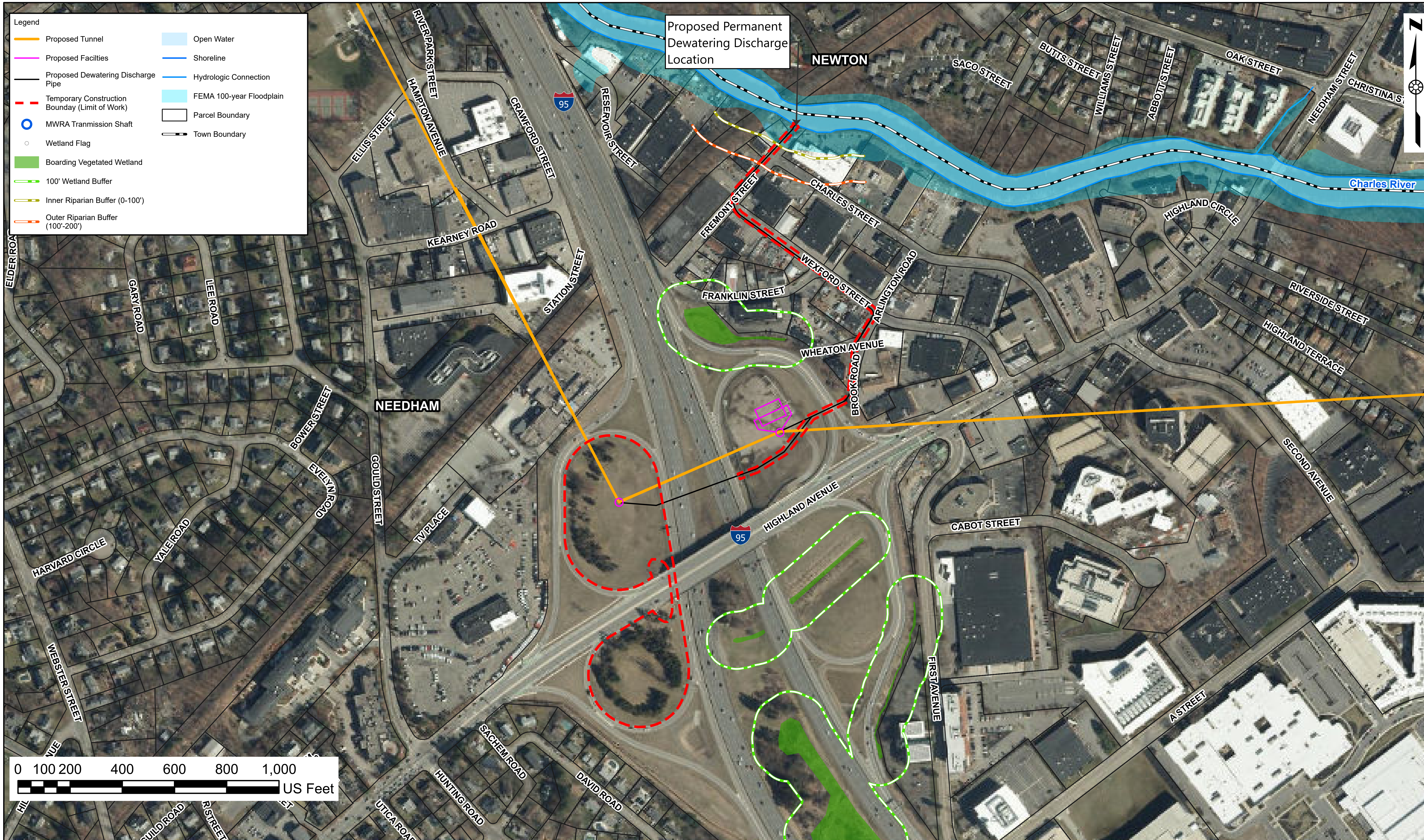
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetlands and Waterways
Highland Avenue Northwest Receiving
Figure 4.6-6

Needham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

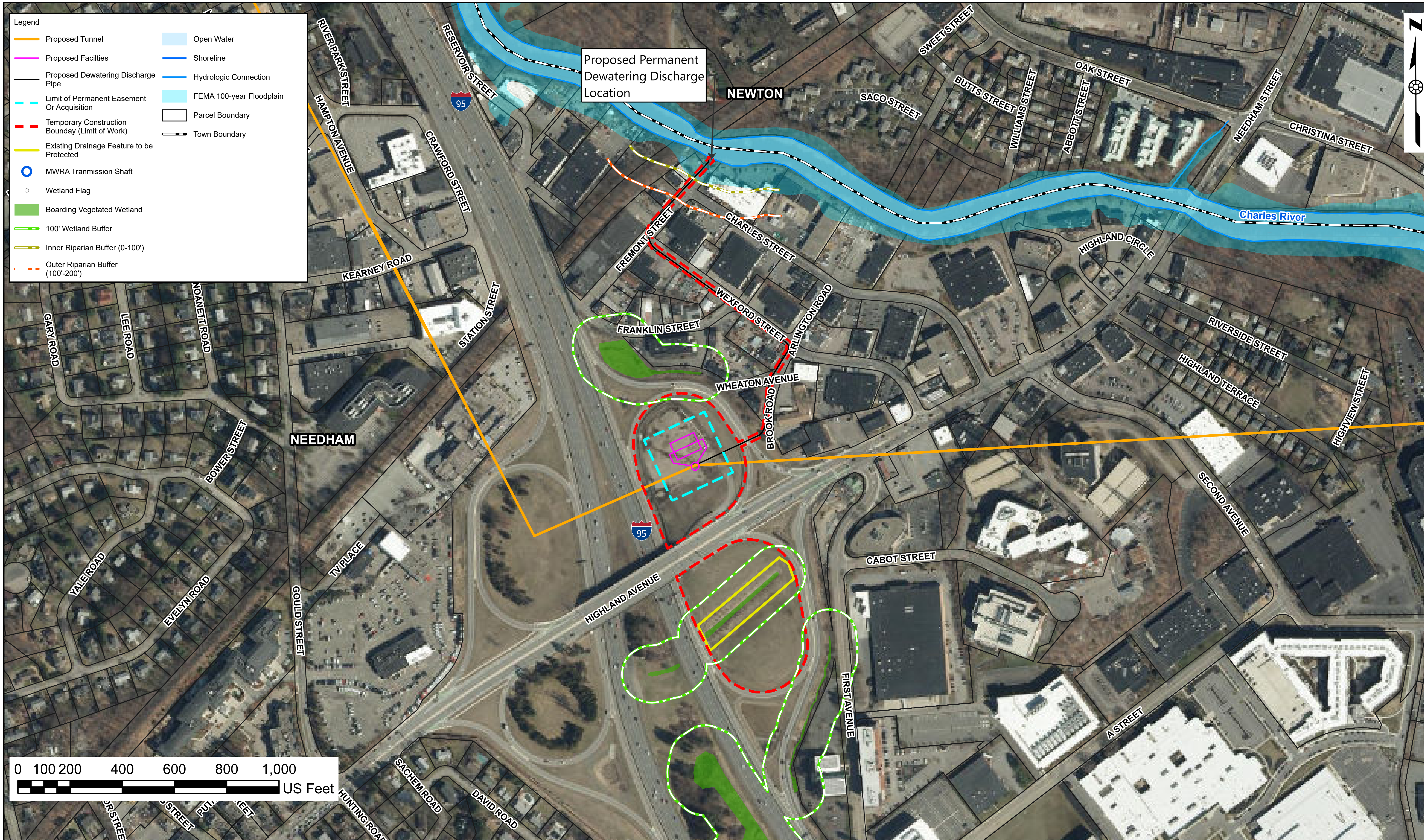
CDM Smith in association with vhb
Jacobs GREEN

Wetlands and Waterways
Highland Avenue Northwest/Southwest Launching
Figure 4.6-7

Needham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

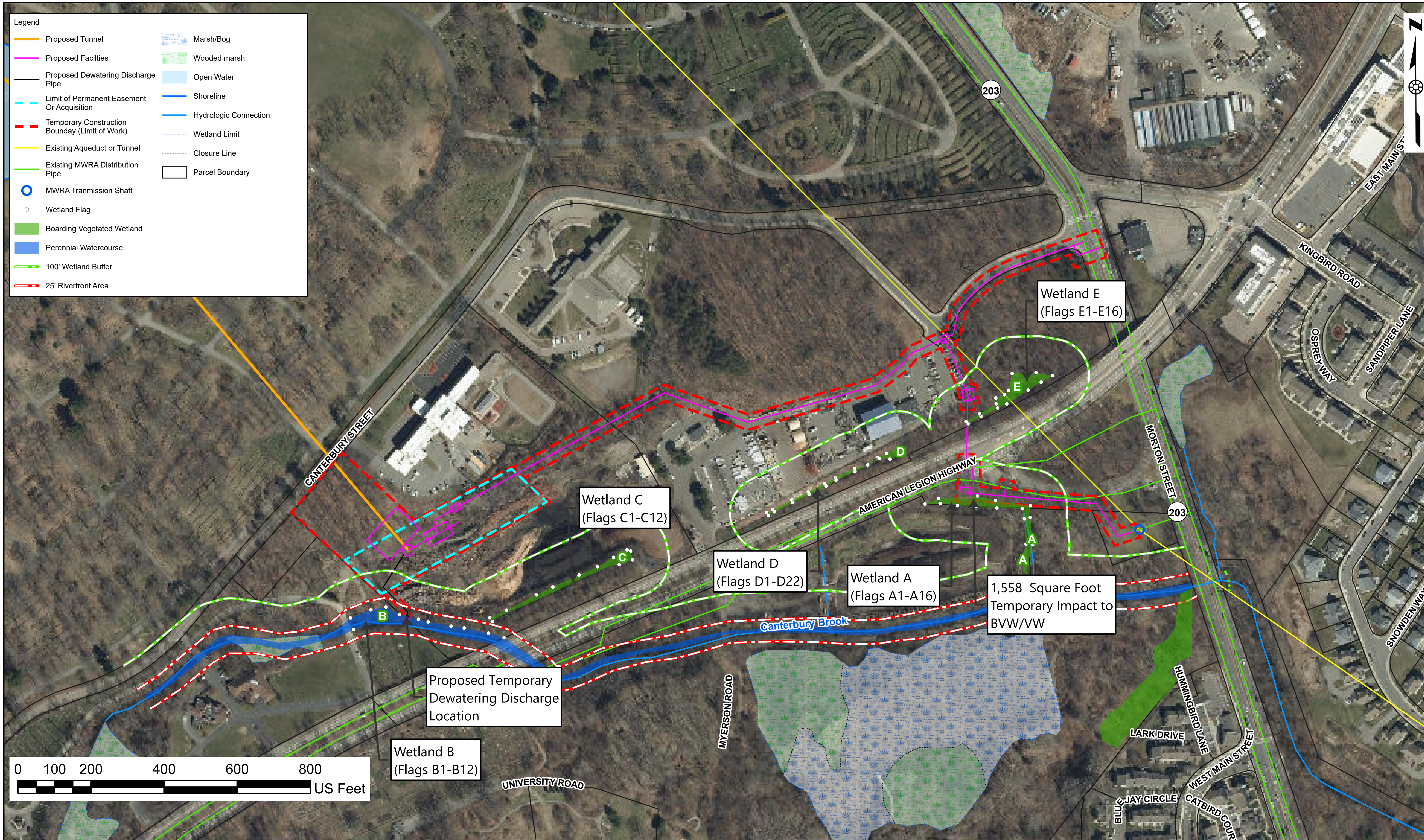
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetlands and Waterways
Highland Avenue Northeast/Southeast Launching
Figure 4.6-8

Needham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Boston, MA

Wetlands and Waterways
American Legion Receiving
Figure 4.6-9

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank

Tandem Trailer and Park Road East Launching

On April 5, 2022, wetland resource areas at the Tandem Trailer site were inspected and field delineated (see **Figure 4.6-2**) On the southern portion of the Tandem Trailer site, flags A-1 to A-6 were used to mark the top of bank and mean annual high-water level of the perennial stream, Seaverns Brook. The brook entered a culvert at A-6.

Flags B-1 to B-9 were used to mark an isolated wetland in the northeastern portion of the Tandem Trailer site that could be characterized as a BVW to two roadway culverts that drain from significantly higher elevations to the north. Ditches and depressed areas at the Tandem Trailer site were examined and determined to not be wetland resource areas due to lack of hydric soils and/or wetland vegetation and wetland hydrology characteristics.

FEMA has identified a Zone A Special Flood Hazard Area within the channel of Seaverns Brook, adjacent to the site, that is considered BLSF.

On April 5, 2022, wetland resource areas at the Park Road East site were inspected and field delineated (see **Figure 4.6-2**). The F series of flags F-1 to F-38 began at flag F-1, which was located to the east of Park Road starting in an upland banking to the roadway. Flag F-1 marked the start of a channel that was above all wetlands, and thus not jurisdictional as defined by Massachusetts Wetlands Regulations. The channel contained wetland vegetation at flag F-2/F-3 including Smartweed (*Polygonum pensylvanicum*, FACW). The intermittent stream continues through culverts and through Red Maple BVW at location F-14. At location F-33 and F-34, the intermittent stream dips under a former exit ramp at the site through a culvert. After an expanse of upland, the F series continues along a concrete culvert on the Bifurcation site with flags F-35 and F-36 to F-37 and F-38.

FEMA has not identified any BLSF areas on-site.

Bifurcation Launching

On March 31 and April 5, 2022, wetland resource areas at the Bifurcation site were inspected and field delineated. (See **Figure 4.6-3**, Wetlands and Waterways Bifurcation Launching.) The wetland flag B series (B-1 to B-7) to the north of the Bifurcation site included Seaverns Brook where it is within a concrete lined channel with some BVW to the east.

The D series on the southern portion of the Bifurcation site appears to receive drainage from the A series of flags at the intermittent stream at the Park Road West site (see **Section 4.6.5.1**). The D series to the south of the Park Road East site appears to receive drainage from the A intermittent stream at the Park Road West site. The D series flags start at the exit from a under roadway culvert. On April 5, 2022, water was flowing through the culvert into the D intermittent stream. Water Cress (*Nasturtium officinale*, OBL), Common Reed (*Phragmites australis*, FACW), and Black Elderberry (*Sambucus nigra*, FACW) were observed within the first section of the D intermittent stream. At flags D-12 and D-13 a corrugated metal open culvert was present to the end of the D series flags (D-19) at the start of the C series flags.

The C series (C-1 to C16) included the top of bank to an intermittent stream, where the bank included asphalt side walls. The C series drains to the A series of wetland flags at the Bifurcation site (A-1 to A-10), which included BVW to an intermittent stream. Bordering vegetated wetland vegetation at flag A-3 included White Pine (*Pinus strobus*, FACU), Glossy Buckthorn, Jewelweed (*Impatiens capensis*, FACW), and unidentified (no flowering or fruit available) sedges and grasses. Wetland soils are hydric, and soils were saturated to the surface near flag A-3.

The E series (E-1 to E-22) on the northern portion of the Bifurcation site delineated an intermittent stream that appeared to drain to the B series to the north of the Bifurcation site through an under-roadway culvert. Purple Loosestrife (*Lythrum salicaria*, OBL) was observed along the E series intermittent stream. The B series (B-1 to B-9) to the north of the Bifurcation site included a concrete bottomed intermittent stream.

The F series on the northwestern portion of the Bifurcation site is a continuation of an intermittent stream from the Park Road East site that went under a former exit ramp and ended at F-37 and F-38 on the Bifurcation site. At the end of the F series, there was a culvert that conveys the intermittent flow into the E series.

FEMA has identified a Zone A Special Flood Hazard Area within the channel of Seaverns Brook to the north of I-90 that is considered BLSF.

Park Road West Receiving and Park Road West Large Connection

On March 31, 2022, wetland resource areas at the Park Road West site were inspected and field delineated (see **Figure 4.6-4** for the Park Road West receiving site (Alternative 4) and **Figure 4.6-5** for the Park Road West large connection site). Wetland areas at the Park Road West site were flagged with tapes labeled Wetland Delineation at the locations labeled A-1 to A-12 (intermittent stream with some bordering vegetated wetland or BVW within) on the southern portion of the site and B-1 to B-5 (BVW to intermittent stream) on the northern portion of the site. Wetland vegetation at A-12 included Common Cattail (*Typha latifolia*, OBL) and Purple Loosestrife. Hydric soils were present, and soils were saturated to the surface. Thus, a BVW was present at the highest elevations of this intermittent stream.

The B series delineated a stone-walled bordered intermittent stream that included wetland species, including Common Cattail, Red Maple, and Purple Loosestrife. This intermittent stream drained to a culvert that appeared to be oriented towards the highway and also received possible roadway drainage.

FEMA has not identified any BLSF areas at this location.

Highland Avenue Northwest/Southwest Launching

On April 12, 2022, wetland resource areas at the Highland Avenue Northwest/Southwest sites were inspected and field delineated (see **Figure 4.6-6**, for the Highland Avenue Northwest receiving site in Alternative 3 and **Figure 4.6-7** for the Highland Avenue Northwest/Southwest launching site in Alternatives 4 and 10). The Highland Avenue Northwest site did not appear to have any wetland features.

The Highland Avenue Southwest site appeared to be all upland, with what appeared to be a dried swale along the east side of the site, oriented north to south. Water from this area may drain under the highway to the central portion of land between the Highland Avenue Southwest and Southeast sites, and then drain to the drainage feature in the Highland Avenue Southeast site.

On May 10, 2022, wetland resources were inspected, and field delineated at a section of the Charles River off the end of Fremont Street where the proposed pipeline would discharge into the Charles River. The wetlands delineated included top of inland bank, which was also the estimated mean annual high-water line. The Charles River is classified as a Riverine wetland area. Orange Wetland Boundary tapes B-1 to B-8 were placed at the top of bank starting at approximately 100 feet to the south of Fremont Street to approximately 100 feet to the north at the railroad bridge.

FEMA has identified a Zone AE Special Flood Hazard Area associated with the Charles River to the north of the site that is considered BLSF below elevation 90.

Highland Avenue Northeast/Southeast Launching

On April 12, 2022, wetland resource areas at the Highland Avenue Northeast/Southeast sites were inspected and field delineated (see **Figure 4.6-8**).

An area outside the Highland Avenue Northeast site near Highland Avenue was under construction and did have a constructed wetland feature and overfill outfall for roadway drainage in the southern portion of the Highland Street Northeast site work area. The mapped location of this wetland area is approximate.

A linear drainage feature on the Highland Avenue Southeast site was delineated with flags A-1 through A-12. This area contained cattails (*Typha spp*.), soft rush (*Juncus effusus*), elderberry (*Sambucus canadensis*), and other species. Soils were hydric within the channel, and water was present on April 12, 2022. This drainage area is either non-jurisdictional based on the date of construction or could be considered an intermittent stream.

A constructed wetland feature and overfill outfall for roadway drainage was also present outside the northeastern portion of the Highland Avenue Southeast site and near Highland Avenue. Roadside drainage that may be an intermittent stream is also located outside to the southeast of the Highland Avenue Southeast site on the opposite side of the off-ramp. The mapped locations of these wetland areas are approximate.

Water from the Highland Avenue Southwest site may drain under the highway to the central portion of land between the Southwest and Southeast sites, and then drain to the drainage feature in the Highland Avenue Southeast site.

On May 10, 2022, wetland resources were inspected, and field delineated at section of the Charles River off the end of Fremont Street where the proposed pipeline would discharge into the Charles River. The wetlands delineated included top of inland bank, which was also the estimated mean annual high-water line. The Charles River is classified as a Riverine wetland area. Orange “Wetland Boundary” tapes B-1 to B-8 were placed at the top of bank starting at approximately 100 feet to the south of Fremont Street to approximately 100 feet to the north at the railroad bridge.

FEMA has identified a Zone AE Special Flood Hazard Area associated with the Charles River to the north of the site that is considered BLSF below elevation 90.

American Legion Receiving

On April 1 and April 4, 2022, wetland resources at the American Legion site were inspected and field delineated. See **Figure 4.6-9**, Wetlands and Waterways American Legion. Five locations were flagged with tapes labeled Wetland Delineation at the locations labeled A-1 to A-16, B-1 to B-12, C-1 to C-12, D-1 to D-22, and E-1 to E-16. Soils, vegetation, and hydrological indicators were examined at each location.

Location A is to the south of the proposed work area off the south side of the American Legion Highway. Location A is an intermittent stream that drains to the east and then south. Location A begins immediately south of the American Legion Highway and may receive roadway drainage. It begins at an elevation and location that is above and separate from Canterbury Brook (location B), which flows into the site from the west and under the American Legion Highway. The top of bank included some BVW within the flags, including Spotted Touch Me Not (*Impatiens capensis*, FACW) and American Elm. Water flow began at flags A10 and A11. The intermittent stream appears to drain to Canterbury Brook to the south, outside the area delineated. USACE wetland delineation forms were completed for location A-16. This was a disturbed area with much fill material along the banks of the stream.

Location B is off the north side of the American Legion Highway, starting near St. Michael Cemetery and extending east to land that is currently occupied by the Landscape Express company. Various sources have been examined to determine if the stream is perennial or intermittent. In April 2022, typically a wet time of year, water flowed in portions of the stream. A MassGIS map of the site showed the stream as an intermittent stream throughout its course, starting from the west at the cemetery to the east. The U.S. Fish & Wildlife Wetlands Inventory map of the site showed the water course as Riverine. The 1987 USGS Boston South[15] quadrangle map shows the stream throughout its course as intermittent (thin blue line). This was compared to a thicker blue line that represented a perennial stream that flows through the Arnold Arboretum nearby. At this time, it appears the stream is intermittent throughout its course through the site. Further investigation would be done during the final design and permitting phase following Massachusetts Wetlands Regulations 310 CMR 10.00 criteria to confirm the status of the stream. As a conservative measure for this Study, Canterbury Brook is be considered a perennial stream.

The top of bank of Canterbury Brook was delineated with flags B-1 through B-12. Poison Ivy (*Toxicodendron radicans*, FAC), Red Maple, and Water Cress plants were observed at the top of bank, within areas of BVW and within the channel, respectively. The soils in this area and throughout the site on the northern side of the highway are Udorthents or disturbed or filled soils with wet substratum. The B delineation ended where the stream was culverted under American Legion Highway. Canterbury Brook then continues east to the south of location A.

Location C is an intermittent drainage channel that drains from the west to the east that was separated from the B delineation and stream by an area of upland.

15 United State Geological Survey, Boston South Quadrangle, 1:25,000. 7.5 Minute Series, sheet 42071-C1-TM-025, Reston, VA. 1987.

Location D was further east off the northern side of American Legion Highway and drained from the west to the east. A portion of this channel to the west appeared to be above all wetlands and, thus, did not appear to be jurisdictional based on Massachusetts regulations. Flags D-1 to D-10 were placed further to the east, where wetland vegetation, including Spotted Touch Me Not, was present within the channel. This area appeared to be an intermittent stream. Location E was delineated further east past upland that separated location D.

Location E was BVW to intermittent stream drainage. The E wetland delineation, including flags E-1 to E 16, was separated from D by an expanse of upland. Wetland vegetation within location E included American Elm, Water Cress, Common Buckthorn (*Rhamnus cathartica*, FAC), Glossy Buckthorn, and Silky Dogwood. Soils were hydric and low chroma to a depth of 20 inches, and soils were saturated to or near the surface.

FEMA has not identified any BLSF areas on the site.

4.6.4.2 Connection and Isolation Valve Sites

FEMA has not identified any BLSF areas on-site at any of the Connection or Isolation Valve sites. **Table 4.6-2** summarizes the wetlands resources at the connection and isolation valve sites, and provides a summary of the receiving waters that would potentially receive drainage generated during construction and lists their impairments. All of the Connection and Isolation Valve sites are proposed to be included in each of the three DEIR Alternatives (3, 4, and 10).

During construction at the connection and isolation valve sites, minor volumes of dewatering would be generated during the excavation process of drilling through the overburden (i.e., soil on top of rock). Minor dewatering and on-site drainage would be managed with the appropriate erosion and sedimentation controls, and as much infiltration would occur on site as possible. Dewatering water and stormwater that does not infiltrate on site would be treated and discharged to local receiving waters either through the municipal separate storm sewer system (MS4) or directly to the water bodies. The Program team would coordinate with local municipalities and receive approval to discharge to MS4s, as necessary.

None of the water bodies in the following table are Outstanding Resource Waters or Public Water Supplies. However, MassDEP considers all water bodies in Massachusetts to be at minimum a Tier 2 water body, which is defined by USEPA to be a Sensitive Water and is regulated under the USEPA 2022 NPDES CGP. All receiving water bodies in the table are Class B waters, and all are considered impaired as they are either a Category 5 (waters requiring a TMDL) or Category 4a (waters with a TMDL completed). There are no groundwater resources near the connection sites. **Figure 4.6-10** through **Figure 4.6-16** show the wetland and waterways resources for the connection sites and isolation valve.

Table 4.6-2 Nearby Surface Waters and Groundwater Resources at Connection and Isolation Valve Sites

Site	Description of Nearby Surface Waters	First Named[1] Receiving Water Body	2018/2020 Non-pollutant Impairments[2]	2018/2020 Pollutant Impairments[3]
School Street Connection (Figure 4.6-10)	There are no surface waters directly adjacent to the site. Drainage would be discharged into the Waltham MS4 and then discharges into Chester Brook north of the site. Chester Brook flows southward, draining to Lyman Pond to the southeast. Lyman Pond flows into Beaver Brook, which then travels through culverts and daylighted areas before ultimately reaching the Charles River.	Beaver Brook (MA72-28, Category 5)	Flow regime modification, other anthropogenic substrate alterations, water chestnut	Algae, chloride, dissolved oxygen, Escherichia Coli (E. Coli), organic enrichment (sewage) biological indicators, total phosphorus, sedimentation/ siltation
Cedarwood Pumping Station Connection (Figure 4.6-11)	The site is surrounded to the south, west, and east by wetlands. It is assumed there is a hydraulic connection from the wetlands to the Charles River.	Charles River (MA72-07, Category 5)	Curly-leaf pondweed (*Potamogeton crispus*), Eurasian water milfoil, (*Myriophyllum spicatum*), fish passage barrier, flow regime modification, water chestnut, benthic macroinvertebrates, fish bioassessments	DDT in fish tissue, E. Coli, harmful algal blooms, nutrient/eutrophication , biological indicators, PCBs in fish tissue, total phosphorus, temperature
Hegarty Pumping Station Connection (Figure 4.6-12)	Rosemary Brook flows northward, through a series of culverts and smaller wetland areas, before running along the eastern side of the site. After flowing past the site, the brook passes through a culvert under I-95 and discharges directly to the Charles River.	Rosemary Brook (MA72-25, Category 4a)	None	Dissolved oxygen and total phosphorus
St. Mary Street Pumping Station Connection (Figure 4.6-13)	There are no surface waters directly adjacent to the site. Drainage would be discharged into the Needham MS4 and then discharged into the wetland areas to the west of the site. These wetlands drain to Hurd Brook, which runs north, traveling through a series of culverts and daylighted areas before ultimately discharging to the Charles River north of I-95.	Charles River (MA72-07, Category 5)	Curly-leaf pondweed, Eurasian water milfoil, fish passage barrier, flow regime modification, water chestnut, benthic macroinvertebrates, fish bioassessments	DDT in fish tissue, E. Coli, harmful algal blooms, nutrient/eutrophication , biological indicators, PCBs in fish tissue, total phosphorus, temperature

Table 4.6-2 Nearby Surface Waters and Groundwater Resources at Connection and Isolation Valve Sites

Site	Description of Nearby Surface Waters	First Named[1] Receiving Water Body	2018/2020 Non-pollutant Impairments[2]	2018/2020 Pollutant Impairments[3]
Newton Street Pumping Station Connection (Figure 4.6-14)	There are no surface waters directly adjacent to the site. North of the site are a series of ponds located within The Robert T. Lynch Municipal Golf Course in Brookline, and southeast of the site are a series of smaller wetlands within the Dexter Southfield School and Apple Orchard School campuses. Drainage would be discharged to the Brookline MS4 on Newton Street, which drains to the southwest and discharges to Sawmill Brook and ultimately to the Charles River.	Sawmill Brook (MA72-23, Category 5)	None	Chloride, dissolved oxygen, Escherichia Coli (E. Coli), organic enrichment (sewage) biological indicators, total phosphorus
Southern Spine Mains Connection (Figure 4.6-15)	There are no surface waters directly adjacent to the site. Drainage would be discharged into the stormwater system on South Street, which discharges into Bussey Brook, which flows through the Arnold Arboretum as culverted and daylighted segments. Bussey Brook is then culverted underground and discharges into Stony Brook, which is an underground, culverted stream that ultimately discharges into the lower segment of the Charles River just upstream of the Massachusetts Avenue Bridge.	Charles River (MA72-38, Category 5)	Fish passage barrier, flow regime modification	Cause unknown (sediment screening value [exceedance]), chlorophyll-a, combined biota/ habitat bioassessments, DDT in fish tissue, dissolved oxygen, dissolved oxygen supersaturation, Escherichia Coli (E. Coli), harmful algal blooms, nutrient/eutrophication biological indicators, odor, oil and grease, PCBs in fish tissue, total phosphorus, salinity, temperature, transparency/clarity

Table 4.6-2 Nearby Surface Waters and Groundwater Resources at Connection and Isolation Valve Sites

Site	Description of Nearby Surface Waters	First Named[1] Receiving Water Body	2018/2020 Non-pollutant Impairments[2]	2018/2020 Pollutant Impairments[3]
Hultman Aqueduct Isolation Valve (Figure 4.6-16)	The Charles River flows to the north of the site, below the I-90 overpass and interchange cloverleafs.	Charles River (MA72-07, Category 5)	Curly-leaf pondweed, Eurasian water milfoil, fish passage barrier, flow regime modification, water chestnut, benthic macroinvertebrates, fish bioassessments	DDT in fish tissue, Escherichia Coli (E. Coli), harmful algal blooms, nutrient/eutrophication, biological indicators, PCBs in fish tissue, total phosphorus, temperature

1 Named means that it is included in the MassDEP Integrated List of Waters.

2 Impairments identified from MassDEP Integrated List of Waters: https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-20182020-reporting-cycle/download

3 Impairments identified from MassDEP Integrated List of Waters: https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-20182020-reporting-cycle/download

School Street Connection

No wetlands or certified vernal pools are mapped within 100 feet of the site, and no surface water bodies are located within 200 feet of the site (see **Figure 4.6-10**). On-site evaluation for the DEIR confirmed that wetland resources do not occur on or directly adjacent to the site.

Cedarwood Pumping Station Connection

On April 14, 2022, wetland resource areas at the Cedarwood Pumping Station were inspected and field delineated (see **Figure 4.6-11**). BVW to intermittent streams that drain to the Charles River were flagged with tapes labeled Wetland Boundary at the locations labeled A-1 to A-25, from east to west, ending at an intermittent channel to the north. The BVW was a red maple and shrub swamp. Wetlands vegetation at flags A-7 to A-8 included Red Maple, Sugar Maple (*Acer saccharum*, FACU), and Black Walnut (*Juglans nigra*, FACU, note – at edge) trees; Silky Dogwood shrubs; and Spotted Touch Me Not and White Avens (*Geum canadense*, FAC) herbaceous plants. An unidentified grape vine (*Vitis sp*.) was also present at flags A-7 to A-8.

Two detention ponds were also observed at the site. These had previously been delineated (top of bank) with red tapes. The delineations appeared to be accurate. The William F. Stanley Elementary School opened in 2003. Based on recent construction, the detention basins, and a post-1996 construction date, this would not be considered a regulated wetland resource area per 310 CMR 10.00 as long as they were properly maintained, which they appeared to be.

Hegarty Pumping Station Connection

On April 14, 2022, wetland resource areas at the Hegarty Pumping Station were inspected and field delineated (see **Figure 4.6-12**). The top of bank and mean annual high-water line to Rosemary Brook (perennial stream) was flagged with tapes labeled Wetland Boundary at the locations labeled A-1 to A-6, and then directly from A-6 to A-12. An area BVW was also delineated from A-6 through A-12. The BVW was a green ash and skunk cabbage swamp. Vegetation observed within the wetland delineation flag A-10 included Green Ash, White Ash (*Fraxinus americana*, FACU), American Elm saplings, Apple (*Malus domestica*, UPL), and herbaceous Skunk Cabbage.

St. Mary Street Pumping Station Connection

No wetlands or certified vernal pools are mapped within 100 feet of the site, and no surface water bodies are located within 200 feet of the site (see **Figure 4.6-13**). On-site evaluation for the DEIR confirmed that wetland resources do not occur on or adjacent to the site.

Newton Street Pumping Station Connection

On April 1, 2022, the Newton Street Pumping Station site was inspected for the presence of wetland resources. The open land to the rear (north) of the building at the site was walked, vegetation was observed, and soil samples were collected (see **Figure 4.6-14**). The soils in the middle of the open land included upland soils, with a surface horizon with a Munsell rating of 10YR 3/2 to about 10 inches deep, below which was a “B” horizon rated 10YR 4/3. The soil was not hydric. Based on these observations, there were no wetland resource areas at the site.

Southern Spine Mains Connection

No wetlands or certified vernal pools are mapped within 100 feet of the site, and no surface water bodies are located within 200 feet of the site (see **Figure 4.6-15**). On-site evaluation for the DEIR confirmed that wetland resources do not occur on or adjacent to the site.

Hultman Aqueduct Isolation Valve

No wetlands or certified vernal pools were identified on-site. The Charles River is located within 100 feet of the site on the opposite side of an exit ramp from I-90 (see **Figure 4.6-16**). The bank line has been estimated based on aerial imagery and would be field delineated for final design.

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith
in association with
vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Wetlands and Waterways
School Street Connection
Figure 4.6-10

Waltham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

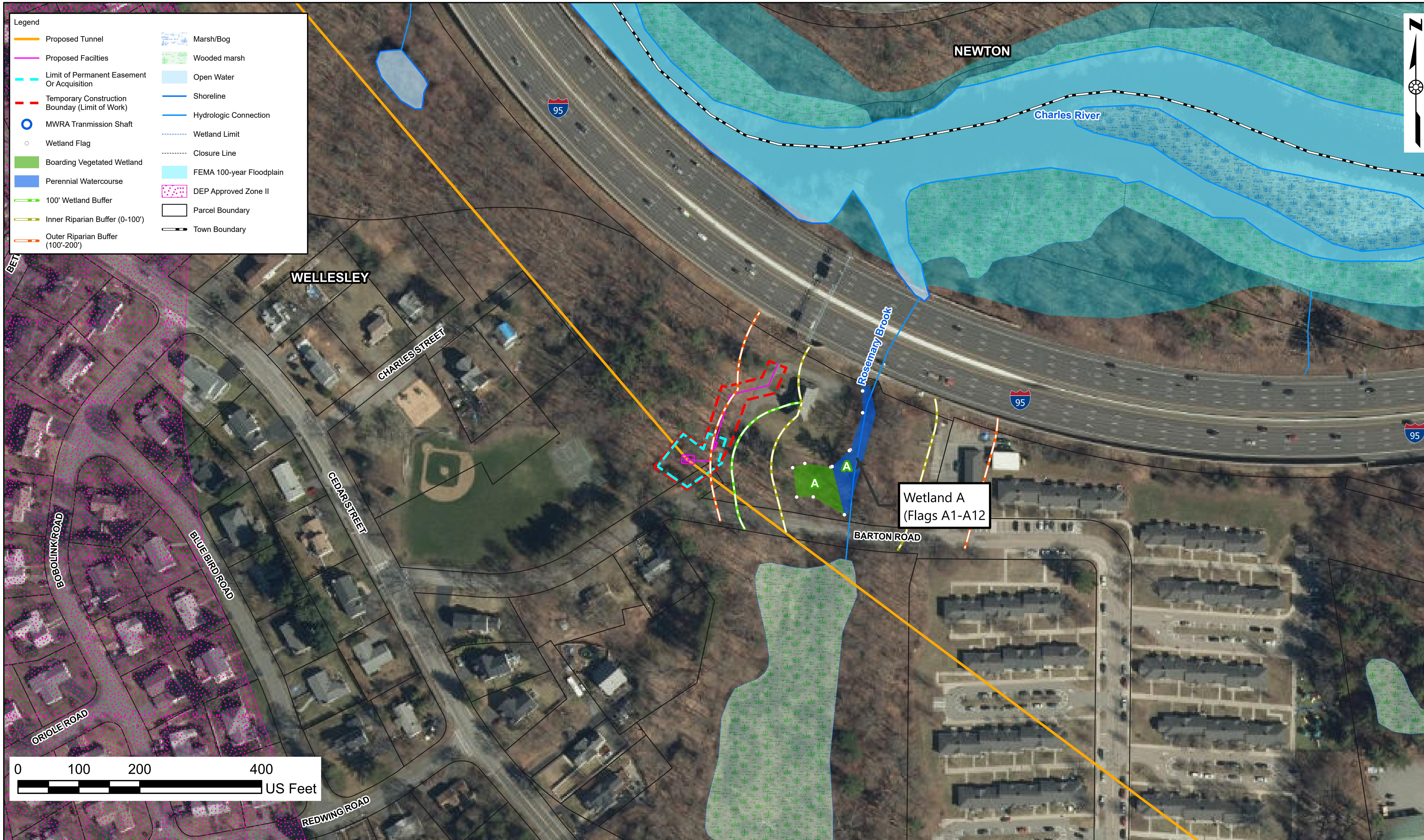
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetlands and Waterways
Cedarwood Pumping Station Connection
Figure 4.6-11

Waltham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

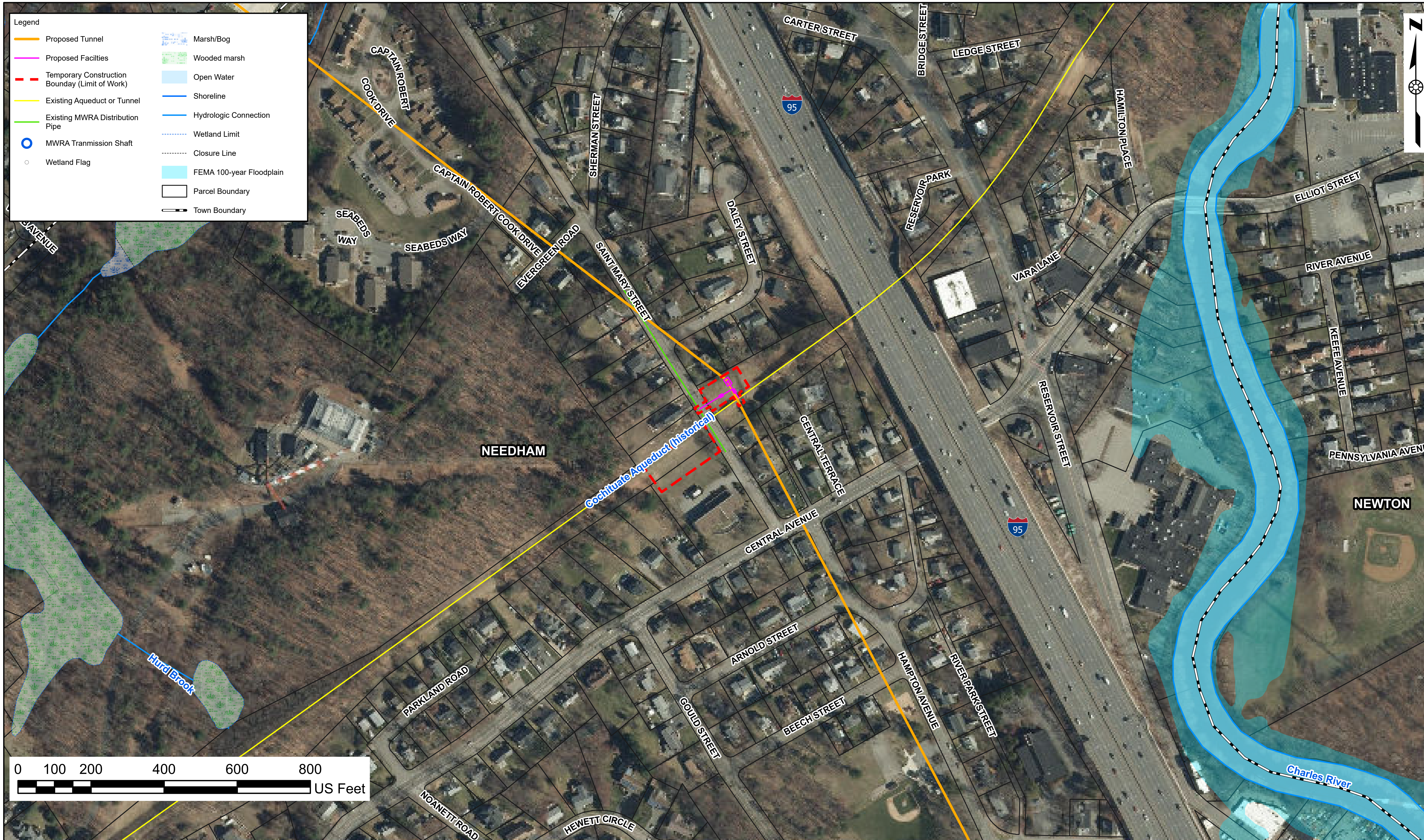
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wellesley, MA

Wetlands and Waterways
Hegarty Pumping Station Connection
Figure 4.6-12

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

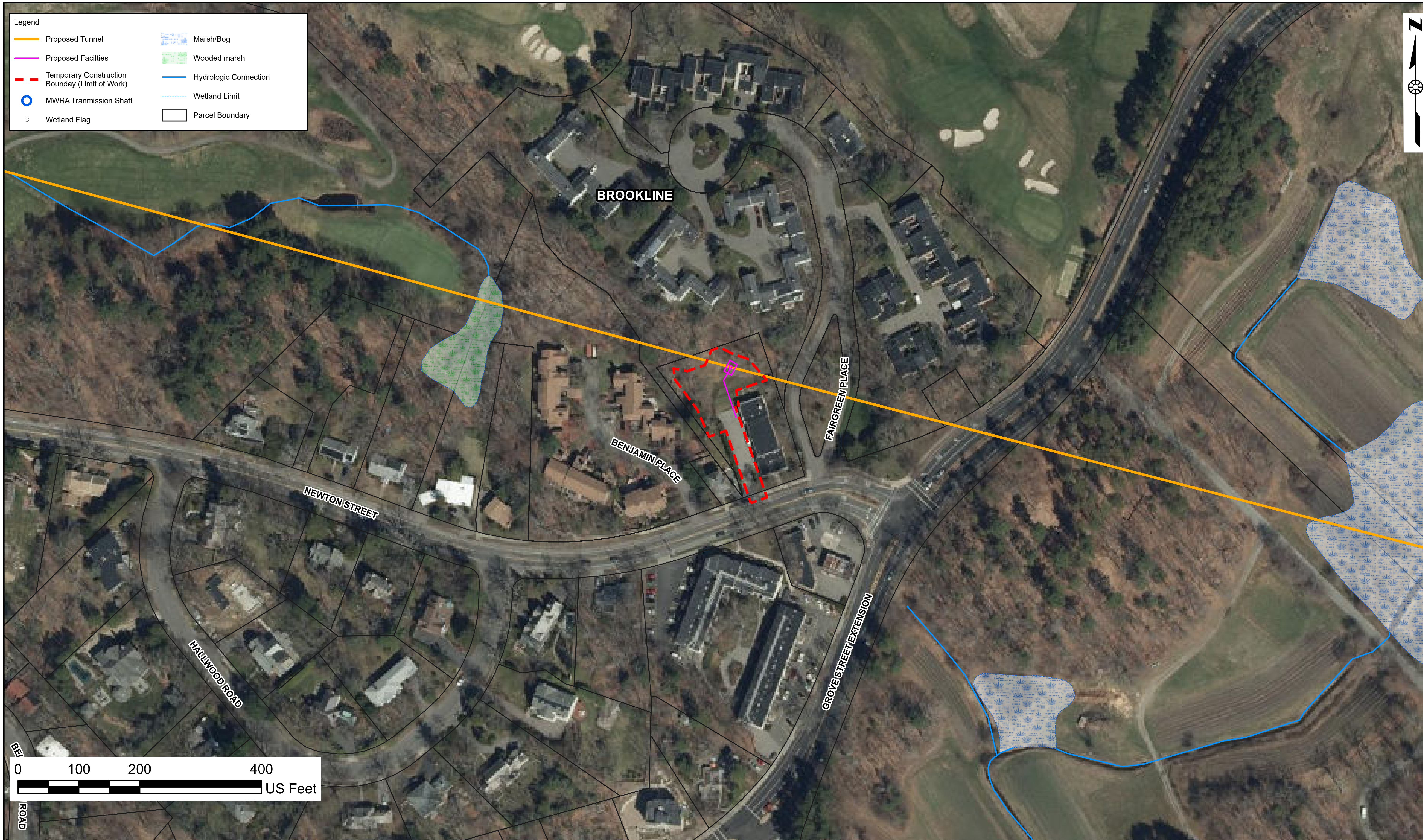
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetlands and Waterways
St. Mary Street Pumping Station Connection
Figure 4.6-13

Needham, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

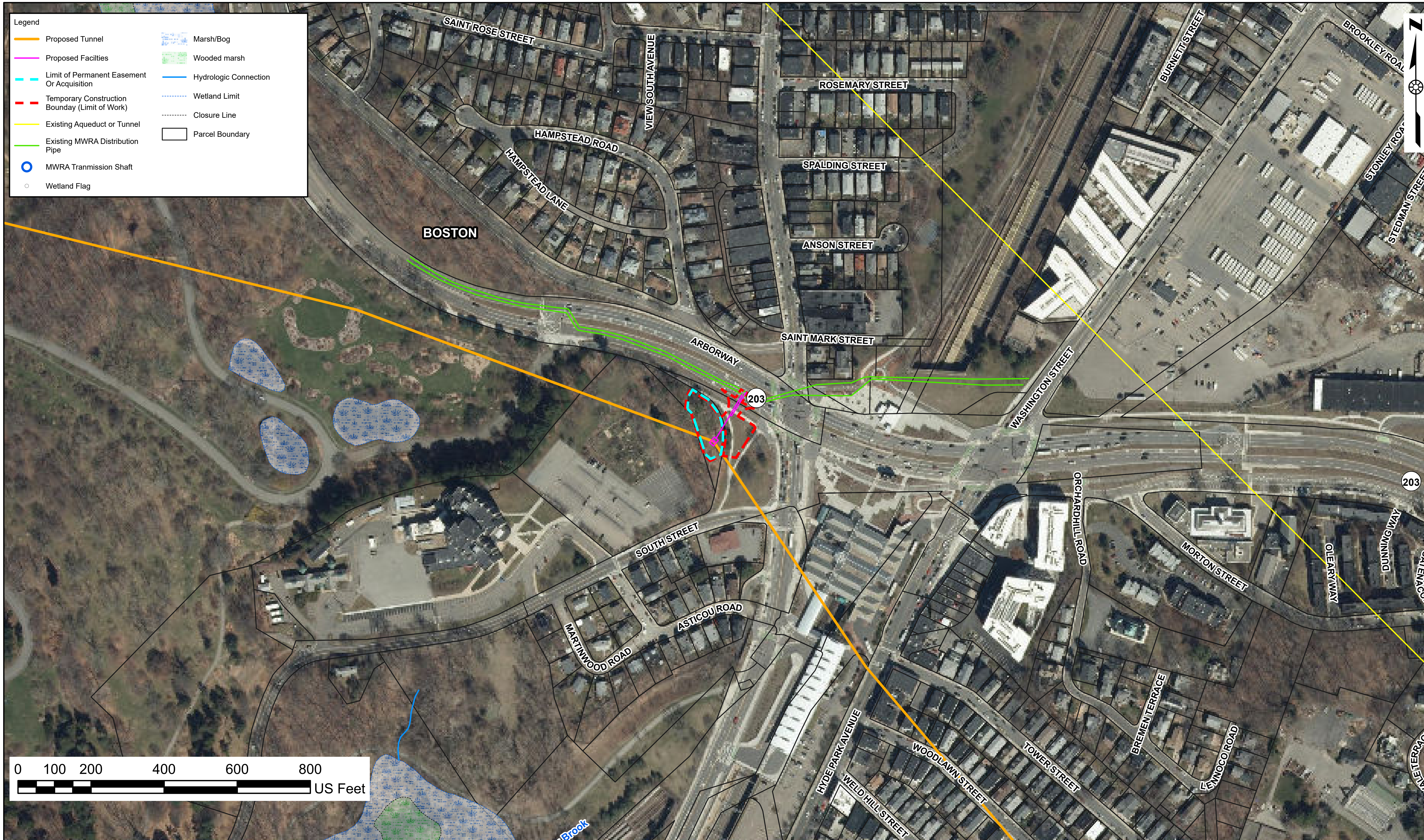
CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

Wetlands and Waterways
Newton Street Pumping Station Connection
Figure 4.6-14

Brookline, MA

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

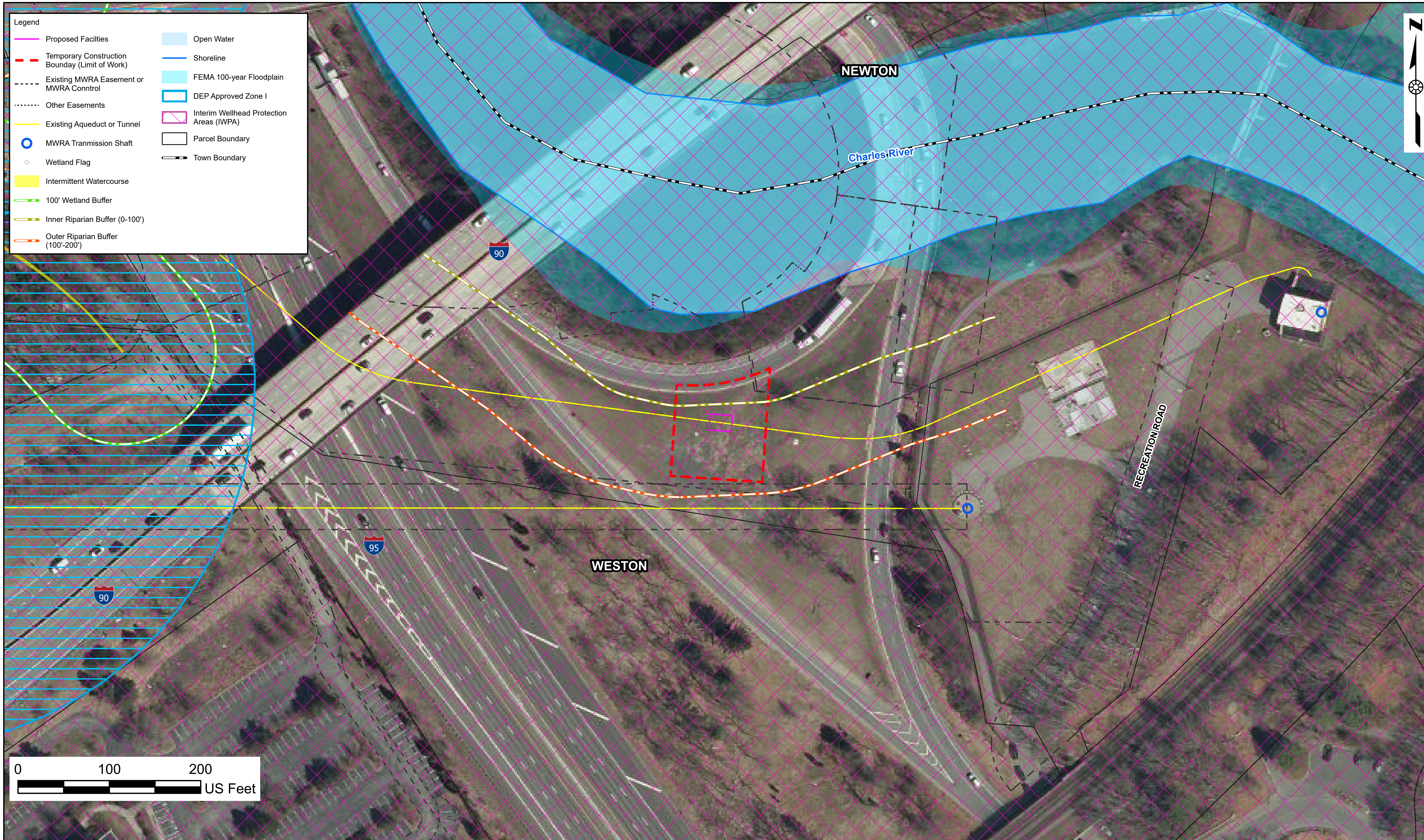
CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Boston, MA

Wetlands and Waterways
Southern Spine Mains Connection
Figure 4.6-15

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Wetlands and Waterways
Hultman Aqueduct Isolation Valve
Figure 4.6-16

Source: MassGIS, MWRA, CDM Smith

This page intentionally left blank

4.6.4.3 Tunnel Alignments – All Alternatives

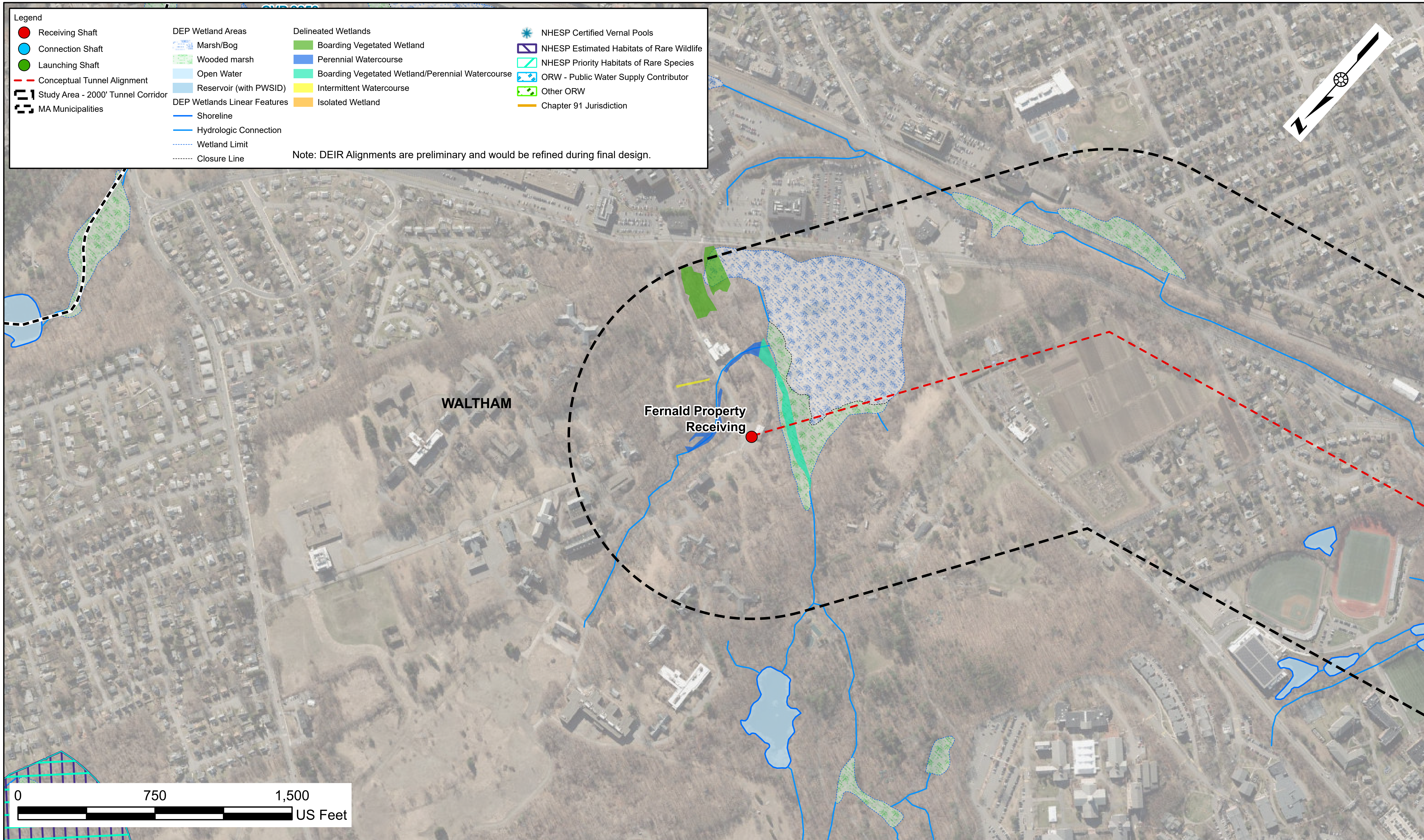
Tunnel alignments for the three DEIR Alternatives would be located in deep rock, with the lowest elevation being at the launching shafts.[16] The TBMs would proceed from the launching shafts driving at an upward grade to the receiving shafts, which would also be in deep rock. This would allow for gravity drainage of groundwater back to the launching sites during construction. The tunnel profiles, tunnel alignments, and invert depths of the launching and receiving shafts would vary slightly among the DEIR Alternatives (as described in **Section 4.4, Construction Methodology**). Wetlands and surface waters along the tunnel alignments were not field delineated.

The following waterbodies are within 1,000 feet of the DEIR tunnel alignments. The tunnel would be located between approximately 200 and 400 feet below ground surface within the rock, well below the bottom elevation of the surface waterbodies.

- Clematis Brook, Waltham
- Beaver Brook, Waltham
- Lyman Pond, Waltham
- Charles River, Waltham, Weston, Newton, Wellesley, Needham
- Stony Brook, Waltham
- Stony Brook Reservoir, Waltham/Weston
- Seaverns Brook, Weston
- Rosemary Brook, Wellesley
- Hurd Brook, Wellesley
- Charles River Country Club Ponds, Newton
- Saw Mill Brook, Newton
- Robert T. Lynch Municipal Golf Course Ponds, Brookline
- Pond at Larz Anderson Park, Brookline
- Pond at Apple Orchard School, Brookline
- Bussey Brook, Boston
- Arnold Arboretum Ponds, Boston
- Stony Brook, Boston
- Lake Hibiscus, Boston

16 DEIR tunnel alignments are preliminary and would be refined during final design.

Given the deep depths of the proposed tunnels, a direct hydrologic connection between the tunnels and surface waters and wetlands would be unlikely, however unmitigated groundwater drawdown during tunnel construction could, in extreme cases, reduce the levels of local water bodies. Therefore, the Program will employ mitigation practices to address the potential impacts to surface waters and wetlands along the alignment, as described in **Section 4.6.7**. See **Figure 4.6-17** through **Figure 4.6-27** for wetlands and waterways along the Alternative 3 tunnel alignment, **Figure 4.6-28** through **Figure 4.6-38** for wetlands and waterways along the Alternative 4 tunnel alignment, and **Figure 4.6-39** through **Figure 4.6-49** for wetlands and waterways along the Alternative 10 tunnel alignment.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

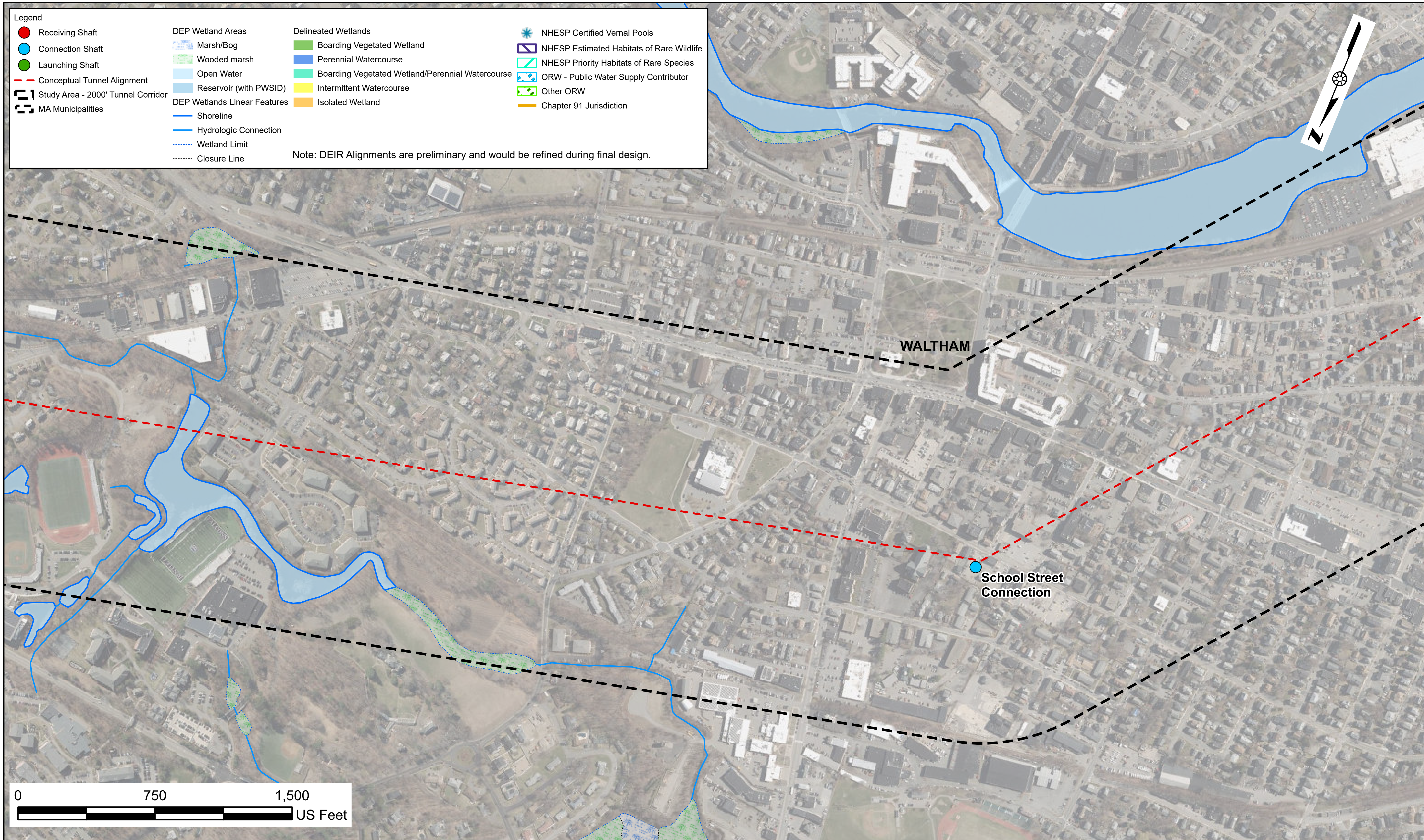
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-17

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

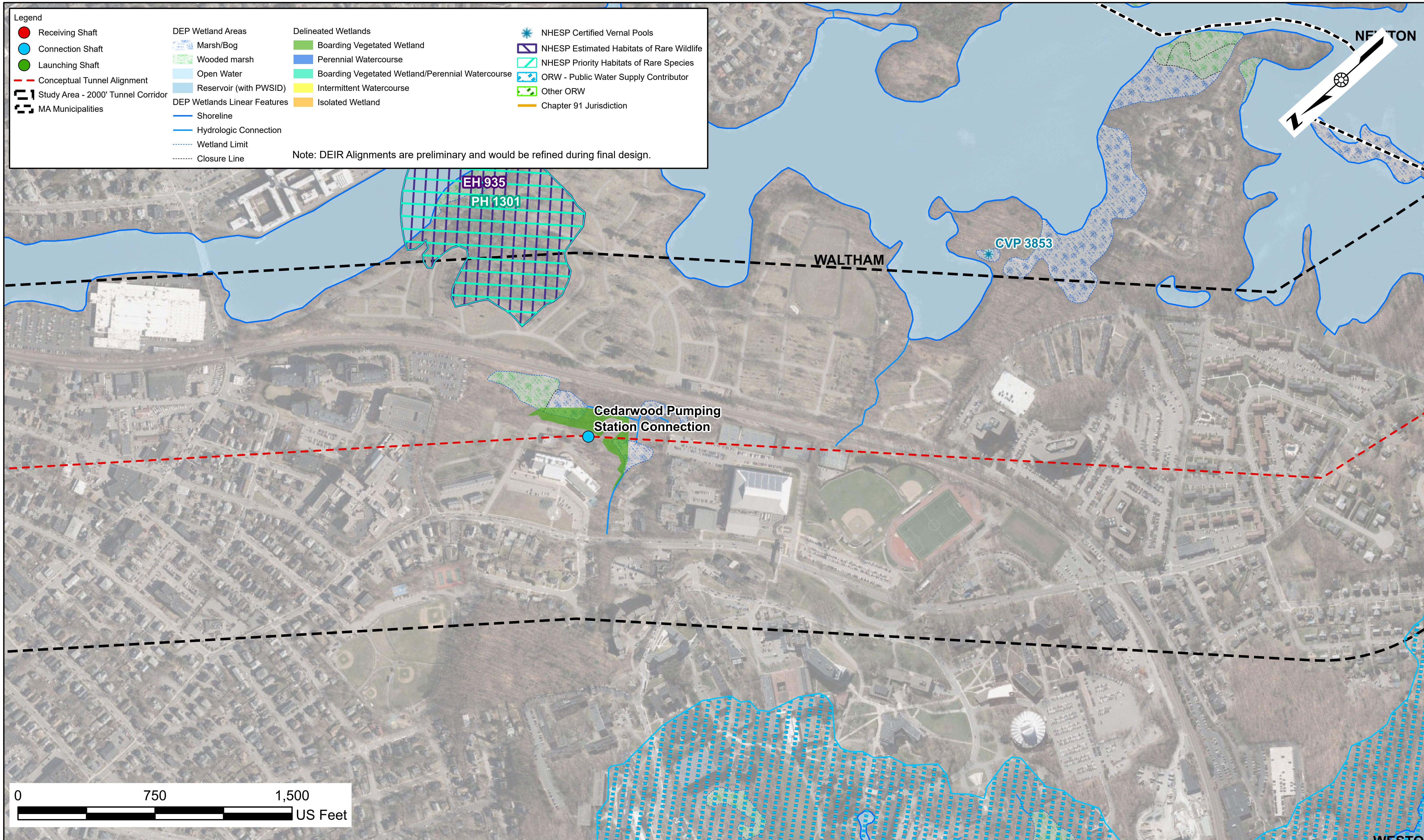
CDM Smith
in association with
vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-18

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

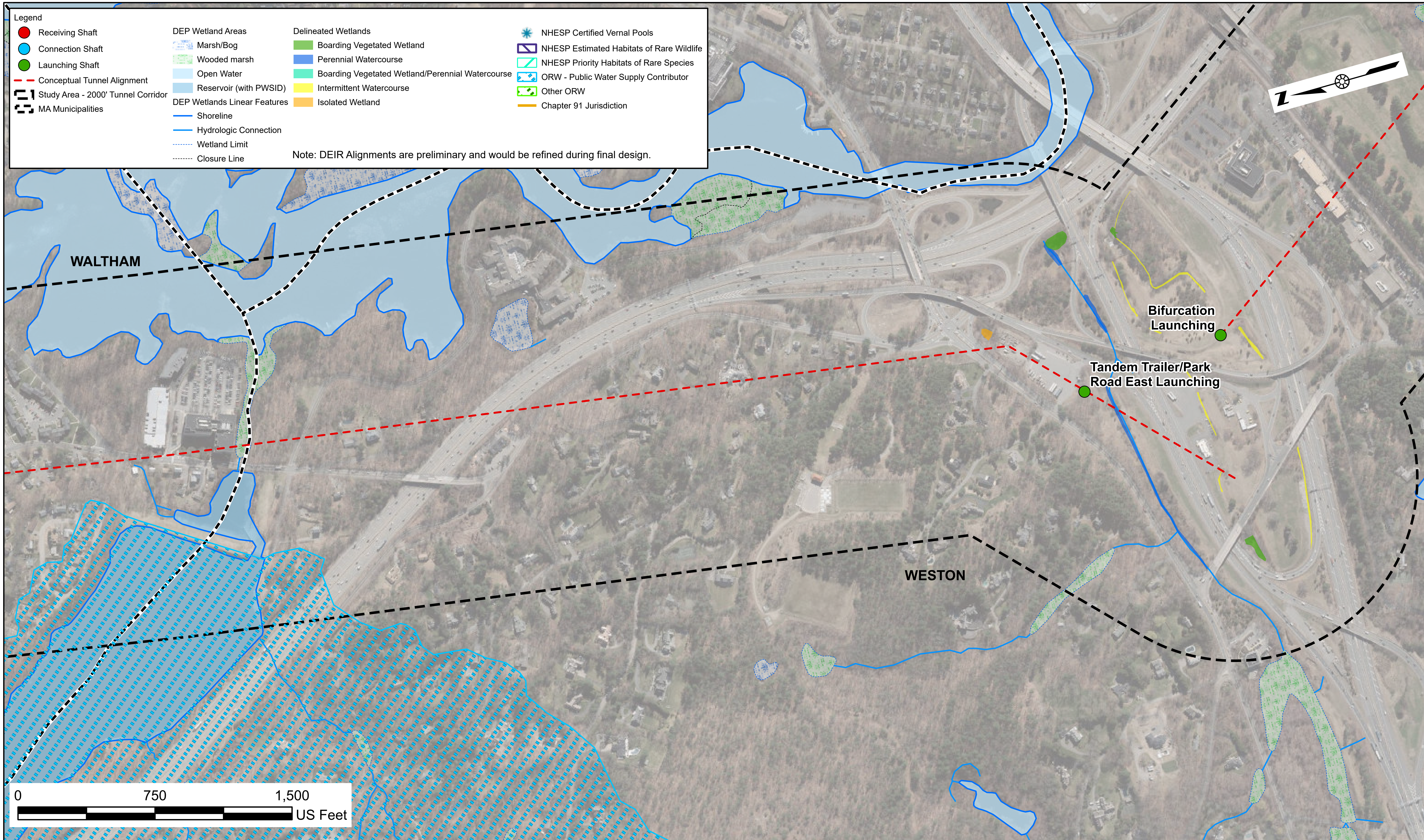
CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-19

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

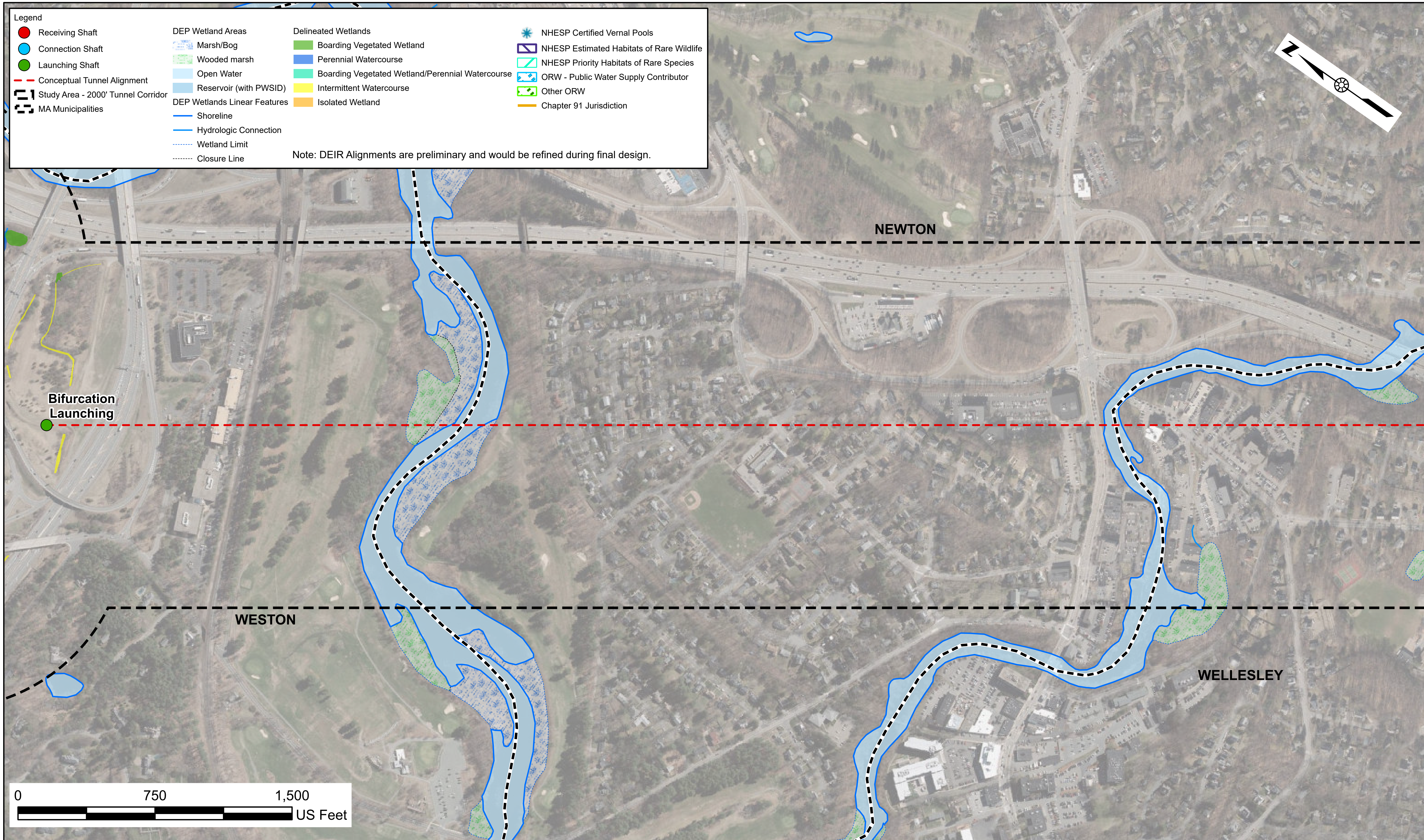
MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-20
Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

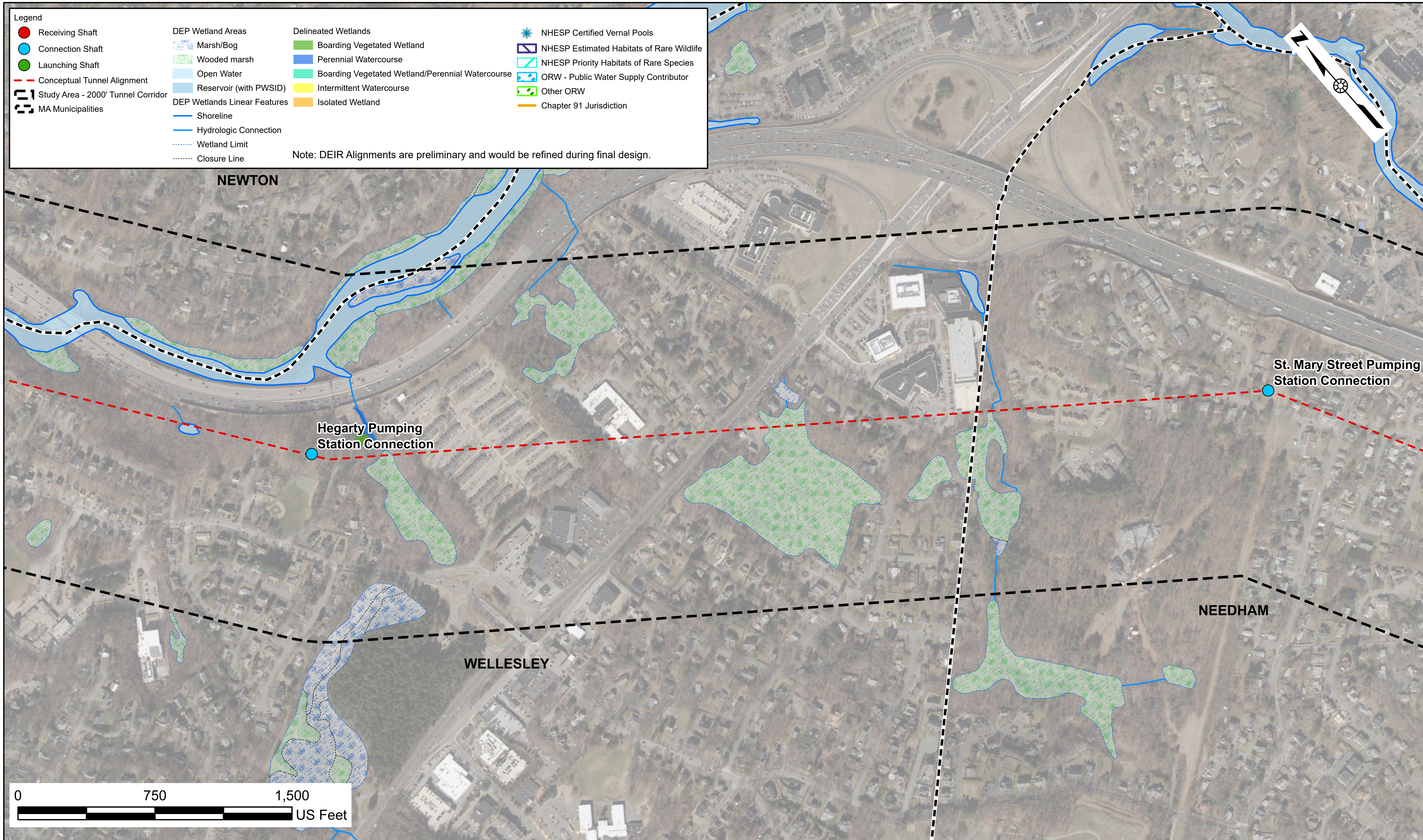
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-21

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

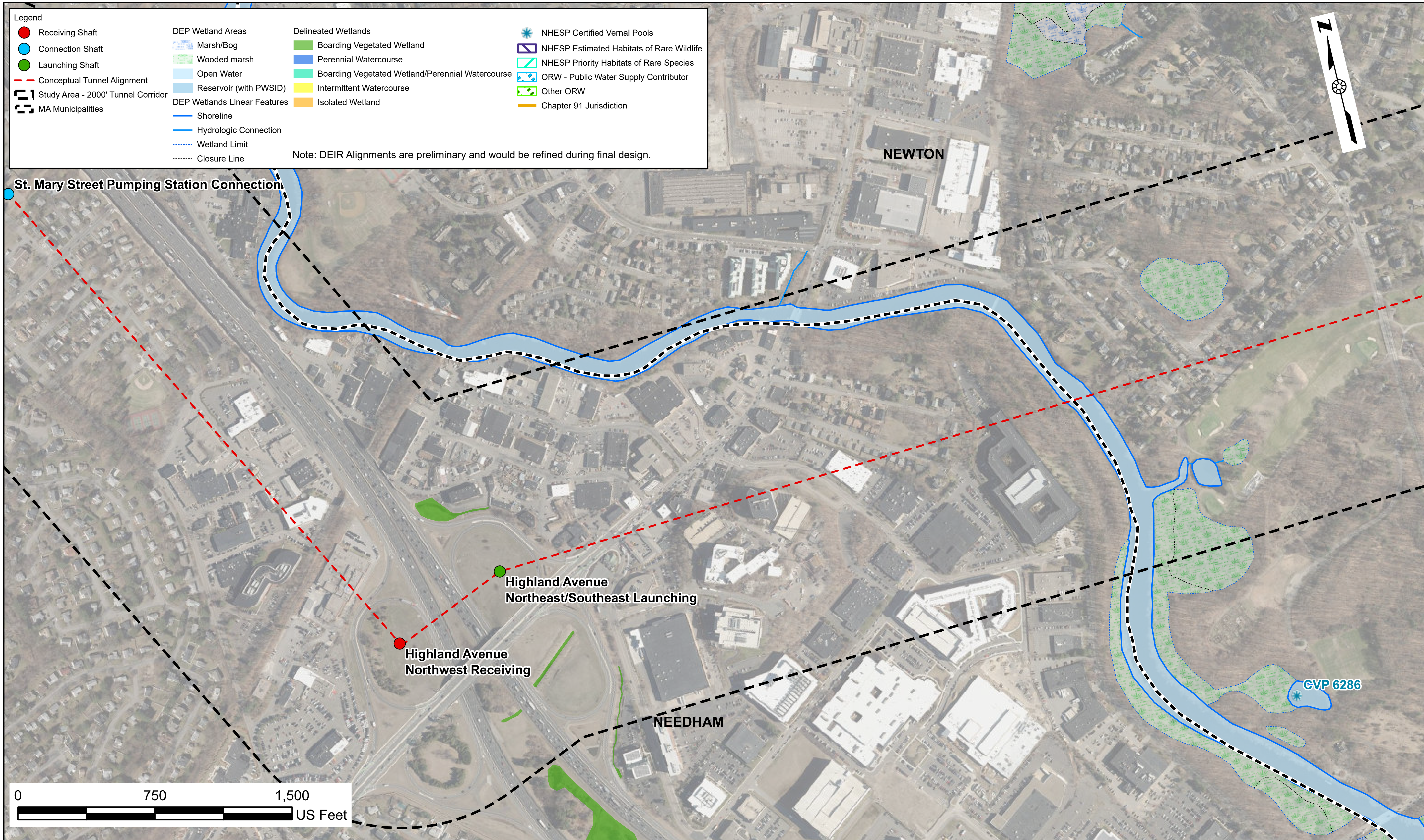
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-22

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

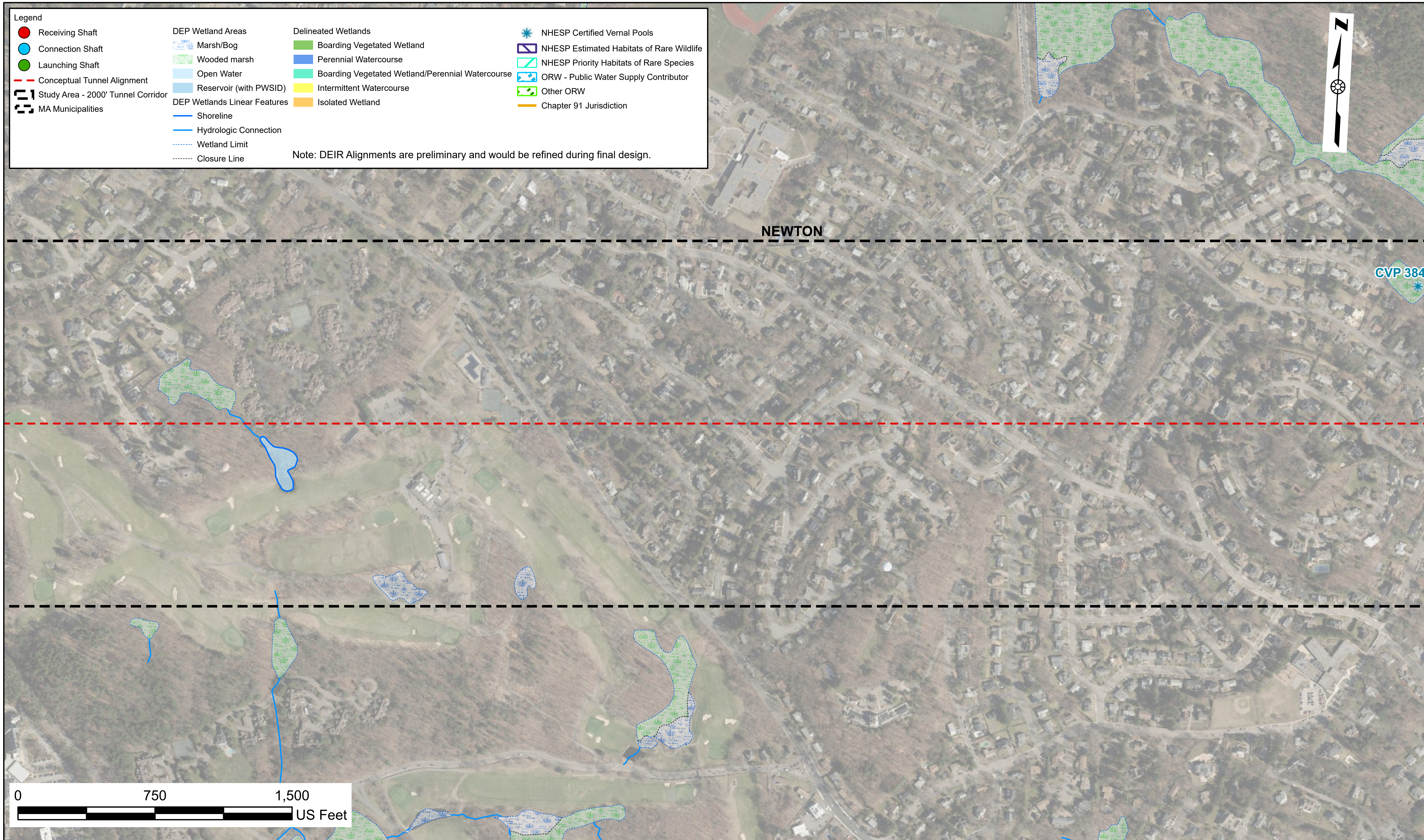
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-23

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

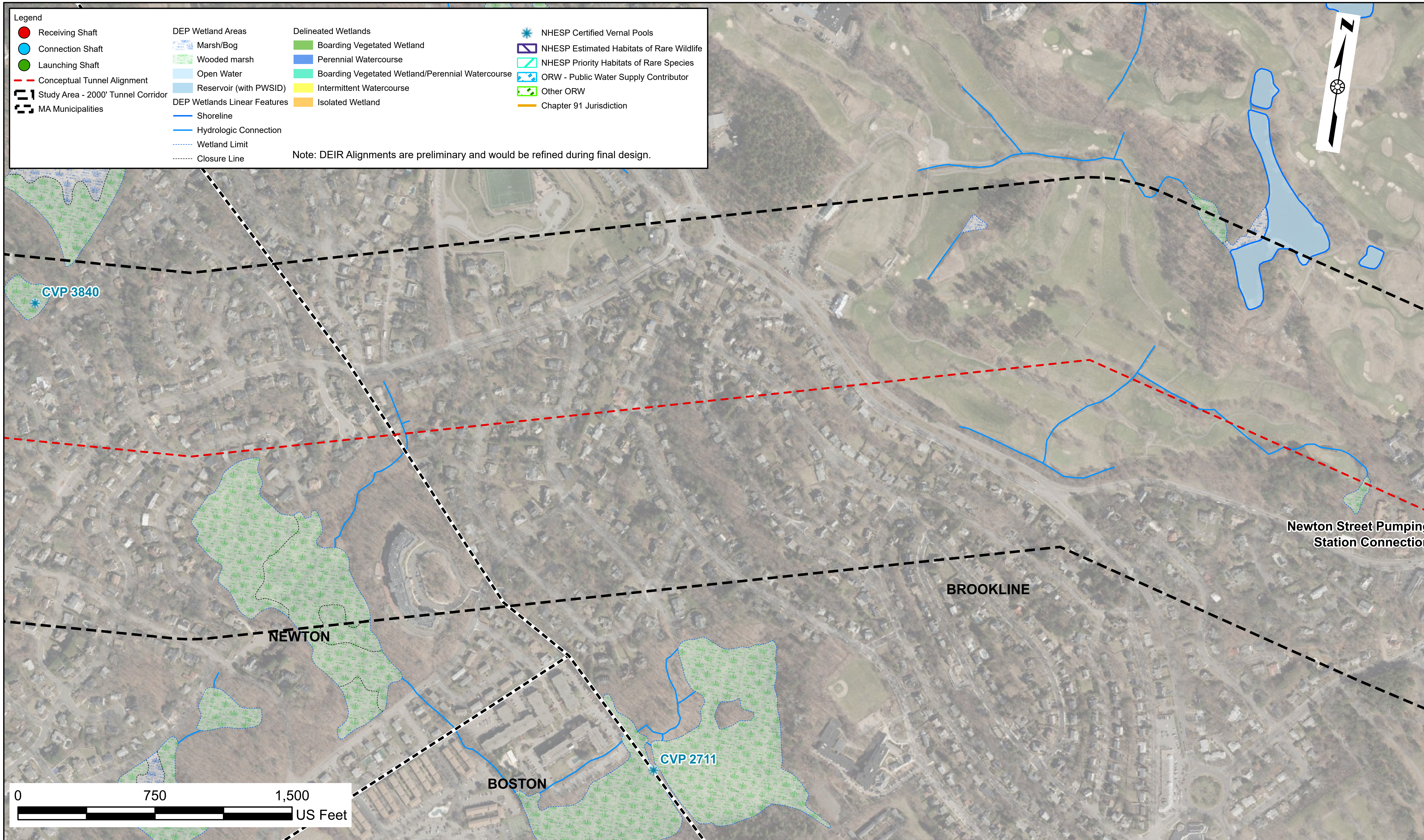
MWRA Contract No. 7159
Draft Environmental
Impact Report

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-24

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

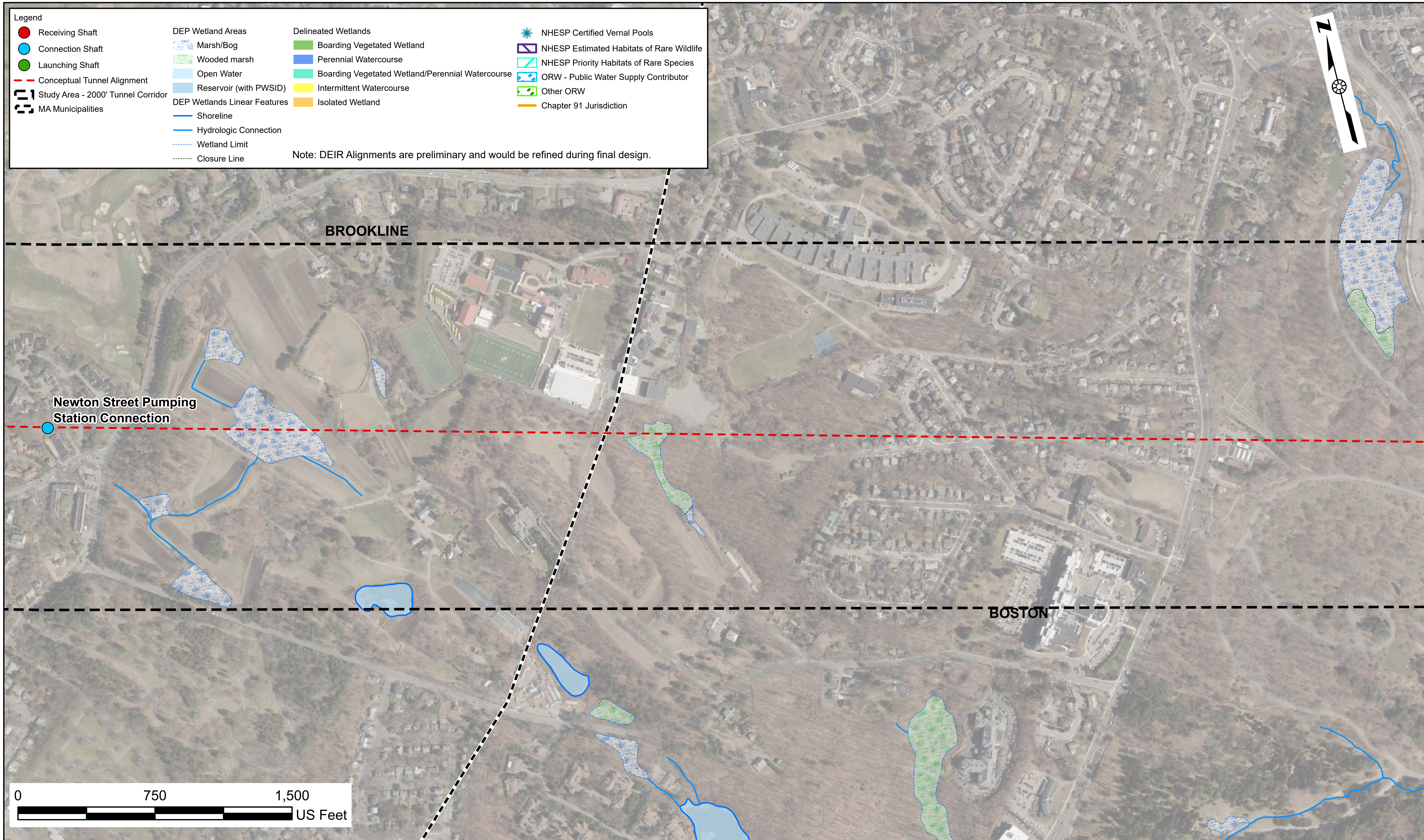
CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-25

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

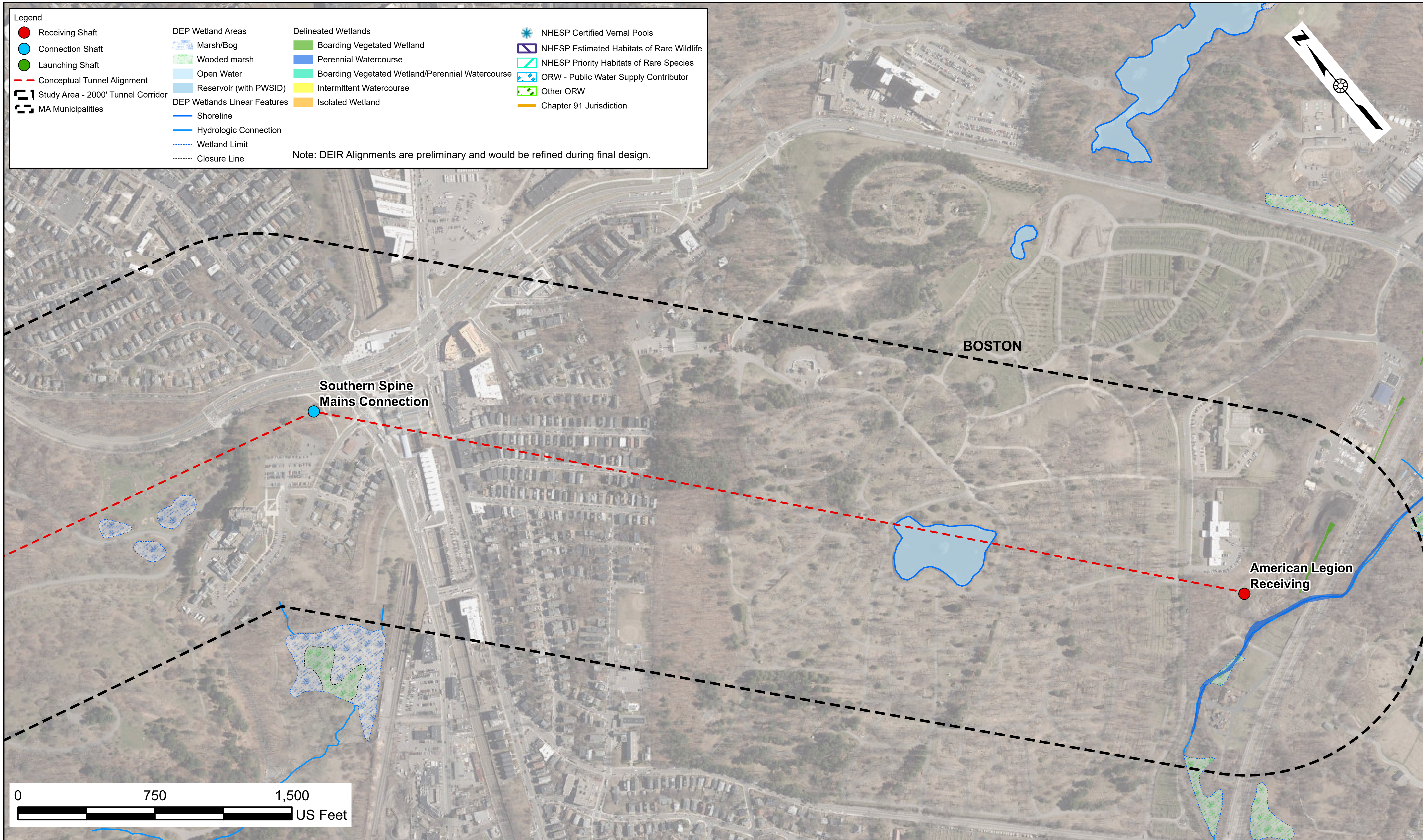
CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-26

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

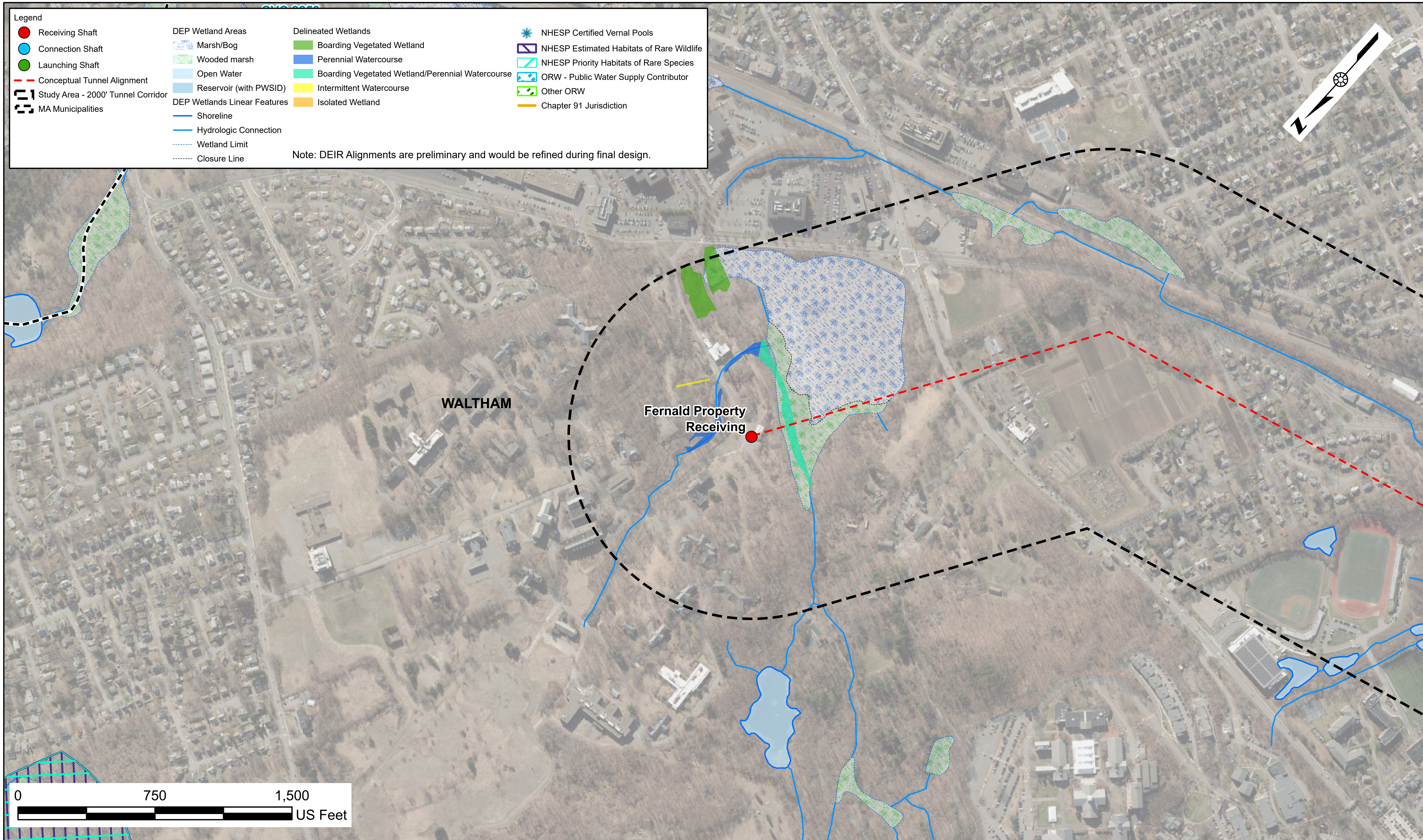
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Wetland and Waterways Overview Map
Alternative 3
Figure 4.6-27

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

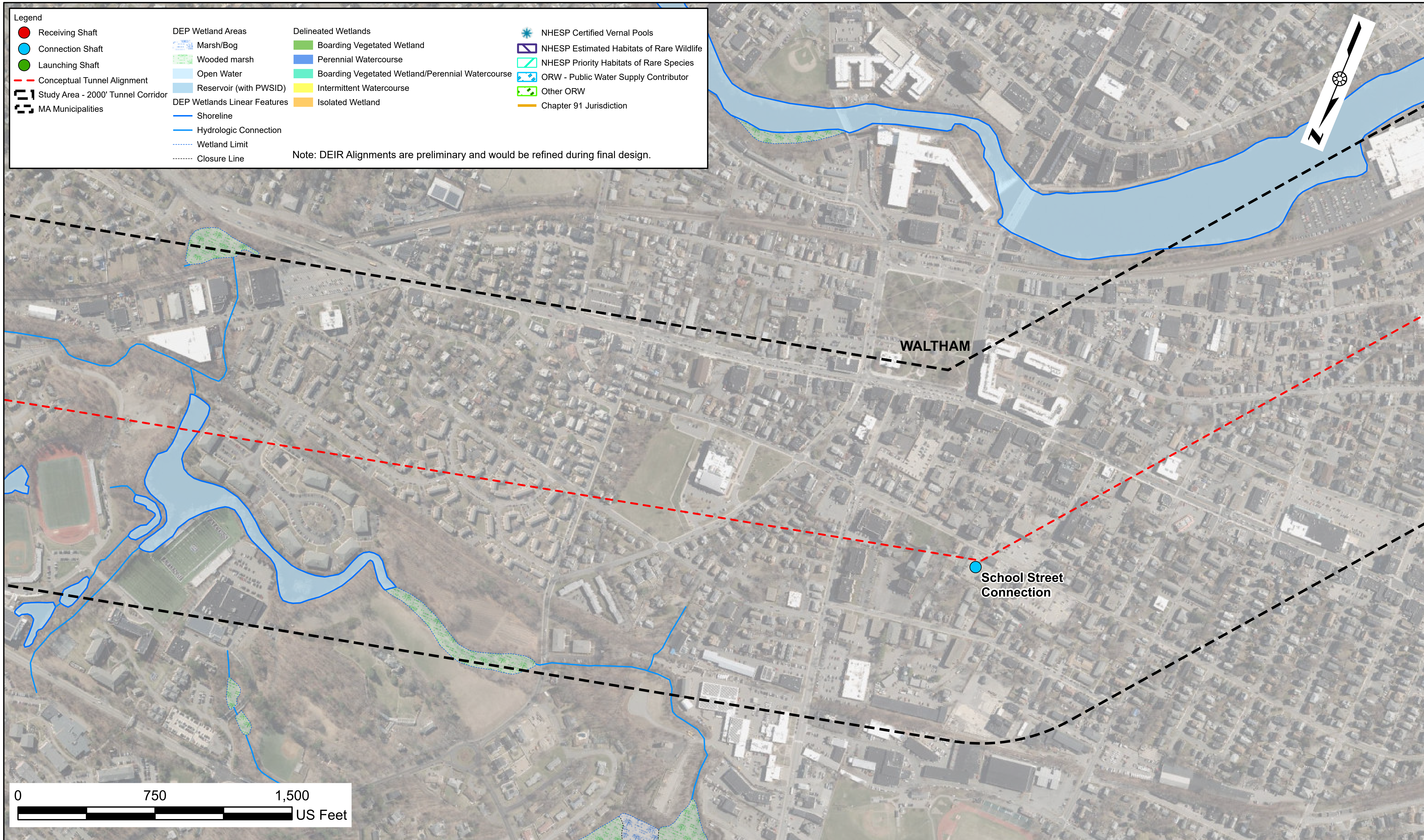
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-28

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

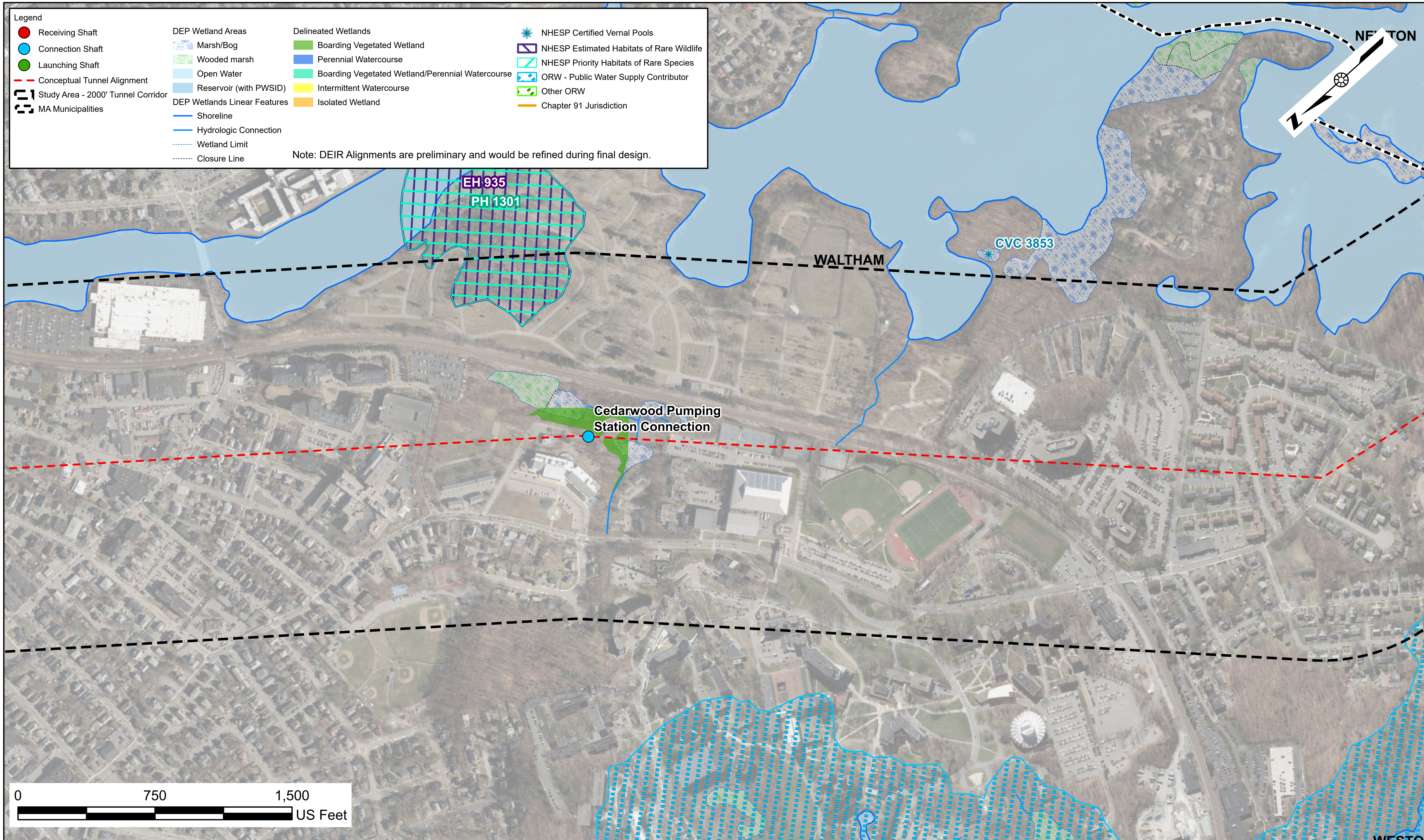
CDM Smith in association with vhb
Jacobs GREEN

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-29

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

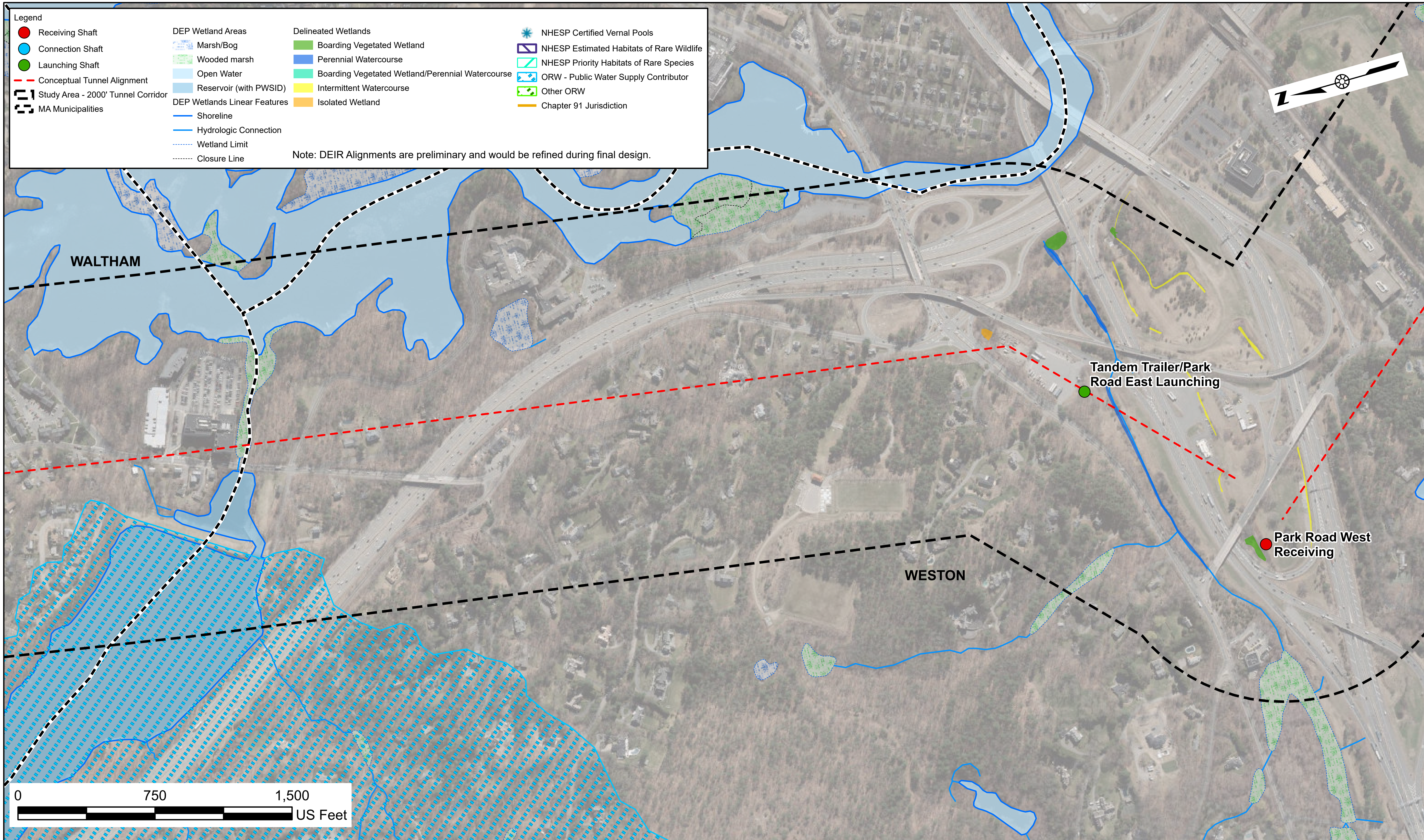
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-30

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

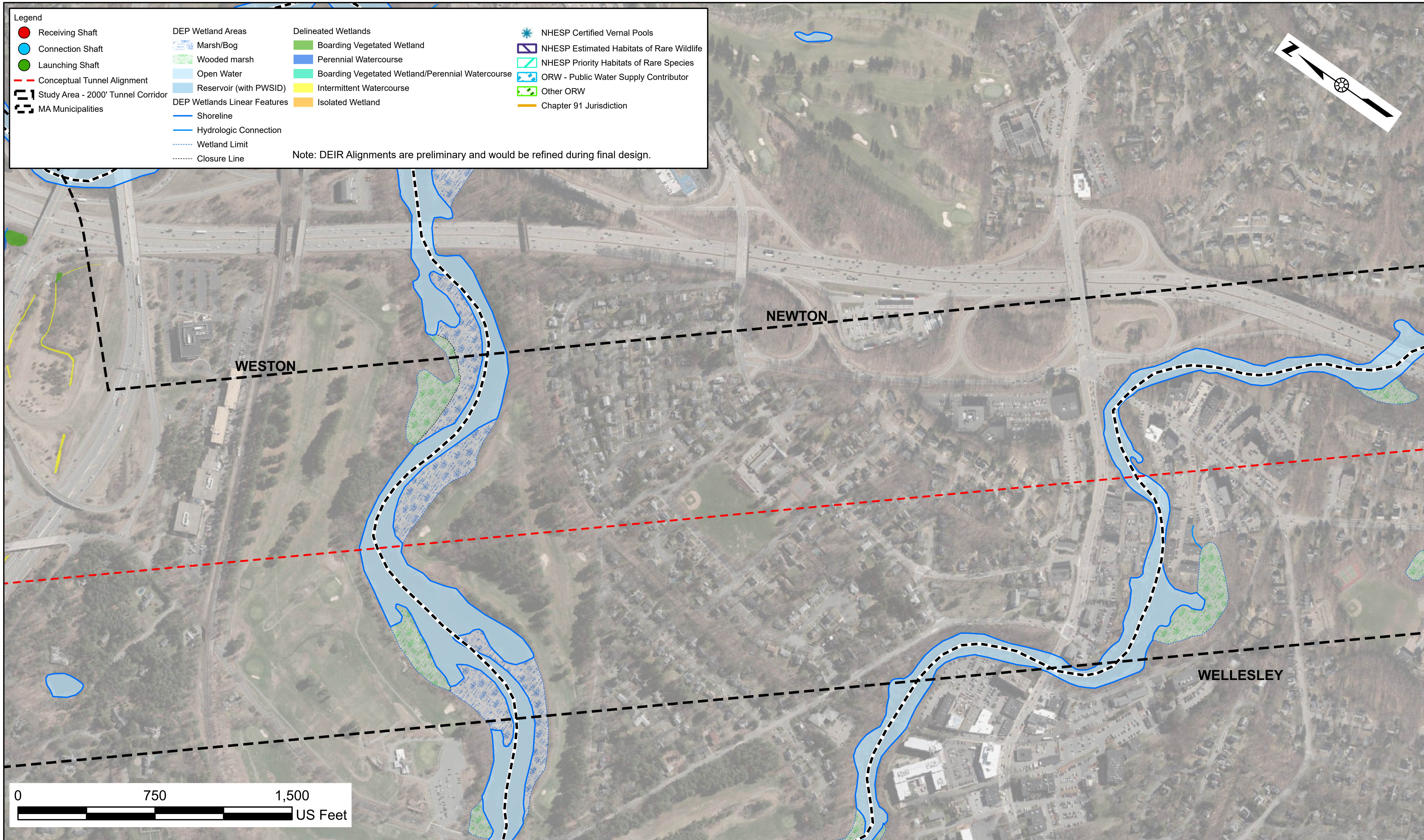
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-31

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

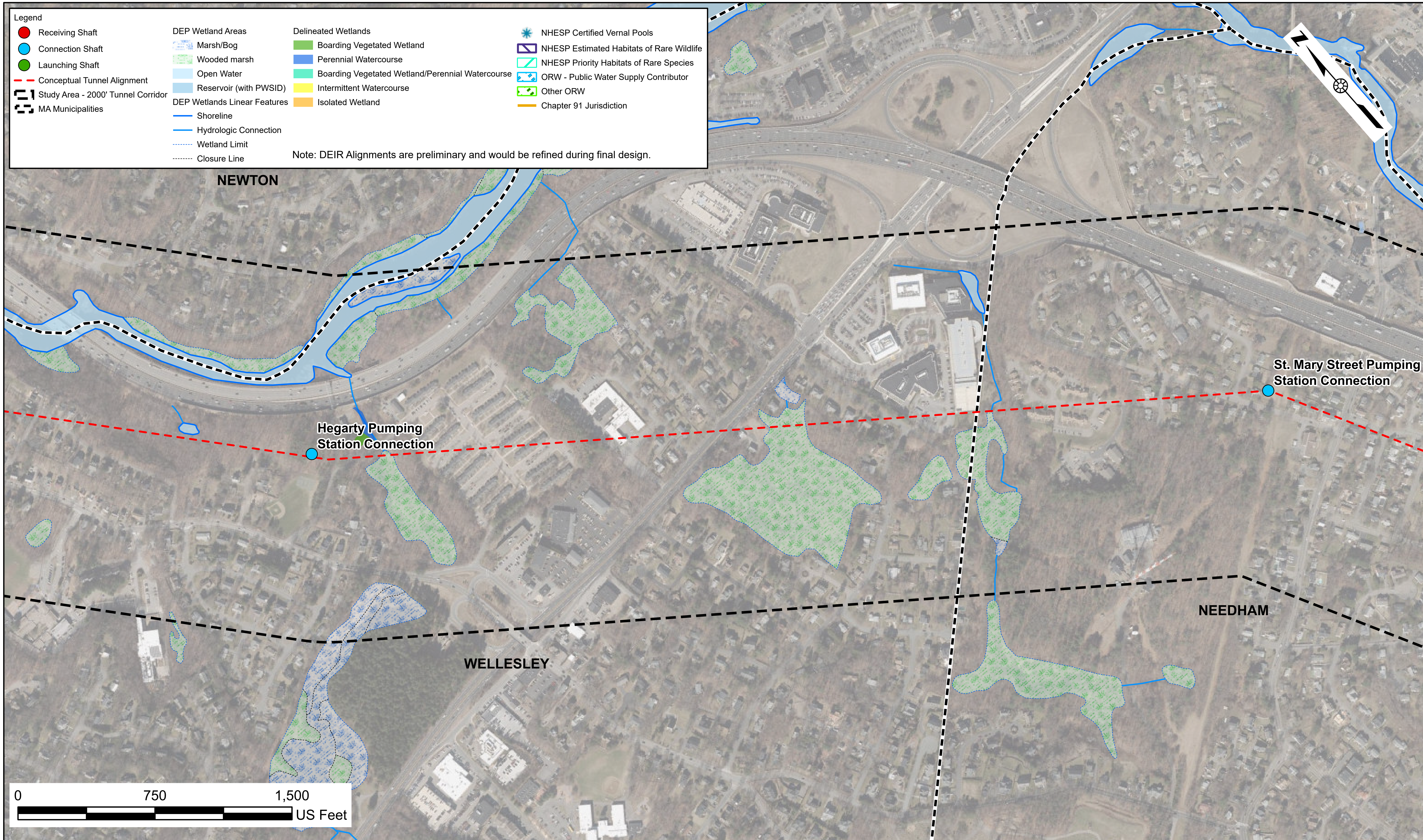
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-32

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

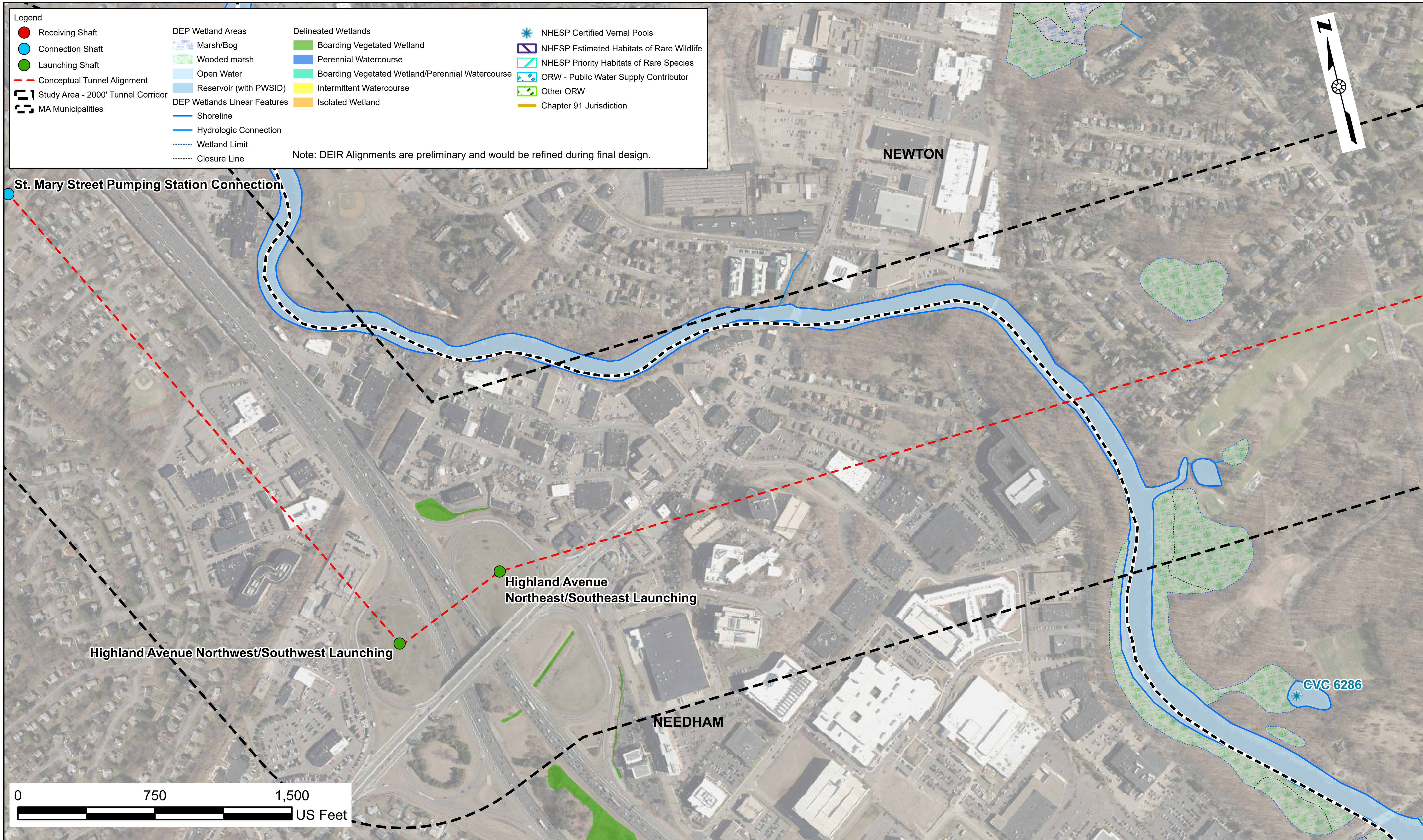
CDM Smith in association with vhb
Jacobs GREEN

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-33

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

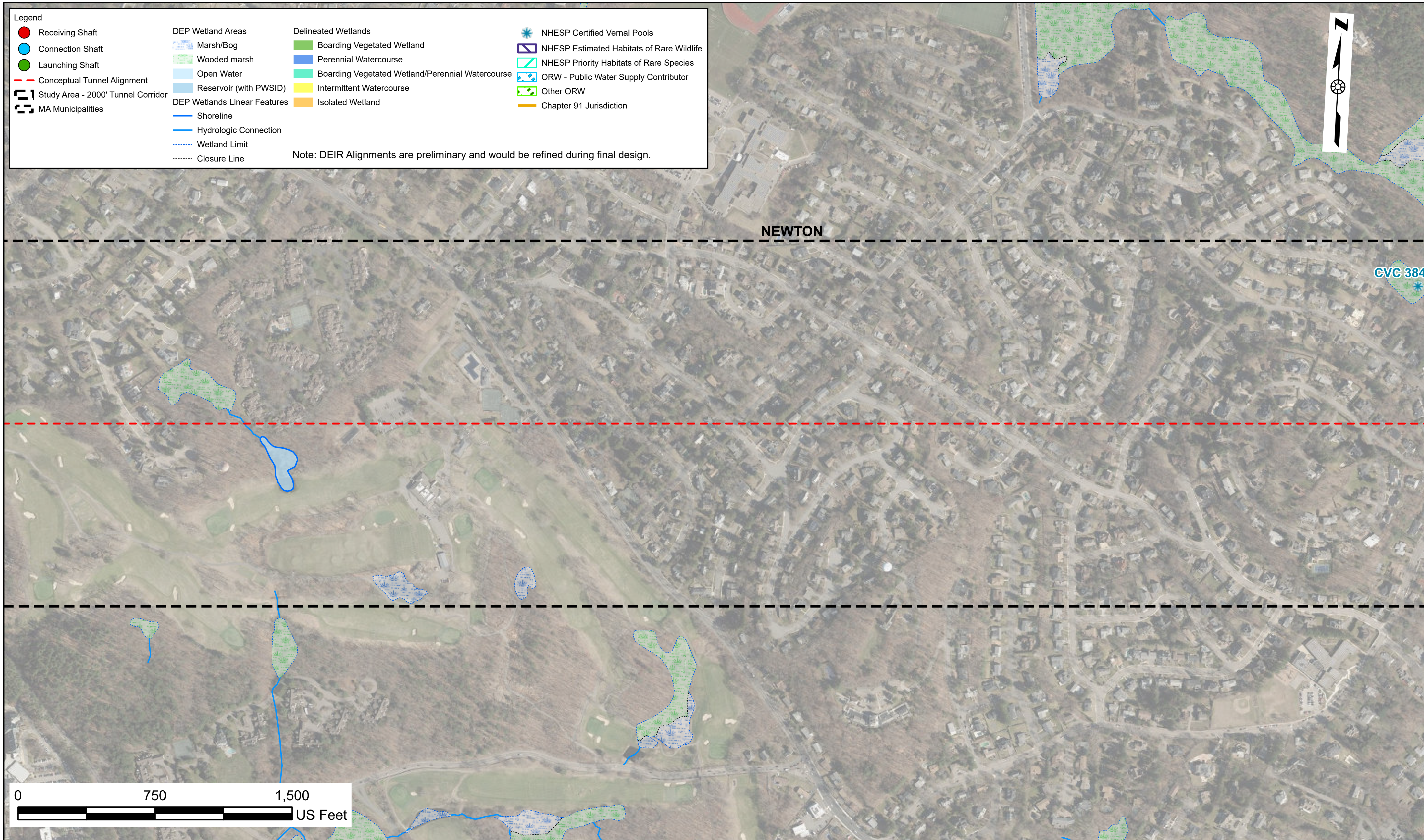
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-34

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

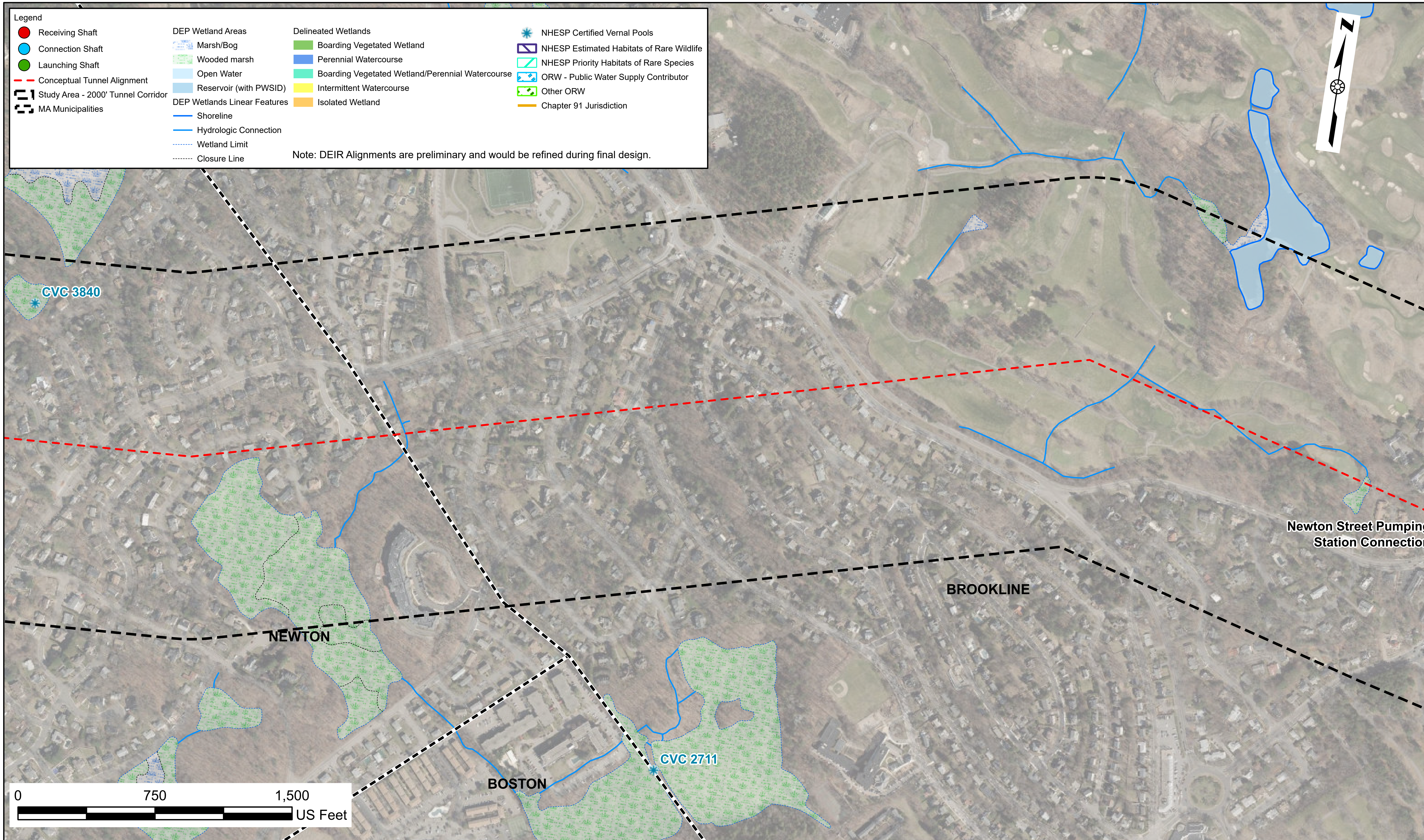
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-35

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

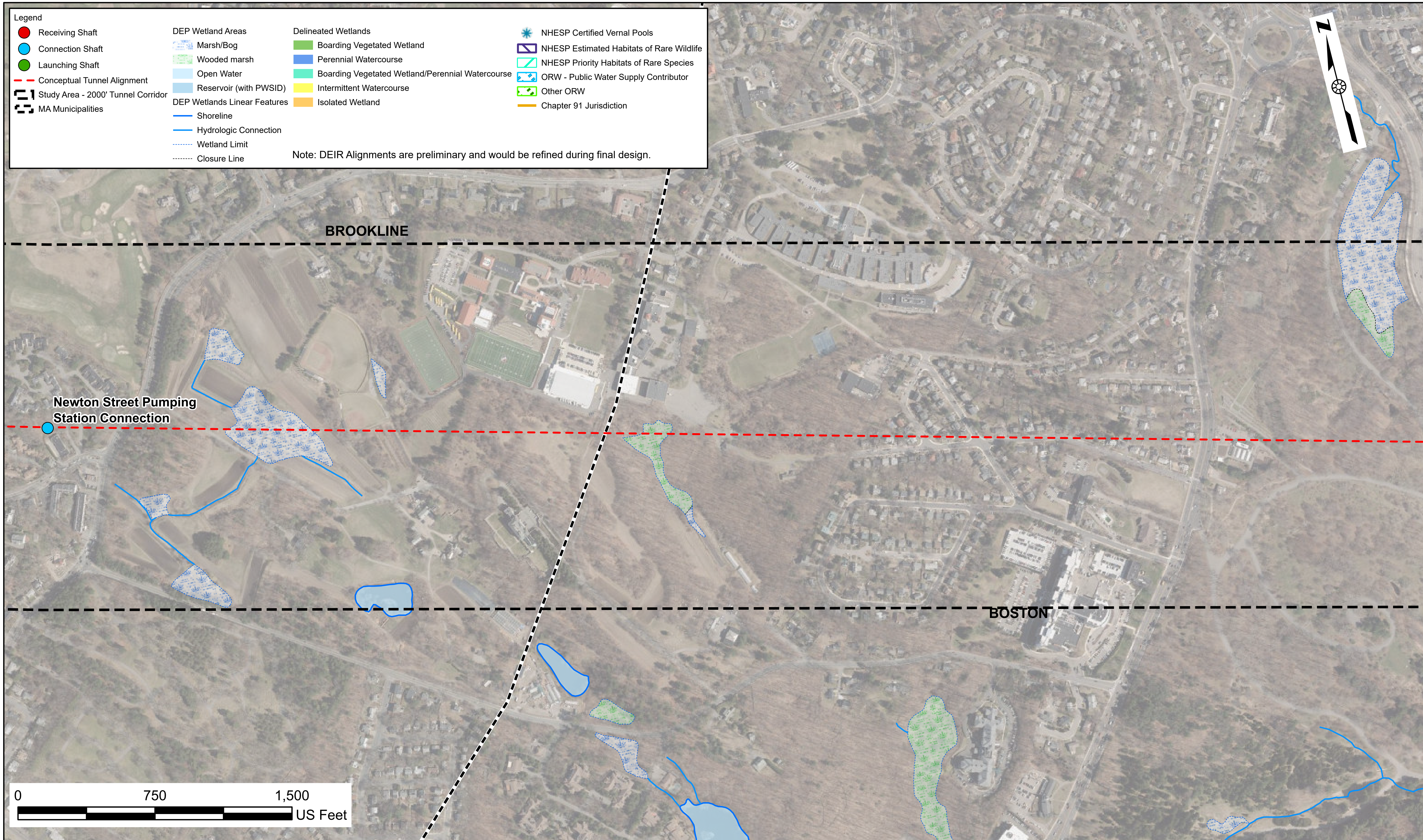
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-36

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

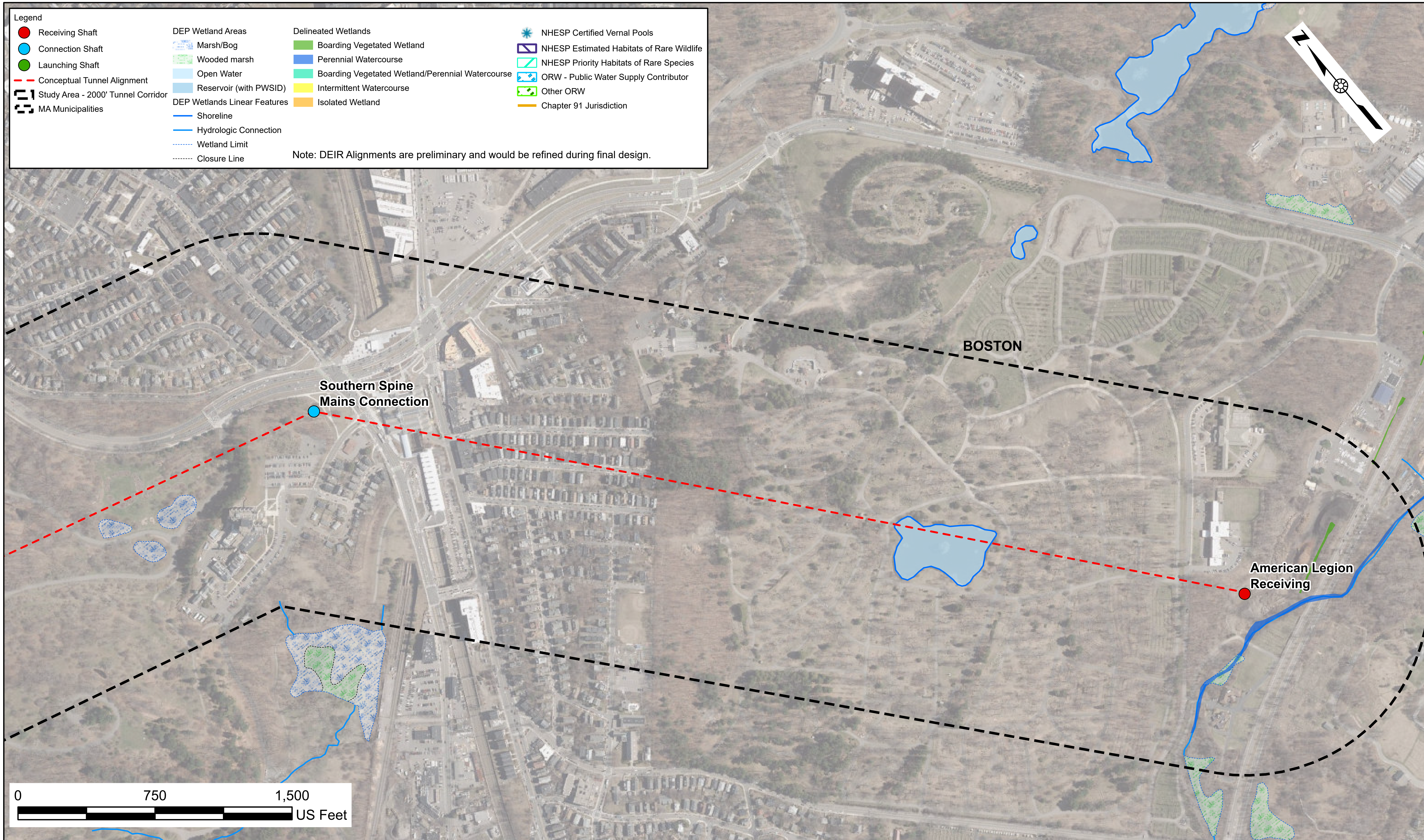
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-37

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

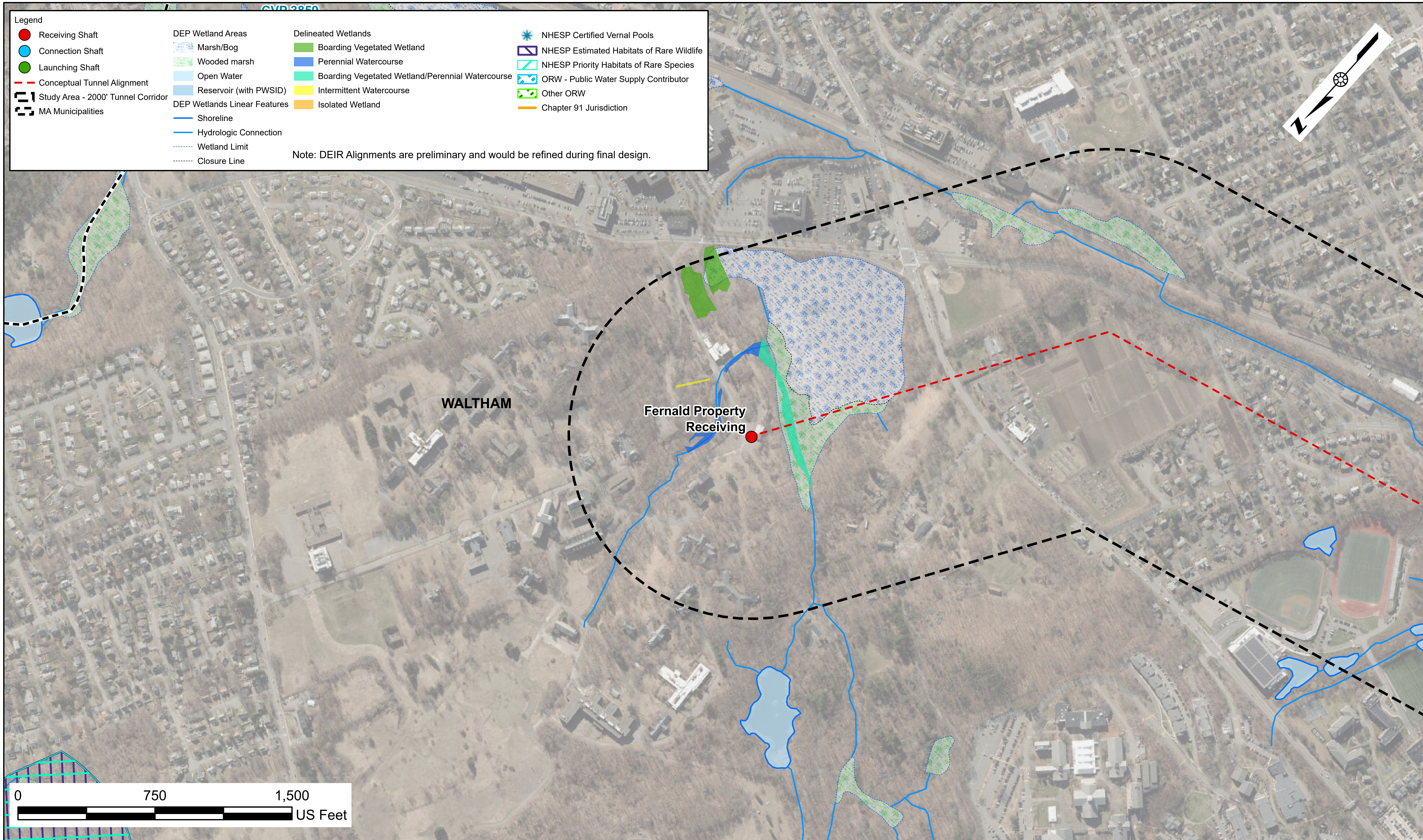
MWRA Contract No. 7159
Draft Environmental Impact Report

Wetland and Waterways Overview Map
Alternative 4
Figure 4.6-38

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN

Wetland and Waterways Overview Map

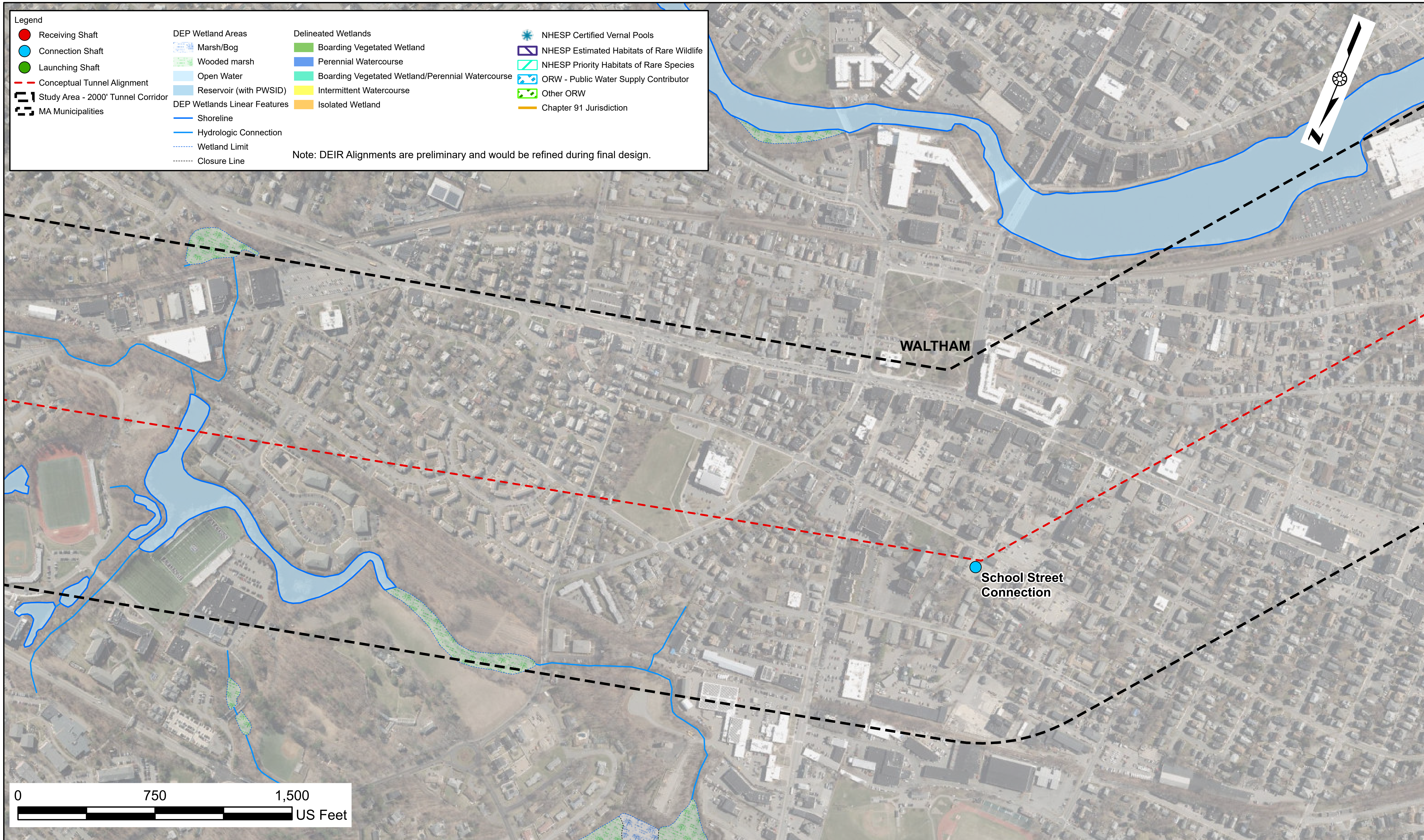
Alternative 10

Figure 4.6-39

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

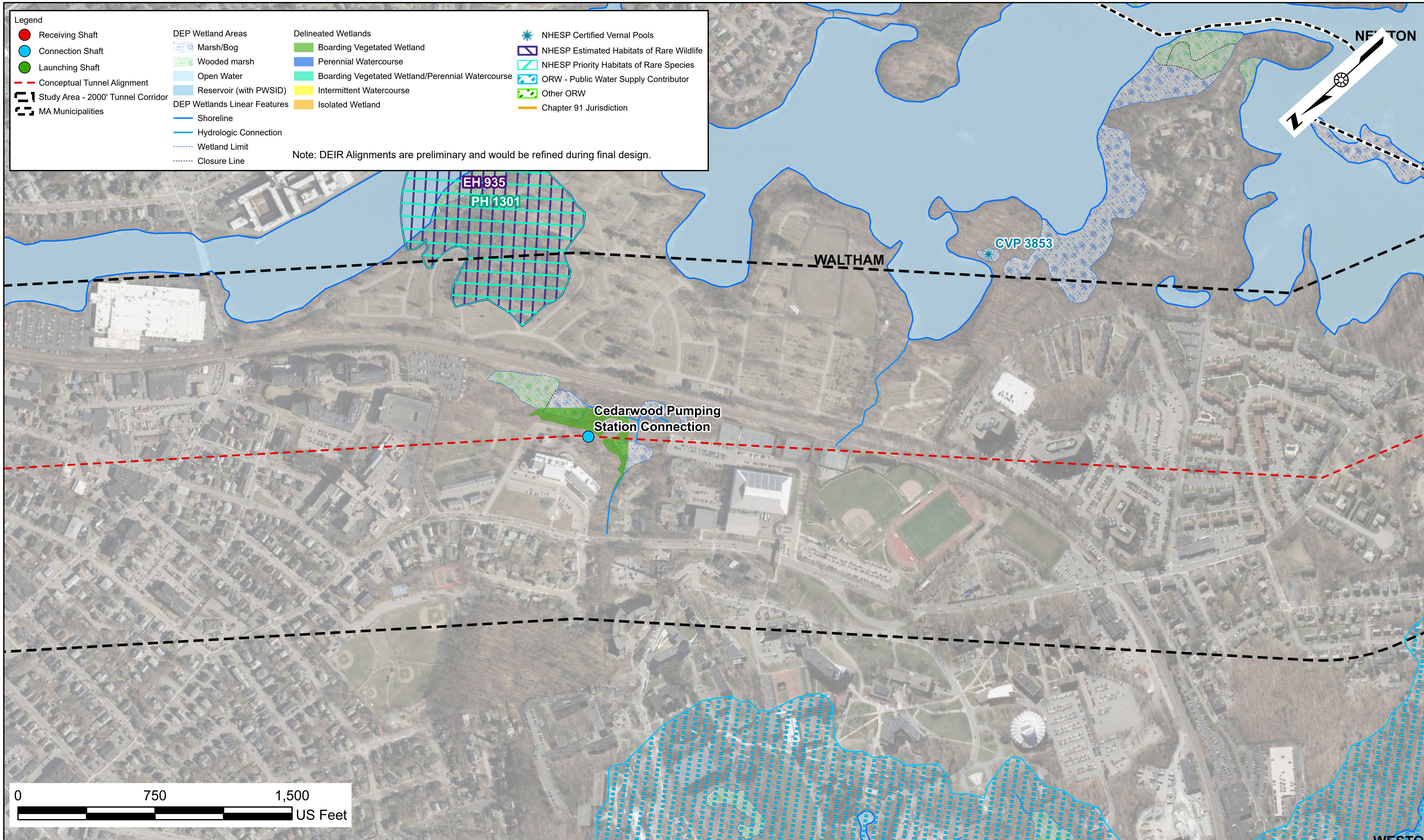
CDM Smith
in association with
vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-40

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

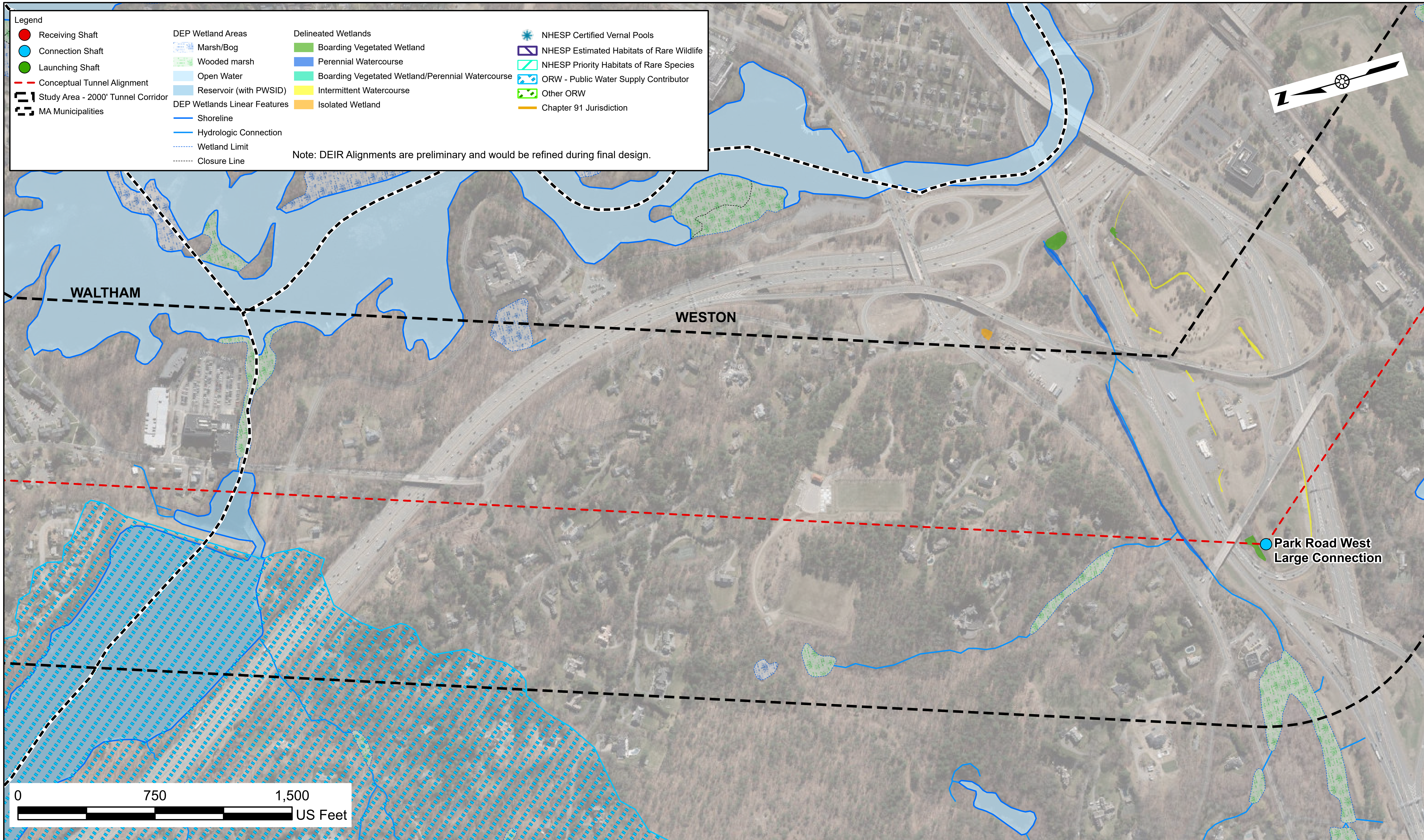
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-41

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

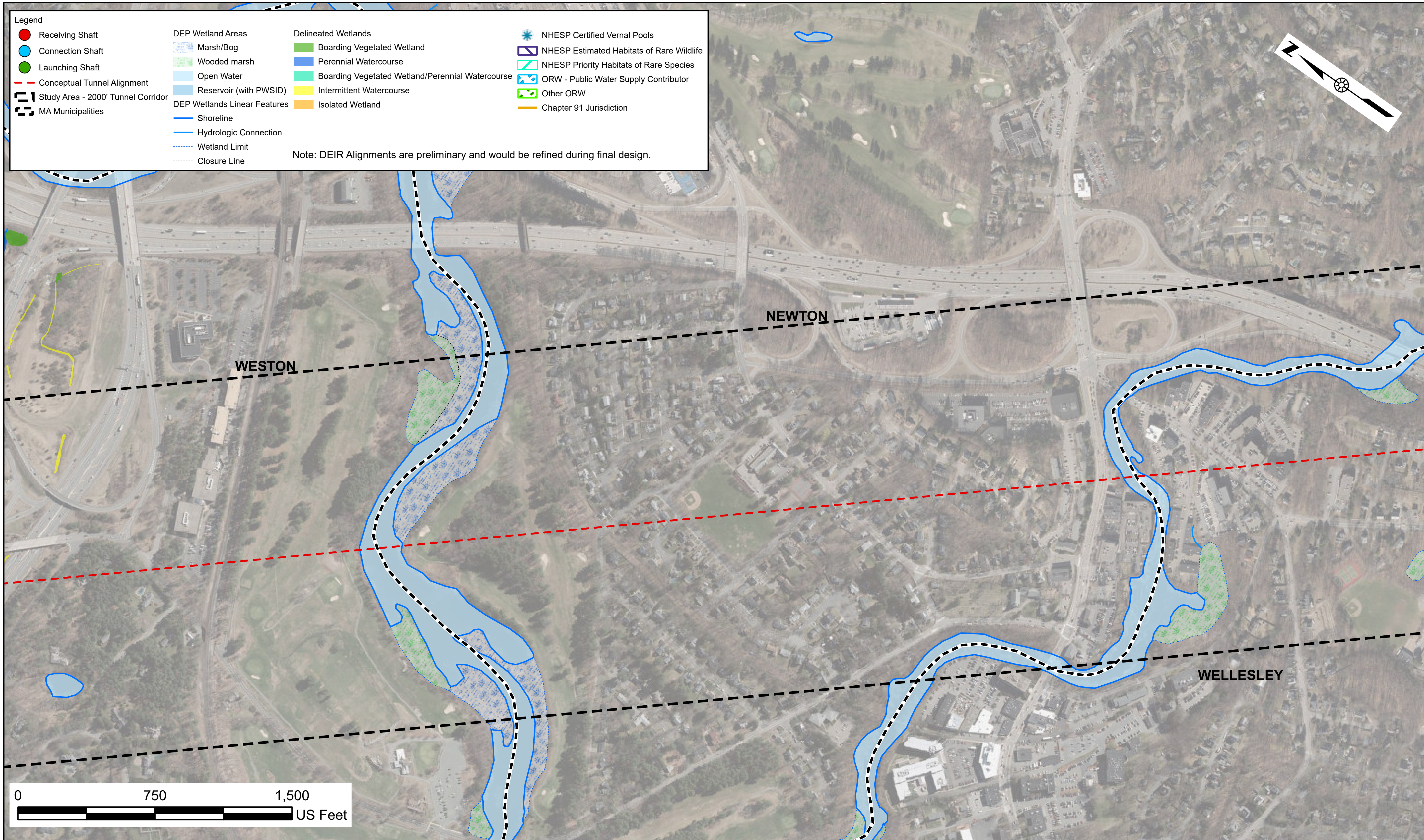
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-42

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

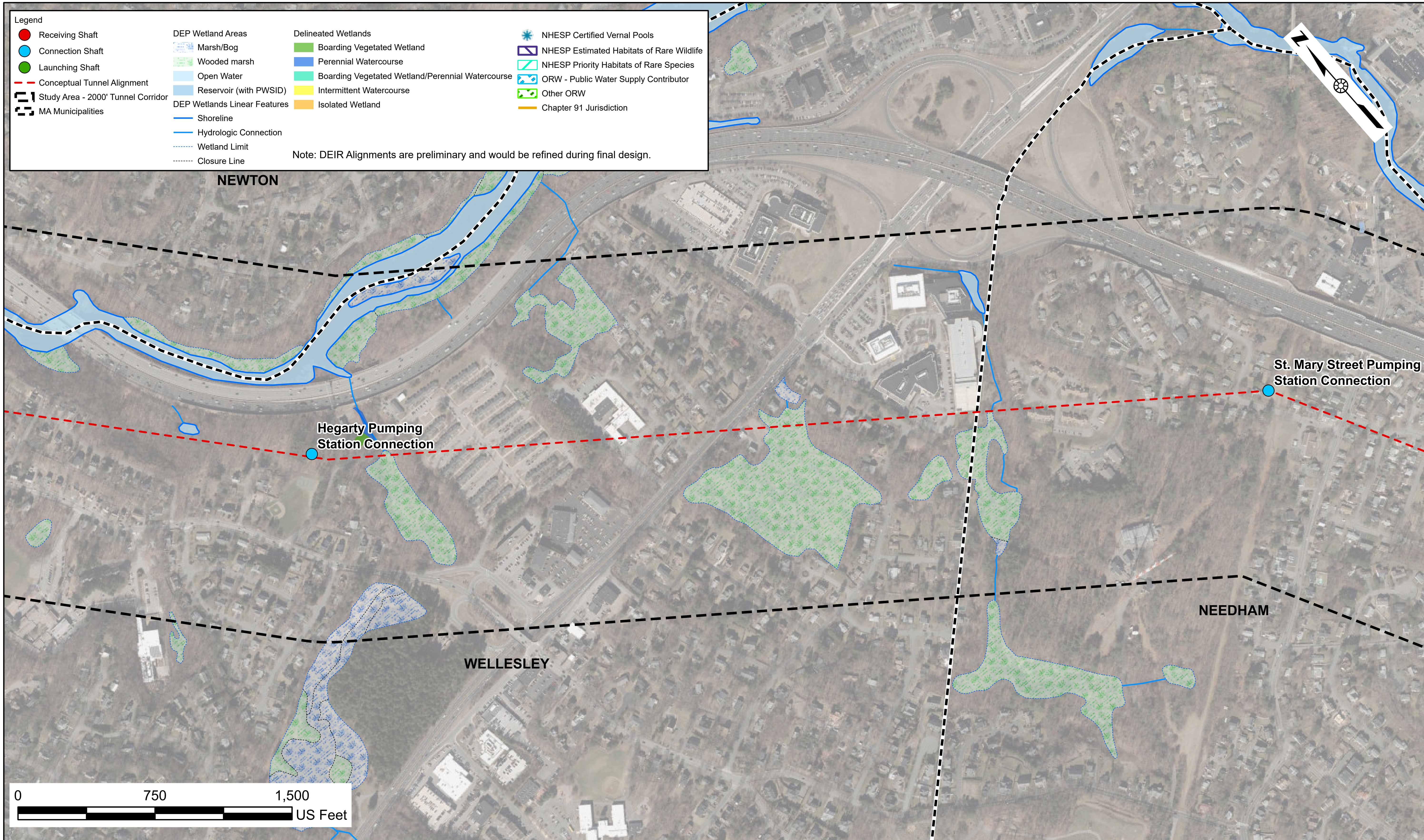
CDM Smith in association with vhb
Jacobs
Green International Affiliates, Inc.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-43

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

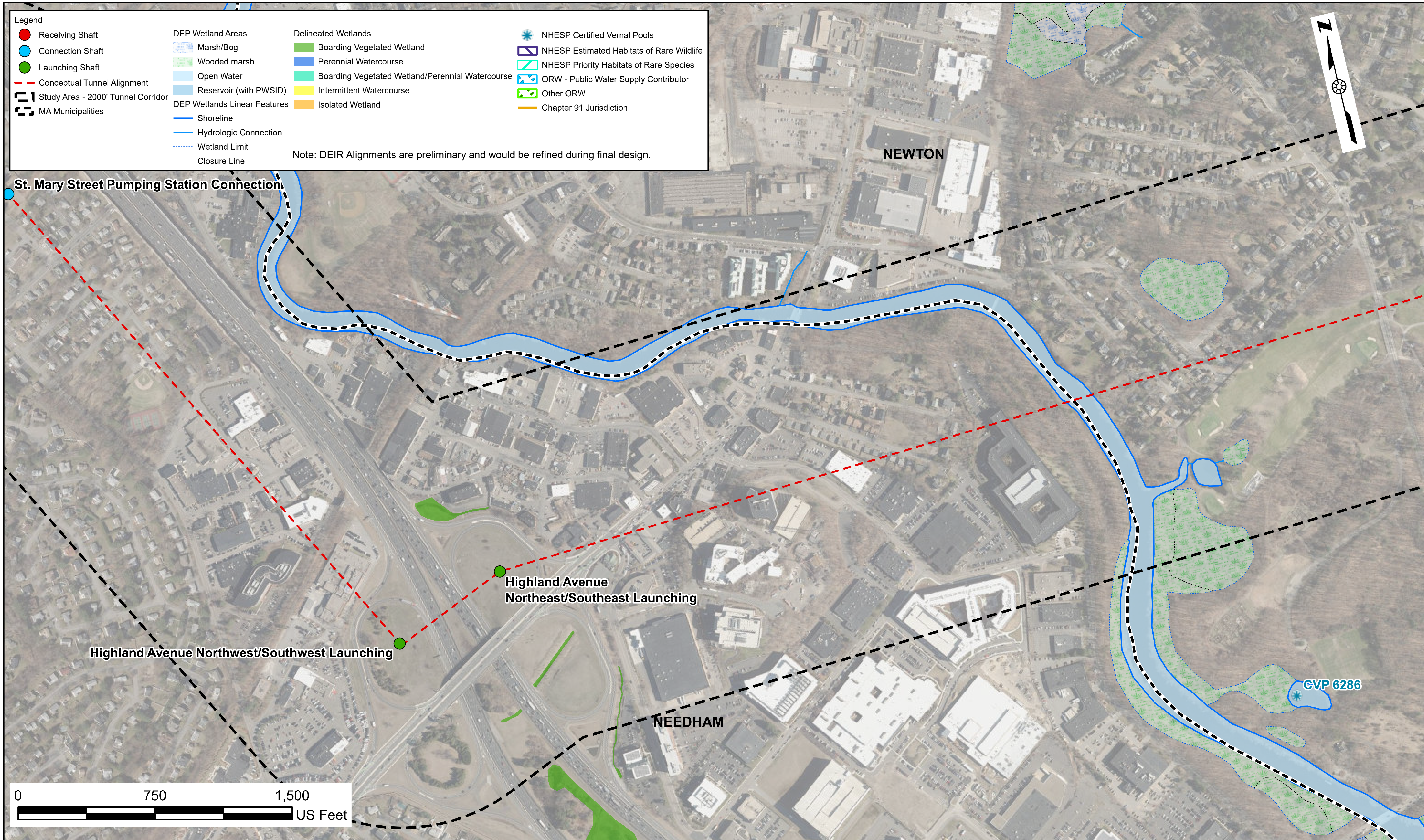
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-44

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

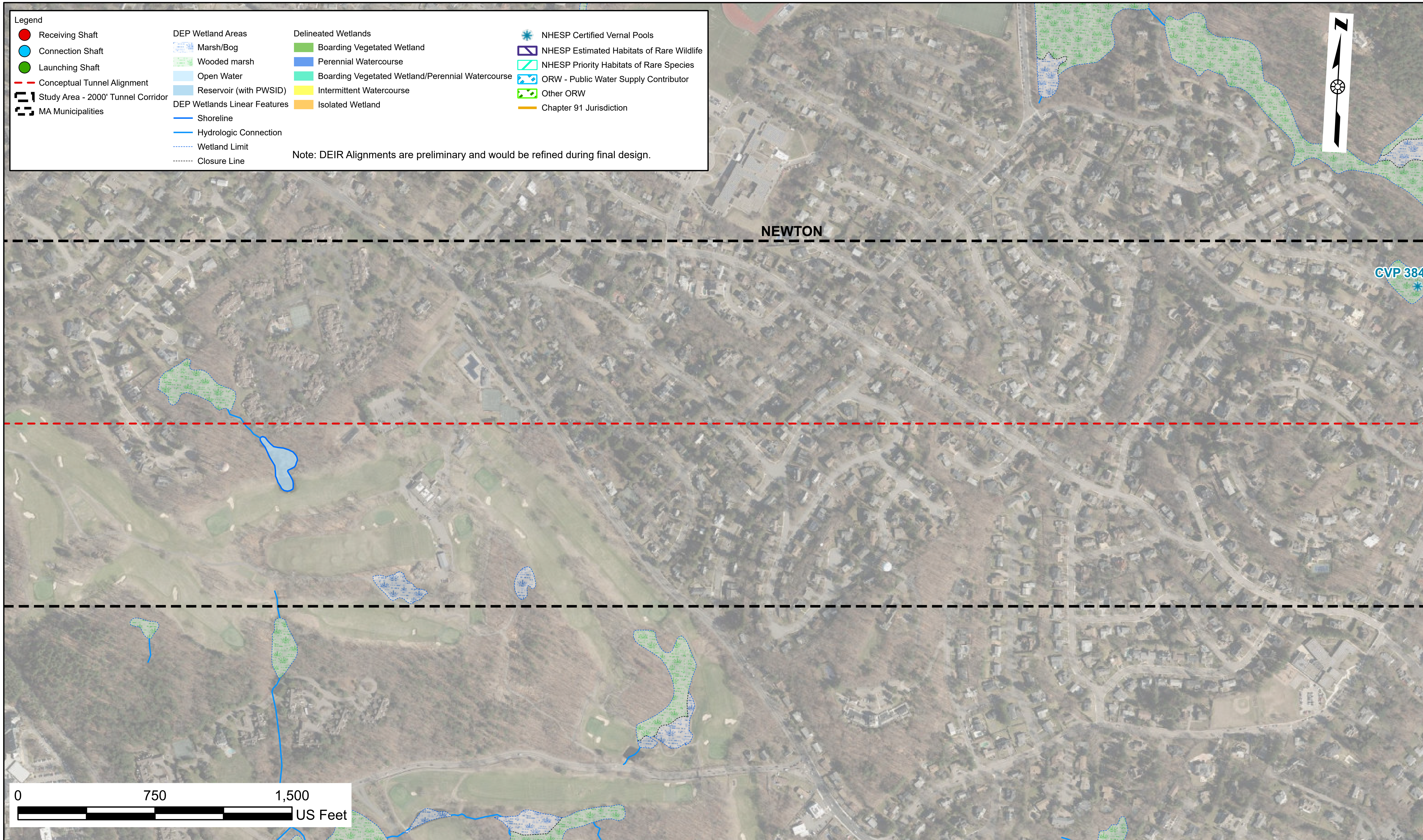
Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program	MWRA Contract No. 7159 Draft Environmental Impact Report	CDM Smith in association with vhb Jacobs GREEN	**Wetland and Waterways Overview Map** **Alternative 10** **Figure 4.6-45** Waltham, Weston, Wellesley, Newton Needham, Brookline, and Boston, MA Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

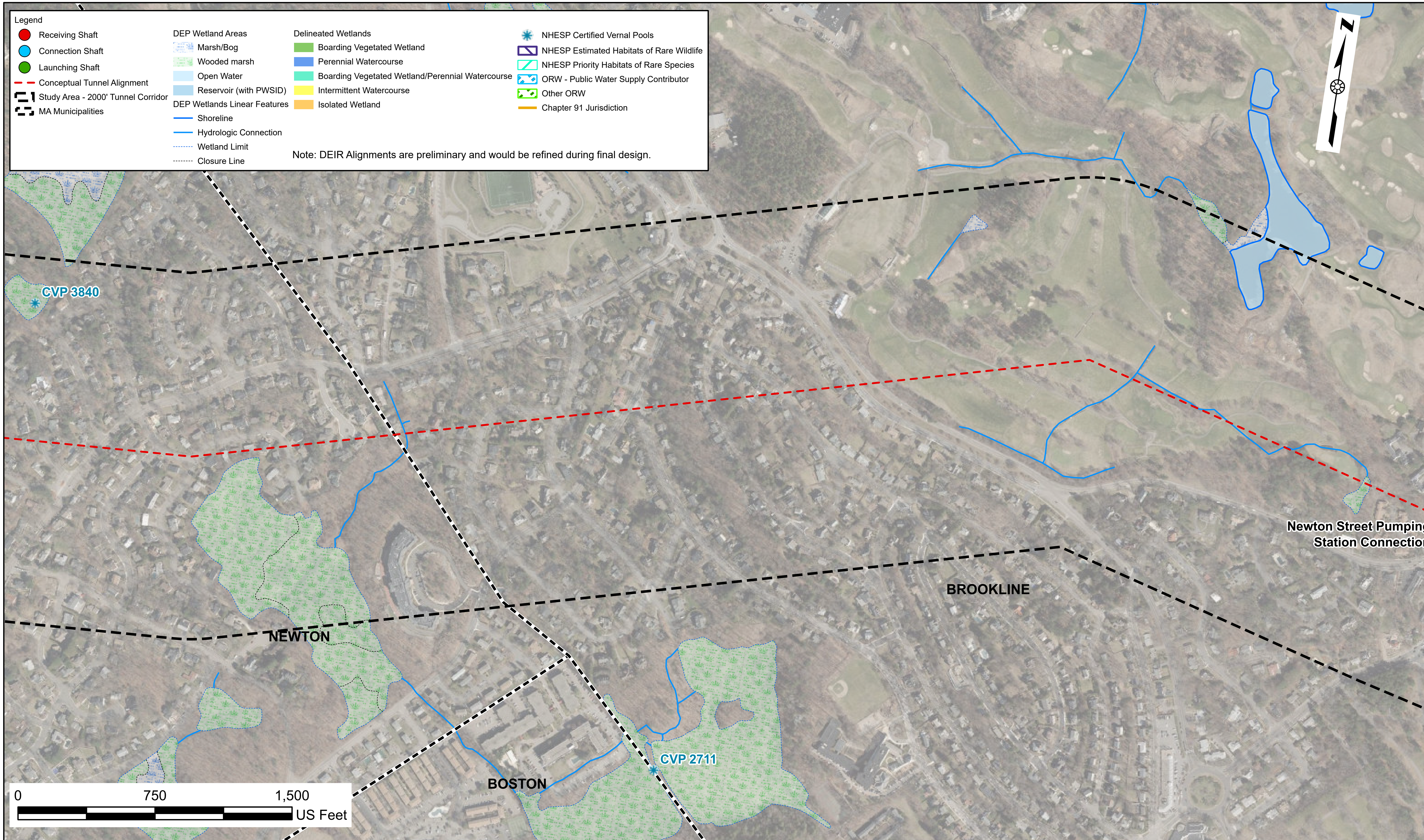
CDM Smith
in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-46

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159 Draft Environmental Impact Report

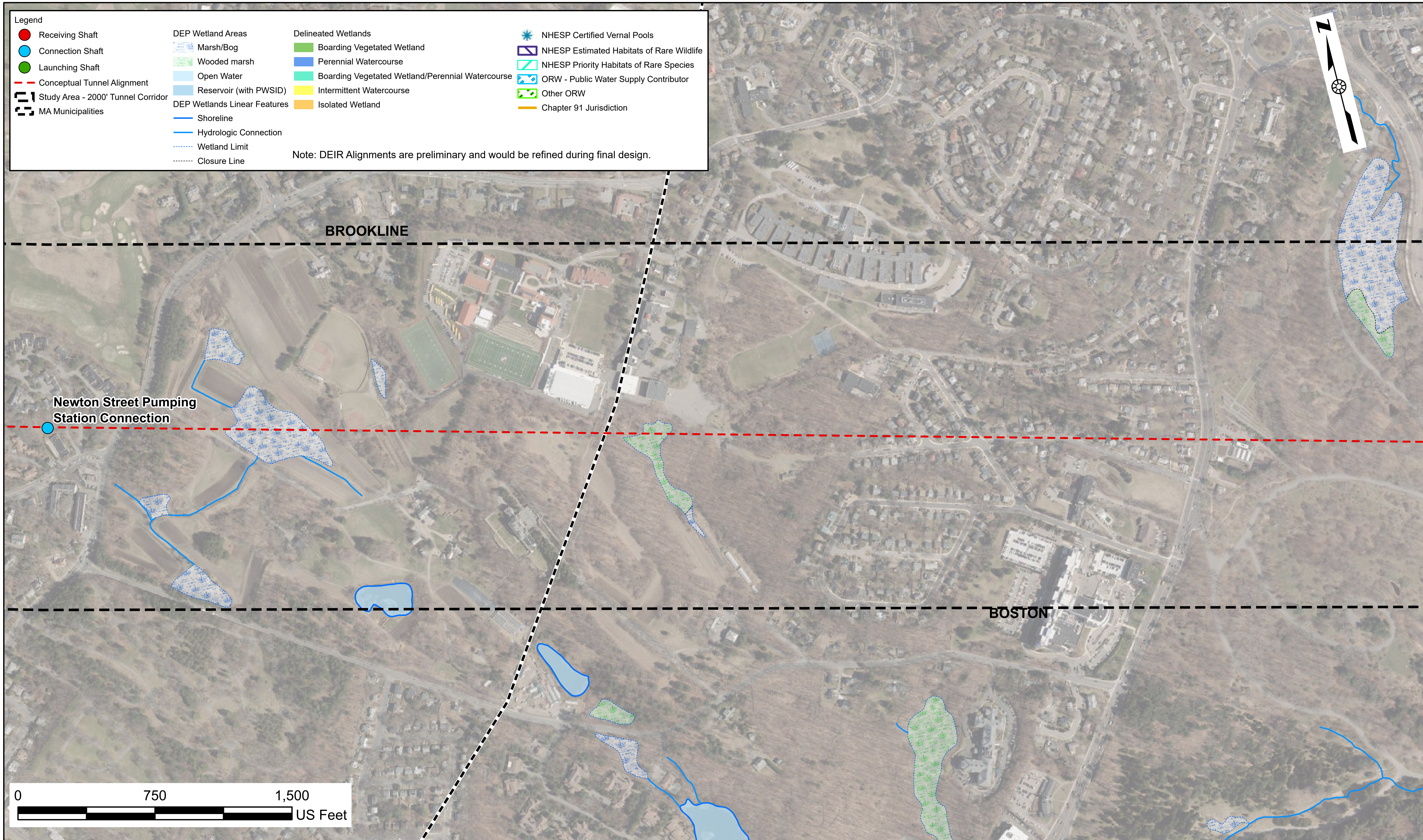
CDM Smith in association with vhb Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-47

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

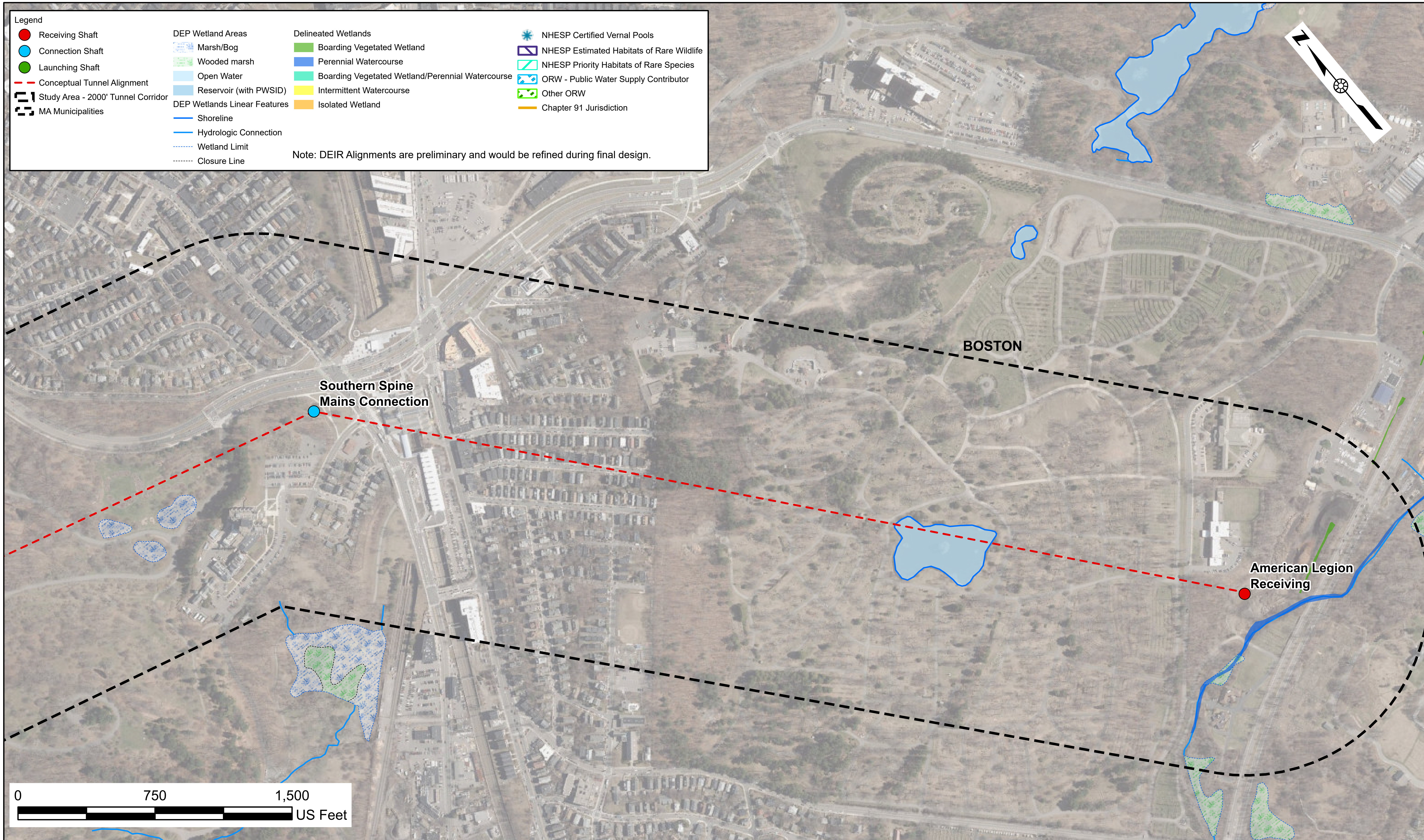
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-48

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wetland and Waterways Overview Map
Alternative 10
Figure 4.6-49

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Source: VHB, MassGIS

This page intentionally left blank

4.6.5 Construction Period Impacts

MEPA requires "a detailed description and assessment of the negative and positive potential environmental impacts of the alternatives. The DEIR shall assess (in quantitative terms, to the maximum extent practicable) the direct and indirect potential environmental impacts from the Program that are within the Scope. The assessment shall include both short-term and long-term impacts for all phases of the Program (e.g., acquisition, development, and operation) and cumulative impacts of the Program, any other Programs, and other work or activity in the immediate surroundings and region."[17]

Direct wetland impacts, both temporary and permanent, are anticipated due to construction of the DEIR Alternatives. Each of the three DEIR Alternatives was assessed for the presence of wetland resources along the tunnel alignments and within and adjacent to proposed Shaft and Connection Sites, and the impacts associated with them. As further described in **Section 4.5**, Rare Species and Wildlife Habitat, there would be no impacts to coldwater fisheries. Seaverns Brook (which is classified as a Coldwater Fish Resource by DFW) has been sampled. The sampling conducted did not indicate any coldwater fish species present. In addition, the results of the temperature readings during the sampling indicated higher temperatures than normally found in a Coldwater Fisheries Resource.[18]

Temporary impacts are unavoidable disturbances to wetlands during construction of the Program but would not impact the wetland beyond that period. Temporary impacts may include:

Installing erosion controls and staging activities within previously disturbed Riverfront areas
Constructing scour mitigation measures at shaft sites for groundwater discharges
Establishing work areas to connect the tunnel with the existing water distribution system

Impacts are described for each alternative on a site-by-site basis below.

Temporary impacts would also include indirect impacts from the migration of exposed soils, which would cease once construction is complete and sites are stabilized. To avoid and minimize construction-period impacts, the contractor would be required to provide erosion and sedimentation control plans prior to commencement of any work that would include ground disturbance. Erosion control plans would also address any work at stream or wetland crossing locations for connections. Disturbed areas, including Riverfront resources, would be restored to preconstruction conditions and revegetated. The proposed interconnection pipelines would be constructed below ground, and any affected wetland resource areas would be restored to preconstruction conditions following pipeline installation. During construction, the Program would meet the requirements of the NPDES 2022 USEPA CGP[19] since all DEIR Alternatives would cumulatively disturb more than 1 acre of land.

17 301 Code of Massachusetts Regulations, Title 11.00: MEPA Regulations (11 CMR 11.07(6)(h))

18 https://www.mass.gov/doc/20182020-integrated-list-of-waters-appendix-12-charles-river-watershed-assessment-and-listing-decision-summary/download

19 US Environmental Protection Agency. 2022. National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. US EPA, February 17, 2022, https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-permit.pdf

The Program would include implementation of erosion and sedimentation controls during each phase of construction through implementation of a NPDES SWPPP. All 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. 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 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.
- The structural and non-structural practices proposed for the Program would comply with criteria contained in the 2022 NPDES CGP. 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).

Permanent impacts, which would be the loss of a wetland resource area following construction, may result from wetland fill, dredging, or waterway alteration. Permanent direct wetland impacts would occur due to scour mitigation measures at permanent tunnel dewatering facility locations, as described in the following sections. No permanent direct or indirect wetland impacts are anticipated due to shaft and tunnel construction or establishment of surface connections to existing facilities.

4.6.5.1 Launching and Receiving Sites – Wetland Impacts by Alternative

Alternative 3

Table 4.6.-3 summarizes the temporary and permanent impacts anticipated at each of the launching and receiving sites included in Alternative 3.

Table 4.6-3 Alternative 3 - Wetland Impacts at Launching and Receiving Sites

Shaft Site & Structure/Activity	Resource Area(s) Affected	Temporary Impacts	Permanent Impacts	Total Impacts
Fernald Property Receiving				
Discharge Pipe	BVW/WW (sf)	116	0	116
Discharge Pipe & Splash Pad	Bank (lf)	8	11	19
	LUW/WW (sf)	289	91	380
Construction Staging Area	RA (sf)	115,352	0	115,352
Top-of-Shaft, Valve Chamber, Access Road, & Paved Parking Area	RA (sf)	0	12,310	12,310
SUBTOTAL	**BVW/VW (sf)**	**116**	**0**	**116**
	Bank (lf)	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**
	RA (sf)	**115,352**	**12,310**	**127,662**
Tandem Trailer/Park Road East Launching				
Discharge Pipe & Splash Pad	Bank (lf)	8	26	34
	BLSF (sf)	300	368	668
	LUW/WW (sf)	652	368	1020
Construction Staging Area	RA	105,722	0	105,722
Top-of-Shaft Structure	RA	0	1,685	1,685
SUBTOTAL	**Bank (lf)**	**8**	**26**	**34**
	BLSF (sf)	**300**	**0**	**300**
	LUW/WW (sf)	**652**	**368**	**1,020**
	RA (sf)	**105,722**	**1,685**	**107,407**
Bifurcation Launching				
Discharge Pipe & Splash Pad	Bank (lf)	8	26	34
	BLSF	250	368	618
	LUW/WW (sf)	652	368	1,020
Construction Staging Area	RA	33,987	0	33,987
SUBTOTAL	**Bank (lf)**	**8**	**26**	**34**
	BLSF	**250**	**368**	**618**
	LUW/WW (sf)	**652**	**368**	**1,020**
	RA	**33,987**	**0**	**33,987**
Highland Avenue Sites				
Discharge Pipe	RA	4,322	0	4,322
Discharge Pipe & Splash Pad	Bank (lf)	8	26	34
	BLSF (sf)	1,340	660	2,000
	LUW/WW (sf)	652	368	1,020
SUBTOTAL	**Bank (lf)**	**8**	**26**	**34**
	BLSF (sf)	**1,340**	**660**	**2,000**
	LUW/WW (sf)	**652**	**368**	**1,020**
	RA (sf)	**4,322**	**0**	**4,322**

Table 4.6-3 Alternative 3 - Wetland Impacts at Launching and Receiving Sites

Shaft Site & Structure/Activity	Resource Area(s) Affected	Temporary Impacts	Permanent Impacts	Total Impacts
American Legion Receiving				
Discharge Pipe & Splash Pad	Bank (lf)	8	11	19
	LUW/WW (sf)	289	91	380
Discharge Pipe	RA (sf)	845	0	845
Connection Pipeline	BVW/VW (sf)	1,558	0	1,558
SUBTOTAL	**BVW/VW (sf)**	**1,558**	**0**	**1,558**
	Bank (lf)	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**
	RA (sf)	**845**	**0**	**845**
TOTAL	**BVW/VW (sf)**	**1,674**	**0**	**1,674**
	Bank (lf)	**40**	**100**	**140**
	BLSF (sf)	**1,890**	**1,396**	**3,286**
	LUW/WW (sf)	**2,534**	**1,286**	**3,820**
	RA (sf)	**260,228**	**13,995**	**274,223**

RA – Riverfront Area, BLSF – Bordering Land Subject to Flooding, BVW – Bordering Vegetated Wetlands, VW – Vegetated Wetlands

Table 4.6-4 summarizes the impacts to receiving water flows from dewatering discharges at launching and receiving sites in Alternative 3.

In order to estimate the flow rates in the existing receiving waterbodies, the U.S. Geological Survey (USGS) Stream Stats: Stream Flow Statistics and Spatial Analysis Tool (web application) was utilized,[20] as shown in **Appendix D.2: USGS Stream Stats Results**. The web application was used to delineate drainage areas for waterways adjacent to potential shaft sites and then to get basin characteristics and estimates of flow statistics for the selected sites. The analysis tool uses regression equations with available GIS information and recorded flood flows from existing stream gages to estimate the flow rates at ungauged locations.[21]

The Stream Stats results for potential receiving water bodies are summarized in **Table 4.6-4** for Alternative 3 (below), **Table 4.6-6** for Alternative 4, and **Table 4.6-8** for Alternative 10. Where sufficient information was available, flow volumes were estimated for average flow conditions (50 percent Flow-Duration), and low-flow conditions (95 percent Flow-Duration). In all cases, flows for the 100-year (1 percent) and 25-year (4 percent) flood events were estimated. Additionally, the USGS Current Water Data for Massachusetts was referenced to identify available stream flow data from any nearby gauges.

More specific information is available for Canterbury/Stony Brook based on modeling studies completed for the Boston Water and Sewer Commission (BWSC) by CDM Smith as part of a stormwater model calibration project completed in 2012.

20 https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools?qt-science_center_objects=0#qt-science_center_objects. Accessed 8/17/21.

21 Magnitude of Flood Flows at Selected Annual Exceedance Probabilities for Streams in Massachusetts (usgs.gov)

For all receiving waterbodies studied, the impact of the additional dewatering flows is anticipated to be minimal from a hydraulics perspective. The downstream surface elevation of the Charles River is controlled mechanically in Boston to maintain a minimally varying level. Operation of gates and pumps at the Charles River Dam makes the river level functionally independent of flow rate. For smaller water bodies such as Seaverns Brook, Clematis Brook, and Canterbury Brook, the additional flows are estimated to add less than 3 percent of the total 25-year event storm flows.

Table 4.6-4 Alternative 3 - Impacts to Dewatering Receiving Waters at Launching and Receiving Sites

Site		Fernald Property Receiving	Fernald Property Receiving	Tandem Trailer/ Park Road East Launching and Bifurcation Launching	Highland Avenue Northwest Receiving and Northeast Launching	American Legion Receiving
Waterway Name		Clematis Brook	Beaver Brook	Seaverns Brook	Charles River	Canterbury Brook/ Stony Brook
Nearby USGS Stream Gauge #		1104500[22]	1104500[22]	N/A	1104200[23]	N/A
USGS Stream Gauge Name		Charles River at Waltham[22]	Charles River at Waltham[22]	N/A	Charles River at Wellesley[23]	N/A
Discharge Volume	***GPM***	300	300	3,350	2,900	300
50 % Duration (avg. flow)	***CFS***	0.89	4.95	2.39	224	1.6
	GPM	398	2,222	1,073	100,539	598
	Discharge Ratio	0.754	0.135	3.122	0.029	0.502
95 % Duration (low flow)	***CFS***	0.03	0.32	0.16	30.6	0.5
	GPM	15	145	70	13,734	224
	Discharge Ratio	19.430	2.069	47.538	0.211	1.339
100-year flood - 1%	***CFS***	188	595	306	8410	381
	GPM	84,381	267,055	137,343	3,774,682	171,005
	Discharge Ratio	0.004	0.001	0.024	0.001	0.002
25-year flood - 4%	***CFS***	129	415	212	6060	266
	GPM	57,899	186,266	95,153	2,719,925	119,390
	Discharge Ratio	0.005	0.002	0.035	0.001	0.003

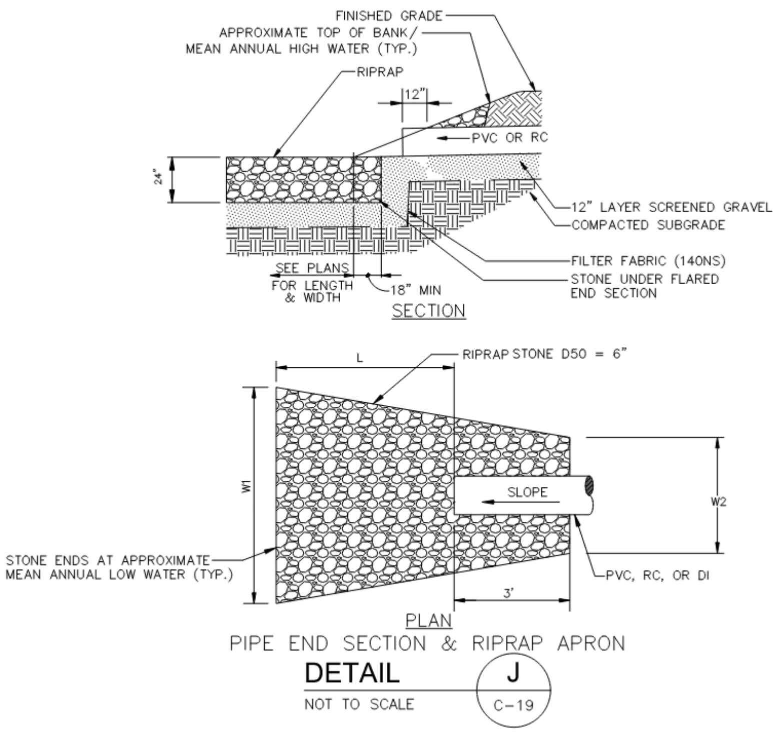
22 https://waterdata.usgs.gov/nwis/inventory?agency_code=USGS&site_no=01104500
23 https://waterdata.usgs.gov/nwis/inventory?site_no=01104200

Fernald Property Receiving

At the Fernald Property, Alternative 3 would include a TBM receiving shaft and associated staging area, which would be adjacent to wetland resources associated with Clematis Brook. (See **Figure 4.6-1**, Wetlands and Waterways, Fernald Property Receiving.) Appropriate erosion and sedimentation controls would be implemented on-site to protect adjacent wetlands, as detailed in the NPDES SWPPP to be developed and implemented by the contractor prior to construction. These measures would include installation of perimeter erosion controls, such as compost filter tubes, straw bales, and/or siltation fence and other BMPs as needed. During shaft construction, dewatering of approximately 300 gallons per minute (GPM) of groundwater inflow would be required. The groundwater would be treated at a temporary water treatment facility within the staging area and discharged to the adjacent BVW/VW associated with Clematis Brook via an approximately 12-inch diameter pipe with a Flared End Section (FES).

At the discharge location an approximately 91-square-foot rip rap splash pad (as shown in **Figure 4.6-50**) would be permanently installed within the 100’ Riverfront and LUW/WW to mitigate potential scour due to the discharge. The extension of the pipeline to the discharge point would temporarily impact 116 square-feet of BVW/VW, but the pipeline would be buried, and the wetland resources would be restored to preconstruction contours and revegetated with native wetland trees and shrubs and a wetland seed mixture upon completion of construction. The new impervious surfaces consisting of an approximate 22-foot-wide access road and paved parking area would result in a negligible increase in stormwater runoff. Mitigation for potential increase in peak discharge would be provided in accordance with the MassDEP Stormwater Management Standards using low-impact development strategies to the extent feasible. No new point source discharges would be anticipated. Restoration of the site would be completed as agreed to between the MWRA and the City of Waltham for the Final Conditions. The 91-square foot rip rap splash pad would remain for dewatering for future tunnel inspection and maintenance.

Figure 4.6-50 Rip Rap Splash Pad Detail



Site	Approx. Pipe Diam	Receiving Water	L	W1	W2
American Legion	6 to 12 inch	Canterbury Brook	10 ft	11 ft	3 ft
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
Bifurcation	27 inch	Seaverns Brook	20 ft	26 ft	6 ft
Highland Avenue Alternatives 3 & 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

The proposed interconnection from the tunnel to the existing WASM 3 pipeline in Waverly Oaks Road would involve the construction of a buried pipeline approximately 72 inches in diameter in Chapel Road between the valve chamber adjacent to the top-of-shaft and a new valve chamber at the site entrance adjacent to Waverly Oaks Road. The pipeline would cross the existing unnamed streams tributary to Clematis Brook, which are currently carried under Chapel Road in culverts. Construction would involve extending the pipeline through RA and the 100-foot wetland buffer zone from the Bank, and under the existing culverts within the limits of the existing roadway. No modifications to the existing culverts are currently proposed, however replacement in-kind may be determined to be required as the Program progresses through final design. With implementation of appropriate sedimentation and erosion controls during construction, no impacts on wetland resources would be anticipated as a result of the connection.

Impacts to Clematis Brook and the downstream Beaver Brook due the volume of dewatering discharge proposed were evaluated, as discussed herein. Clematis begins in the nearby Cedar Hill Reservation and flows south into a wetland directly adjacent to the site. From here, the wetland outfall is piped through an 18” drainpipe, under MA Rt-60, and into Beaver Brook. Beaver Brook travels through a series of culverts and daylighted areas until eventually reaching the Charles River.

At the discharge location, Clematis Brook enters a large wetland without a major conveyance channel. Due to the dispersed nature of this portion of Clematis Brook, the impacts to water depth are expected to be minimal, and flow calculations were not completed. Downstream, the wetland discharges to Beaver Brook, a natural bottom channel, which has a more defined flow path. To estimate impacts to the existing channel, the depth of flow was estimated assuming the channel to be a natural, rectangular, open channel, 5 feet wide (estimated from satellite images), with an estimated slope of ½ to 1 percent. It was also assumed that no water infiltrates into the upstream wetland. The channel was conservatively modeled as having a rectangular cross section. With these assumptions, it was calculated that adding 150 GPM would increase flow levels by approximately 1". This additional flow would be a consistent increase during both wet and dry weather periods. Given the small increase to depth of flow in the channel, it is estimated that Beaver Brook would be able to accommodate receiving shaft construction dewatering flow. The dispersed nature of the wetland/Clematis Brook at the discharge location means that flow levels would increase by well under 1" and therefore can also likely be accommodated. **Table 4.6-4** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Tandem Trailer/Park Road East Launching

Alternative 3 would involve a TBM launching shaft and associated staging area at the Tandem Trailer site, which is adjacent to Seaverns Brook and includes a small wetland and previously altered Riverfront on site (see **Figure 4.6-2**, Wetlands and Waterways Tandem Trailer/Park Road East Launching). The construction staging area would be located within 100' and 200' Riverfront primarily to the north of Seaverns Brook, with a smaller area between I-90 and the brook to the south. The TBM launching shaft and associated top of shaft structure are proposed within the 200' Riverfront to the north of Seaverns Brook. This location is proposed due to site sharing requirements that limit the shaft to being located outside of the area used for tandem trailer parking by MassDOT. Appropriate erosion and sedimentation controls would be implemented on-site to protect the brook and wetlands, as detailed in the NPDES SWPPP to be developed by the contractor. These measures would include installation of perimeter erosion controls such as compost filter tubes, straw bales, and/or siltation fence.

During tunnel construction, dewatering of approximately 1,860 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water treatment facility located within the staging area and discharged to Seaverns Brook via an approximately 30-inch diameter buried pipe with an FES and splash pad. At the proposed discharge location, Seaverns Brook is conveyed within a previously altered channel. As protection against scour, an approximately 370-square-foot rip rap splash pad would be permanently installed within previously altered 100' Riverfront, LUW/WW and BLSF adjacent to the brook. An appropriate amount of material would be removed at suitable elevation to provide compensatory flood storage volume of approximately 25 cubic yards for the minor loss in flood storage due to the pipe structure. This pipe FES and splash pad would remain in place for potential use in future tunnel dewatering as part of future maintenance activities. Additional impervious surfaces consisting of an approximately 30-foot-wide paved area would result in a negligible increase in stormwater runoff. Mitigation for any potential increase in peak discharge would be provided in accordance with the MassDEP Stormwater Management Standards using low-impact development strategies to the extent feasible. No new point source discharges would be anticipated. Upon completion of construction, all temporarily disturbed areas would be restored to preconstruction conditions and revegetated. Restoration of the site, including revegetation of altered RA areas, would be completed as agreed to between the MWRA and MassDOT for the Final Conditions.

Alternative 3 would also include a connecting tunnel from the Tandem Trailer site to provide a connection to the existing Hultman Aqueduct on the Park Road East site (see **Figure 4.6-2**, Wetlands and Waterways Tandem Trailer/Park Road East Launching). Dewatering of approximately 150 GPM would be required for construction of the shaft and valve chamber at the connection point. Groundwater inflows would be treated and discharged to the existing on-site stormwater management system that eventually flows through the Bifurcation site to Seaverns Brook. Appropriate erosion and sedimentation controls would be implemented as detailed in the NPDES SWPPP, which would be developed and implemented by the contractor prior to construction. Upon completion of construction, these measures would be removed, and all disturbed areas would be restored to preconstruction conditions. The new impervious surfaces consisting of an approximately 22-foot-wide access road and paved parking area would result in a negligible increase in stormwater runoff. Mitigation for any potential increase in peak discharge would be provided in accordance with the MassDEP Stormwater Management Standards using low-impact development strategies to the extent feasible. No new point source discharges would be anticipated. No long-term loss of wetlands resources would occur at Park Road East.

Impacts to Seaverns Brook due the volume of dewatering discharge proposed were evaluated and are discussed herein. Seaverns Brook is the primary discharge for Schenck's Pond, adjacent to the Norumbega Reservoir which is owned by the Authority. The brook also receives flow from Pine Brook Country Club and Doublet Hill Conservation Area to the north before reaching the Tandem Trailer site. Flowing to the east, the brook leaves the site and enters a series of culverts and daylighted channels which carry the flow under I-95 and I-90 ramps before discharging into the Charles River. The location of the brook is ideal as it is in very close proximity to the shaft and minimal piping would be required; approximately 615 linear feet. Survey shows that the brook is approximately 8 feet in width at the culvert. Using Manning's equation, assuming a box culvert and 1 percent slope on a natural bottom channel (Manning's n = 0.030), adding an additional 1,860 GPM would increase the depth of flow by approximately 3.25".

The brook is anticipated to able to handle the additional flow and discharge into the Charles River which is immediately downstream. **Table 4.6-4** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Bifurcation Launching

Alternative 3 would include a TBM launching shaft and associated staging area at the Bifurcation site, which includes on-site wetland resources (see **Figure 4.6-3**). Permanent direct impacts to on-site wetlands have been avoided through the design process and are not anticipated due to the shaft construction. Appropriate erosion and sedimentation controls would be implemented on-site to protect adjacent wetlands, as detailed in the NPDES SWPPP to be developed by the contractor. These measures would include installation of perimeter erosion controls such as compost filter tubes, straw bales, and/or siltation fence. During shaft and tunnel construction, dewatering of approximately 1,340 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water treatment facility located within the staging area and discharged to Seaverns Brook. To reach the discharge location from the treatment facility, an approximately 27-inch-diameter pipeline with a FES would be constructed through an existing passageway under I-90. At the proposed discharge location, the channel of Seaverns Brook consists of a 10-foot-wide channel underlain by concrete within previously altered 100’ Riverfront and BLSF. As additional protection against scour, an approximately 370-square foot rip rap splash pad would be permanently installed adjacent to the brook.

Upon completion of construction, the pipe, FES, and scour protection measures would remain for potential use in future tunnel dewatering. An appropriate amount of material would be removed at suitable elevation to provide compensatory flood storage volume of approximately 25 cubic yards for the minor loss in flood storage due to the pipe structure. New impervious surfaces consisting of an approximately 22-foot-wide access road and paved parking area would result in a negligible increase in stormwater runoff. Mitigation for any potential increase in peak discharge would be provided in accordance with the MassDEP Stormwater Management Standards using low impact development strategies to the extent feasible. No new point source discharges would be anticipated. Upon completion of construction, disturbed areas would be restored to preconstruction conditions and revegetated. Restoration of the site would be completed as agreed to among the MWRA, MassDOT, and the Town of Weston for the Final Conditions. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at Seaverns Brook.

Impacts to Seaverns Brook due the volume of dewatering discharge proposed were evaluated, using the same analysis as described in the previous Tandem Trailer/Park Road East Launching section. Given the volume of flow to be discharged to Seaverns Brook from the Bifurcation launching site (approximately 1,340 GPM) the impacts to the depth of flow of the brook would be less than 3.25 inches. **Figure 4.6-4** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Highland Avenue Northwest/Southwest Receiving

Alternative 3 would involve a TBM receiving shaft and associated staging area at the Highland Avenue Northwest site, which does not include wetlands on-site or immediately adjacent (see **Figure 4.6-6**, Wetlands and Waterways Highland Avenue Northwest Receiving). During shaft and tunnel construction, dewatering of approximately 150 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water treatment facility within the staging area and discharged to the Charles River. To reach the discharge location from the shaft site, an approximately 12-inch-diameter temporary pipeline would be extended from the receiving shaft under the highway via trenchless technology to the launching shaft at the Highland Avenue Northeast site, where permanent connection to the Charles River would be established. To reach the discharge location from the Highland Avenue Northeast shaft site, an approximately 27-inch-diameter buried pipeline would be extended from the site to the river within local roadways.

At the proposed discharge location, the Bank of the Charles River includes existing rip rap erosion protection within previously altered Riverfront and BLSF. As additional protection against scour from dewatering discharges, a FES and an approximately 370-square-foot rip rap splash pad would be permanently installed on the riverbank within previously altered 100’ Riverfront, LUW/WW and BLSF. An appropriate amount of material would be removed at suitable elevation to provide compensatory flood storage volume of approximately 50 cubic yards for the minor loss in flood storage due to the pipe structure. Upon completion of construction, the pipe and splash pad would remain for potential future use in tunnel dewatering related to future maintenance activities. Appropriate erosion and sedimentation controls would be implemented on-site to protect adjacent areas as detailed in the NPDES SWPPP, which would be developed by the contractor and implemented prior to construction. Upon completion of tunnel construction, disturbed areas would be restored to preconstruction conditions and revegetated. Restoration of the site would be completed as agreed to between the MWRA and MassDOT for the Final Conditions. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at the Charles River.

Impacts to the Charles River due the volume of dewatering discharge proposed would be minimal, given the small discharge quantity and high volume of river flow and size of the Charles in this location. Additionally, the downstream surface elevation of the Charles River is controlled mechanically in Boston to maintain a minimally varying level. Operation of gates and pumps at the Charles River Dam makes the river level functionally independent of flow rate. **Table 4.6-4** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Highland Avenue Northeast/Southeast Launching

Alternative 3 would involve a TBM launching shaft and associated staging area at the Highland Avenue Northeast site, which does not include any wetlands on-site (see **Figure 4.6-8**). Staging activities, such as materials storage and parking would occur adjacent to the existing non-jurisdictional stormwater feature within the Southeast cloverleaf. During tunnel construction, dewatering of approximately 2,750 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water-treatment facility within the staging area and discharged to the Charles River. To reach the discharge location from the shaft site, a connection would be made to an approximately 27-inch-diameter buried pipeline extending from the Highland Avenue Northwest site within local roadways to the river as described above. This pipeline is the same pipeline that would convey flow from the Highland Avenue Northwest site to the Charles River. At the proposed discharge location, the Bank of the Charles River includes existing rip rap erosion protection within previously altered Riverfront and BLSF. As additional protection against scour from dewatering discharges, an FES and an approximately 660-square-foot rip rap splash pad would be permanently installed on the riverbank within previously altered 100’ Riverfront, LUW/WW and BLSF. An appropriate amount of material would be removed at suitable elevation to provide compensatory flood storage volume of approximately 50 cubic yards for the minor loss in flood storage due to the pipe structure.

Upon completion of construction, the pipe and splash pad would remain for potential future use in tunnel dewatering. Appropriate erosion and sedimentation controls would be implemented on site to protect adjacent areas as detailed in the NPDES SWPPP to be developed by the contractor and implemented prior to construction. New impervious surfaces consisting of an approximately 22-foot-wide access road and paved parking area would result in a negligible increase in stormwater runoff. Mitigation for any potential increase in peak discharge would be provided in accordance with the MassDEP Stormwater Management Standards using low-impact development strategies to the extent feasible. No new point source discharges would be anticipated. Upon completion of tunnel construction, disturbed areas would be restored to preconstruction conditions and revegetated. Restoration of the site would be completed as agreed to between the MWRA and MassDOT for the Final Conditions. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at the Charles River.

Impacts the Charles River due the volume of dewatering discharge proposed would be minimal, given the volume of flow and size of the Charles in this location. Additionally, the downstream surface elevation of the Charles River is controlled mechanically in Boston to maintain a minimally varying level. Operation of gates and pumps at the Charles River Dam makes the river level functionally independent of flow rate. **Table 4.6-4** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

American Legion Receiving

Alternative 3 would involve a TBM receiving shaft and associated staging area at the American Legion site, which is adjacent to Canterbury Brook and includes a linear BVW/VW and previously altered Riverfront on site. (See **Figure 4.6-9**, Wetlands and Waterways American Legion Receiving.) Permanent direct impacts to on-site wetlands have been avoided and are not proposed due to the Program construction. Appropriate erosion and sedimentation controls would be implemented on-site to protect the waterway and wetlands, as detailed in the NPDES SWPPP, which would be developed by the contractor. These measures would include installation of perimeter erosion controls such as compost filter tubes, straw bales, and/or siltation fence.

During shaft construction, dewatering of approximately 300 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water treatment facility within the staging area and discharged to Canterbury Brook via an approximately 12-inch pipe with an FES. At the proposed discharge location, the brook is conveyed in a previously altered channel with fairly steep banks. As protection against scour, an approximately 91-square-foot rip rap splash pad would be permanently installed adjacent to the brook within previously altered RA, as agreed to among the MWRA, DCR, and the Department of Youth Services (DYS) for the Final Conditions.

Other permanent features would include new impervious surfaces consisting of an approximately 22-foot-wide paved access road and parking area. The roadway and parking area would result in a negligible increase in stormwater runoff. Mitigation for any potential increase in peak discharge would be mitigated in accordance with the MassDEP Stormwater Management Standards using low-impact development strategies to the extent feasible. No new point source discharges are anticipated. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at Canterbury Brook.

The proposed interconnections from the tunnel shaft to the existing MWRA infrastructure in Morton Street, American Legion Highway, and at Shaft 7C would involve the construction of an approximately 72-inch-diameter pipeline from the valve chamber adjacent to the shaft to a proposed valve chamber within an upland area near the entrance to the City of Boston DPW Lot from Canterbury Lane. Two approximately 48-inch pipelines would extend from the valve chamber. One would extend eastward, crossing through a wooded upland to a small valve chamber or buried valves and connect to the existing water mains in Morton Street. There would be no wetland or buffer zone impacts associated with this connection.

A second pipeline would extend from the chamber roughly southeastward under American Legion Highway to a small valve chamber or buried valves and to the existing Shaft 7C site and include a connection to the existing water main on the south side of the roadway (see **Figure 4.6-9**) This pipeline would involve work within wetlands and the 100-foot buffer zone intermittent stream banks adjacent to American Legion Highway and the intermittent stream channel near where it is culverted under the connecting ramp from the highway to Morton Street. It anticipated that the roadway crossings would be accomplished via trenchless technology as a means for reducing wetland impacts. Approximately 1,558 square feet of temporary impact to BVW/VW would be required to install the pipeline adjacent to the channel, but the pipeline would be buried, and the wetland resources would be restored to preconstruction contours and revegetated with native wetland trees and shrubs and a wetland seed mixture upon completion of construction. With implementation of appropriate sedimentation and erosion controls during construction and post-construction site restoration, no permanent impacts on wetland resources are anticipated as a result of these connections.

Based on modeling studies completed for the Boston Water and Sewer Commission (BWSC) by CDM Smith as part of a stormwater model calibration project completed in 2012, the estimated available capacity of the downstream culverts of Canterbury Brook during a 10-year storm ranges from 50 to 100 cfs. This indicates that the additional dewatering discharge should have a minimal impact as the receiving shaft dewatering is estimated to contribute approximately 0.33 cfs (150 GPM).

Alternative 4

Table 4.6-5 summarizes the temporary and permanent direct wetland impacts anticipated at each of the sites included in Alternative 4.

Table 4.6-5 Alternative 4 - Wetland Impacts at Proposed Launching and Receiving Sites

Shaft Site & Structure/Activity	Resource Area(s) Affected	Temporary Impacts	Permanent Impacts	Total Impacts
Fernald Property Receiving				
Discharge Pipe	BVW/WW (sf)	116	0	116
Discharge Pipe & Splash Pad	Bank (lf) LUW/WW (sf)	8 289	11 91	19 380
Construction Staging Area	RA (sf)	115,352	0	115,352
Top-of-Shaft, Valve Chamber, Access Road, & Paved Parking Area	RA (sf)	0	12,310	12,310
SUBTOTAL	**BVW/VW (sf)**	**116**	**0**	**116**
	Bank (lf)	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**
	RA (sf)	**115,352**	**12,310**	**127,662**
Tandem Trailer/Park Road East Launching				
Discharge Pipe & Splash Pad	Bank (lf) BLSF (sf) LUW/WW (sf)	8 300 652	26 368 368	34 668 1020
Construction Staging Area	RA	105,722	0	105,722
Top-of-Shaft Structure	RA	0	1,685	1,685
SUBTOTAL	**Bank (lf)**	**8**	**26**	**34**
	BLSF (sf)	**300**	**368**	**668**
	LUW/WW (sf)	**652**	**368**	**1,020**
	RA (sf)	**105,722**	**1,685**	**107,707**
Highland Avenue Sites				
Discharge Pipe	RA	4,322	0	4,322
Discharge Pipe & Splash Pad	Bank (lf) BLSF (sf) LUW/WW (sf)	8 1,340 652	26 660 368	34 2,000 1,020
SUBTOTAL	**Bank (lf)**	**8**	**26**	**34**
	BLSF (sf)	**1,340**	**660**	**2,000**
	LUW/WW (sf)	**652**	**368**	**1,020**
	RA (sf)	**4,322**	**0**	**4,322**
American Legion Receiving				
Discharge Pipe & Splash Pad	Bank (lf) LUW/WW (sf)	8 289	11 91	19 380
Discharge Pipe	RA (sf)	845	0	845
Connection Pipeline	BVW/VW (sf)	1,558	0	1,558
SUBTOTAL	**BVW/VW (sf)**	**1,558**	**0**	**1,558**
	Bank (lf)	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**
	RA (sf)	**845**	**0**	**845**
TOTAL	**BVW/VW (sf)**	**1,674**	**0**	**1,674**
	Bank (lf)	**32**	**74**	**106**
	BLSF (sf)	**1,640**	**1,028**	**2,668**
	LUW/WW (sf)	**1,882**	**918**	**2,800**
	RA (sf)	**226,241**	**13,995**	**240,236**

RA – Riverfront Area, BLSF – Bordering Land Subject to Flooding, BVW – Bordering Vegetated Wetlands, VW – Vegetated Wetlands

Table 4.6-6 summarizes the impacts to receiving water flows from dewatering discharges at launching and receiving sites in Alternative 4.

Table 4.6-6 Alternative 4 - Impacts to Dewatering Receiving Waters at Launching and Receiving Sites

Site		Fernald Property Receiving	Fernald Property Receiving	Tandem Trailer/Park Road East Launching and Park Road West Receiving	Highland Avenue Northwest Launching and Northeast Launching	American Legion Receiving
Waterway Name		Clematis Brook	Beaver Brook	Seaverns Brook	Charles River	Canterbury Brook/Stony Brook
Nearby USGS Stream Gauge #		1104500[2]	11045004	N/A	1104200[3]	N/A
USGS Stream Gauge Name		Charles River at Waltham[4]	Charles River at Waltham[4]	N/A	Charles River at Wellesley[5]	N/A
Discharge Volume	***GPM***	300	300	2,160	4,130	300
50 % Duration (avg. flow)	***CFS***	0.89	4.95	2.39	224	1.6
	GPM	398	2,222	1,073	100,539	598
	Discharge Ratio	0.754	0.135	2.013	0.041	0.502
95 % Duration (low flow)	***CFS***	0.03	0.32	0.16	30.6	0.5
	GPM	15	145	70	13,734	224
	Discharge Ratio	19.430	2.069	30.651	0.301	1.339
100-year flood -1%	***CFS***	188	595	306	8410	381
	GPM	84,381	267,055	137,343	3,774,682	171,005
	Discharge Ratio	0.004	0.001	0.016	0.001	0.002
25-year flood -4%	***CFS***	129	415	212	6060	266
	GPM	57,899	186,266	95,153	2,719,925	119,390
	Discharge Ratio	0.005	0.002	0.023	0.002	0.003

Fernald Property Receiving

Like Alternative 3, Alternative 4 would include a TBM receiving shaft and associated staging area at the Fernald Property, with a connecting pipeline to WASM 3 in Waverly Oaks Road. The wetland impacts for Alternative 4 would be the same as described above for Alternative 3. No long-term loss of wetlands or waterways would occur.

Impacts to the Beaver Brook and Clematis Brook from the dewatering discharge would be the same as those discussed for Alternative 3. **Table 4.6-6** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Tandem Trailer/Park Road East Launching

Like Alternative 3, Alternative 4 would include a TBM launching shaft and associated staging area at the Tandem Trailer site. The wetland impacts for Alternative 4 would be the same as described above for Alternative 3.

Like Alternative 3, Alternative 4 would also include a connection to the existing Hultman Aqueduct on the Park Road East site. The wetland impacts for Alternative 4 would be the same as described above for Alternative 3. The only permanent wetland impacts would be associated with the TBM launching shaft and top of shaft structure as well as the FES and rip rap splash pad for the dewatering discharge at Seaverns Brook.

Impacts to the Seaverns Brook from the dewatering discharge would be the same as those discussed for Alternative 3. **Table 4.6-6** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Park Road West Receiving

Alternative 4 would include a TBM receiving shaft and associated staging area at the Park Road West site, which includes on-site wetland resources (see **Figure 4.6-4**). Permanent direct impacts to onsite wetlands have been avoided and are not anticipated as a result of the shaft construction. Appropriate erosion and sedimentation controls would be implemented on site to protect adjacent wetlands, as detailed in the NPDES SWPPP that would be developed by the contractor and implemented prior to construction. These measures would include installation of perimeter erosion controls such as compost filter tubes, straw bales, and/or siltation fence. During shaft construction, dewatering of approximately 150 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water-treatment facility within the staging area and discharged via an approximately 12-inch-diameter pipe with an FES to existing highway drainage features on site that eventually flow through the Bifurcation site to Seaverns Brook.

Impacts to Seaverns Brook due the volume of dewatering discharge proposed were evaluated, using the same analysis as described in the previous Alternative 3 Tandem Trailer/Park Road East Launching section. Given the low volume of flow to be discharged to Seaverns Brook from the Park Road West Receiving site (approximately 150 GPM) the impacts to the depth of flow of the brook are expected to be minimal. **Table 4.6-6** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

At the proposed location of the discharge to the drainage system, the existing channel consists of rip rap. Appropriate erosion and sedimentation controls would be implemented as detailed in the NPDES SWPPP to be developed and implemented by the contractor prior to construction. The other permanent features would include new impervious surfaces consisting of an approximate 22-foot-wide paved access road and parking area. The roadway and parking would result in a negligible increase in stormwater runoff. Mitigation for any potential increase in peak discharge would be mitigated in accordance with the MassDEP Stormwater Management Standards using low-impact development strategies to the extent feasible. No new point source discharges are anticipated. Restoration of the site would be completed as agreed to between the MWRA and MassDOT for the Final Conditions.

Highland Avenue Northwest/Southwest Launching

Alternative 4 would involve a TBM launching shaft and associated staging area at the Highland Avenue Northwest site, which does not include any wetlands on site or immediately adjacent (see **Figure 4.6-7**, Wetlands and Waterways Highland Avenue Northwest/Southwest Launching). During shaft and tunnel construction, dewatering of approximately 1,380 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water-treatment facility within the staging area and discharged to the Charles River. To reach the discharge location from the shaft site, a surface pipeline with FES and rip rap splash pad would be extended from the site to the river, as described above for Alternative 3. Similar to Alternative 3, upon completion of tunnel construction, the FES and splash pad would remain for potential use in future tunnel dewatering. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at the Charles River.

Impacts to the Charles River due the volume of dewatering discharge proposed would be minimal, given the small discharge quantity and high volume of river flow and size of the Charles in this location. Additionally, the downstream surface elevation of the Charles River is controlled mechanically in Boston to maintain a minimally varying level. Operation of gates and pumps at the Charles River Dam makes the river level functionally independent of flow rate. **Table 4.6-6** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Highland Avenue Northeast/Southeast Launching

Like Alternative 3, Alternative 4 would involve a TBM launching shaft and associated staging area at the Highland Avenue Northeast site, which does not include any wetlands on-site. Storage and parking would occur within upland areas at the southeast cloverleaf, which includes a non-jurisdictional stormwater management area. The wetland impacts for Alternative 4 would be the same as described above for Alternative 3. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at the Charles River.

Impacts to the Charles River from the dewatering discharge would be the same as those discussed for Alternative 3. **Table 4.6-6** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

American Legion Receiving

Like Alternative 3, Alternative 4 would involve a TBM receiving shaft and associated staging area at the American Legion site, with the same proposed buried pipeline connections to existing MWRA infrastructure. The wetland impacts for Alternative 4 would be the same as described above for Alternative 3. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at Canterbury Brook.

Impacts to Canterbury Brook from the dewatering discharge would be the same as those discussed for Alternative 3. **Table 4.6-6** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Alternative 10

Table 4.6-7 below summarizes the temporary and permanent direct wetland impacts anticipated at each of the shaft sites included in Alternative 10.

Table 4.6-7 Alternative 10 - Wetland Impacts at Proposed Launching and Receiving Sites

Shaft Site & Structure/Activity	Resource Area(s) Affected	Temporary Impacts (sf)	Permanent Impacts (sf)	Total Impacts (sf)
Fernald Property Receiving				
Discharge Pipe	BVW/WW (sf)	116	0	116
Discharge Pipe & Splash Pad	Bank (lf) LUW/WW (sf)	8 289	11 91	19 380
Construction Staging Area	RA (sf)	115,352	0	115,352
Top-of-Shaft, Valve Chamber, Access Road, & Paved Parking Area	RA (sf)	0	12,310	12,310
SUBTOTAL	**BVW/VW (sf)**	**116**	**0**	**116**
	Bank (lf)	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**
	RA (sf)	**115,352**	**12,310**	**127,662**
Highland Avenue Sites				
Discharge Pipe	RA	4,322	0	4,322
Discharge Pipe & Splash Pad	Bank (lf) BLSF (sf) LUW/WW (sf)	8 1,340 1,034	36 660 726	44 2,000 1,760
SUBTOTAL	**Bank (lf)**	**8**	**36**	**44**
	BLSF (sf)	**1,340**	**660**	**2,000**
	LUW/WW (sf)	**1,034**	**726**	**1,760**
	RA (sf)	**4,322**	**0**	**4,322**
American Legion Receiving				
Discharge Pipe & Splash Pad	Bank (lf) LUW/WW (sf)	8 289	11 91	19 380
Discharge Pipe	RA (sf)	845	0	845
Connection Pipeline	BVW/VW (sf)	1,558	0	1,558
SUBTOTAL	**BVW/VW (sf)**	**1,558**	**0**	**1,558**
	Bank (lf)	**8**	**11**	**19**
	LUW/WW (sf)	**289**	**91**	**380**
	RA (sf)	**845**	**0**	**845**
TOTAL	**BVW/VW (sf)**	**1,674**	**0**	**1,674**
	Bank (lf)	**24**	**58**	**82**
	BLSF (sf)	**1,340**	**660**	**2,000**
	LUW/WW (sf)	**1,612**	**908**	**2,520**
	RA (sf)	**120,519**	**12,310**	**132,829**

RA – Riverfront Area, BLSF – Bordering Land Subject to Flooding, BVW – Bordering Vegetated Wetlands, VW – Vegetated Wetlands

Table 4.6-8 summarizes the impacts to receiving water flows from dewatering discharges at launching and receiving sites in Alternative 10.

Table 4.6-8 Alternative 10 - Impacts to Dewatering Receiving Waters at Launching and Receiving Sites

Site		Fernald Property Receiving	Fernald Property Receiving	Park Road West Large Connection	Highland Avenue Northwest Launching and Northeast Launching	American Legion Receiving
Waterway Name		Clematis Brook	Beaver Brook	Seaverns Brook via Drainage Swale	Charles River	Canterbury Brook/Stony Brook
Nearby USGS Stream Gauge #		1104500[2]	11045004	N/A	1104200[3]	N/A
USGS Stream Gauge Name		Charles River at Waltham[4]	Charles River at Waltham[4]	N/A	Charles River at Wellesley[5]	N/A
Discharge Volume	***GPM***	300	300	150	6,110	300
50 % Duration (avg. flow)	***CFS***	0.89	4.95	2.39	224	1.6
	GPM	398	2,222	1,073	100,539	598
	Discharge Ratio	0.754	0.135	0.140	0.061	0.502
95 % Duration (low flow)	***CFS***	0.03	0.32	0.16	30.6	0.5
	GPM	15	145	70	13,734	224
	Discharge Ratio	19.430	2.069	2.129	0.445	1.336
100-year flood -1%	***CFS***	188	595	306	8410	381
	GPM	84,381	267,055	137,343	3,774,682	171,005
	Discharge Ratio	0.004	0.001	0.001	0.002	0.002
25-year flood -4%	***CFS***	129	415	212	6060	266
	GPM	57,899	186,266	95,153	2,719,925	119,390
	Discharge Ratio	0.005	0.002	0.002	0.002	0.003

Fernald Property Receiving

Like Alternative 3, Alternative 10 would include a TBM receiving shaft and associated staging area at the Fernald Property, with a connecting pipeline to WASM 3 in Waverly Oaks Road. The wetland impacts for Alternative 10 would be the same as described above for Alternative 3. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at Clematis Brook.

Impacts to the Beaver Brook and Clematis Brook from the dewatering discharge would be the same as those discussed for Alternative 4. **Table 4.6-8** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Park Road West Large Connection

Alternative 10 would include two large connection shafts to the tunnel and two connections to the existing Hultman Aqueduct on the Park Road West site (see **Figure 4.6-5**). The Hultman Aqueduct is adjacent to a BVW and unnamed intermittent stream along the northern perimeter of the site. The proposed shaft and valve chambers are located more than 100 feet from the wetland resources, but the connections to the existing aqueduct would involve work within the 100-foot buffer zone to the BVW and Bank. No direct impacts to any wetland resources are proposed.

Dewatering of approximately 150 GPM would be required for construction of the shaft and valve chambers at the connection points. The groundwater inflows would be treated and discharged to the existing swale on site adjacent to the highway off-ramp. At the proposed location of the discharge to the drainage system, the existing channel consists of rip rap. Appropriate erosion and sedimentation controls would be implemented as detailed in the NPDES SWPPP to be developed and implemented by the contractor prior to construction. Other permanent features would include new impervious surfaces consisting of an approximately 22-foot-wide paved access road and parking area. The roadway and parking would result in a negligible increase in stormwater runoff. Mitigation for any potential increase in peak discharge would be mitigated in accordance with the MassDEP Stormwater Management Standards using low-impact development strategies to the extent feasible. No new point source discharges are anticipated. No long-term loss of wetlands would occur.

Impacts to Seaverns Brook from the dewatering discharge would be the same as those discussed for Alternative 4. **Table 4.6-8** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Highland Avenue Northwest/Southwest Launching

Alternative 10 would involve a TBM launching shaft and associated staging area at the Highland Avenue Northwest site, which does not include wetlands on-site or immediately adjacent. During shaft and tunnel construction, dewatering of approximately 3,370 GPM of groundwater inflow would be required. The groundwater would be treated at a temporary water-treatment facility within the staging area and discharged to the Charles River. To reach the discharge location from the shaft site, a surface pipeline with FES and rip rap splash pad would be extended from the site to the river, similar to that described above for Alternative 4, except that the proposed pipe would be 36-inch diameter. Similar to Alternative 4, upon completion of tunnel construction, the FES and splash pad would remain for potential use in future tunnel dewatering. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at the Charles River.

Impacts to the Charles River due the volume of dewatering discharge proposed would be minimal, given the small discharge quantity and high volume of river flow and size of the Charles in this location. Additionally, the downstream surface elevation of the Charles River is controlled mechanically in Boston to maintain a minimally varying level. Operation of gates and pumps at the Charles River Dam makes the river level functionally independent of flow rate. **Table 4.6-8** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

Highland Avenue Northeast/Southeast Launching

Alternative 10 would also involve a TBM launching shaft and associated staging area at the Highland Avenue Northeast site, which does not include wetlands on-site. The wetland impacts for Alternative 10 would be the same as described above for Alternative 4. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at the Charles River.

Impacts to the Charles River from the dewatering discharge would be the same as those discussed for Alternative 4. **Table 4.6-8** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

American Legion Receiving

Like Alternative 3, Alternative 10 would involve a TBM receiving shaft and associated staging area at the American Legion site, with the same proposed buried pipeline connections to existing MWRA infrastructure. The wetland impacts for Alternative 10 would be the same as described above for Alternative 3. The only permanent wetland impacts would be associated with the FES and rip rap splash pad for the dewatering discharge at Canterbury Brook.

Impacts to Canterbury Brook from the dewatering discharge would be the same as those discussed for Alternative 4. **Table 4.6-8** includes the ratios of dewatering to receiving water flows for varying stream flow levels.

4.6.5.2 Connection and Isolation Valve Sites

Table 4.6-9 below summarizes the temporary and permanent direct wetland impacts anticipated at each of the Connection sites associated with Alternatives 3, 4, and 10.

Table 4.6-9 Wetland Impacts at Connection and Isolation Valve Sites – Alternatives 3, 4 and 10

Site	Structure	Resource Area(s) Affected	Temporary Impacts (sf)	Permanent Impacts (sf)	Total Impacts (sf)
School Street	N/A	0	0	0	0
Cedarwood Pumping Station	N/A	0	0	0	0
Hegarty Pumping Station	Discharge Pipe and Splash Pad	RA	5,757	157	5,914
St. Mary Street Pumping Station	N/A	0	0	0	0
Newton Street Pumping Station	N/A	0	0	0	0
Southern Spine Mains	N/A	0	0	0	0
Hultman Aqueduct Isolation Valve	Isolation Valve Chamber	RA	7,837	2,989	10,826
Total		**RA**	**13,594**	**3,146**	**16,740**

RA – Riverfront Area, BLSF – Bordering Land Subject to Flooding, BVW – Bordering Vegetated Wetlands, VW – Vegetated Wetlands

School Street Site

No wetland resources have been identified near this site. In accordance with the 2022 NPDES CGP, appropriate construction period controls would be implemented on-site to prevent potential off-site impacts.

Cedarwood Pumping Station

The interconnection to the Cedarwood pumping station would involve work within approximately 20 feet of the BVW areas to the south of the pumping station (see **Figure 4.6-11**). No direct wetland alterations would occur in this area, and appropriate construction measures would be undertaken per the NPDES SWPPP to prevent siltation from occurring in the wetland as a result of the Program.

Hegarty Pumping Station

The interconnection to the Hegarty pumping station would involve work within approximately 110 feet of the stream and associated wetland to the east of the pumping station connection point (see **Figure 4.6-12**). No direct BVW or waterway alterations would occur in this area and appropriate construction measures would be undertaken per the NPDES SWPPP to prevent siltation from occurring in the wetland resources as a result of the Program. While the shaft is outside of RA, the approximately 24-inch-diameter buried pipeline connection to the existing infrastructure and associated meter vault would involve approximately 5,914 square feet of temporary impact and approximately 157 square feet of permanent impact to previously altered 200’ Riverfront, much of which is within the existing access road. Upon completion of construction, impacted areas would be restored and revegetated or repaved. The 157 square feet includes the top of the meter vault, which would not significantly impair the ability of the area to protect the interests of the WPA.

St. Mary Street Pumping Station

No wetland resources have been identified near this site. In accordance with the 2022 NPDES CGP, appropriate construction-period controls would be implemented on-site to prevent potential off-site impacts. See **Figure 4.6-13**.

Newton Street Pumping Station

No wetland resources have been identified near this site. In accordance with the 2022 NPDES CGP, appropriate construction-period controls would be implemented on-site to prevent potential off-site impacts. See **Figure 4.6-14**

Southern Spine Mains

No wetland resources have been identified near this site. In accordance with the 2022 NPDES CGP, appropriate construction-period controls would be implemented on-site to prevent potential off-site impacts. See **Figure 4.6-15**.

Hultman Aqueduct Isolation Valve

All DEIR Alternatives would include an Isolation Valve on the Hultman Aqueduct within an interchange ramp area in Weston immediately to the west of the existing Shaft 5/5A site (see **Figure 4.6-16**). The construction of the proposed valve chamber and associated reducers would require a temporary construction area of approximately 0.3 acres. The valve chamber would be within RA associated with the Charles River, which is located on the opposite side of the roadway ramp. Temporary impact to 2,556 square feet and 8,270 square feet of previously altered 100 feet of Riverfront and 200 feet of Riverfront, respectively, would be required for installation of the Isolation Valve. Permanent impacts would include approximately 623 square feet and 2,366 square feet of previously altered 100’ Riverfront and 200’ Riverfront, respectively. Upon completion of construction, the area would be restored as close as possible to preconstruction contours and revegetated. The proposed permanent RA impact is unavoidable because it represents the paved access road, stormwater management area, top of the valve chamber and access hatch, which would not significantly impair the ability of the area to protect the interests of the WPA.

4.6.5.3 Tunnel Alignments – All Alternatives

One Certified Vernal Pools (CVP 3840) was identified within 1,000 feet of the tunnel alignment in Newton, which is common to all the DEIR Alternatives. CVP 3840 is located approximately 750 feet north of the centerline of the tunnel alignment (consistent for all alternatives), which is at a depth of more than 200 feet where it passes the vernal pool. Se**e Figure 4.6-17** through **Figure 4.6-27** for wetlands and waterways along the Alternative 3 tunnel alignment, **Figure 4.6-28** through **Figure 4.6-38** for wetlands and waterways along the Alternative 4 tunnel alignment, and **Figure 4.6-39** through **Figure 4.6-49 for** wetlands and waterways along the Alternative 10 tunnel alignment. See **Figure 4.6-24**, **Figure 4.6-35**, and **Figure 4.6-46** for the pool location along Alternatives 3, 4, and 10, respectively. Various other surface waters and wetlands occur near the tunnel along all of the DEIR Alternative Alignments.

Although it is unlikely due to the deep depth of the tunnels, temporary impacts to wetland resources could occur due to migration of groundwater associated with surface waters into the tunnel after excavation, but prior to installation of the tunnel lining. Groundwater drawdown is typically caused by interconnectivity of discontinuities within an otherwise impermeable rock mass, which in turn, is hydraulically connected to the surface water body. Therefore, the Program will employ mitigation practices, as outlined in the following paragraphs, to address the potential for groundwater drawdown. Given the general similarity among the alternatives of geologic conditions and surface waters along the tunnel alignments, the likelihood of this potential impact does not differ among the DEIR Alternatives.

If groundwater drawdown were to reduce the levels of local water bodies, the specific impacts would vary depending on the type of area affected, magnitude of the drawdown, and duration of impact. In all cases, the impacts would be temporary and water levels would return to preconstruction conditions upon completion of the tunnel liner. Construction contract documents would require monitoring of groundwater inflows during construction and would establish action levels at which mitigation measures must be implemented to reduce groundwater drawdown. These action levels would be set at groundwater inflow volumes low enough that impacts to surface waters would be unlikely. Mitigation measures to address groundwater drawdown are described below.

The primary mitigation to reduce the potential for groundwater 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 water-bearing features are encountered by the probing. The probing and pre-grouting 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 is 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—and not proposed as a replacement for—the pre-excavation probing and grouting described above, 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 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 is to provide an alternative water supply for domestic and irrigation wells until groundwater levels can be restored. This mitigation measure is described in **Chapter 5 Water Supply and Water Management Act** and the associated **Appendix J, Water Supply Contingency Plan**. The Water Supply Contingency Plan includes identified courses of action to be taken to provide water service to affected homeowners. Figures showing the location of nearby wells are included in **Appendix J**, and a listing of the wells is also in the Appendix J.

No-Build Alternative

Under the No-Build Alternative, the shafts, tunnels, connections, and associated appurtenances would not be constructed. No permanent or temporary wetland impacts would occur unless a failure in the existing Metropolitan Tunnel System were to result in ancillary wetland resource impacts. The location and severity of such impacts cannot be predicted or estimated.

4.6.5.4 Tunnel Dewatering and Disinfection

If the entirety of the approximately 14.5 miles of fully excavated tunnel were to be dewatered at one location, then it is estimated that the maximum required pumping and treatment capacity would be approximately 6,100 GPM if the entire tunnel length was fully mined and unlined (as shown in Alternative 10 in **Table 4.6-10** where all dewatering is performed at Highland Avenue sites**)**. This estimate was determined based on observations during construction of the MetroWest Water Supply Tunnel Program. The calculated maximum dewatering rates (see **Table 4.6-10**) are expected to only be observed near the completion of construction when the tunnel section has been excavated to its maximum length prior to final lining.

Dewatering Plan - Monitoring and Treatment of Dewatering Discharge

The contractor would develop a Dewatering Plan to manage groundwater inflow into the tunnel, which would include treatment through an on-site temporary water-treatment facility to meet applicable discharge water quality criteria). The assumed maximum treatment capacity at any one site would be approximately 3,400 GPM (see **Table 4.6-10** for estimated dewatering quantities by discharge location)**.** Dewatering discharges would be collected and treated for pollutants such as turbidity, pH, and petroleum hydrocarbons before discharging into receiving water bodies or existing on-site stormwater management systems. Scour protection would be provided for water bodies receiving dewatering discharges. Dewatering discharges would be treated to meet applicable surface- water-quality standards for the receiving waters (i.e., Class B waters) and other applicable environmental permits.

The Program would adhere to the 2022 NPDES CGP, which requires site inspections and daily turbidity monitoring for dewatering discharges. During construction, the contractor would follow the NPDES SWPPP and maintain erosion and sediment controls to make sure they are effective and function properly. The contractor would replace and/or upgrade controls as necessary to meet the requirements of the 2022 NPDES CGP.

If sampling results obtained for compliance with the 2022 NPDES CGP indicate the Program needs coverage under the new Dewatering and Remediation General Permit (DRGP), then coverage would be requested, and the Program would adhere to DRGP requirements. Note that the current remediation general permit (RGP) is expired and the DRGP is in the process of being issued. The Program would adhere to the requirements of the permit that is current at the time of construction.

Table 4.6-10 Proposed Discharge Volumes and Locations by Alternative

Alternative	Tunnel Segment	Launch Site	Diameter (ft)	Length (mi)	Estimated Total Dewatering (GPM)	Estimated Total Dewatering (MGD)	Proposed Discharge Location
3	Tunnel Segment 1 (North)	Tandem Trailer	15	4.6	1,860	2.7	Seaverns Brook
	Tunnel Segment 2 (South)	Bifurcation	15	3.3	1,340	1.9	Seaverns Brook
	Tunnel Segment 3 (South)	Highland Ave NE	15	6.8	2,750	4.0	Charles River
4	Tunnel Segment 1 (North)	Tandem Trailer	15	4.6	1,860	2.7	Seaverns Brook
	Tunnel Segment 2 (South)	Highland Ave NW	15	3.4	1,380	2.0	Charles River
	Tunnel Segment 3 (South)	Highland Ave NE	15	6.8	2,750	4.0	Charles River
10	Tunnel Segment 1 (North)/ Tunnel Segment 2 (South)	Highland Ave NW	15	8.3	3,360	4.8	Charles River
	Tunnel Segment 3 (South)	Highland Ave NE	15	6.8	2,750	4.0	Charles River

Disinfection Procedures

Once the tunnel has been constructed but prior to operation, the new tunnel system would be disinfected so that bacterial testing requirements would be met. The tunnel system would be flushed after the disinfection process until the water quality would be acceptable for use by customers, based on Authority and MassDEP requirements. The chlorinated water in the tunnels would be dechlorinated prior to being discharged into their respective receiving surface water bodies.

Tunnel Inspection and Cleaning

After the physical construction of the tunnels, shafts, and connecting piping are complete, commissioning would begin with a thorough inspection and cleaning of the tunnel. It is anticipated that this would be done by deploying personnel within the tunnel to clean it, possibly using power washers. Any dirt or debris would be carried by the wash water to the low points where it would be pumped out, then treated by filtration to remove solids, dechlorination, and pH adjustment. Water would meet the surface-water quality standards of the receiving water before being discharged.

Pressure Testing and Tunnel Disinfection

The next step in the process would be pressure testing and disinfection. Tunnel disinfection would conform to the procedures in American Water Works Association (AWWA) C-651-14 – Disinfecting Water Mains; specifically, the Slug Method or the Continuous Method[24]. The Continuous Method, used on the MetroWest Water Supply Tunnel, conservatively assumed to be the method for this evaluation, would require the most chlorine volume and the most time to implement. This method would use dechlorination chemicals and pH adjustment chemicals to treat the disinfection water to meet water-quality requirements prior to discharge to a receiving water. Other treatment methods may be used as needed to ensure that discharged disinfection water meets the requirements for discharge to the receiving water. It is assumed the dechlorination chemical would be liquid sodium thiosulfate and the pH adjustment chemical would be liquid citric acid.

Tunnel Flushing

Once disinfection is complete, the tunnel system would be flushed to bring the water quality in the tunnel in line with potable water requirements. First, the disinfection water would be displaced with potable water to remove highly chlorinated water until only the typical 2 parts per million (ppm) of chloramines remain in the tunnel.

For disinfection and flushing operations, the system would discharge to a surface water, to be determined during final design. One possible sequence would be to divide the tunnel system into three segments—North Tunnel Segment 1, South Tunnel Segment 2 and South Tunnel Segment 3—(for Alternative 3 as an example) to individually perform disinfection and flushing in the following directions:

North Tunnel Segment 1, from the Fernald Property to the Hultman Aqueduct
South Tunnel Segment 2, from the Hultman Aqueduct to the Highland Avenue Northeast site
South Tunnel Segment 3, from the American Legion Site to Highland Ave Northeast site

There are multiple locations that would be subject to future permit requirements where disinfection, flushing, dechlorination, and pH adjustment could be initiated and where spent tunnel water could be discharged.

4.6.6 Final Conditions

Final Conditions for proposed sites would include maintenance of vegetation within cleared areas (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. Shafts, valve chambers, parking areas, and stormwater management features would be located in small, fenced-in areas. Proposed Final Conditions are described for each alternative on a site-by-site basis below. See **Section 4.6.1** for the assessment of compliance with the Massachusetts Stormwater Management Standards, which would be met at all sites to the extent practicable.

24 AWWA Standard C651-14 Disinfecting Water Mains, Effective Date February 1, 2015

No permanent or temporary wetland or surface water impacts would occur in association with future operation of the tunnel under any of the DEIR Alternatives. As described further below, as a result of the implementation of wetland and surface-water resource area impact avoidance measures, all proposed shafts, valve chambers, and other permanent appurtenances are outside identified wetland and water-resource areas, with the exception of RA previously altered by non-Program development.

It is not expected that there would be changes to current water resources conditions once construction is complete in any of the three Alternatives. The final tunnel would be pressurized substantially higher than the surrounding groundwater thereby preventing groundwater inflow into the tunnel. The completed tunnel will also be lined.

Similar to the currently proposed dewatering and disinfection procedures, future tunnel maintenance may require flushing and discharge of treated water to surface water. For this reason, outfalls constructed for construction-period dewatering are anticipated to be permanently retained. For more details on these discharges, see **Section 4.6.1.1.**

Under Final Conditions at launching, receiving, and connection sites, stormwater would be managed appropriately, and mitigation would be provided for proposed impervious cover.

The stormwater management systems would be designed to manage stormwater runoff in accordance with the latest Massachusetts Stormwater Handbook published by MassDEP.[25] The Program would use LID and green infrastructure to the maximum extent possible at each site and would implement structural stormwater control measures (SCMs) to meet MassDEP Stormwater Management Standards. The Program would also implement good housekeeping practices to ensure that the stormwater management systems are properly maintained.

Stormwater management systems would be designed to treat stormwater runoff and mitigate new impervious surfaces on-site. Structural SCMs would be designed to meet the MassDEP Stormwater Management Standards, treating a minimum of ½ to 1 inch of runoff generated by the new impervious areas. Appropriate groundwater recharge would be provided at each site based on the soil types if impervious cover is proposed. If infiltration SCMs are proposed, test pits would be completed during the design phase to assess soils and ensure that infiltration can occur; otherwise different types of SCMs would be used that provide the required volume of treatment.

The following sections provide summaries of the wetland impacts and stormwater management approach for each alternative.

4.6.6.1 Alternative 3

There would be no wetland impacts under Final Conditions for Alternative 3. With the exception of RA previously altered by non-Program development (as at the Tandem Trailer and Fernald Property sites), all

25 The current Massachusetts Stormwater Handbook at the time of this report is dated 2008, but MassDEP is working on a revised handbook.

proposed shafts, valve chambers, and other permanent appurtenances would be located outside identified wetland resource areas.

Table 4.6-11 provides a summary of the proposed impervious cover estimated at each site. As the final site designs are refined, the proposed impervious cover estimates may change. Under final design, stormwater management systems would be designed to meet the Stormwater Management Standards.

Table 4.6-11 Proposed Impervious Cover under Final Conditions at Alternative 3 Sites

Site	Change in Impervious Cover (ac)
Launching and Receiving Sites	
Fernald Property	0.13
Bifurcation	0.66
Tandem Trailer	0.03
Park Road East	0.21
Highland Avenue Northwest	0.00
Highland Avenue Northeast	0.69
American Legion	0.52
Connection and Isolation Valve Sites	
School Street	0.00
Cedarwood Pumping Station	0.08
Hegarty Pumping Station	0.08
St. Mary Street Pumping Station	0.06
Newton Street Pumping Station	0.06
Southern Spine Mains	0.09
Hultman Aqueduct Isolation Valve	0.07
TOTAL	**2.7**

Fernald Property Receiving

The top-of-shaft structure and the valve chamber for the connection to the water main in Waverly Oaks Road in Waltham would be within the 100-foot wetland buffer zone of the BVW located to the southeast and would occupy 12,310 square feet of RA altered by previous development for the Fernald School campus. Inspection and maintenance activities on site would not adversely impact wetland resources. Program construction, restoration, and revegetation of the site upon completion of construction would include removal of the existing abandoned buildings, vehicles, equipment, and debris within the area, which would improve the natural resource values of the RA as compared to existing conditions.

Tandem Trailer and Park Road East Launching

The proposed top-of-shaft structure at the launching shaft located on the Tandem Trailer site would be within the 200-foot Riverfront to Seaverns Brook. Inspection and maintenance activities on-site would not adversely impact any wetland resources.

The proposed top-of-shaft structure at the launching shaft at Park Road East would be within the 100-foot wetland buffer zone of the intermittent stream located to the north. A connection tunnel would extend between the Tandem trailer site and the Park Road East site to provide a connection to the Hultman Aqueduct. Inspection and maintenance activities on-site would not adversely impact any wetland resources.

Bifurcation Launching

The proposed top-of-shaft structure at the launching shaft would be within the 100-foot wetland buffer zone of the intermittent stream located to the south. Inspection and maintenance activities on-site would not adversely impact wetland resources.

Highland Avenue Northwest/Southwest Launching

No wetlands were identified at the Highland Avenue Northwest or Southwest sites and there would be no proposed permanent surface features on-site for Alternative 3 in the Build Condition. A connecting tunnel would cross under the site and I-90 to the Highland Avenue Northeast site where required appurtenances would be located. Inspection and maintenance activities at that site would not adversely impact adjacent wetland resources.

Highland Avenue Northeast/Southeast Launching

There are no anticipated wetland impacts at the Northeast or Southeast sites for Alternative 3 in the Build Condition. No wetlands were identified on site at the northeast cloverleaf. Inspection and maintenance activities at the top-of-shaft structure and valve chamber on-site would not adversely impact any adjacent wetland resources. No permanent facilities are proposed for the southeast cloverleaf.

American Legion Receiving

The proposed site access road at the American Legion site would be within the 100-foot buffer zone to Canterbury Brook. Inspection and maintenance activities on-site would not adversely impact wetland resources.

4.6.6.2 Alternative 4

There would be no wetland impacts under Final Conditions for Alternative 4. With the exception of RA previously altered by non-Program development (as at the Tandem Trailer and Fernald Property sites), all proposed shafts, valve chambers, and other permanent appurtenances would be located outside identified wetland resource areas.

Table 4.6-12 summarizes the proposed impervious cover estimated at each site. As the final site designs are refined, the proposed impervious cover estimates may change. Under final design, stormwater management systems would be designed to meet Stormwater Management Standards.

Table 4.6-12 Proposed Impervious Cover under Final Conditions at Alternative 4 Sites

Site	Change in Impervious Cover (ac)
Launching and Receiving Sites	
Fernald Property	0.13
Tandem Trailer	0.03
Park Road East	0.21
Park Road West Site	0.41
Highland Avenue Northwest	0.00
Highland Avenue Northeast	0.69
American Legion	0.52
Connection and Isolation Valve Sites	
School Street	0.00
Cedarwood Pumping Station	0.08
Hegarty Pumping Station	0.08
St. Mary Street Pumping Station	0.06
Newton Street Pumping Station	0.06
Southern Spine Mains	0.09
Hultman Aqueduct Isolation Valve	0.07
TOTAL	**2.4**

Fernald Property Receiving

The Final Conditions at the Fernald Property for Alternative 4 would be the same as described above for Alternative 3. Inspection and maintenance activities on-site would not adversely impact wetland resources.

Tandem Trailer and Park Road East Launching

The Final Conditions at the Tandem Trailer site for Alternative 4 would be the same as described above for Alternative 3. Inspection and maintenance activities on-site would not adversely impact wetland resources.

The Final Conditions at the Park Road East site for Alternative 4 would be the same as described above for Alternative 3. Inspection and maintenance activities on-site would not adversely impact wetland resources.

Park Road West Receiving

The proposed top-of-shaft structure at the launching shaft would be within the 100-foot wetland buffer zone of the intermittent stream located to the north. Inspection and maintenance activities on-site would not adversely impact wetland resources.

Highland Avenue Northwest/Southwest Launching

The Final Conditions at the Highland Avenue Northwest site for Alternative 4 would include a top-of-shaft structure. Inspection and maintenance activities on-site would not adversely impact nearby wetland resources. No permanent facilities are proposed for the southwest cloverleaf.

Highland Avenue Northeast/Southeast Launching

The Final Conditions at the Highland Avenue Northeast site for Alternative 4 would be the same as Alternative 3. Inspection and maintenance activities on-site would not adversely impact wetland resources. No permanent facilities are proposed for the southwest cloverleaf.

American Legion Receiving

The Final Conditions at the American Legion site for Alternative 4 would be the same as described above for Alternative 3. Inspection and maintenance activities on-site would not adversely impact wetland resources.

4.6.6.3 Alternative 10

There would be no wetland impacts under Final Conditions for Alternative 10. With the exception of RA previously altered by other development, all proposed shafts, valve chambers, and other permanent appurtenances would be located outside identified wetland resource areas.

Table 4.6-13 summarizes the proposed impervious cover estimated at each site. As the final site designs are refined, proposed impervious cover estimates may change. Under final design, stormwater management systems would be designed to meet Stormwater Management Standards.

Table 4.6-13 Proposed Impervious Cover under Final Conditions at Alternative 10 Sites

Site	Change in Impervious Cover (ac)
Launching and Receiving Sites	
Fernald Property	0.13
Park Road West Large Connection	0.54
Highland Avenue Northwest	0.00
Highland Avenue Northeast	0.69
American Legion	0.52
Connection and Isolation Valve Sites	
School Street	0.00
Cedarwood Pumping Station	0.08
Hegarty Pumping Station	0.08
St. Mary Street Pumping Station	0.06
Newton Street Pumping Station	0.06
Southern Spine Mains	0.09
Hultman Aqueduct Isolation Valve	0.07
TOTAL	**2.3**

Fernald Property Receiving

The Final Conditions at the Fernald Property for Alternative 10 would be the same as described above for Alternative 3. Inspection and maintenance activities on-site would not adversely impact wetland resources.

Park Road West Large Connection

The two valve chambers for the connections to the Hultman Aqueduct on the Park Road West site in Weston would be within the 100-foot wetland buffer zone of the BVW located to the north. Inspection and maintenance activities on-site would not adversely impact wetland resources.

Highland Avenue Northwest/Southwest Launching

The Final Conditions at the Highland Avenue Northwest site for Alternative 10 would be the same as for Alternatives 3 and 4. Inspection and maintenance activities on-site would not adversely impact nearby wetland resources. No permanent facilities are proposed for the southwest cloverleaf.

Highland Avenue Northeast/Southeast Launching

The Final Conditions at the Highland Avenue Northeast site for Alternative 10 would be the same as Alternatives 3 and 4. Inspection and maintenance activities on-site would not adversely impact wetland resources. No permanent facilities are proposed for the southeast cloverleaf.

American Legion Receiving

The Final Conditions at the American Legion site for Alternative 10 would be the same as described above for Alternative 3 and 4. Inspection and maintenance activities on-site would not adversely impact wetland resources.

4.6.6.4 Connection and Isolation Valve Sites

School Street Connection

No wetland resources have been identified near this site. Inspection and maintenance activities during operation of the tunnel in the Final Condition would not impact nearby wetlands.

Cedarwood Pumping Station Connection

The Cedarwood Pumping Station site includes BVW areas to the south of the pumping station. Inspection and maintenance activities during operation of the tunnel in the Final Condition would not impact adjacent wetlands.

Hegarty Pumping Station Connection

The Hegarty Pumping Station site is within approximately 110 feet of Rosemary Brook and an associated BVW. A proposed meter vault would occupy approximately 157 square feet of RA previously altered for construction of the pumping station and other infrastructure. Site restoration upon completion of construction would restore the natural resource values of the RA to preconstruction conditions. Inspection and maintenance activities during operation of the tunnel in the Final Condition would not impact nearby wetlands or waterways.

St. Mary Street Pumping Station Connection

No wetland resources have been identified near this site. Inspection and maintenance activities during operation of the tunnel in the Final Condition would not impact nearby wetlands.

Newton Street Pumping Station Connection

No wetland resources have been identified near this site. Inspection and maintenance activities during operation of the tunnel in the Final Condition would not impact nearby wetlands.

Southern Spine Mains Connection

No wetland resources have been identified near this site. Inspection and maintenance activities during operation of the tunnel in the Final Condition would not impact nearby wetlands.

Hultman Aqueduct Isolation Valve

The valve chamber would be within RA associated with the Charles River previously altered due to highway construction. Inspection and maintenance activities during operation of the tunnel in the Final Condition would not impact nearby wetlands or waterways.

4.6.6.5 Tunnel Alignments – All Alternatives

See **Figure 4.6-17** through **Figure 4.6-27** for wetlands and waterways along the Alternative 3 tunnel alignment, **Figure 4.6-28** through **Figure 4.6-38** for wetlands and waterways along the Alternative 4 tunnel alignment, and **Figure 4.6-39** through **Figure 4.6-49** for wetlands and waterways along the Alternative 10 tunnel alignment. In the Final Conditions, all three DEIR final tunnels would be pressurized substantially higher than the surrounding groundwater thereby preventing groundwater inflow into the tunnel. The final construction would include a concrete and/or steel liner depending on ground conditions. The pressurization of the tunnel would prevent migration of groundwater from wetlands or waterways into the tunnel. Consequently, there would be no potential for impacts to wetlands along any of the tunnel alignment alternatives in the Final Conditions.

4.6.7 Avoidance, Minimization, and Mitigation Measures

As discussed in **Sections 4.6.2.8** and **4.6.2.9** there are state and federal guidelines governing wetland mitigation and stormwater management. MassDEP also requires that all projects within regulatory jurisdiction must meet the Massachusetts Stormwater Standards, which aim to protect wetlands and water resources from pollution and impacts of development. Compliance with these standards is further described in the subsequent sections.

MassDEP has published a guidance document for wetland mitigation that discusses avoidance and minimization.[26] The document avoids relying solely on replication for loss of wetlands, in light of evidence to suggest that poorly designed or constructed replication projects can fail to become new wetland areas as they were designed to do. The guidance document establishes avoidance as the first consideration for a project, using "evaluation of reasonable project designs that attempt to locate projects away from wetlands in order to avoid impacts." After considering all reasonable avoidance, minimization measures can be taken such as "steepening slopes, and, depending on the scale/nature of the project, construction of retaining walls or bridge spans to reduce wetland impacts." Only after avoidance and minimization have been applied to the fullest extent practicable should replication be considered for mitigation purposes.

Federal guidelines about avoidance and minimization are presented in the Section 404(b)(1) "Guidelines for Specification of Disposal Sites for Dredged or Fill Material," as discussed above in **Section 4.6.2**, Regulatory Framework. A Memorandum of Agreement (MOA) between the USACE and USEPA sets forth a sequence approach for evaluating wetland impacts that calls first for avoidance, then minimization, and finally compensatory mitigation for impacts. The goal of the guidelines and MOA is to establish no net loss of wetland functions and values.

4.6.7.1 Avoidance

The proposed Launching, Receiving, Connection and Isolation Valve sites were identified after an extensive site-selection process to identify sites that would avoid and minimize, to the extent practicable, potential land-use impacts to resource areas and sensitive receptors.

Development of the Program alternatives went through a rigorous screening process, which led to identification of launching, receiving and connecting sites that aimed to avoid and minimize impacts. As described in the Environmental Notification Form (ENF), options including operational changes, rehabilitation, surface pipelines, and deep-rock tunnels were evaluated for their ability to meet water demand and system reliability and resilience. From that screening tier, deep-rock tunnels emerged at the preferred option. MWRA developed 28 preliminary alternative tunnel alignments (15 southern segments and 13 northern segments) that were evaluated against engineering, high-level social and environmental, operational and cost factors. As described in Chapter 3, Alternatives, the options were narrowed to 10 candidate deep-rock alternatives with specific locations for launching, receiving and connecting sites that were specifically identified for their ability to avoid and minimize impacts. The 10 candidate deep-rock alternatives were further narrowed to three DEIR alternatives, Alternatives 3, 4, 10. This assessment evaluated temporary and permanent impacts to wetland resources within or adjacent to launching, receiving and connecting site.

Further avoidance of wetland impacts was considered when identifying proposed construction areas, including shaft and connection locations and routes for interconnecting pipelines, as described below. When possible, shafts and valve chambers were located outside jurisdictional areas and associated buffer zones, and groundwater discharge locations were sited in areas lacking significant wetland vegetation on the

26 Massachusetts Inland Wetland Replication Guidelines, March 2002, https://www.mass.gov/doc/inland-wetland-replication-guidelines-0/download.

bank. In certain locations, such as the Park Road West, Park Road East, and Bifurcation sites, work is required within the buffer zone for connections to the existing Hultman Aqueduct. Because dewatering discharges must be conveyed to an existing surface water, it was not feasible to avoid work within RA adjacent to the perennial streams at the Fernald Property (Clematis Brook), Tandem Trailer (Seaverns Brook), and Bifurcation sites (Seaverns Brook). Proposed discharge locations were sited in areas lacking wetland vegetation on the Bank to avoid impacts to BVW.

Interconnecting pipelines were routed to avoid crossing wetlands and waterways, where feasible. At the Fernald Property, the pipeline route to WASM 3 must cross two streams but avoids resource impacts by crossing the streams where they are carried in a culvert. No modifications to the existing culvert is currently proposed, however replacement in-kind may be determined to be required as the Program progresses through final design. At the American Legion site, the pipeline connection to Shaft 7C must cross an intermittent steam and associated BVW in two locations. Impacts at one of the locations would be avoided by completing the construction using trenchless technology. Impacts at the second crossing are unavoidable but would be temporary because the pipeline would be buried, and the wetland resources would be restored in place.

Complete avoidance of all wetland impacts would only be possible through the No-Build Alternative, which does not meet the Program purpose.

4.6.7.2 Minimization

Where construction of the DEIR Alternatives would involve unavoidable wetland impacts, all feasible minimization measures were evaluated and implemented. At all sites, proposed dewatering discharge splash pads would be located in an upland area where BVW does not occur along the waterway. Splash pads would not be oversized but appropriate for the anticipated flow volumes. Pipeline connection routes were chosen to utilize existing roadway or utility corridors, with wetland resource crossing locations at narrow portions of the wetland and at locations of existing culverts where feasible. No modifications to existing culverts are currently proposed, however replacement in-kind may be determined to be required as the Program progresses through final design.

4.6.7.3 Mitigation

In accordance with WPA and CWA requirements, mitigation would be provided for all proposed permanent wetland impacts. As a result of implementation of the avoidance measures described below, none of the proposed DEIR Alternatives involve permanent impacts to federally jurisdictional wetland resources, BVW, LUW/WW, ILSF, or Bank. Permanent unavoidable impacts would occur to RA and BLSF due to proposed top of shaft structures and discharge pipes and associated rip rap splash pads required for dewatering, to enable future tunnel maintenance. Mitigation for impacts to RA would include restoration and revegetation of disturbed areas outside the limits of the rip rap. Mitigation for BLSF impacts would include providing compensatory flood storage volume within the same floodplain sufficient to offset the volume of flood water displaced by the permanent dewatering discharge infrastructure.

Construction of the surface pipeline connection from the American Legion site to the existing water supply infrastructure would require unavoidable temporary impacts to BVW/VW in one location. This impact would be mitigated by restoring the wetland in-place, in-kind upon completion of pipeline construction.

Mitigation would also be provided for proposed impervious cover generated at Program sites. As described in **Section 4.6.1**, 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. LID and structural SCMs would be implemented at each site so that each site meets the Stormwater Standards.

The sections below describe specific steps taken towards avoidance and minimization and proposed mitigation under each of the DEIR Alternatives.

Alternative 3

Fernald Property Receiving

The proposed layout for the receiving shaft and staging area under Alternative 3 avoids all permanent direct wetland impacts at the Fernald Property, with the exception of unavoidable impacts to RA altered before the Program. The proposed outlet pipe for the groundwater discharge has been designed to minimize temporary impacts by providing adequate scour mitigation for anticipated flow volumes. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring in accordance with the 2022 NPDES CGP would avoid any temporary or permanent indirect effects.

Permanent wetland impacts associated with construction of the interconnection pipeline to WASM3 have been avoided by locating the pipe within the existing roadway layout of Chapel Street. The pipeline alignment would cross the intermittent stream on-site where the stream is contained within an existing culvert. No permanent impacts to the existing culverts are currently proposed, however replacement in-kind may be determined to be required as the Program progresses through final design. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring in accordance with the 2022 NPDES CGP would avoid temporary or permanent indirect effects due to pipeline construction.

Tandem Trailer/Park Road East Launching

The proposed layout for the launching shaft and staging area under Alternative 3 avoids all permanent direct wetland impacts at Tandem Trailer, with the exception of unavoidable impacts to RA previously altered by non-Program highway construction. The proposed outfall for the groundwater discharge has been designed to avoid temporary wetland impacts by discharging to Seaverns Brook where the waterway is within a constructed channel and no BVW is present. Unavoidable permanent impacts to RA and BLSF would occur due to the top of shaft structure and components of the groundwater discharge outfall, which would remain in the Final Condition. In order to minimize impacts to RA, the diameter of the proposed top of saft structure would be reduced. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring during construction in accordance with the 2022 NPDES CGP would avoid temporary or permanent indirect effects to wetland resources.

Bifurcation Launching

The proposed layout for the launching shaft and staging area under Alternative 3 avoids all permanent direct wetland impacts. The proposed outfall for the groundwater discharge has been designed to avoid temporary wetland impacts by discharging to Seaverns Brook where the Bank, LUW/WW, and BLSF consist of a concrete channel and no BVW is present. (For the purposes of compliance with WPA performance standards, it is assumed that the Bank of the concrete channel is not significant to the protection of wildlife habitat.) Temporary impacts to RA have been minimized because work would occur within areas previously disturbed by highway construction. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring in accordance with the 2022 NPDES CGP would avoid any temporary or permanent indirect effects to wetland resources.

Highland Avenue Northwest Launching

The proposed layout for the receiving shaft and staging area under Alternative 3 avoids all temporary and permanent direct wetland impacts. The proposed outfall for the groundwater discharge has been designed to minimize temporary and permanent wetland resource impacts by discharging to the Charles River where the Bank and BLSF consist of rip rap and no BVW is present. The temporary dewatering pipe would travel through the Highland Avenue Northwest site and under I-95 before connecting to the permanent discharge pipe, which would run through Brook Road, Wexford Street, and Fremont Street before reaching the Bank of the Charles River. The RA in the area consists of previously altered areas of roadway and commercial development.

Highland Avenue Northeast/Southeast Launching

The proposed layout for the launching shaft and staging area avoids under Alternative 3 all temporary and permanent direct wetland impacts. The proposed outfall for the groundwater discharge has been designed to minimize temporary and permanent wetland resource impacts by discharging to the Charles River where the Bank and BLSF consists of rip rap and no BVW is present. The permanent dewatering pipe would travel through the Highland Avenue Northeast site and under I-95, through Brook Road, Wexford Street, and Fremont Street before reaching the Bank of the Charles River. The RA in the area consists of previously altered areas of roadway and commercial development.

American Legion Receiving

The proposed layout for the receiving shaft and staging area avoids under Alternative 3 all permanent direct wetland impacts. The proposed outfall for the groundwater discharge has been designed to avoid temporary wetland impacts by discharging to Canterbury Brook where the waterway is within a constructed channel and no BVW is present. Temporary impacts to RA would occur within previously disturbed areas. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring in accordance with the 2022 NPDES CGP would avoid any temporary or permanent indirect effects to wetland resources.

Permanent wetland impacts associated with construction of the interconnection pipelines to Shaft 7C and existing watermains have been avoided because the pipeline would be buried, and the BVW/VW temporarily impacted during construction would be restored. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring in accordance with the 2022 NPDES CGP would avoid any temporary or permanent indirect effects due to pipeline construction.

Alternative 4

Fernald Property Receiving

The avoidance, minimization, and mitigation measures for the proposed receiving shaft, staging area, and pipeline connection to WASM3 at the Fernald Property under Alternative 4 are the same as described above for Alternative 3.

Tandem Trailer and Park Road East Launching

The avoidance, minimization, and mitigation measures for the proposed launching shaft, staging area, and dewatering at the Tandem Trailer site under Alternative 4 would be the same as described above for Alternative 3.

The avoidance, minimization, and mitigation measures for the proposed work at the Park Road East site under Alternative 4 would be the same as described above for Alternative 3.

Park Road West Receiving

The proposed layout for the receiving shaft and staging area at the Park Road West site under Alternative 4 avoids all permanent direct wetland impacts. The proposed outfall for the groundwater discharge has been designed to avoid temporary wetland impacts by discharging to the existing rip rap swale on site, as opposed to the adjacent BVW. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring in accordance with the 2022 NPDES CGP would avoid any temporary or permanent indirect effects to wetland resources.

Highland Avenue Northwest/Southwest Launching

The proposed layout for the launching shaft and staging area at the Highland Avenue Northwest and Highland Avenue Southwest sites under Alternative 4 avoids all temporary and permanent direct wetland impacts. The proposed outfall for the groundwater discharge has been designed to minimize temporary and permanent wetland resource impacts by discharging to the Charles River where the Bank and BLSF consists of rip rap and no BVW is present. The temporary dewatering pipe would travel under I-95 and through the Highland Avenue Northwest site before connecting to the permanent discharge pipe, which would run through Brook Road, Wexford Street, and Fremont Street before reaching the Bank of the Charles River. The RA and BLSF in the area consist of previously altered areas of roadway and commercial development.

Highland Avenue Northeast/Southeast Launching

The avoidance, minimization, and mitigation measures for the proposed launching shaft, staging area, and dewatering at the Highland Avenue Northeast/Southeast sites under Alternative 4 are the same as described above for Alternative 3.

American Legion Receiving

The proposed layout for the receiving shaft, staging area, and pipeline connections at the American Legion site under Alternative 4 avoids all permanent direct wetland impacts as described above for Alternative 3.

Alternative 10

Fernald Property Receiving

The avoidance, minimization, and mitigation measures for the proposed receiving shaft, staging area, and pipeline connection to WASM3 at the Fernald Property under Alternative 10 are the same as described above for Alternative 3.

Park Road West Large Connection

The proposed layout for large connector shafts and the two valve chambers that would connect to the Hultman Aqueduct avoids all permanent direct wetland impacts. The proposed outfall for the groundwater discharge has been designed to avoid temporary wetland impacts by discharging to the existing rip rap swale on site, as opposed to the adjacent BVW. This outfall is to remain following completion of construction to provide for a means of dewatering for future tunnel inspection and maintenance. Implementation of erosion and sedimentation BMPs and regular inspection and monitoring in accordance with the 2022 NPDES CGP would avoid any temporary or permanent indirect effects to wetland resources.

Highland Avenue Northwest/Southwest Launching

The proposed layout for the launching shaft and staging area at the Highland Avenue Northwest and Highland Avenue Southwest sites under Alternative 10 avoids all temporary and permanent direct wetland impacts, with the exception of unavoidable impacts to RA and BLSF previously altered by other development, as described above for Alternative 4.

Highland Avenue Northeast/Southeast Launching

The proposed layout for the launching shaft and staging area at the Highland Avenue Northeast and Highland Avenue Southeast sites under Alternative 10 avoids all temporary and permanent direct wetland impacts, with the exception of unavoidable impacts to RA and BLSF previously altered by other development, as described above for Alternative 3.

American Legion Receiving

The proposed layout for the receiving shaft, staging area, and pipeline connections at the American Legion site under Alternative 10 avoids all permanent direct wetland impacts as described above for Alternative 3.

Connection and Isolation Valve Sites

School Street Connection

The proposed layout for the connection shaft and staging area avoids all temporary and permanent direct wetland impacts. In accordance with the 2022 NPDES CGP, appropriate construction period controls would be implemented on site to prevent any potential offsite impacts.

St. Mary Street Pumping Station Connection

The proposed layout for the connection shaft and staging area avoids all temporary and permanent direct wetland impacts. In accordance with the 2022 NPDES CGP, appropriate construction period controls would be implemented on site to prevent any potential offsite impacts.

Newton Street Pumping Station Connection

The proposed layout for the connection shaft and staging area avoids all temporary and permanent direct wetland impacts. In accordance with the 2022 NPDES CGP, appropriate construction period controls would be implemented on site to prevent any potential offsite impacts.

Cedarwood Pumping Station Connection

The proposed layout for the connection shaft and staging area avoids all temporary and permanent direct wetland impacts. The interconnection to the Cedarwood Pumping Station would involve work within approximately 40 feet of the BVW areas to the south of the pumping station. No direct wetland alterations would occur in this area, and appropriate construction measures would be undertaken per the NPDES SWPPP to prevent siltation from occurring in the wetland as a result of the Program.

Hegarty Pumping Station Connection

The proposed impacts to RA due to the connection to the existing pumping station are unavoidable because the existing facility and associated piping to which the connection must be made are within the RA. The proposed layout for the connection shaft and staging area minimizes permanent RA impacts by siting the proposed shaft outside of the RA to the extent practicable. In accordance with the 2022 NPDES CGP, appropriate construction period controls would be implemented on-site to prevent potential offsite impacts. The proposed permanent RA impact of 866 square feet includes the top-of-the-meter vault, which would not significantly impair the ability of the area to protect the interests of the WPA.

Southern Spine Mains Connection

The proposed layout for the connection shaft and staging area avoids all temporary and permanent direct wetland impacts. In accordance with the 2022 NPDES CGP, appropriate construction period controls would be implemented on site to prevent any potential off-site impacts.

Hultman Aqueduct Isolation Valve

The proposed permanent and temporary impacts to RA due to the installation of the Isolation Valve are unavoidable. To achieve its intended function, the valve chamber must be located on the existing Hultman

Aqueduct to the east of the Bifurcation and to the west of Shaft 5/5A. The interchange ramp area represents the only feasible location of adequate size that is not already occupied by roadways. It is not feasible to shift the valve chamber location to avoid impacts to RA because the chamber must be sited on the alignment of the existing pipeline. Temporary impacts to the previously disturbed RA area would be mitigated by restoring and revegetating the area altered for construction. The proposed permanent RA impact of 3,130 square feet represents the paved access road, top of the valve chamber and access hatch, which would not significantly impair the ability of the area to protect the interests of the WPA.

4.6.7.4 Compliance with Wetlands Protection Act Performance Standards

The following section discusses Program compliance with the Massachusetts Wetlands Protection Act and associated Regulations in 310 CMR 10.00. Program construction would require the issuance of an Order of Conditions from the Waltham, Weston, Wellesley, Newton and Boston Conservation Commissions. It is anticipated that the Program would file a Notice of Intent in each of these municipalities identifying the project as a Limited Project in accordance with 310 CMR 10.53(3)(d) which applies to *"The construction, reconstruction, operation and maintenance of underground and overhead public utilities, such as electrical distribution or transmission lines, or communication, sewer, water and natural gas lines*…"

Pursuant to 310 CMR 10.53(3)(d), *"the Issuing Authority may issue an Order of Conditions and impose such conditions as will contribute to the interests identified in M.G.L. c. 131, § 40 permitting the following limited projects (although no such project may be permitted which will have any adverse effect on specified habitat sites of Rare Species, as identified by procedures established under 310 CMR 10.59). In determining whether to exercise its discretion to approve the limited projects listed in 310 CMR 10.53(3), the Issuing Authority shall consider the following factors: the magnitude of the alteration and the significance of the project site to the interests identified in M.G.L. c. 131, § 40, the availability of reasonable alternatives to the proposed activity, the extent to which adverse impacts are minimized, and the extent to which mitigation measures, including replication or restoration, are provided to contribute to the protection of the interests identified in M.G.L. c. 131, § 40*."

Under 310 CMR 10.53(3)(d), the following general conditions apply to a Public Utilities Limited Project:

1. *the issuing authority may require a reasonable alternative route with fewer adverse effects for a local distribution or connecting line not reviewed by the Energy Facilities Siting Council*;
2. *best available measures shall be used to minimize adverse effects during construction;*
3. *the surface vegetation and contours of the area shall be substantially restored; and*
4. *all sewer lines shall be constructed to minimize inflow and leakage.*

The Program includes work in WPA Inland Wetland resources identified as Bank, BVW, BLSF, LUW, and Riverfront Area, as well as the 100-foot buffer zone. As described in the following resource-specific discussions, all DEIR alternatives would satisfy general conditions 1-3 of the Limited Project provisions. General condition 4 is not applicable to the Program because no sewer lines are proposed.

Bank

As discussed above in **Section 4.6.5, Construction Period Impacts** and as shown in **Table 4.6-3**, **Table 4.6-5**, and **Table 4.6-7**, the Program would result in impacts to Bank along Clematis Brook, Seavern's Brook, the Charles River, and Canterbury Brook for installation of flared end discharge pipes and associated rip rap splash pads as a countermeasure against scour due to dewatering discharges.

The general performance standards for Bank are promulgated in 310 CMR 10.54(4)(a). These standards require that any proposed work on a Bank shall not impair the following:

1. The physical stability of the Bank;

The proposed discharge pipes and splash pads would not impair the physical stability of the Bank. These measures would reduce the possibility of undercutting and deterioration of the existing Bank due to dewatering discharge flows.

2. The water carrying capacity of the existing channel within the Bank;

The proposed scour countermeasures would not alter the carrying capacity of the waterways. The proposed scour countermeasures would largely be embedded and would not restrict flows or significantly affect the channel capacity.

3. Ground water and surface water quality;

The Program would have no impact on existing groundwater and surface water quality. Erosion and sedimentation controls and pre-treatment of all discharges are proposed to prevent any adverse water quality impacts due to discharges to the waterway.

4. The capacity of the Bank to provide breeding habitat, escape cover and food for fisheries;

The Program would not significantly alter the Bank's capacity to provide important fisheries habitat functions. The proposed scour countermeasures would not affect breeding habitat, cover or food sources.

5. the capacity of the Bank to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of Intent is filed on or after November 1,987, that (cumulatively) alter(s) up to 10% or 50 feet (whichever is less) of the length of the bank found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. In the case of a bank of a river or an intermittent stream, the impact shall be measured on each side of the stream or river. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.

The proposed work would not alter the Bank's capacity to provide important wildlife habitat functions. Wildlife passage within the waterways and along adjacent banks would be maintained to allow for terrestrial and aquatic animals to continue to travel along the stream banks and would not restrict access to the surface waters. Within a given municipality, none of the DEIR Alternatives would alter more than 50 linear feet of Bank found to be significant to the protection of wildlife habitat. For the purposes of this determination, it is assumed that the Bank of the concrete channel along Seaverns Brook at the Bifurcation site is not significant to the protection of wildlife habitat.

Bordering Vegetated Wetland

As discussed above in **Section 4.6.5 Construction Period Impacts** and as shown in **Table 4.6-3**, **Table 4.6-5**, and **Table 4.6-7**, the Program would result in approximately 116 square-feet of unavoidable, temporary alteration of BVW at the Fernald Property associated with construction of a dewatering discharge pipeline, and 1,558 square-feet of unavoidable, temporary alteration of BVW for installation of the connecting pipeline from the American Legion site to Shaft 7C.

The general performance standards for BVW are promulgated in 310 CMR 10.55(4) and are discussed below:

(a) Where the presumption set forth in 310 CMR 10.55(3) is not overcome, any proposed work in a Bordering Vegetated Wetland shall not destroy or otherwise impair any portion of said area.

Upon completion of construction, the pipelines would be buried and wetland resources would be restored to original conditions. Wetland resources would be replanted with a native wetland plant seed mix and native wetland trees and shrubs. There would be no permanent impact to BVW.

(b) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of up to 5000 square feet of Bordering Vegetated Wetland when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area would function in a manner similar to the area that would be lost:

1. the surface of the replacement area to be created ("the replacement area") shall be equal to that of the area that would be lost ("the lost area");

2. the ground water and surface elevation of the replacement area shall be approximately equal to that of the lost area;

3. The overall horizontal configuration and location of the replacement area with respect to the bank shall be similar to that of the lost area;

4. the replacement area shall have an unrestricted hydraulic connection to the same water body or waterway associated with the lost area;

5. the replacement area shall be located within the same general area of the water body or reach of the waterway as the lost area;

6. at least 75% of the surface of the replacement area shall be reestablished with indigenous wetland plant species within two growing seasons, and prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard U.S. Soil Conservation Service methods; and

7. the replacement area shall be provided in a manner which is consistent with all other General Performance Standards for each resource area in Part III of 310 CMR 10.00. In the exercise of this discretion, the issuing authority shall consider the magnitude of the alteration and the significance of the project site to the interests identified in M.G.L. c. 131, § 40, the extent to which adverse impacts can be avoided, the extent to which adverse

Not applicable. As discussed above, the Program would require work that would result in a total of 1,674 square-feet of temporary alteration of BVW. No loss of BVW is proposed. The temporarily disturbed areas of BVW would be restored to their original conditions after completion of work and revegetated. Separate wetland replacement areas are not required or proposed since on-site, in-kind restoration is provided.

In the exercise of this discretion, the issuing authority shall consider the magnitude of the alteration and the significance of the project site to the interests identified in M.G.L. c. 131, § 40, the extent to which adverse impacts can be avoided, the extent to which adverse impacts are minimized, and the extent to which mitigation measures, including replication or restoration, are provided to contribute to the protection of the interests identified in M.G.L. c. 131, § 40.

c) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of a portion of Bordering Vegetated Wetland when;

1. said portion has a surface area less than 500 square feet;

2. said portion extends in a distinct linear configuration ("finger-like") into adjacent uplands; and

3. in the judgment of the issuing authority it is not reasonable to scale down, redesign or otherwise change the proposed work so that it could be completed without loss of said wetland.

Not applicable. No loss of BVW is proposed.

(d) Notwithstanding the provisions of 310 CMR 10.55(4)(a),(b) and (c), no project may be permitted which would have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

Not applicable. The DEIR Alternative's launching, receiving and connection sites are not within any Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife as regulated by NHESP.

(e) Any proposed work shall not destroy or otherwise impair any portion of a Bordering Vegetated Wetland that is within an Area of Critical Environmental Concern designated by the Secretary of Energy and Environmental Affairs under M.G.L. c. 21A, § 2(7) and301 CMR 12.00: Areas of Critical Environmental Concern.

Not applicable. None of the Program sites are located within an Area of Critical Environmental Concern.

Land Under Water Bodies and Waterways

As discussed above in **Section 4.6.5 Construction Period Impacts** and as shown in **Table 4.6-3**, **Table 4.6-5**, and **Table 4.6-7**, the Program would result in impacts to LUW associated with Clematis Brook, Seavern's Brook, the Charles River, and Canterbury Brook for installation of flared end discharge pipes and associated rip rap splash pads as a countermeasure against scour due to dewatering discharges.

The Program would fully comply with all performance standards for LUW. The regulations for LUW (310 CMR 10.56(4)) list general performance standards which require that work within LUW not impair any of the following:

(a) The water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks;

The proposed scour countermeasures would not alter the carrying capacity of the waterways.

(b) Ground and surface water quality;

The Program would have no impact on existing groundwater and surface water quality. Erosion and sedimentation controls and pre-treatment of all discharges are proposed to prevent any adverse water quality impacts due to discharges to the waterway.

(c) The capacity of said land to provide breeding habitat, escape cover and food for fisheries;

The Program would not significantly alter the capacity of the LUW to provide important fisheries habitat functions.

(d) The capacity of said land to provide important wildlife habitat functions.

The proposed work would not alter the capacity of LUW to provide important wildlife habitat functions. Wildlife passage within the waterways and along adjacent banks would be maintained to allow for terrestrial and aquatic animals to continue to travel along the stream banks and would not restrict access to the surface waters. Within a given municipality, none of the DEIR Alternatives would alter more than 5,000 square feet of LUW found to be significant to the protection of wildlife habitat.

310 CMR 10.56(4)(c) states:

"Notwithstanding the provisions of 310 CMR 10.56(4)(a) or (b), no project may be permitted which would have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

Not applicable. The DEIR Alternative's launching, receiving and connection sites are not within any Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife as regulated by NHESP.

Bordering Land Subject to Flooding

As discussed above in **Section 4.6.5 Construction Period Impacts** and as shown in **Table 4.6-3**, **Table 4.6-5**, and **Table 4.6-7,** the Program 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.

The general performance standards for BLSF are promulgated in 310 CMR 10.57(4)(a) and are discussed below.

1. *Compensatory storage shall be provided for all flood storage volume that would be lost as the result of a proposed project within BLSF, when in the judgment of the issuing authority said loss would cause an increase or would contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows.*

Compensatory storage shall mean a volume not previously used for flood storage and shall be incrementally equal to the theoretical volume of flood water at each elevation, up to and including the 100-year flood elevation, which would be displaced by the proposed project. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or water body. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of the river, stream or creek.

As discussed above in **Section 4.6.5 Construction Period Impacts** the Program would result in a permanent alteration of approximately 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 as a result of constructing dewatering discharge pipes and associated rip rap splash pads. 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.

2. Work within BLSF, including that work required to provide the above-specified compensatory storage, shall not restrict flows so as to cause an increase in flood stage or velocity.

Work within BLSF would not restrict flows so as to cause an increase in flood stage or velocity at any location. The proposed scour countermeasures would largely be embedded and would not restrict or significantly affect flood flows.

3. Work in those portions of BLSF found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important wildlife habitat functions.

The proposed work would not alter the capacity of BLSF to provide important wildlife habitat functions. Wildlife passage within the waterways and along adjacent banks would be maintained to allow for terrestrial and aquatic animals to continue to travel along the stream banks and would not restrict access to the surface waters. Within a given municipality, none of the DEIR Alternatives would alter more than 5,000 square feet of BLSF found to be significant to the protection of wildlife habitat.

Riverfront Area

As discussed above in **Section 4.6.5 Construction Period Impacts** the Program would involve work within RA at the Fernald Property and Tandem Trailer site for temporary construction staging and permanent top of shaft structures, valve chambers, parking, access roads, dewatering discharge pipes, and associated rip rap splash pads. Work within RA at the Charles River would be required for permanent dewatering discharge pipes (originating at the Highland Avenue Northwest or Highland Avenue Northeast sites) and associated rip rap splash pads. Additionally, the Hegarty Pumping Station connection requires work within the 200' RA associated with Rosemary Brook.

As demonstrated below, work proposed in the Riverfront Area complies with the requirements contained in 310 CMR 10.58(4):

Where the presumption set forth in 310 CMR 10.58(3) is not overcome, the applicant shall prove by a preponderance of the evidence that there are no practicable and substantially equivalent economic alternatives to the proposed project with less adverse effects on the interests identified in M.G.L. c.131 § 40 and that the work, including proposed mitigation, would have no significant adverse impact on the riverfront area to protect the interests identified in M.G.L. c. 131 § 40. In the event that the presumption is partially overcome, the issuing authority shall make a written determination setting forth its grounds in the Order of Conditions and the partial rebuttal shall be taken into account in the application of 310 CMR 10.58 (4)(d)1.a. and c.; the issuing authority shall impose conditions in the Order that contribute to the protection of interests for which the riverfront area is significant.

4.6.7.5 Alternatives Analysis

As stated in 310 CMR 10.58(4)(c), work within the RA requires that:

There must be no practicable and substantially equivalent economic alternative to the proposed project with less adverse effects on the interests identified in M.G.L. c. 131 § 40.

As discussed in the Environmental Notification Form and **Chapter 3, Alternatives**, the development of Program alternatives included a rigorous screening process to identify potential launching, receiving, and connecting sites that would avoid and minimize environmental impacts. Further avoidance of impacts to wetland resources was considered when identifying proposed construction areas within selected sites. Proposed Program construction has been located outside of jurisdictional areas to the extent feasible given site constraints and Program requirements. Shafts, valve chambers and pipeline connection facilities are not proposed within the 100' RA at any sites. Permanent impacts proposed within the 100' RA at the Fernald Property, Tandem Trailer, and Bifurcation and 25' RA at American Legion are due to the rip rap splash pads, which would not be practicable to locate outside of RA because dewatering discharges must be conveyed to an existing surface water.

The access road to the Hultman Aqueduct is within the 100' RA because the existing highway ramp from which it originates is within the RA. Given the location of the existing facilities, it would not be feasible to avoid these impacts. At the Hultman Aqueduct Isolation Valve, to achieve its intended function, the valve chamber must be located on the existing Hultman Aqueduct to the east of the Bifurcation and to the west of Shaft 5/5A. The interchange ramp area represents the only feasible location of adequate size that is not already occupied by roadways. It is not feasible to shift the valve chamber location to avoid impacts to RA because the chamber must be sited on the alignment of the existing pipeline, which is entirely within RA in this location.

Permanent facilities within 200' RA are proposed at the Fernald Property, Tandem Trailer, Hegarty Pumping Station and Hultman Aqueduct Isolation Valve. At the Fernald Property, the permanent facilities within 200' RA consist of the top of shaft structure, valve chamber, and associated access road, which would be located within a previously degraded and largely impervious portion of the site. Alternative locations for these facilities would mainly impact less-disturbed RA or were not found practicable given requirements for the connection to WASM3 and constraints identified by the City of Waltham for future uses of the site. The permanent facilities within 200' RA at Tandem Trailer under Alternatives 3 and 4 consist of the top of shaft structure and access road, which would both be located within a previously disturbed portion of the site. Alternative locations for these elements would impact less-disturbed RA or were not found practicable given MassDOT's requirement that the existing tandem trailer parking facilities be retained on site. At Hegarty Pumping Station, impacts within 200' RA are due to installation of the near surface pipeline for the connection to the existing water distribution infrastructure, which is also located within the RA.

4.6.7.6 No Significant Adverse Impact

As stated in 310 CMR 10.58(4)(d), work within the RA requires that:

The work, including proposed mitigation measures, must have no significant adverse impact on the riverfront area to protect the interests identified in M.G.L. c. 131, § 40.

According to the provisions of this regulation, *"the issuing authority may allow the alteration of up to 5000 square feet or 10% of the riverfront area within the lot, whichever is greater*," subject to the following:

a. At a minimum, a 100 foot wide area of undisturbed vegetation is provided. This area shall extend from mean annual high-water along the river unless another location would better protect the interests identified in M.G.L. c. 131 § 40. If there is not a 100 foot wide area of undisturbed vegetation within the riverfront area, existing vegetative cover shall be preserved or extended to the maximum extent feasible to approximate a 100 foot wide corridor of natural vegetation. Replication and compensatory storage required to meet other resource area performance standards are allowed within this area; structural stormwater management measures may be allowed only when there is no practicable alternative. Temporary impacts where necessary for installation of linear site-related utilities are allowed, provided the area is restored to its natural conditions. Proposed work which does not meet the requirement of 310 CMR 10.58(4)(d)1.a. may be allowed only if an applicant demonstrates by a preponderance of evidence from a competent source that an area of undisturbed vegetation with an overall average width of 100 feet would provide equivalent protection of the riverfront area, or that a partial rebuttal of the presumptions of significance is sufficient to justify a lesser area of undisturbed vegetation;

Existing conditions at Program sites do not include a 100-foot-wide area of undisturbed vegetation within the RA. During construction, existing vegetation will be retained to the extent feasible. In the Final Conditions, the Program would restore a minimum 100'-wide vegetated area within the RA at all sites except the American Legion. At the American Legion site, the 25' RA would be restored to the extent feasible. As shown in **Table 4.6-14** for all DEIR Alternatives the Program would permanently impact less than 10 percent of the RA at a given site in the Final Conditions. Temporary impacts during the construction-period would exceed the 10 percent impact threshold at the Fernald Property, Tandem Trailer site and the Highland Avenue discharge location.

Table 4.6-14 ***RFA Impacts Summary***

Shaft Site	Total Site RA (sf)	Temporary Impacts (sf)	Temporary Impacts (% of Total Site RA)	Permanent Impacts (sf)	Permanent Impacts (% of Total Site RA)
Alternative 3					
Fernald Property Receiving	663,376	115,352	17%	12,310	2%
Tandem Trailer/Park Road East Launching	660,728	105,722	16%	1,685	0.3%
Bifurcation Launching	660,728	33,987	5%	0	0%
Hultman Aqueduct Isolation Valve	194,548	7,836	4%	2,989	2%
Hegarty Pumping Station Connection	76,198	5,757	8%	157	0.2%
Highland Avenue Northeast/Southeast Launching	17,428	4,322	25%	0	0%
American Legion Receiving (25' RFA)	13,015	845	6%	0	0%
Alternative 4					
Fernald Property Receiving	663,376	115,352	17%	12,310	2%
Tandem Trailer/Park Road East Launching	660,728	105,722	16%	1,685	0.3%
Hultman Aqueduct Isolation Valve	194,548	7,836	4%	2,989	2%
Hegarty Pumping Station Connection	76,198	5,757	8%	157	0.2%
Highland Avenue Northeast/Southeast Launching	17,428	4,322	25%	-	0%
American Legion Receiving (25' RFA)	13,015	845	6%	-	0%
Alternative 10					
Fernald Property Receiving	663,376	115,352	17%	12,310	2%
Hultman Aqueduct Isolation Valve	194,548	7,836	4%	2,989	2%
Hegarty Pumping Station Connection	76,198	5,757	8%	157	0.2%
Highland Avenue Sites	17,428	4,322	25%	-	0%
American Legion Receiving (25' RFA)	13,015	845	6%	-	0%

b. Stormwater is managed according to standards established by the Department in its Stormwater Policy.

As described below in **Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards**, stormwater management measures at all Program sites would be designed to meet or exceed the standards established by the DEP.

c. Proposed work does not impair the capacity of the riverfront area to provide important wildlife habitat functions. Work shall not result in an impairment of the capacity to provide vernal pool habitat identified by evidence from a competent source, but not yet certified. For work within an undeveloped riverfront area which exceeds 5,000 square feet, the issuing authority may require a wildlife habitat evaluation study under 310 CMR 10.60.

As discussed above for other wetland resources, the Program would not impair the area's ability to provide important wildlife habitat functions in the Final Conditions. No vernal pools are present on or near the Program sites.

d. *Proposed work shall not impair groundwater or surface water quality by incorporating erosion and sedimentation controls and other measures to attenuate nonpoint source pollution.*

As discussed above for other wetland resources, erosion and sedimentation controls and pre-treatment of all discharges are proposed to prevent any adverse water quality impacts due to discharges to the waterway.

4.6.7.7 Redevelopment

As demonstrated below, work proposed in the Riverfront Area complies with the requirements contained in 310 CMR 10.58(5):

Notwithstanding the provisions of 310 CMR 10.58(4)(c) and (d), the issuing authority may allow work to redevelop a previously developed riverfront area, provided the proposed work improves existing conditions … Work to redevelop previously developed riverfront areas shall conform to the following criteria:

(a) At a minimum, proposed work shall result in an improvement over existing conditions of the capacity of the riverfront area to protect the interests identified in M.G.L. c. 131 § 40. When a lot is previously developed but no portion of the riverfront area is degraded, the requirements of 310 CMR 10.58(4) shall be met.

Work proposed in the RA in the Final Conditions would improve existing conditions with respect to the capacity of the RA on the Program Sites. As described in **Section 4.6.5 Construction Period Impacts** the work would protect the interests described in the WPA by providing for restoration and revegetation of existing previously disturbed or degraded RA at all Program sites. The proposed permanent top of shaft structures, top of valve chambers and access hatches would not significantly impair the ability of the areas to protect the interests of the WPA.

(b) Stormwater management is provided according to standards established by the Department.

As described below in **Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards**, stormwater management measures at all Program sites would be designed to meet or exceed the standards established by the DEP.

(c) Within 200-foot riverfront areas, proposed work shall not be located closer to the river than existing conditions or 100 feet, whichever is less, or not closer than existing conditions within 25-foot riverfront areas, except in accordance with 310 CMR 10.58(5)(f) or (g).

The Program would require work within the 200-foot riverfront area at the Fernald Property (Alternatives 3, 4, and 10) and Tandem Trailer site (Alternatives 3 & 4) for temporary construction staging and permanent top of shaft structures, valve chambers, parking, access roads, and dewatering discharge pipes and associated rip rap splash pads. At the Fernald Property and Hegarty Pumping Station, the connection to the existing water distribution infrastructure would also require work within RA. At each location, the RA has been previously altered by other development and the proposed work is not closer than existing conditions.

(d) Proposed work, including expansion of existing structures, shall be located outside the riverfront area or toward the riverfront area boundary and away from the river, except in accordance with 310 CMR 10.58(5)(f) or (g).

The proposed work does not include any expansion of existing structures. All permanent facilities have been located outside of the 100' RA to the extent feasible. Upon completion of construction, site restoration would be provided at a minimum ratio of 1:1 for restored area to area of alteration in accordance with 310 CMR 10.58(5)(f).

(e) The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area, except in accordance with 310 CMR 10.58(5)(f) or (g).

In the Final Conditions, the proposed work area would not exceed the amount of degraded area and upon completion of construction, site restoration would be provided at a minimum of ratio of 1:1 for restored area to area of alteration in accordance with 310 CMR 10.58(5)(f).

(f) When an applicant proposes restoration on-site of degraded riverfront area, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), and (e) at a ratio in square feet of at least 1:1 of restored area to area of alteration not conforming to the criteria. Areas immediately along the river shall be selected for restoration. Alteration not conforming to the criteria shall begin at the riverfront area boundary.

As described above, in the Final Conditions the Program is anticipated to meet the criteria of 310 CMR 10.58(5)(c), (d) and (e). If it is determined that the criteria cannot be met, mitigation would be identified to provide an area of sufficient size to achieve a ratio of at least 2:1 of mitigation area to area of alteration.

(g) When an applicant proposes mitigation either on-site or in the riverfront area within the same general area of the river basin, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), or (e) at a ratio in square feet of at least 2:1 of mitigation area to area of alteration not conforming to the criteria or an equivalent level of environmental protection where square footage is not a relevant measure.

As described above, in the Final Conditions the Program is anticipated to meet the criteria of 310 CMR 10.58(5)(c), (d) and (e). If it is determined that the criteria cannot be met, mitigation would be identified to provide an area of sufficient size to achieve a ratio of at least 2:1 of mitigation area to area of alteration.

(h) The issuing authority shall include a continuing condition in the Certificate of Compliance for projects under 310 CMR 10.58(5)(f) or (g) prohibiting further alteration within the restoration or mitigation area, except as may be required to maintain the area in its restored or mitigated condition. Prior to requesting the issuance of the Certificate of Compliance, the applicant shall demonstrate the restoration or mitigation has been success fully completed for at least two growing seasons.

The Program would complete post-construction monitoring for at least two growing seasons after completion of construction to demonstrate that the restoration has been successfully completed and would thereafter request Certificates of Compliance.

Buffer Zone

As identified in 310 CMR 10.53(1) of the WPA regulations*, "the issuing authority should consider the characteristics of the buffer zone, such as the presence of steep slopes, that may increase the potential for adverse impacts on resource areas. Conditions may include limitations on the scope and location of work in the buffer zone as necessary to avoid alteration of resource areas. The issuing authority may require erosion and sedimentation controls during construction, a clear limit of work, and the preservation of natural vegetation adjacent to the resource area and/or other measures commensurate with the scope and location of the work within the buffer zone to protect the interests of the Act."*

The proposed Program has been designed to address these requirements. As described above in **Section 4.6.5 Construction Period Impacts**, an erosion and sedimentation control program as described in the contractor's NPDES CGP SWPPP would be implemented to prevent adverse impacts during construction. Limits of work would be clearly marked in the field and temporary construction fencing would be installed within the buffer zone to protect unimpacted resource area. Upon completion of construction, areas of disturbed buffer zone would be restored and revegetated.

4.6.7.8 Compliance with MassDEP Stormwater Management Standards

This section describes how the Program would comply with the MassDEP Stormwater Management Standards. Note that MassDEP is currently revising the standards, and the Program would adhere to the most recent version of the standards during the design process.

Standard 1. *No new stormwater conveyance (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

There would be no direct discharge of untreated stormwater to nearby wetlands or waters of the Commonwealth. Five permanent outfalls are anticipated to be installed at Highland Avenue Northeast/Northwest, Tandem Trailer, Bifurcation, Fernald, and American Legion sites, however these outfalls will be designed to convey dewatering water and will not discharge any untreated stormwater to the receiving waters.

Standard 2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed predevelopment peak discharge rates.*

To ensure the Program would not adversely impact the surrounding area, the stormwater management systems would be designed to mitigate peak runoff rates in accordance with the Massachusetts Stormwater Handbook. The stormwater management systems would be designed such that post-development peak discharge rates do not exceed predevelopment peak discharge rates.

Standard 3. *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low-impact development techniques, stormwater management practices, and good operation and maintenance. At a minimum, the annual* *recharge from the post-development site shall approximate the annual recharge from predevelopment conditions based on soil types. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

During the design stage, soils data would be reviewed to determine predevelopment annual recharge volumes. To maintain compliance with Standard 3, the stormwater management systems would be designed to infiltrate the required recharge volume as determined based on soils data and requirements of the Massachusetts Stormwater Handbook. If infiltration SCMs are proposed, test pits would be performed to determine infiltration rates at each site.

Standard 4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).*

The Program would be designed to meet the water quality requirements of Standard 4 using on-site treatment trains that would achieve 80 percent TSS removal. SCMs designed for stormwater quality treatment would be sized to capture and treat the first inch of runoff from the proposed impervious surfaces. Proposed catch basins would have deep sumps and hoods to capture and detain sediments. Proposed SCMs and catch basins would be inspected and maintained to ensure proper water-quality treatment of stormwater runoff. These stormwater control measures associated with Standard 4 would also support the goals of the Charles River TMDL by reducing phosphorus loads from the site through stormwater treatment. For more information on the Charles River TMDL, see **Section 4.6.4**.

Standard 5. *For land uses with higher potential pollutant loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.*

Under Final Conditions, none of the sites would be considered LUHPPLs.

Standard 6. *Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resource Waters, shellfish beds, swimming beaches, coldwater fisheries, and recharge areas for public water supplies.*

The proposed SCMs would comply with the Massachusetts Stormwater Handbook for discharges near and to Critical Areas. There are two Critical Areas near the Program sites that potentially receive dewatering and stormwater runoff:

Bifurcation Launching – This site is within the Zone I and II wellhead protection areas to public water supply wells (Nickerson Field G.P. Well [Source ID 3333000-03G] and Route 128 G.P. Well [Source ID 3333000-04G]). These wells, however, have an inactive status.

Tandem Trailer and Park Road East Launching – This site is within the Zone II wellhead protection areas to public water supply wells (Nickerson Field G.P. Well [Source ID 3333000-03G] and Route 128 G.P. Well [Source ID 3333000-04G]). These wells, however, have an inactive status.

At all sites, not just at Bifurcation, Tandem Trailer, and Park Road East, stormwater management systems would be designed to capture and treat the first inch of runoff through LID and structural SCMs.

Standard 7. *Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.*

The DEIR Alternatives sites are considered a mix of new development and redevelopment and would meet the stormwater management standards accordingly.

Standard 8. *A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction-period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

SWPPP(s) would be developed, and coverage under the 2022 NPDES CGP for Stormwater Discharges would be obtained prior to construction. The SWPPP(s) would address the requirements of Standard 8.

Standard 9. *A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

A Long-Term Pollution Prevention Plan would be developed for the sites to comply with the requirements of this standard. The plan would outline source control, pollution prevention, and good house-keeping measures and maintenance requirements of the SCMs and drainage features associated with the Program.

Standard 10. *All illicit discharges to the stormwater management system are prohibited.*

There would be no illicit discharges to the proposed stormwater management systems associated with the Program. If any illicit connections to sites that have existing stormwater management systems are identified during construction, those connections would be removed from the stormwater management systems. The Program’s compliance with Standard 10 supports the goals of the Charles River bacteria TMDL by reducing bacteria loads from the site. For more information on the Charles River TMDL, see **Section 4.6.4**.

This page intentionally left blank

4.7 Cultural and Historic Resources

The Secretary's Certificate requires a comprehensive analysis of the Program's potential environmental impacts for cultural and historical resources, including the identification of measures to avoid, minimize, and mitigate these impacts. This section presents the regulatory framework, methodology, existing conditions, impact assessment, and avoidance and minimization measures for historic resources. Draft Environmental Impact Report (DEIR) Alternatives 3, 4, and 10 are evaluated for their impacts on properties within the 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).

Three properties within the Program APE—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.

4.7.1 Resource Definition

A historic property is defined as those listed in the State Register of Historic Places as defined by Massachusetts General Law (MGL), Chapter 9, Section 26c, or those considered eligible for inclusion in the State Register. In addition to properties nominated and/or listed directly in the State Register, the State Register includes:

- Properties listed in, or formally determined eligible for listing in, the National Register
- Locally designated historic landmarks and districts
- Historic properties subject to a preservation easement held by the Massachusetts Historical Commission (MHC)

4.7.2 Regulatory Framework

The Program is subject to State Register Review (MGL, Chapter 9, Section 26-27c, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00) by the MHC. In addition, should the Program receive federal funding at a later date, it would be subject to MHC review under Section 106 of the National Historic Preservation Act (NHPA), as amended (36 CFR 800).

In a letter dated April 27, 2021, the MHC responded to the ENF on the Program requesting further information about the locations and boundaries of the geotechnical investigation areas so that the commission could provide comments to assist, avoid, minimize, or mitigate any adverse effects to historic and archaeological resources. The additional information was provided in a submittal separate from this section on April 28, 2021. In a letter dated May 20, 2021, MHC acknowledged receipt of the submittal and determined that the investigation would have no adverse effect on the nearby resources provided the

MWRA implement protective measures for the Hegarty Street Pumping Station. On April 1, 2022, the MWRA sent details on the proposed locations of the second geotechnical investigation to MHC, and the commission responded with a determination of no effect on May 3, 2022. Subsequently, staff of the MHC reviewed draft Cultural Resources and Archaeological Assessments, in a letter dated September 9, 2022, opined that the proposed demolition of buildings listed as contributing elements to the Walter E. Fernald State School Historic District would constitute an adverse effect on the district. The letter indicated that "the MHC would consult with the MWRA to identify ways to eliminate, minimize or mitigate the adverse effects to the Walter E. Fernald State School Historic District." See **Appendix E** for copies of correspondence with MHC**.**

4.7.3 Methodology

4.7.3.1 Area of Potential Effects (APE)/Study Area

APEs for the Program were based on the definition used in Section 106, where it is defined as "…the geographic area within which the undertaking may cause changes in the character of or use of historic properties if any such properties exist" [36 CFR 800.16(d)]. The establishment of a Program APE is based on the potential for effects, both direct (from construction) and indirect (noise, vibration, visual, etc.) and would differ for above-ground historic properties (historic districts, buildings, objects, and structures) and below-ground historic properties (archaeological sites). Only above-ground properties are considered in this section.

The first step in shaping the APE boundary at each launching, receiving, connection, and isolation valve site was to identify a preliminary Study Area based on the anticipated final conditions at each site. Proposed permanent structures would include shafts and valve chambers, which would be topped with concrete that is expected to rise not more than 3 feet above grade. Infrastructure on the concrete may include low railings and air vents, and the latter are anticipated to be about 5 feet tall. Metal fencing around the permanent structures would likely be about 8 feet high. A Study Area of 400 feet around the limits of work was assumed to account for potential visual effects associated with the Program at all sites. 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, surface piping areas were omitted in the creation of the Study Area, and the APE in these spaces extends only to the boundaries of the LOD. At all sites, visibility of and from the sites was considered in determining the more precise APE boundaries within the Study Area. Boundaries were drawn where views were blocked by:

- Intervening development
- Vegetation (such as trees and thick brush)
- Geographical features (such as slopes)

Fieldwork was undertaken to verify visibility. The APE for each location is shown in **Figure 4.7-1** through **Figure 4.7-16**.

4.7.3.2 Desktop Study

A desktop study was carried out to identify known historic properties within the Program APE. The Massachusetts Cultural Resource Information System (MACRIS) online database and GIS mapping tool, which serves as the repository for the Inventory of the Historic and Archaeological Assets of the Commonwealth (the Inventory) maintained by the MHC, was reviewed. MHC's Inventory is a compilation of districts, sites, buildings, structures, and objects that have been previously surveyed. Properties included in the Inventory may or may not have been previously evaluated or determined eligible for inclusion in the National or State Registers. MACRIS was reviewed to identify inventoried properties, and copies of inventory and National Register nomination forms were obtained for all properties within the Program APE.

4.7.3.3 Fieldwork

Fieldwork consisted of site visits to each location during the winter and spring of 2022 to document existing resources and verify APE boundaries based on visual inspection. Previously identified inventoried and designated historic properties were field verified, and photographs were taken to assess and document each property's current historical integrity. Views to and from the project sites, both within and near the APE, were taken to help illustrate the setting of each location and show which historic properties could be visually impacted by the Program. The photographs are included in **Appendix E**. The fieldwork survey was conducted entirely within the public right-of-way (ROW) and did not access private property. When views of buildings were visually impeded by vegetation or distance, municipal assessment records and property cards were used to collect information on existing buildings.

4.7.3.4 Evaluation of Eligibility

The results of the field survey and research, in addition to guidelines in the Programmatic Memorandum of Agreement (PMOA)[1] between MWRA and MHC, provided the information to develop the recommendations in this section. This information was used to assess whether a property or area would meet the criteria for listing in the State/National Registers. Although the Program is a state action, National Register criteria were used as a widely recognized framework to evaluate potential historic properties.

Established by the National Park Service (NPS), the criteria are broadly defined to encompass the wide range of resources and kinds of significance that would qualify properties for listing in the State/National Register. State agencies, including MWRA and MHC, generally use the criteria in evaluating the eligibility of historic properties during State Register Review.

1 The PMOA summarizes the intention of MWRA to cooperate with MHC in minimizing impacts to historic resources. It includes a complete list of the buildings and structures under the care and control of MWRA and identifies those that are listed in or eligible for listing in the State Register. It also indicates the resources that are exempt from review due to age, and those that are not historically significant. The document streamlines the MHC consultation process by establishing whether certain activities are exempt or nonexempt from review and identifying other general principles and procedures.

According to the NPS, the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, association, and that meet one or more of the following criteria:

- Criterion A: are associated with events that have made a significant contribution to the broad patterns of history; or
- Criterion B: are associated with the lives of persons significant in our past; or
- Criterion C: embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- Criterion D: have yielded, or may be likely to yield, information important to prehistory or history.

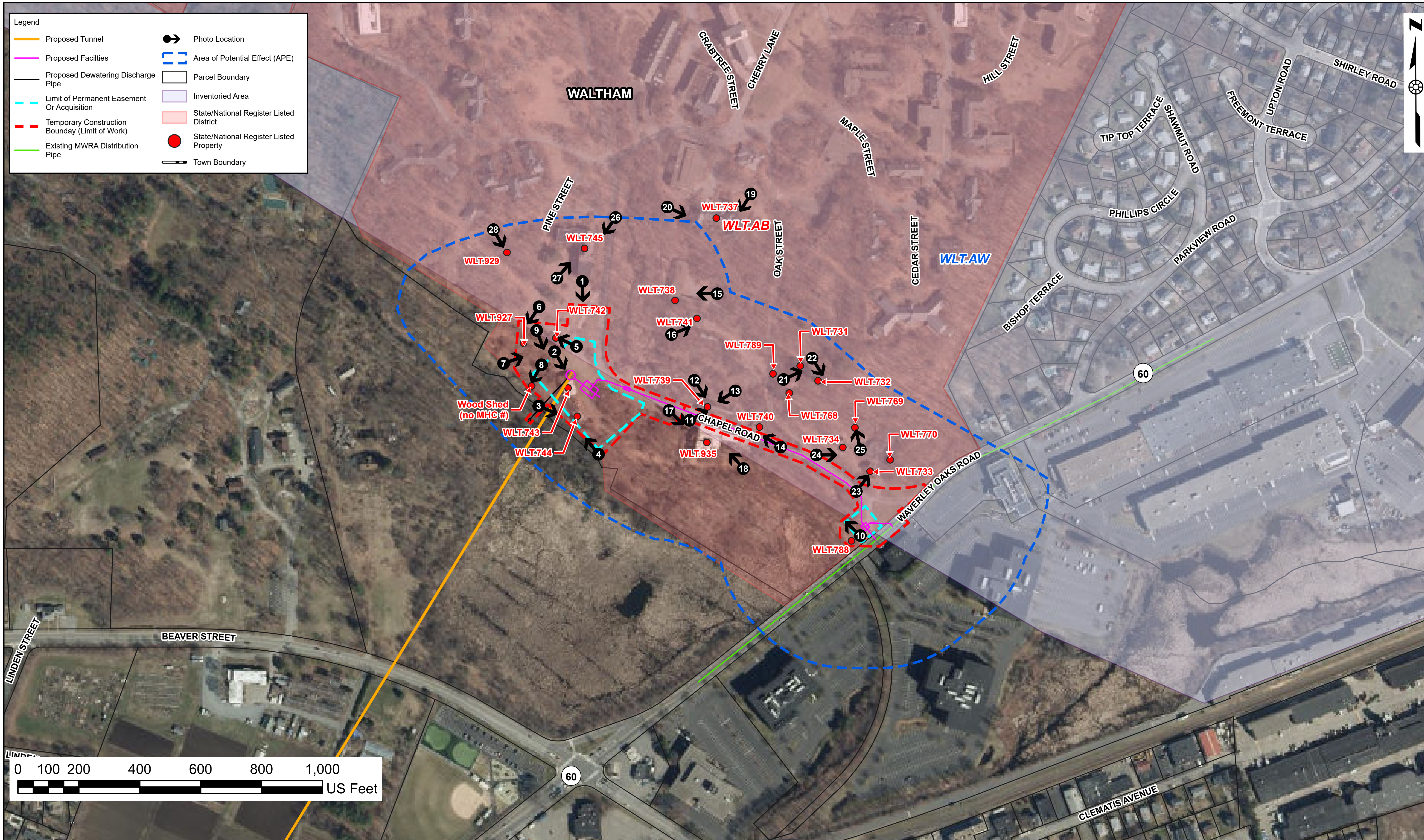
In most circumstances, properties that have achieved significance within the past 50 years are not eligible for the State/National Register.

The discussion for each site only includes properties that have been listed in, or are determined eligible for listing in, the State/National Register(s). Inventoried properties were evaluated for the Program, and those that exhibited potential eligibility are identified as "eligible" in this section. Although MHC frequently provides opinions on the eligibility of unlisted properties, this does not equate to a formal determination, and therefore such properties were not considered eligible in the context of the Program. While the inventoried properties that appear to be ineligible are not described in detail, they are listed in the tables for each site. Photographs of each of the properties are presented in **Appendix E** and keyed to the maps in **Figure 4.7-1** through **Figure 4.7-16**.

4.7.3.5 Archaeological Resources

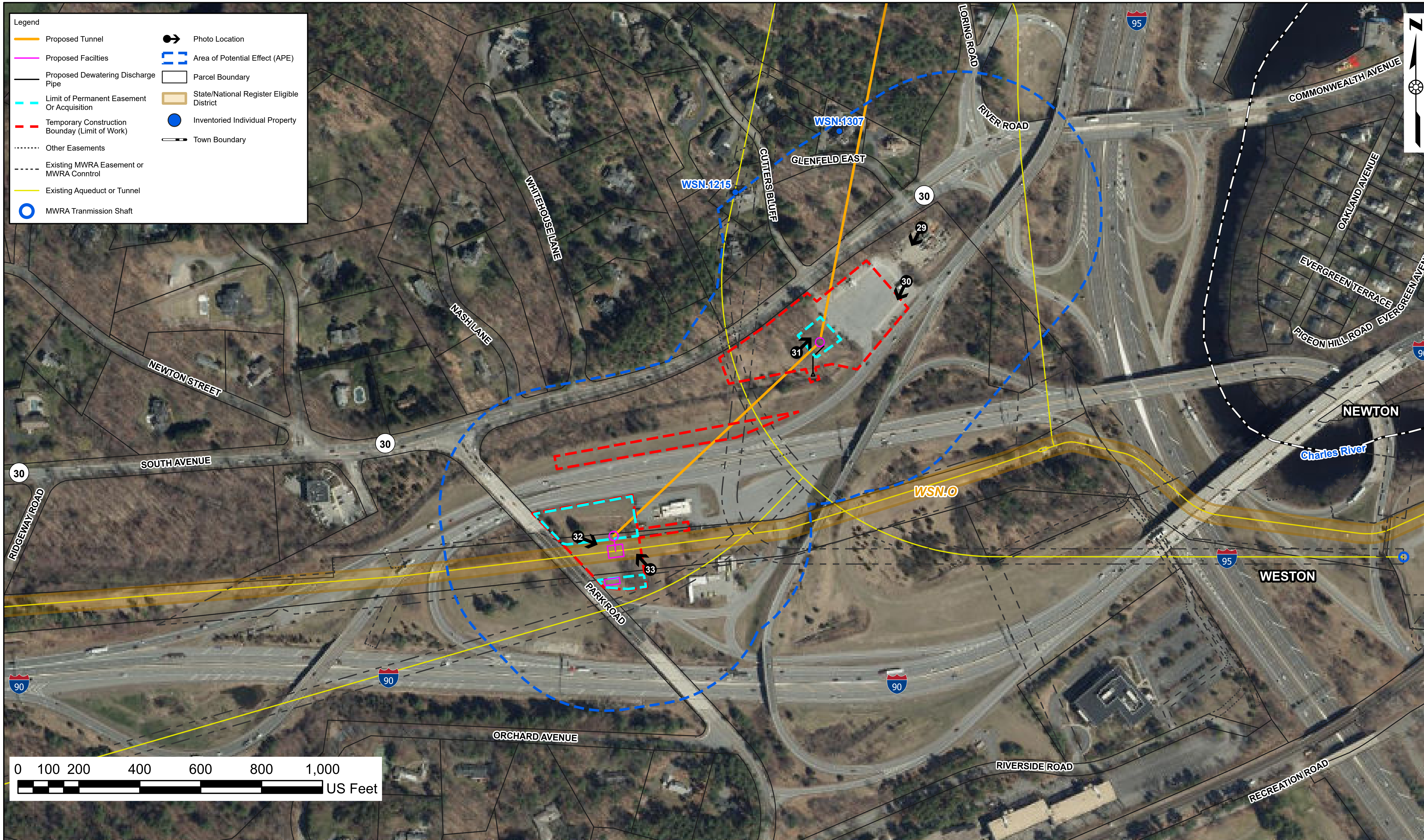
Gray & Pape, Inc. completed an archaeological assessment of launching, receiving, and connection sites associated with the Program. The assessment used historical and archaeological research and walkover surveys to understand the history of land use and existing conditions at each site. Due to extensive landscape disturbance at each site, the assessment concluded that none of the sites were archaeologically sensitive and recommended no further archaeological investigation. The MHC will review the report results and concur with the findings or request additional information.

The MWRA will prepare an Inadvertent Discovery Plan (IDP), in the event that any unanticipated discoveries are made during construction, A draft IDP will be included in the Final EIR.



Metropolitan Water Tunnel Program	MWRA Contract No. 7159 Draft Environmental Impact Report	CDM Smith in association with vhb; Jacobs; Green International Affiliates, Inc.	Cultural Resources Fernald Property Receiving Figure 4.7-1
			Waltham, MA — Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

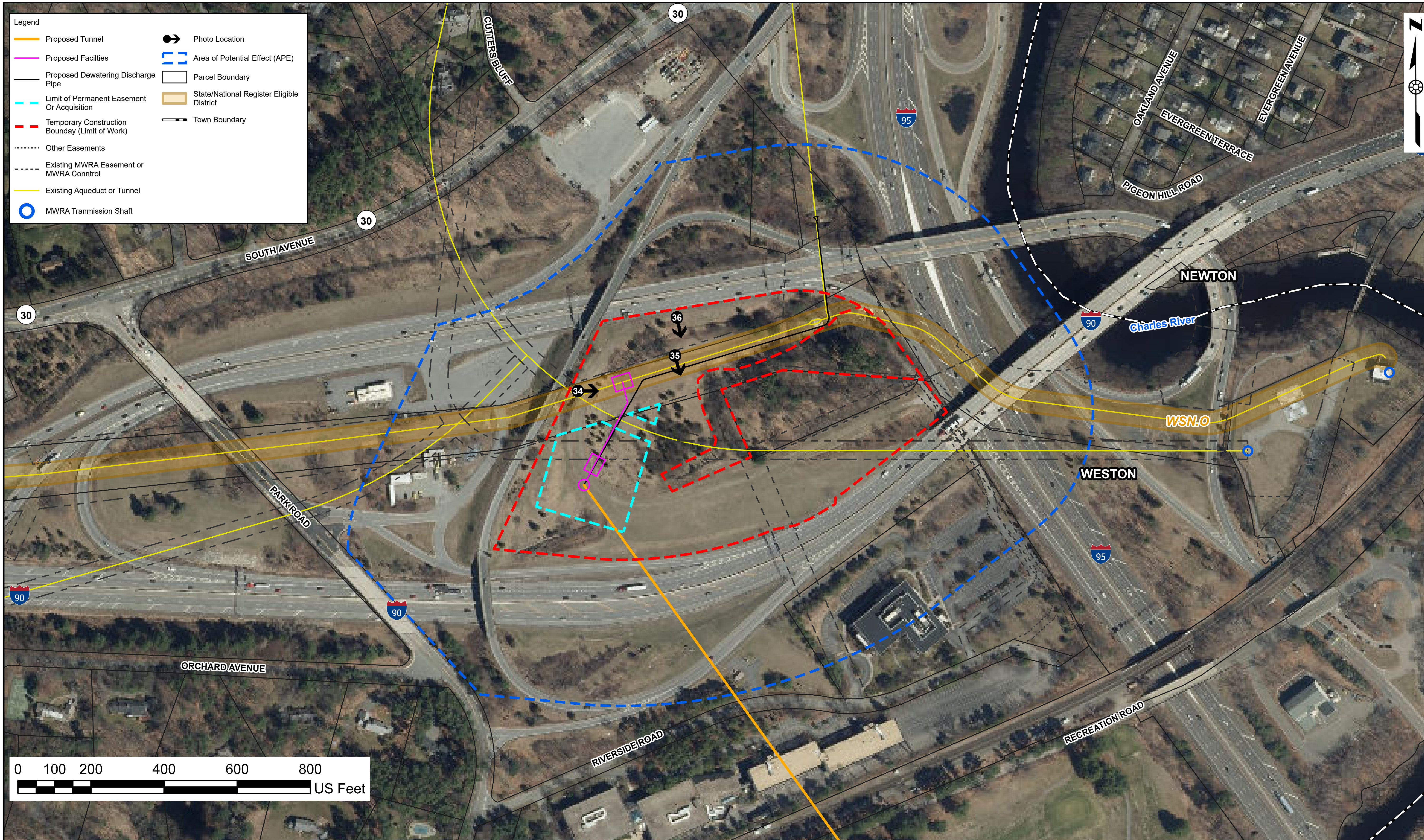
CDM Smith in association with vhb
Jacobs GREEN

Cultural Resources
Tandem Trailer/Park Road East Launching
Figure 4.7-2

Weston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

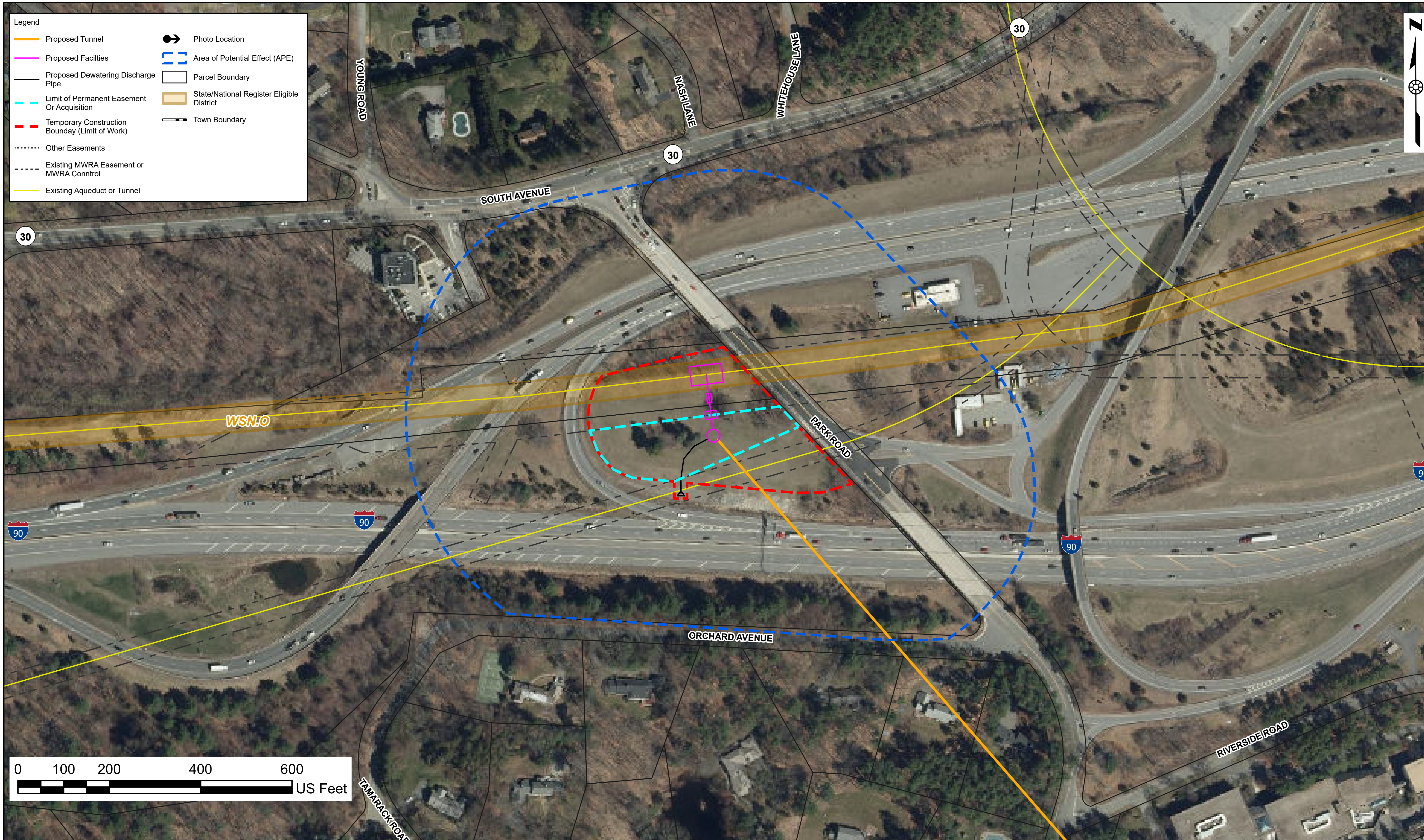
MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Cultural Resources
Bifurcation Launching
Figure 4.7-3
Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

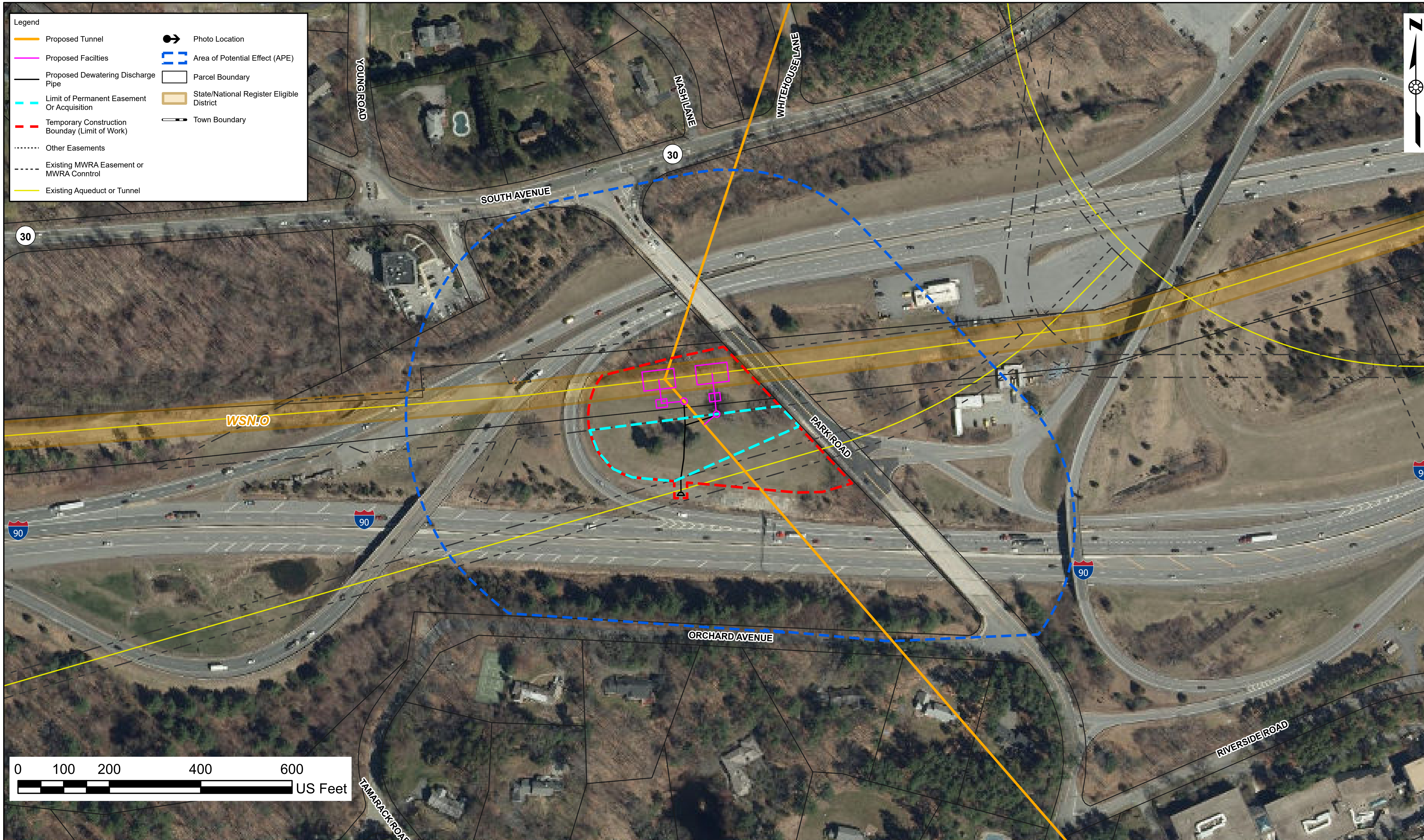
CDM Smith
in association with
vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Cultural Resources
Park Road West Receiving
Figure 4.7-4

Weston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Cultural Resources
Park Road West Large Connection
Figure 4.7-5
Source: MassGIS, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Cultural Resources
Highland Avenue Northwest Receiving
Figure 4.7-6

Needham, MA

Source: MassGIS, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Needham, MA

Cultural Resources
Highland Avenue Northwest/Southwest Launching
Figure 4.7-7

Source: MassGIS, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

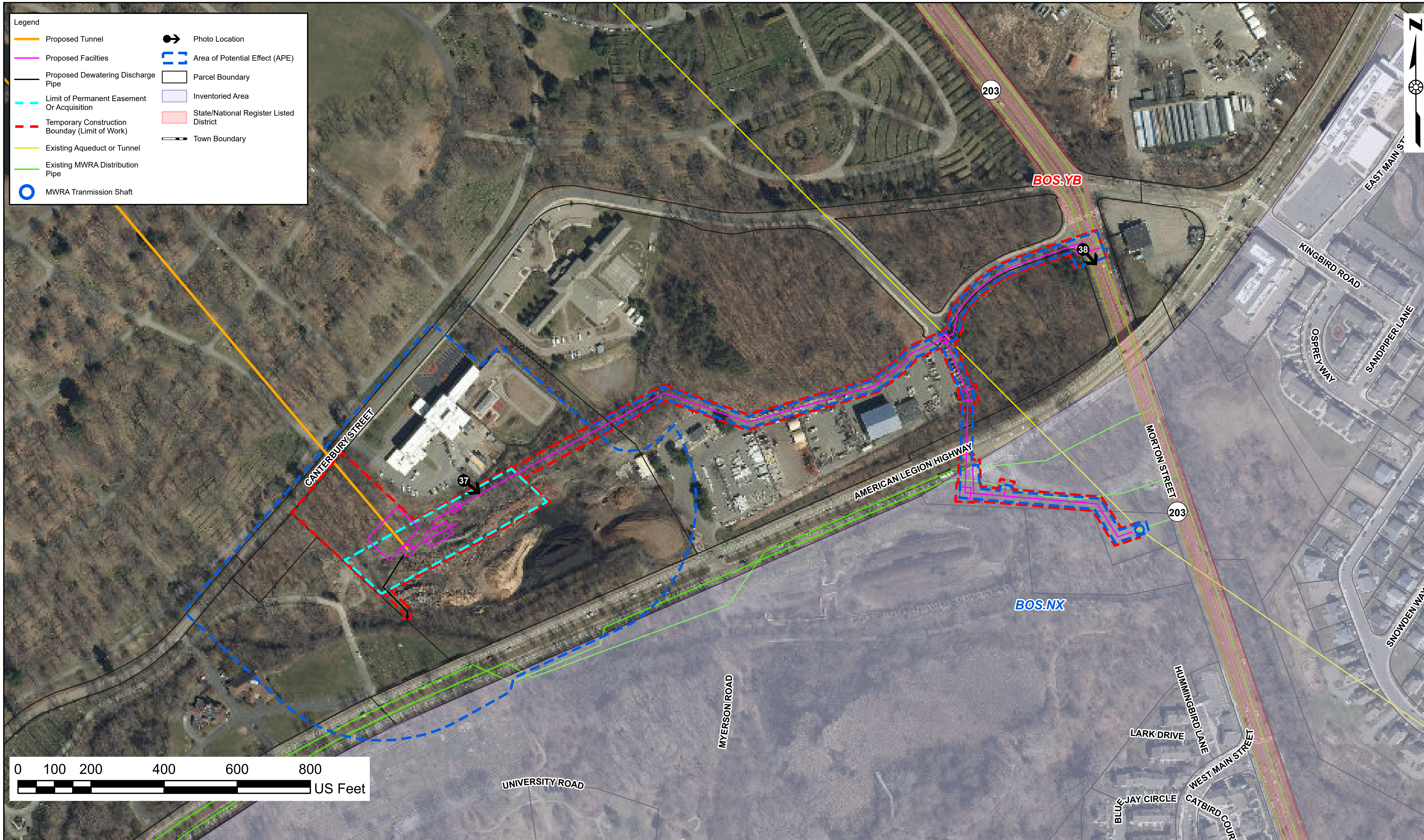
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Cultural Resources
Highland Avenue Northeast/Southeast Launching
Figure 4.7-8

Needham, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

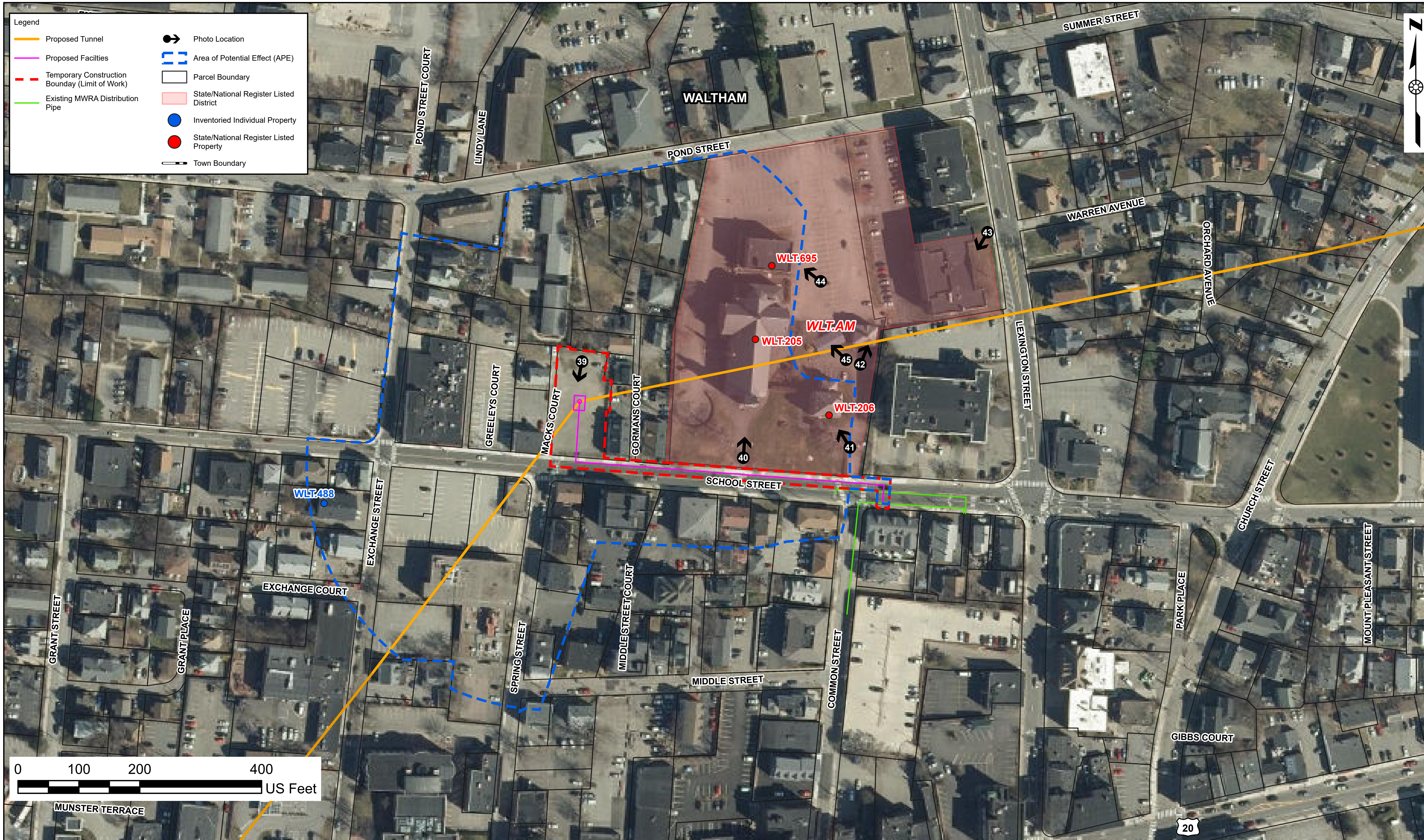
CDM Smith in association with vhb
Jacobs GREEN

Cultural Resources
American Legion Receiving
Figure 4.7-9

Boston, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

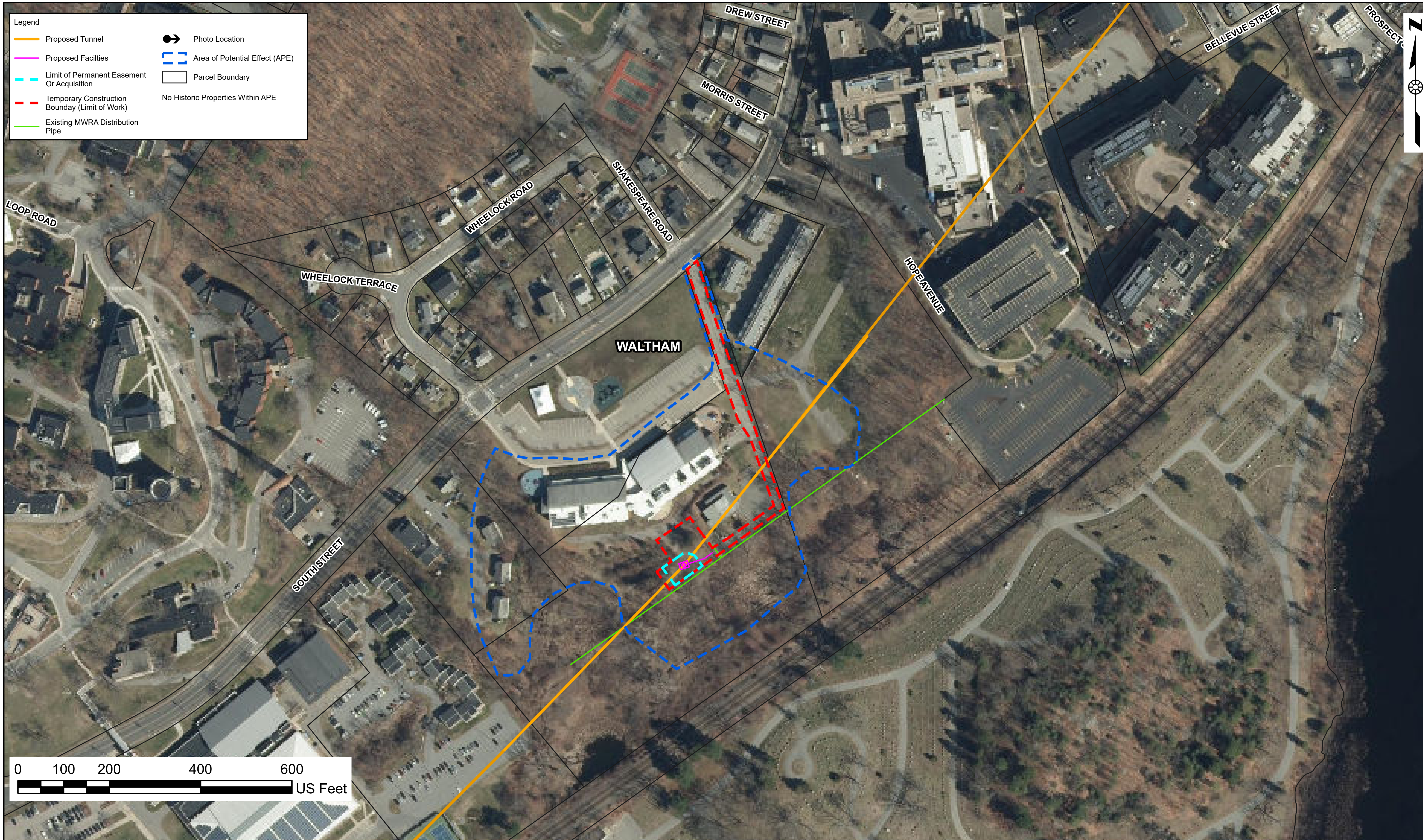
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, MA

Cultural Resources
School Street Connection
Figure 4.7-10

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

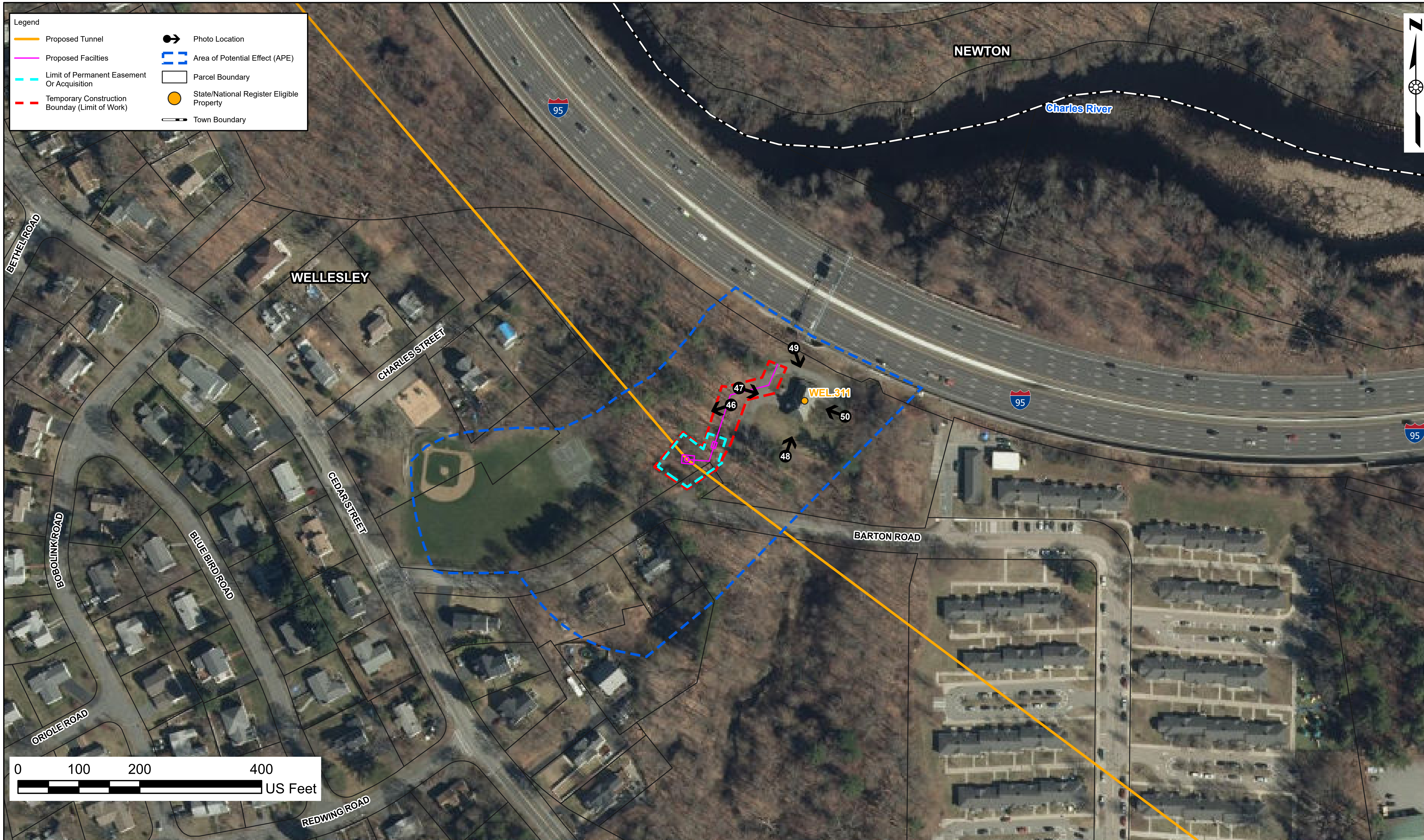
CDM Smith
in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Cultural Resources
Cedarwood Pumping Station Connection
Figure 4.7-11

Waltham, MA

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wellesley, MA

Cultural Resources
Hegarty Pumping Station Connection
Figure 4.7-12

Source: MassGIS, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Needham, MA

Cultural Resources
St. Mary Street Pumping Station Connection
Figure 4.7-13

Source: MassGIS, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

Brookline, MA

Cultural Resources
Newton Street Pumping Station Connection
Figure 4.7-14

Source: MassGIS, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

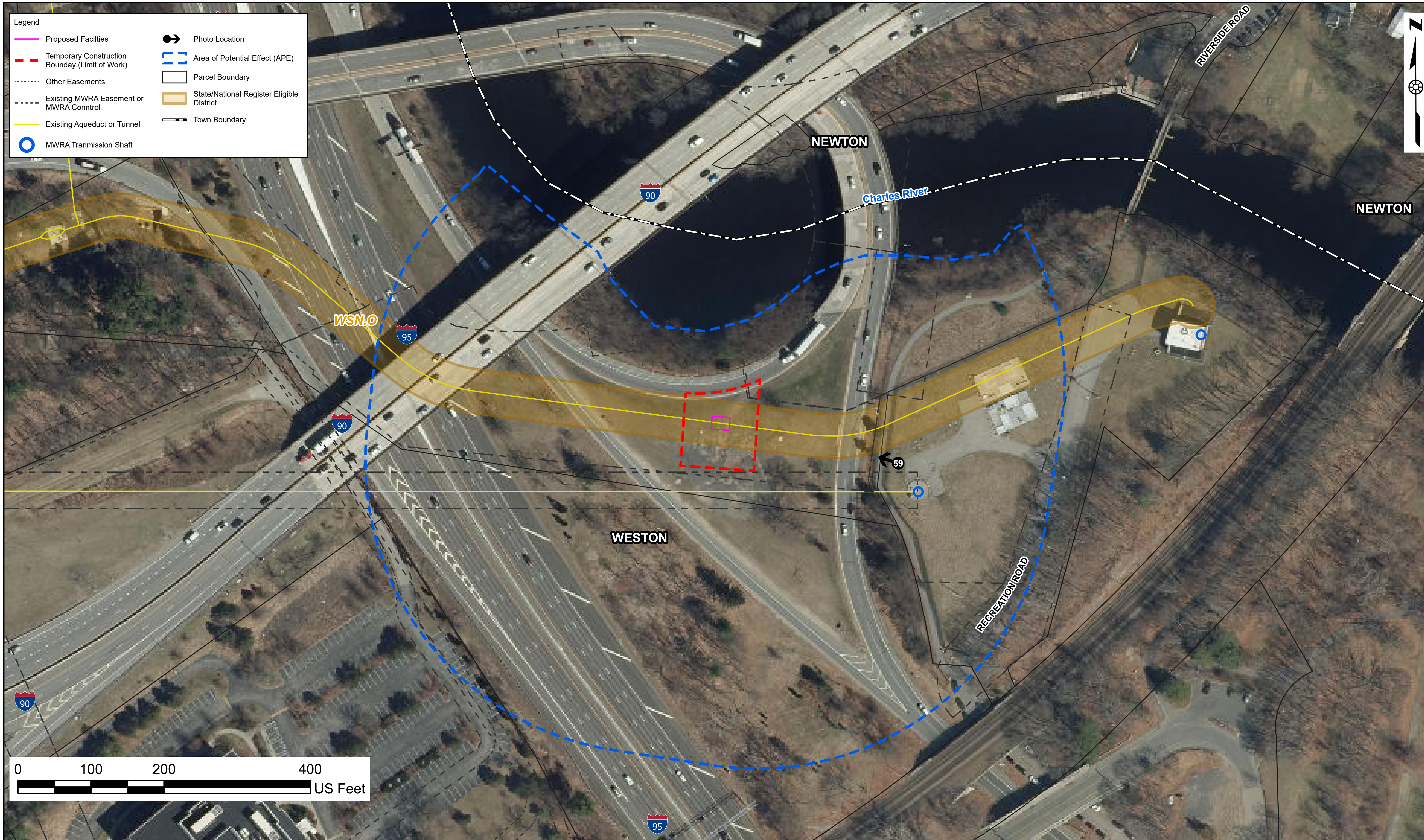
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Boston, MA

Cultural Resources
Southern Spine Mains Connection
Figure 4.7-15

Source: MassGIS, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Cultural Resources
Hultman Aqueduct Isolation Valve
Figure 4.7-16

Weston, MA

Source: MassGIS, MWRA

This page intentionally left blank

4.7.4 Existing Conditions

The DEIR Alternatives include launching, receiving, connection, and isolation valve sites. Proposed work at each site depends on their proposed uses, which can vary at the same site depending on alternatives. The discussion of historic properties within the APEs is organized by site. For each site, the discussion includes a short description of the setting, a summary of resources included in MACRIS 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).

Select photographs of the sites and properties within the APEs that are listed in or eligible for the State/National Register(s) are included in **Appendix E**, and the photograph locations are keyed to maps on **Figure 4.7-1** through **Figure 4.7-16**. Photograph numbers that pertain to each site location's discussion are cross-referenced in the text and can be found in **Appendix E**.

4.7.4.1 Launching and Receiving Sites

This section describes historic properties within the APEs for launching and receiving sites used in all three DEIR Alternatives. The sites used in each Alternative are summarized below in **Table 4.7-1**.

Table 4.7-1 Launching and Receiving Sites Used in Alternatives

Site	Alternative 3	Alternative 4	Alternative 10
Fernald Property	X	X	X
Tandem Trailer/Park Road East	X	X	
Bifurcation	X		
Park Road West		X	X[1]
Highland Avenue Northwest/ Southwest	X	X	X
Highland Avenue Northeast/ Southeast	X	X	X
American Legion	X	X	X

1 In Alternative 10, Park Road West serves as a Large Connection site

Fernald Property

The Fernald Property (Photos 1-28) is located northeast of Waltham's city center within the approximately 190-acre Walter E. Fernald State School (MHC number WLT.AB; Fernald School). The property is bordered by commercial, industrial, and residential land use to the east, the Beaver Brook North Reservation to the north, and Bentley University and the University of Massachusetts College of Agriculture to the west and south. The site is at the southeast edge of the Walter E. Fernald State School district boundary, where buildings are surrounded by wooded areas and a substantial hill that rises to the north. It encompasses the east section of Chapel Road from its intersection with Waverley Oaks Road, and to the west it includes a cleared and wooded area containing several buildings on the south side of Chapel Road (see Photo 1). At the Fernald Property, the APE boundary was created with reference to the visibility limitations imposed by the dense tree cover on most sides of the proposed construction area (see **Figure 4.7-1**). Historic resources that are located within the Fernald Property APE (most of which are also within the Fernald School historic district) are included in **Table 4.7-2**.

Table 4.7-2 ***Historic Properties Within the APE at the Fernald Property***

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

Source: 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 Each 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 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, and it was also included in the National Register Multiple Property Submission (NRMPS) for Massachusetts State Hospitals and State Schools at the same time. Funded by the state legislature, it was the first publicly supported institution of its type in North America. It grew quickly in size and reputation, and in 1887 the state legislature paid $18,000 for the new campus in Waltham, which was designed with reference to the existing landscape and sun exposure. Pupils were transferred there from South Boston between 1890 and 1891, and they took part of a mix of classroom education, manual training for boys and domestic education for girls, and recreational activities. The school had strong connections with local communities and institutions, including programs with medical students at Tufts University, Harvard College, and Boston University. There was also a formal parole or vocational system that allowed students outside placements. The school enjoyed an international reputation for decades, and it reflected major shifts in scientific trends and clinical approaches over the years. Much of this success is owed to the leadership of three important superintendents—Samuel Gridley Howe, Edward Jarvis, and Walter E. Fernald—all of whom were active between 1848 and 1924. Major building programs took place between 1895 and 1925 and after 1972, when a court order to improve services prompted new construction and upgrades to existing buildings, along with an improved student-to-staff ratio. In the 2000s, the institution became a center for adults with mental disabilities, and the last patient was discharged in 2014. In summary, the school's primary significance lies in the fact that it was representative of the development of the State Hospital and School System in Massachusetts.

Individual contributing and noncontributing resources within the Walter E. Fernald State School (WLT.AB) that are also in the Fernald Property APE are listed in **Table 4.7-3** below. Some are within or adjacent to the Program's limits of work, but others have been included so they could be assessed for possible visual effects.

Table 4.7-3 Individual Resources Within both the Walter E. Fernald State School Historic District (WLT.AB) and the APE

MHC #	Property Name	Date of Construction	In/Adjacent to Limits of Work	Contributing to 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	No
WLT.734	Cottage #20 – Staff Residence	1925	Yes	Yes	No
WLT.737	Lavers Hall	1914	No	Yes	No
WLT.738	Maintenance	1930	No	Yes	No
WLT.739	Greenhouse	ca. 1940	Yes	No	Potentially [1]
WLT.740	Electric Substation	ca. 1960	Yes	No	Potentially
WLT.741	Engineer's Storage	ca. 1930	No	Yes	No
WLT.742	Stucco Shed	ca. 1920	Yes	Yes	Yes
WLT.743	Metal Shed	ca. 1970	Yes	No	Yes
WLT.744	Concrete Block Garage	ca. 1950	Yes	No	Yes
WLT.745	Tarbell Hall	1934	No	Yes	No
WLT.768	Garage	ca. 1950	No	No	No
WLT.769	Garage	ca. 1930	No	Yes	No
WLT.770	Garage	1955	No	No	No
WLT.788	Shed	ca. 1970s	Yes	No	Yes
WLT.789	Concrete Shed	ca. 1970s	No	No	No
WLT.927	Barn Foundation	ca. 1900	Yes	Yes	Yes
WLT.929	Cast Iron Fence	ca. 1890s	No	Yes	No
WLT.935	Power Plant	1921	Yes	Yes	No
N/A	Shed (wood)	ca. 1920	Yes	Yes	Yes

Source: MACRIS
N/A: None assigned
[1] "Potentially" indicates that demolition may be needed if the road is widened

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 physical condition of the buildings has declined since 1994, with graffiti, broken windows, and masonry damage and collapse found throughout the property. The poor condition of the buildings diminishes, but does not eliminate, the significance of the structures under Architecture, because they are still recognizable as institutional buildings from various time periods. Thus, the condition of the original contributing individual resources has not made them noncontributing, and the Fernald School retains Significance in the Areas of Architecture, Health/Medicine, and Social History for the purposes of the Program.

The Walter E. Fernald State School 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. All but one of the contributing individual resources (which is outside the APE) were constructed within this period of significance, and all but three of the noncontributing resources were constructed after 1940. All the structures in the latter category are ca. 1930 garages, and one of them (WLT.769) is within the Program APE. The nomination form does not indicate why the garages were considered noncontributing; therefore, the one in the Fernald Property APE (WLT.769) was reevaluated for the Program. Its brick side elevations and cast stone quoins are typical of 1930s garages, as is the fact that it is banked into a hill to the rear (see Photo 25). For these reasons, the garage is considered to contribute to the Walter E. Fernald State School historic district in the context of the Program. After similar reevaluations of the other structures within the APE, their original statuses as contributing or noncontributing were retained.

Tandem Trailer and Park Road East

The Tandem Trailer site is an irregularly shaped site in Weston bordered by a wooded area to the southwest, ramps associated with I-90 and I-95 to the southeast, and South Avenue to the north (see Photos 29-31). It contains a mostly flat, partially paved area for the use of tandem trailer truck storage and transit, and the land descends on the west side of the site into wooded space. There is a residential area to the north up a hill across South Avenue.

The Park Road East site is located to the southwest across other I-90 ramps, and it is bordered by Park Road on the west and highway infrastructure on all other sides (see Photos 32 and 33). It is made up of a grassy area that rises to the south, and the Hultman Aqueduct (WSN.O) passes through its center. The site is generally surrounded by transportation infrastructure.

As it is in an open area, the Tandem Trailer/Park Road East site APE generally follows the boundary of the Study Area (see **Figure 4.7-2**). However, it has been minimally restricted to account for views blocked by trees. Historic resources within the Tandem Trailer/Park Road East site APE are included in **Table 4.7-4**.

Table 4.7-4 Historic Properties Within the APE at the Tandem Trailer and Park Road East Sites

MHC #	Property Name [1]	Address	Date	Designation(s)
WSN.O	Hultman Aqueduct	N/A	1938-1940	Eligible
WSN.1215	N/A	4 Cutter's Bluff	1900	INV
WSN.1307	Shaw Brothers House	6 Glenfield East	1900	INV

Source: MACRIS INV: Inventory of Historic and Archaeological Assets of the Commonwealth

1 Each 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.

Hultman Aqueduct (WSN.O)

The Hultman Aqueduct is an 18-mile-long pressurized water supply conduit that extends from Marlborough near the Wachusett Aqueduct terminal chamber to a point near the Charles River in Weston (see Photo 36). It was added to the Inventory in 1985, and it is considered eligible for listing in the National

Register according to the terms of the 1994 MWRA PMOA.[2] The aqueduct was built between 1938 and 1940 after a 1937 report prepared by the Metropolitan District Water Supply Commission and the Department of Public Health.[3] Its purpose was to bypass the Sudbury Reservoir, which had become increasingly polluted, and bring clean water from the Wachusett Reservoir to the Metropolitan Water District. For these reasons, the aqueduct is significant under Criterion A in the Areas of Community Planning and Development and Politics/Government. It is also significant under Criterion C in the Areas of Architecture and Engineering, as it is representative of period water infrastructure techniques.

Bifurcation Site

The Bifurcation site (Photos 34-36) is an irregularly shaped area in Weston bordered by Interstate 95 (I-95) to the east and Interstate 90 (I-90) and its associated ramps on all other sides (see Photos 34 and 35). It is generally surrounded by transportation infrastructure, but there are office buildings to the south across I-90. The site is mostly flat at the south and center, with a narrow low area containing the Hultman Aqueduct (WSN.O) on its north side. The aqueduct is flanked by small, steep hills to the north and south. The site contains wooded areas in the center and along the north boundary, and there are also several informal dirt roads. As the site is in an open area, its APE generally follows the boundary of the Study Area (see **Figure 4.7-3**). However, the APE has been restricted to the northwest and southwest to account for views blocked by highway infrastructure. Historic resources within the Bifurcation site APE are included in **Table 4.7-5**.

Table 4.7-5 Historic Properties Within the APE at the Bifurcation Site

MHC #	Property Name	Address	Date	Designation(s)
WSN.O	Hultman Aqueduct	N/A	1938-1940	Eligible

Source: MACRIS
INV: Inventory of Historic and Archaeological Assets of the Commonwealth

Park Road West

The Park Road West site is an irregularly shaped area in Weston bordered by I-90 to the south, associated ramps to the west and north, and Park Road to the east. It contains a grassed area with small clumps of trees, and it is bisected by the Hultman Aqueduct (WSN.O). The site is surrounded on most sides by transportation infrastructure, but there is also a residential area to the north up a hill across South Avenue. As the site is in an open area, the Park Road West site APE generally follows the boundary of the Study Area (see **Figure 4.7-4** and **Figure 4.7-5**). However, it excludes some areas to the south where trees would block views. Historic resources within the Park Road West site APE are included in **Table 4.7-6**.

2 "Programmatic Memorandum of Agreement between the Massachusetts Water Resources Authority and the Massachusetts Historical Commission," (Boston: Massachusetts Historical Commission, 1994).

3 The full title of the report is "Special Report of the Metropolitan District Water Supply Commission and the Department of Public Health Relative to Improvements in Distribution and to Adequate Protection of Pollution of Sources of Water Supply within the Metropolitan Water District."

Table 4.7-6 Historic Properties Within the APE at the Park Road West Site

MHC #	Property Name	Address	Date	Designation(s)
WSN.O	Hultman Aqueduct	N/A	1938-1940	Eligible

Source: MACRIS
INV: Inventory of Historic and Archaeological Assets of the Commonwealth

Highland Avenue Northwest/Southwest and Northeast/Southeast

The Highland Avenue sites (Northwest, Southwest, Northeast, Southeast) are grassed areas in the quadrants of a cloverleaf interchange in Needham. The western quadrants contain small stands of trees. The surrounding area has been densely developed, mostly with commercial businesses. The APEs for all the Highland Avenue sites exclude some areas near the edges of the Study Areas due to substantial development and, in some cases, vegetation. No Highland Avenue sites contain historic resources (see **Figure 4.7-6** through **Figure 4.7-8**).

American Legion

The American Legion site (Photos 37-38) is an irregularly shaped area located behind 450 Canterbury Street in Boston. It is comprised of a landscaping area at the top of a small hill used by Landscape Express to the east at 415 American Legion Highway, along with bordering woods to the north, south, and west. St. Michael Cemetery (not included in the Inventory) is further to the southwest, and Forest Hills Cemetery (BOS.XA, not in the APE) is to the north across Canterbury Street. The Boston Nature Center is to the south across American Legion Highway on land previously occupied by the Boston State Hospital (BOS.NX). At the American Legion site, the APE boundary was created with reference to the visibility limitations imposed by the trees on most sides of the construction area, as well as the large building at 450 Canterbury Street (see **Figure 4.7-9**). Historic resources within the American Legion site APE are included in **Table 4.7-7**.

Table 4.7-7 Historic Properties Within the APE at the American Legion Site

MHC #	Property Name[1]	Address	Date	Designation(s)
BOS.YB	Morton Street	Morton Street	1930s	NRDIS, NRMPS
BOS.NX	Boston State Hospital	N/A	c.1895-1970	INV

Source: MACRIS *INV: Inventory of Historic and Archaeological Assets of the Commonwealth*

1 Each 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.

Morton Street (BOS.YB)

Morton Street is a 2.5-mile connecting parkway that runs northwest to southeast from Jamaica Plain to Dorchester in two segments. The Morton Street historic district was listed in the National Register in 2004 under the National Register Multiple Property Submission (NRMPS) Metropolitan Park System of Greater Boston (BOS.VE). The first segment of Morton Street, a small portion of which is within the American Legion site APE, is characterized by two asphalt vehicular lanes separated by a turf median. The borders of the road feature bike lanes, vertical granite curbs, and intermittent 100- to 75-year-old deciduous trees. Franklin Park (BOS.IM) and Forest Hills Cemetery (BOS.XA) are visible from Morton Street. The second segment, which is well outside the American Legion site APE, is hillier and more urban. Although the National Register nomination could not confirm whether the Massachusetts Department of Public Works or the City of Boston originally laid out the road, Morton Street was built in the 1930s to connect the southern, central, and eastern parts of Boston. Like most parkways of its kind, it served as a link between existing vehicular roadways and important sites such as Franklin Park and Forest Hills Cemetery. For these reasons, it is significant under Criterion A in the areas of Transportation and Community Planning and Development. As its materials and configuration are also typical of local parkways, it has additional significance under Criterion C in the areas of Engineering and Landscape Architecture. Morton Street was transferred to the Metropolitan District Commission (MDC) in 1956, along with several other parks and parkways. In subsequent years, the care and control of Morton Street, along with that of several other city parks and parkways, was carried out by the Department of Conservation and Recreation (DCR).

4.7.4.2 Connection and Isolation Valve Sites

The connection and isolation valve sites are common to all three DEIR Alternatives.

School Street

The School Street site (Photos 39-45) is in a flat, roughly rectangular parcel located in downtown Waltham (see Photo 39). It is bordered by School Street to the south, Macks Court to the west, and residential properties to the north and east. Many more densely packed residential buildings in the surrounding area are interspersed with government and religious institutions, schools, and businesses, some of which are inventoried or designated. The School Street site APE boundary is generally defined by the positions of the nearby buildings, which often block views to and from the site (see **Figure 4.7-10**). Historic resources within the School Street site APE are included in **Table 4.7-8**.

Table 4.7-8 Historic Properties Within the APE at the School Street Site

MHC #	Property Name[1]	Address	Date	Designation(s)
WLT.AM	St. Mary's Roman Catholic Church Complex	145 School Street	c.1872-1922	NRDIS, NRMPS
WLT.488	Waltham Town Hall – Waltham Junior High School	50-52 Exchange Street	1832	INV

Source: MACRIS
INV: Inventory of Historic and Archaeological Assets of the Commonwealth
NRMPS: National Register Multiple Property Submission NRDIS: National Register of Historic Places, District Listing

1 Each 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.

St. Mary's Roman Catholic Church Complex (WLT.AM)

St. Mary's Roman Catholic Church and its surrounding complex were listed in the National Register in 1989 and included in the Waltham MA NRMPS at the same time. Generally, religious buildings are not considered eligible for listing in the National Register; however, the St. Mary's complex meets Criteria Consideration A, which allows for the listing of religious properties that derive their primary significance from architectural distinction. Thus, while the St. Mary's complex appears to have significance under

Criterion A in the Area of Ethnic Heritage: European for its association with ethnic trends in 19th- and 20th-century Waltham, it has even more significance under Criterion C in the Area of Architecture for its representation of several architectural styles. The buildings are in excellent condition, and no major event has occurred since 1989 that would jeopardize their listing.

The church was constructed in the Romanesque Revival style between 1858 and 1872 to serve Waltham's earliest Catholic parish (WLT.205; Photo 40). Their earlier church had been destroyed by fire in 1846, and the population of Irish immigrants in the city was growing rapidly. The church was enlarged by architect Murphy of Providence between 1875 and 1877, and it was renovated in 1902 by Cowen & Hanrahan. Other buildings within the St. Mary's Roman Catholic Church Complex (WLT.AM) historic district include the Second Empire style rectory (1882-83; WLT.206; Photo 41) and carriage house (1882-83; WLT.696; Photo 42), the Classical Revival style Saint Mary's High School (1922; WLT.693; Photo 43), the Georgian Revival style Saint Mary's Religious Education Center (c.1920; WLT.695; Photo 44), and a more recent brick garage (WLT.692; Photo 45). All the individual resources contribute to the St. Mary's Roman Catholic Church Complex historic district except for the garage, and none are within or adjacent to the proposed limits of work. Saint Mary's High School is completely outside the 400-foot study area; however, the church and the rectory have been included in the School Street site APE because their heights and positions make them vulnerable to possible visual effects.

Cedarwood Pumping Station

The Cedarwood Pumping Station site is in a wooded area behind Stanley Elementary School in southwest Waltham. Development associated with Brandeis University is located to the west, and there are residential properties and parks to the north. The southwest edge of Waltham's city center is east of the site, and it contains a mix of residential, institutional, and commercial properties. Mount Feake Cemetery (WLT.801, not in APE) and Water Works (WLT.Z, not in APE) are to the south, separated from the site by dense trees, and the Massachusetts Bay Transportation Authority (MBTA) ROW. These trees were taken into consideration in defining the Cedarwood Pumping Station APE boundaries, which contain no historic resources (see **Figure 4.7-11**).

Hegarty Pumping Station

The Hegarty Pumping Station site (Photos 46-50) is on a wooded hill adjacent to Pumping Station #1 (WEL.311) in eastern Wellesley (see Photo 46). The surrounding area is primarily residential. There is a small park west of the site, and I-95 passes directly to the northeast. The highway and its noise barrier, along with the woods and development that extend north and south from the site, were taken into consideration when the APE boundaries were drawn (see **Figure 4.7-12**). Historic resources within the Hegarty Pumping Station APE are included in **Table 4.7-9**.

Table 4.7-9 Historic Properties Within the APE at the Hegarty Pumping Station Site

MHC #	Property Name	Address	Date	Designation(s)
WEL.311	Pumping Station 1	Cedar Street/Barton Road	1884	Eligible

Source: MACRIS

Pumping Station #1 (WEL.311)

Pumping Station #1 was inventoried in 1982, and MHC deemed it eligible for listing in the National Register in a letter addressed to MWRA dated May 20, 2021. Constructed in 1884 after Wellesley was authorized to supply the town with water the previous year, the pumping station is one of many new buildings that were needed as the municipal water supply system was developed in the 1880s (see Photos 47-50). It was built on land that had been purchased from Oliver Morse, who was the engineer on the site for the rest of his career. Some upheaval resulted from the construction of the pumping station and the larger water system in Wellesley, as the Italian immigrants who built it rioted when their pay was delayed, and many streets were left in poor condition after the water pipes were laid. However, the Town of Wellesley was one of the first municipalities to use cast iron rather than concrete pipes and to meter the water system. The pumping station is significant under Criterion A in the areas of Community Planning and Development and Politics/Government for its role in the development of the new municipal water supply system that was created in the Boston area during the 1880s. It is also significant under Criterion C in the Area of Architecture for its Queen Anne-style details, which include corbelling at the eaves and a gabled entry porch. It is architecturally representative of public buildings from the late 19th century, which were often elaborate despite their utilitarian function. The station was restored in 1979-80, and it is currently in good condition.

St. Mary Street Pumping Station

The St. Mary Street Pumping Station site (Photos 51-53) is composed of two small, roughly rectangular grassed areas on either side of St. Mary Street in Needham. It overlaps with a segment of the Sudbury Aqueduct Linear District (NEE.F), and it is within a residential neighborhood that is intersected by I-95 just east of the St. Mary Street Pumping Station site. There are some commercial properties beyond I-95, and infrastructure for a television station is located to the west through a densely wooded area. The St. Mary Street Pumping Station APE boundary was drawn with reference to the trees to the west, the highway and its tall noise barriers to the east, and the residential buildings to the north and south (see **Figure 4.7-13**). Historic resources within the St. Mary Street Pumping Station APE are included in **Table 4.7-10**.

Table 4.7-10 Historic Properties Within the APE at the St. Mary Street Pumping Station Site

MHC #	Property Name	Address	Date	Designation(s)
NEE.F	Sudbury Aqueduct Linear District	Various	1875-1878	NRDIS, NRTRA

Source: MACRIS
NRDIS: National Register of Historic Places, District Listing
NRTRA: National Register Thematic Resource Area

Sudbury Aqueduct Linear District (NEE.F)

The Sudbury Aqueduct was listed in the National Register in 1990, and it was included in a National Register Thematic Resource Area (NRTRA) at the same time. Constructed between 1875 and 1878, the brick aqueduct runs for 16.5 miles from Farm Pond in Framingham to Chestnut Hill Reservoir in Brookline, and it was designed by City of Boston Engineer J.P. Davis and the Resident Engineer of Sudbury Supply, A. Fetley (see Photos 51-53). It was the second aqueduct in a series built to bring water to Boston from the

Sudbury River, when the population increased dramatically with five surrounding towns being annexed in 1874. The aqueduct consists of 21 segments; chambers for access and monitoring, ventilation, diversion, or flow control; bridges and siphons to carry the aqueduct over rivers and roads; and waste weirs to allow for inspection, cleaning, monitoring, and repair. The aqueduct was taken out of service in 1974 but it retains significance under Criterion C in the Area of Engineering for its representation of late 19th-century water technology and municipal architecture techniques. It also retains significance under Criterion A in the Areas Community Planning and Development and Politics/Government for its role in the history of water distribution for Boston. No major event has occurred since 1989 that would jeopardize its listing.

Newton Street Pumping Station

The Newton Street Pumping Station site is located toward the rear of an MWRA property near the intersection of Newton Street and Fairgreen Place in Brookline (see Photo 54). The site is in a clearing at the base of a small, wooded hill. Most of the nearby buildings are residential, but there are also businesses to the southwest and schools to the east. A country club is north of the site, and Walnut Hills Cemetery is to the south. The Newton Street Pumping Station APE boundary was drawn with reference to this development, along with the dense trees on the hill at the northwest boundary of the John Harris House and Farm (historic name for the Allandale Farm [BKL.1705], not in APE) across Newton Street (see **Figure 4.7-14**). Historic resources within the Newton Street Pumping Station APE are included in **Table 4.7-11**.

Table 4.7-11 Historic Properties Within the APE at the Newton Street Pumping Station Site

MHC #	Property Name [1]	Address	Date	Designation(s)
BKL.1395	Louis Goldsmith House	331 Newton Street	1906	INV

Source: MACRIS INV: Inventory of Historic and Archaeological Assets of the Commonwealth

1 Each 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.

Southern Spine Mains

The Southern Spine Mains site (Photos 55-58) contains wooded and landscaped areas, and it also extends northeast into a section of parkway within the Olmsted Park System (BOS.IO). The landscaped part of the site is flat and contains paved pedestrian pathways. A rough-faced stone wall topped with a metal fence separates it from the wooded area, which rises in a slope to the west. The site is east of a community garden, a large parking lot, and the Arnold Arboretum (BOS.MF). While there is some commercial and transportation-related development nearby, including the Forest Hills MBTA station to the east, the areas to the north and east of the site and the Arnold Arboretum are mostly residential. The Southern Spine Mains APE excludes a small part of the Arboretum grounds where views are blocked by trees and small portions of the residential neighborhood to the north where views are blocked by buildings. Historic resources within the Southern Spine Mains site APE are included in **Table 4.7-12**.

Table 4.7-12 Historic Properties Within the APE at the Southern Spine Mains Site

MHC #	Property Name [1]	Address	Date	Designation(s)
BOS.IO	Olmsted Park System	N/A	1870s+	NRDIS
BOS.MF	Arnold Arboretum	125 Arborway	1872	NRIND, NHL
BOS.ML	Bussey Institute – State Biological Laboratory	307-305 South Street	1904, 1969	INV

Source: MACRIS

NRDIS: National Register of Historic Places, District Listing *NHL: National Historic Landmark*
NRIND: National Register of Historic Places, Individual Listing
INV: Inventory of Historic and Archaeological Assets of the Commonwealth

1 Each 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.

Olmsted Park System (BOS.IO)

Designed by noted landscape architect Frederick Law Olmsted Sr. beginning in the 1870s, the Olmsted Park System is a series of associated parks that extends south from the Back Bay Fens in the Fenway neighborhood of Boston to Franklin Park in Dorchester. The historic district, which contains the Back Bay Fens, the Riverway, Jamaica Pond, the Arborway, and Franklin Park, was listed in the National Register in 1971. Olmsted intended to create a much-needed municipal open space in the city, while addressing sanitation problems associated with the tidal swamp in the location of the Back Bay Fens, linking newly annexed parts of the city with central Boston, and creating a variety of recreation opportunities. The design of the park system created an important precedent that guided landscape architects in later regional projects. For these reasons, the district has significance under Criterion A for Recreation and Community Planning and Development and under Criterion C for Landscape Architecture. The Arborway, part of which is within the Southern Spine Mains APE, runs past the Arnold Arboretum to link Jamaica Pond with Franklin Park (see Photo 58).

Arnold Arboretum (BOS.MF)

The Arnold Arboretum is a 281-acre property containing more than 6,000 varieties of trees and shrubs with detailed records of their locations and development. The historic resource was listed in the National Register in 1965, and it became a National Historic Landmark the same year. The property was established in 1872 with the funds of James Arnold, a merchant who set aside $100,000 for the study and research of agriculture and horticulture. The gift was presented to Harvard University, which appointed Charles Sprague Sargent as director of the arboretum. Sargent quickly realized that Arnold's gift would not be enough to develop and maintain the site, so he turned to the City of Boston. Frederick Law Olmsted, who was working for the City at the time, wanted to make the arboretum part of his Olmsted Park System (BOS.IO), setting off a nine-year dispute over ownership. Eventually the City of Boston took possession of the property, leasing it to Harvard for 1,000 years at a rent of one dollar per year.

In addition to the multitude of tree varieties, the arboretum contains artificial ponds, roads and pathways, and two hills with scenic views from their summits (see Photos 56-57). Architectural elements within the grounds include a brick administration building constructed in 1890, four workers' houses, and multiple greenhouses. Scientific research has also been a major activity at the property since its establishment, as evidenced by the library and herbarium. For these reasons, the Arnold Arboretum has significance under

Criterion A in the Areas of Agriculture, Education, Invention, Recreation, and Science, and under Criterion C in the Areas of Architecture and Landscape Architecture.

Hultman Aqueduct Isolation Valve

The Hultman Aqueduct Isolation Valve site is a triangular grassed area surrounded by ramps that are associated with I-90 and I-95 in Weston (see Photo 59). It contains a small hill and several trees, and the Hultman Aqueduct (WSN.O) passes through the site below grade. The site is bordered to the east by the existing MWRA property at 15 Recreation Road and to the west and south by highway infrastructure and office buildings. There are residential neighborhoods to the north across the Charles River. As the site is in an open area, the Hultman Aqueduct Isolation Valve APE generally follows the boundary of the Study Area (see **Figure 4.7-16**); however, it eliminates some spaces to the north where trees along the Charles River would block views. Historic resources within the Hultman Aqueduct Isolation Valve site APE are included in **Table 4.7-13**.

Table 4.7-13 Historic Properties Within the APE at the Hultman Aqueduct Isolation Valve Site

MHC #	Property Name	Address	Date	Designation(s)
WSN.O	Hultman Aqueduct	N/A	1938-1940	Eligible

Source: MACRIS

4.7.5 Construction-Period Impacts

Predictions of vibration levels and their effects on historic properties were based on measurement methods described in the Federal Transit Administration's (FTA's) noise and vibration guidance manual and the vibration limits outlined in the United States Bureau of Mines (USBM); for more information on noise and vibration thresholds, see **Chapter 4, Section 4.12, Noise and Vibration**. Construction noise levels were predicted using methods and reference noise emissions from the Federal Highway Administration's Roadway Construction Noise Model (RCNM), and the potential effects of the noise were estimated through HUD regulation 24 CFR Part 51 and a 1974 USEPA study. Based on the proposed work described in **Chapter 3, Alternatives** and the analyses in **Chapter 4, Section 4.12, Noise and Vibration**, no construction-period (temporary) impacts are anticipated at any of the State/National Register-listed or eligible historic properties within the APEs under any of the alternatives. With the implementation of proper mitigation and monitoring controls, temporary noise and vibration levels would be reduced. Vibration levels below those that might cause damage may be perceived by the public. See **Table 4.12-10** in **Chapter 4, Section 4.12, Noise and Vibration** for the distance threshold for vibration impacts. Structures of each building type that are located farther from the proposed construction that the distances provided in the table are not anticipated to experience impacts.

Historic resources that are listed in or eligible to be listed in the State/National Registers, and that may be subject to noise and vibration levels that exceed the thresholds, have been identified and evaluated for potential effects. They include the Walter E. Fernald State School (WLT.AB), St. Mary's Roman Catholic Church Complex (WLT.AM), Pumping Station #1 (WEL.311), the Hultman Aqueduct (WSN.O), the Sudbury Aqueduct Linear District (NEE.F), and Morton Street (BOS.YB).

No noise or vibration effects are anticipated at any of these properties. However, the Authority will conduct vibration monitoring for sensitive buildings during construction.

4.7.5.1 Alternative 3

Launching and Receiving Sites

Fernald Property

No construction vibration impacts associated with potential structural damage are anticipated at the Fernald Property. The historic resources within the Walter E. Fernald State School (WLT.AB) that are proximate to the anticipated location of construction equipment are proposed for demolition, including a metal shed (WLT.743; Photos 1-3), a stucco shed (WLT.742; Photo 5), a barn foundation (WLT.927; Photos 6 and 7), a concrete block garage (WLT.744; Photos 1, 3, and 4), and a wood shed (no MHC number; Photos 8 and 9). Therefore, for the purposes of this evaluation, direct/physical impacts to the historic Fernald Property are considered permanent in nature and discussed below in **4.7.6, Final Conditions**. Construction-related noise at the Fernald Property is not expected to exceed established thresholds. There would be no construction noise impact to receptors primarily due to the substantial distance between the construction site and receptors. Thus, no temporary construction-period impacts to historic resources are anticipated at the Fernald Property; the anticipated impacts are considered to be permanent.

Tandem Trailer and Park Road East

As the Hultman Aqueduct (WSN.O) runs directly through the Park Road East site, temporary construction-period impacts are anticipated due to necessary connections between the existing, historic infrastructure and new valve chamber. Direct impacts, however, would be expected to be limited to those connection points. The aqueduct will be protected to the maximum extent practicable and would not be at risk of indirect structural damage due to vibration from construction activities. The Hultman Aqueduct historic district would also be unaffected by noise because it is wholly underground within the APEs of the Tandem Trailer/Park Road East sites. Thus, construction period impacts to historic resources at the Tandem Trailer/Park Road East sites would be limited and would not be considered to cause adverse effects.

Bifurcation

As the Hultman Aqueduct runs directly through the Bifurcation site, temporary construction-period impacts are anticipated due to necessary connections between the existing, historic infrastructure and new valve chamber. Direct structural impacts, however, would be expected to be limited to those connection points. The aqueduct would not be at risk of indirect structural damage due to vibration from construction activities. The Hultman Aqueduct historic district would also be unaffected by noise because it is wholly underground within the Bifurcation site APE. Thus, construction-period impacts to historic resources at the Bifurcation site would be limited and would not be considered to cause adverse effects.

Highland Avenue Sites

There are no historic properties that are listed in or eligible for listing in the State/National Registers within the APEs at either of the Highland Avenue sites. Therefore, no construction-period impacts to historic resources would be expected at this location.

American Legion

As Morton Street (BOS.YB; Photo 38) is within the limits of work at the American Legion site, it would have limited construction-period impacts due to the need to access the existing underground distribution pipe. While some temporary impacts to the character-defining median are anticipated, this section of median would be reinstalled or reconstructed with in-kind materials. Construction-related noise levels are anticipated to exceed established thresholds at the American Legion site, but Morton Street would not be impacted because the nature of its significance is such that it cannot be diminished by increased noise. Similarly, the nature of Morton Street's significance as a roadway makes it less susceptible to temporary vibration impacts.

Connection and Isolation Valve Sites

School Street

Based on estimates developed using the FTA's noise and vibration guidance manual, St. Mary's Roman Catholic Church Complex (WLT.AM) is too far from the proposed limits of work to be at risk of structural damage from vibration. As described in Section 4.12 as shown in Table 4.12-10, no potential impacts to stained glass would be anticipated given the distance (approximately 200 feet) between the St. Mary's Roman Catholic Church Complex (WLT.AM) and the proposed School Street site. Construction-related noise levels are anticipated to exceed established thresholds at the School Street site, but the St. Mary's Roman Catholic Church Complex (WLT.AM) would not be impacted because its significance is such that it cannot be diminished by increased noise. The historic district is significant for its association with ethnic trends in 19th-century Waltham and for its representation of several architectural styles. Religious buildings are not eligible for listing in the National Register unless they derive their primary significance from their architectural attributes, so religious services do not typically contribute to the historic significance of a building. Since increased noise levels cannot change the historic ethnic trends that led to the construction of the complex or its architectural design, they would not affect the district. Thus, no construction-period impacts to historic resources are anticipated at the School Street site.

Cedarwood Pumping Station

No historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE. Therefore, no construction-period impacts to historic resources are expected at this location.

Hegarty Pumping Station

According to data from **Section 4.7.4.2**, Pumping Station #1 (WEL.311; Photos 47-50) is too far from the anticipated location of construction equipment with the potential to cause structural damage through vibration to be at risk for structural damage. Construction-related noise levels are anticipated to exceed established thresholds at the Hegarty Pumping Station site but Pumping Station #1 (WEL.311) would not be impacted because its significance is such that it cannot be diminished by increased noise. The building is significant for its role in a new municipal water system that was developed in the 1880s and its Queen Anne-style architectural details. Since noise levels cannot change either of these attributes, they would not affect the historic property. Thus, no construction-period impacts to historic resources would be anticipated at the Hegarty Pumping Station site.

St. Mary Street Pumping Station

As the Sudbury Aqueduct Linear District (NEE.F; Photos 51-53) is within the limits of work at the St. Mary Street Pumping Station site, temporary construction-period impacts are anticipated due to necessary connections between the existing, historic infrastructure and new valve chamber. Direct structural impacts, however, would be expected to be limited to those connection points. The aqueduct would not be at risk of indirect structural damage due to vibration from construction activities. The Sudbury Aqueduct Linear District would also be unaffected by noise because it is wholly underground within the St. Mary Street Pumping Station site APE. Thus, construction-period impacts to historic resources at the St Mary Street Pumping Station would be limited and would not be considered to cause adverse effects.

Newton Street Pumping Station

There are no historic properties that are listed in or eligible for listing in the State/National Registers within the Newton Street Pumping Station site APE. Therefore, no construction-period impacts to historic resources would be expected at this location.

Southern Spine Mains

According to data from **Section 4.7.4.2**, the Arnold Arboretum (BOS.MF; Photos 56-57) and the Olmsted Park System (BOS.IO; Photo 58) are not expected to be impacted by vibration from work at the Southern Spine Mains site, as none of the buildings within the districts are close enough to the anticipated location of construction equipment with the potential to cause structural damage through vibration. In addition, construction noise levels at the Southern Spine Mains site are not expected to exceed the established thresholds, so construction-period impacts to historic resources would not be anticipated at this location.

Hultman Aqueduct Isolation Valve

As the Hultman Aqueduct (WSN.O) runs directly through the Hultman Aqueduct Isolation Valve site, temporary construction-period impacts are anticipated due to necessary connections between the existing, historic infrastructure and new valve chamber. Direct structural impacts, however, are expected to be limited to those connection points. The aqueduct would not be at risk of indirect structural damage due to vibration from construction activities. The Hultman Aqueduct historic district would also be unaffected by noise because it is wholly underground within the Hultman Aqueduct Isolation Valve APE. Thus, construction-period impacts to historic resources at the Hultman Aqueduct Isolation Valve site would be limited and would not be considered to cause adverse effects.

In summary, the Program would cause no adverse construction-period impacts on historic resources under Alternative 3, as summarized in **Table 4.7-14**.

Table 4.7-14 Construction-Period Impacts to Historic Properties, Alternative 3

Program Site	**Historic Resource**	**MHC No.**	**Designation**	**Noise Impact**	**Vibration Impact**	**Physical/ Direct Impact**
Launching and Receiving Sites						
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	No Effect	No Effect	No Effect[1]
Tandem Trailer/Park Road East	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect
Bifurcation	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect	No Effect	No Adverse Effect
Connection and Isolation Valve Sites						
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Effect	No Effect	No Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Effect	No Effect	No Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Effect	No Effect	No Adverse Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect	No Effect	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRIND, NHL	No Effect	No Effect	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect

NRDIS: National Register of Historic Places, District Listing
NHL: National Historic Landmark
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area
1 Physical impacts to the district are considered to be long-term and are discussed in 4.7.7

4.7.5.2 Alternative 4

Launching and Receiving Sites

Fernald Property

As described in **Section 4.7.5.1**, no temporary construction-period impacts to historic resources would be expected at the Fernald Property.

Tandem Trailer and Park Road East

For reasons described in **Section 4.7.5.1**, construction-period impacts to historic resources at the Tandem Trailer/Park Road East sites would be limited and would not be considered to cause be adverse effects.

Park Road West

As the Hultman Aqueduct (WSN.O) runs directly through the Park Road West site, temporary construction-period impacts are anticipated due to the necessary connections between the existing, historic infrastructure and a new valve chamber. Direct impacts, however, would be expected to be limited to those connection points. The aqueduct would not be at risk of indirect structural damage due to vibration from construction activities. The Hultman Aqueduct historic district would also be unaffected by noise because it is wholly underground within the Park Road West site APE. Thus, construction-period impacts to historic resources at this site would be limited and would not be considered to cause adverse effects.

Highland Avenue Sites

As stated in **Section 4.7.5.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites. Therefore, no construction-period impacts to historic resources would be expected at this location.

American Legion

For reasons described in **Section 4.7.5.1**, temporary construction-period impacts to historic resources would be limited in nature and would not be considered to cause adverse effects.

Connection and Isolation Valve Sites

School Street

For reasons described in **Section 4.7.5.1**, no construction-period impacts to historic resources would be expected at the School Street site.

Cedarwood Pumping Station

As stated in **Section 4.7.5.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE. Therefore, no construction-period impacts to historic resources would be expected at this location.

Hegarty Pumping Station

For reasons described in **Section 4.7.5.1**, no construction-period impacts to historic resources would be expected at the Hegarty Pumping Station.

St. Mary Street Pumping Station

For reasons described in **Section 4.7.5.1**, construction-period impacts to historic resources at the St. Mary Street Pumping Station would be limited and would not be considered to cause adverse effects.

Newton Street Pumping Station

As stated in **Section 4.7.5.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE. Therefore, no construction-period impacts to historic resources would be expected at this location.

Southern Spine Mains

For reasons described in **Section 4.7.5.1**, no construction-period impacts to historic resources would be expected at the Southern Spine Mains.

Hultman Aqueduct Isolation Valve

For reasons described in **Section 4.7.5.1**, construction-period impacts to historic resources at the Tandem Trailer/Park Road East sites would be limited and would not be considered to cause adverse effects.

In summary, the Program would cause no adverse construction-period impacts to historic resources under Alternative 4, as summarized in **Table 4.7-15**

Table 4.7-15 Construction Period Impacts to Historic Properties, Alternative 4

Program Site	Historic Resource	MHC No.	Designation	Noise Impact	Vibration Impact	Physical/ Direct Impact
Launching and Receiving Sites						
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	No Effect	No Effect	No Effect[1]
Tandem Trailer/Park Road East	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect
Park Road West	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect	No Effect	No Adverse Effect
Connection and Isolation Valve Sites						
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Effect	No Effect	No Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Effect	No Effect	No Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Effect	No Effect	No Adverse Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect	No Effect	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect

NRDIS: National Register of Historic Places, District Listing
NHL: National Historic Landmark
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area
[1] Physical impacts to the district are considered to be long-term and are discussed in 4.7.7

4.7.5.3 Alternative 10

Launching and Receiving Sites

Fernald Property

For reasons described in **Section 4.7.5.1**, no temporary construction-period impacts to historic resources would be expected at the Fernald Property.

Park Road West

For reasons described in **Section 4.7.5.2**, construction-period impacts to historic resources at the Park Road West site would be limited and would not be considered to cause adverse effects.

Highland Avenue Northwest/Southwest and Northeast/Southeast

As stated in **Section 4.7.5.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites. Therefore, no construction-period impacts to historic resources would be expected at this location.

American Legion

For reasons described in **Section 4.7.5.1**, temporary construction-period impacts to historic resources would be limited in nature and would not be considered to cause adverse effects.

Connection and Isolation Valve Sites

School Street

For reasons described in **Section 4.7.5.1**, no construction-period impacts to historic resources would be expected at the School Street site.

Cedarwood Pumping Station

As stated in **Section 4.7.5.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE. Therefore, no construction-period impacts to historic resources would be expected at this location.

Hegarty Pumping Station

For reasons described in **Section 4.7.5.1**, no construction-period impacts to historic resources would be expected at the Hegarty Pumping Station.

St. Mary Street Pumping Station

For reasons described in **Section 4.7.5.1**, construction-period impacts to historic resources at the St. Mary Street Pumping Station would be limited and would not be considered to cause adverse effects.

Newton Street Pumping Station

As stated in **Section 4.7.5.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE. Therefore, no construction-period impacts to historic resources would be expected at this location.

Southern Spine Mains

For reasons described in **Section 4.7.5.1**, no construction-period impacts to historic resources would be expected at Southern Spine Mains.

Hultman Aqueduct Isolation Valve

For reasons described in **Section 4.7.5.1**, construction-period impacts to historic resources at the Tandem Trailer/Park Road East sites would be limited and would not be considered to cause adverse effects.

In summary, the Program would cause no adverse construction-period impacts to historic resources under Alternative 10, as summarized in **Table 4.7-16**.

Table 4.7-16 Construction Period Impacts to Historic Properties, Alternative 10

Program Site	Historic Resource	MHC No.	Designation	Noise Impact	Vibration Impact	Physical/ Direct Impact
Launching and Receiving Sites						
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	No Effect	No Effect	No Effect[1]
Park Road West Large Connection	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect	No Effect	No Adverse Effect
Connection and Isolation Valve Sites						
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Effect	No Effect	No Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Effect	No Effect	No Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Effect	No Effect	No Adverse Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect	No Effect	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRIND, NHL	No Effect	No Effect	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Effect	No Effect	No Adverse Effect

NRDIS: National Register of Historic Places, District Listing

NHL: National Historic Landmark

NRMPS: National Register Multiple Property Submission

NRTRA: National Register Thematic Resource Area

[1] Physical impacts to the district are considered to be long-term and are discussed in 4.7.7

4.7.6 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 construction) and indirect/nonphysical (visual). As discussed in **Section 4.7.5**, no long-term operational noise or vibration impacts are anticipated and therefore noise and vibration impacts would not be considered to cause permanent impacts.

4.7.6.1 Alternative 3

Direct/Physical Impacts to Launching and Receiving Sites

Fernald Property

The Program would physically impact the Walter E. Fernald State School (WLT.AB) at the Fernald Property. There are 22 individual resources within both the Fernald Property APE and the Walter E. Fernald State School (WLT.AB) historic district, and 14 are contributing. Of the 22 resources, 11 are within or adjacent to the temporary construction boundary, and between six and eight would be directly impacted by construction (see **Figure 4.7-1** and **Table 4.7-3**). The potentially impacted buildings would be:

- A stucco shed (ca. 1920; WLT.742; Photo 5)
- A metal shed (ca. 1970; WLT.743; Photos 1-3)
- A concrete block garage (ca. 1950; WLT.744; Photos 1, 3, and 4)
- A barn foundation (ca. 1900; WLT.927; Photos 6 and 7)
- A woodshed (no MHC number, Photos 8 and 9)
- A shed to the east near Waverley Oaks Road (ca. 1970s; WLT.788; Photo 10)
- A greenhouse (ca.1940; WLT.739; Photos 11-13)
- An electric substation (ca. 1960; WLT.740; Photo 14)

The garage and the four sheds would be demolished; the metal shed is on the site of the proposed shaft, the east shed is near the site of a proposed valve chamber, the woodshed would be within the limits of work, and the spaces currently occupied by the garage and the stucco shed would be used for staging and parking, respectively. The remains of the barn foundation would be dismantled to make space for construction trailers and parking. The greenhouse and the electric substation may be demolished if construction necessitates the widening of Chapel Road.

The metal shed, the east shed, the garage, the greenhouse, and the electric substation were all constructed after the end of the period of significance, and they were not considered to contribute to the Walter E. Fernald State School historic district when the Fernald School nomination form was completed in 1994. After being reevaluated for the Program, they are still considered noncontributing. Similarly, the stucco shed, the barn foundation, and the woodshed retain their status as contributing buildings (for more detail on contributing and noncontributing individual resources within the district, see **Section 4.7.4, Fernald School Site**). The stucco shed and the woodshed have likely declined in condition since the Walter E. Fernald State School district was nominated, but they are still recognizable as utilitarian buildings from the 1920s. The barn was not standing in 1994, so it was nominated in its current state. Thus, the Program would have a permanent, direct adverse effect on the Walter E. Fernald State School.

Tandem Trailer and Park Road East

At the Tandem Trailer/Park Road East sites, the Hultman Aqueduct (WSN.O) would be physically impacted long-term, as one valve chamber would be connected to the aqueduct at the Park Road East site (see **Figure 4.7-2**). The resource is significant partly because it represents period engineering techniques, and the proposed work would not be extensive enough to diminish this broader significance. The rest of the Hultman Aqueduct's significance lies in its historic role as part of the water supply system in the greater Boston area, and this would not be diminished by connecting the aqueduct to new water infrastructure. Thus, the Program would have no permanent, direct adverse effect on the historic district.

Bifurcation

At the Bifurcation site, the Hultman Aqueduct (WSN.O) would be physically impacted long-term, as one valve chamber would be connected to the aqueduct (see **Figure 4.7-3**).This resource is significant partly because it represents period engineering techniques, however, and the proposed work would not be extensive enough to diminish this broader significance. The rest of the Hultman Aqueduct's significance lies in its historic and present role as part of the water supply system in the greater Boston area, and this would not be diminished by connecting the aqueduct to new water infrastructure. Rather, the proposed valve chamber connections to the aqueduct would be important components in the continued operation of the water system. Thus, the Program would have no permanent, direct adverse effect on the Hultman Aqueduct historic district.

Highland Avenue Northwest and Northeast/Southeast

No historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites (see **Figure 4.7-6** through **Figure 4.7-8**). Therefore, no permanent, direct impacts to historic resources would be expected at this location.

American Legion

At the American Legion site, Morton Street (BOS.YB; Photo 38) would be physically impacted during construction, as an underground pipe would be laid beneath the road at the northeastern limit of the work area (see **Figure 4.7-9**). The impacted segment of the road would be repaved and returned to its original use, and any work required at the median would conclude with the repair and/or reconstruction of this median segment in-kind. Thus, the Program would have no permanent, direct effect on the Morton Street (BOS.YB) historic district.

Direct/Physical Impacts to Connection and Isolation Valve Sites

School Street

The St. Mary's Roman Catholic Church Complex (WLT.AM) is outside the limits of work at the School Street site, so it would not be physically impacted by the Program (see **Figure 4.7-10**). Thus, no permanent, direct impacts to historic resources would be anticipated at this location.

Cedarwood Pumping Station

No historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE (see **Figure 4.7-11**). Therefore, no permanent, direct impacts to historic resources would be expected at this location.

Hegarty Pumping Station

Pumping Station #1 (WEL.311; Photos 47-50) is outside the limits of work at the Hegarty Pumping Station site, so it would not be physically impacted by the Program (see **Figure 4.7-12**). Thus, no permanent, direct impacts to historic resources would be anticipated at this location.

St. Mary Street Pumping Station

The Sudbury Aqueduct Linear District (NEE.F; Photos 51-53) would be directly affected by the Program at the St. Mary Street Pumping Station site, as a pipe would be connected to the aqueduct for flushing (see **Figure 4.7-13**). However, the significance of the resource lies in its representation of period engineering techniques and its historic and present role as part of the water supply system in the greater Boston area. Proposed work on the aqueduct would not be extensive enough to diminish the former, and connections to new water infrastructure would not diminish the latter. In fact, the proposed valve chamber connections to the aqueduct would be important components in the continued operation of the water supply system. For these reasons, the Program would have no permanent, direct adverse effect on the Sudbury Aqueduct Linear District.

Newton Street Pumping Station

No historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE (see **Figure 4.7-14**). Therefore, no permanent, direct impacts to historic resources would be expected at this location.

Southern Spine Mains

The Arnold Arboretum (BOS.MF; Photos 56-57) is outside the limits of work at the Southern Spine Mains site, so it would not be physically impacted by the Program (see **Figure 4.7-15**). At the Southern Spine Mains site, the Olmsted Park System (BOS.IO; Photo 58) would be physically impacted during construction, as an underground pipe would be laid beneath the Arborway on the northeast side of the work area (see **Figure 4.7-15**). The impacted segment of the road would be repaved and returned to its original use, and any work required at the median would conclude with in-kind repair and/or reconstruction of this median segment. Thus, the Program would have no permanent, direct effect on the Olmsted Park System historic district.

Hultman Aqueduct Isolation Valve

At the Tandem Trailer/Park Road East sites, the Hultman Aqueduct (WSN.O) would be physically impacted long-term, as one valve chamber would be connected to the aqueduct (see **Figure 4.7-16**).The resource is significant partly because it represents period engineering techniques, however, and the proposed work would not be extensive enough to diminish this broader significance. The rest of the Hultman Aqueduct's significance lies in its historic and present role as part of the water supply system in the greater Boston area, and this would not be diminished by connecting the aqueduct to new water infrastructure. Rather, the proposed valve chamber connections to the aqueduct would be important components in the continued operation of the water system. Thus, the Program would have no permanent, direct adverse effect on the historic district.

Table 4.7-17 summarizes potential permanent, direct effects (or lack thereof) to historic resources under Alternative 3.

Table 4.7-17 Permanent, Direct Impacts to Historic Properties, Alternative 3

Program Site	Historic Resource	MHC No.	Designation	Direct Impacts
Launching and Receiving Sites				
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	Adverse Effect
Tandem Trailer/Park Road East	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect
Bifurcation	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect
Connection and Isolation Valve Sites				
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Adverse Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRDIS, NHL	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect

NRDIS: National Register of Historic Places, District Listing
NHL: National Historic Landmark
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area

Indirect/Nonphysical Impacts to Launching and Receiving Sites

In the context of the Program, potential indirect (nonphysical) impacts would be visual only. They could occur where new, permanent construction would be visible from historic properties.

Fernald Property

New permanent structures would be visible from many individual resources within the Walter E. Fernald State School (WLT.AB), due in part to the hilly topography on the campus. All these resources have been included in the APE, but some are located outside the temporary construction boundary, and some contribute to the Walter E. Fernald State School historic district while others do not (see **Table 4.7-3** and **Figure 4.7-1**). All resources within the Fernald Property APE that were identified as contributing or noncontributing when the district nomination form was completed in 1994 retain their status in the context of the Program, except for one garage (WLT.769; for more information, see **Section 4.7.4, Fernald School Site**). Visual impacts to noncontributing resources have no adverse effect on the Walter E. Fernald State School.

The assessment of impacts to contributing resources is more complex. The Walter E. Fernald State School generally appears to retain integrity of setting, and the paved parking lots that were identified in 1994 as the most significant alterations to the landscape are not in the APE. For this reason, most of the nonutilitarian contributing buildings could be vulnerable to potential visual impacts from the Program. However, the Program construction boundary is near the rear (southeast) entrance to the campus among a group of maintenance and utility buildings that generally date to the 1920s and 1930s. These resources include:

- Maintenance Building (1930; WLT.738; Photo 15)
- Engineers' Storage Building (ca. 1930; WLT.741; Photo 16)
- Stucco shed (ca. 1920; WLT.742; Photo 5)
- Woodshed (ca. 1920; no MHC number; Photos 8 and 9)
- Power Plant (1921; WLT.935; Photos 17 and 18)

The two sheds are within the Program limits of work and are proposed for demolition. As the other buildings served utilitarian purposes, new permanent construction related to water infrastructure would not diminish their integrity of setting or their significance.

There are also contributing structures with other historic uses in the APE. Residential buildings include:

- Lavers Hall (1914; WLT.737; Photos 19 and 20)
- A dormitory and four cottages built for staff residence (1925; WLT.731 – WLT.734; Photos 21-24)
- One garage associated with Cottage #20 (ca. 1930; WLT.769; Photo 25)
- Tarbell Hall (1934; WLT.745; Photos 26 and 27), which abuts a clearing adjacent to the Program temporary construction area
- A Cast Iron Fence (ca. 1890s; WLT.929; Photo 28) that may have surrounded a campus cemetery is across Pine Street in a wooded area to the west

The setting of the resources that predate the nearby maintenance buildings was altered by the construction of the latter in the 1920s and 1930s and the subsequent shift in the general use of the area. Other nonutilitarian buildings were constructed after the development of some maintenance-related structures; therefore, the addition of more infrastructure would not fundamentally change their original setting. For these reasons, the Program would have no permanent, indirect adverse effect on the Walter E. Fernald State School historic district.

Tandem Trailer and Park Road East

The Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O) at the Tandem Trailer/Park Road East sites because it is wholly underground at these locations (see **Figure 4.7-2**).

Bifurcation

The Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O) at the Bifurcation site because it is wholly underground at this location (see **Figure 4.7-3**; Photo 36).

Highland Avenue Northwest and Northeast/Southeast

No historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites (see **Figure 4.7-6** through **Figure 4.7-8**). Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

American Legion

The Program would have no permanent, indirect effect on Morton Street (BOS.YB) at the American Legion site because all permanent facilities would be wholly underground where the district overlaps with the American Legion site APE (see **Figure 4.7-9**).

Indirect/Non-Physical Impacts to Connection and Isolation Valve Sites

In the context of the Program, potential indirect (nonphysical) impacts would be visual only. They could occur where new, permanent construction would be visible from historic properties.

School Street

The proposed valve chamber may be visible from some parts of St. Mary's Catholic Church (WLT.205; Photo 40), Saint Mary's Rectory (WLT.206; Photo 41), and St. Mary's Religious Education Center (WLT.695; Photo 44) within the St. Mary's Roman Catholic Church Complex (WLT.AM; see **Figure 4.7-10**). Since the complex meets Criteria Consideration A (see **Section 4.7.2** for more details), it derives its significance primarily from its architectural form, plan, and materials rather than the integrity of its setting. Thus, the Program would have no permanent, indirect adverse effect on the St. Mary's Roman Catholic Church Complex.

Cedarwood Pumping Station

No historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE (see **Figure 4.7-11**). Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

Hegarty Pumping Station

While the proposed valve chamber and/or fencing may be visible from the façade of Pumping Station #1 (WEL.311; see **Figure 4.7-12** and Photo 47), the building is deemed eligible for its role in the municipal water system of the 1880s and for its Queen Anne-style architectural details. The developmental history associated with the property would not be diminished by changes to the setting, and the key characteristics that convey architectural significance are associated with the building's form, plan, and materials. Thus, the Program would have no indirect adverse effect on the pumping station.

St. Mary Street Pumping Station

The Program would have no indirect effect on the Sudbury Aqueduct Linear District (NEE.F; Photo 51-53) because it is completely underground at the St. Mary Street Pumping Station site (see **Figure 4.7-13**).

Newton Street Pumping Station

No historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE (see **Figure 4.7-14**). Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

Southern Spine Mains

The proposed valve chamber is not expected to be visible from the Arnold Arboretum (BOS.MF), as it would be constructed at the bottom of a wooded slope about 300 feet from the property (see Photo 55). The valve chamber may be visible from the parkway within the Olmsted Park System (BOS.IO) because the road is adjacent to the proposed site, but visibility, if any, is expected to be negligible. For these reasons, no permanent, indirect impacts to any historic resources are expected at this location.

Hultman Aqueduct Isolation Valve

The Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O) at the Hultman Aqueduct Isolation Valve because it is wholly underground at this location (see **Figure 4.7-16**).

Table 4.7-18 summarizes potential permanent, indirect effects (or lack thereof) to historic resources under Alternative 3.

Table 4.7-18 Permanent, Indirect Impacts to Historic Properties, Alternative 3

Program Site	Historic Resource	MHC No.	Designation	Indirect Impacts
Launching and Receiving Sites				
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	No Adverse Effect
Tandem Trailer/Park Road East	Hultman Aqueduct	WSN.O	Eligible	No Effect
Bifurcation	Hultman Aqueduct	WSN.O	Eligible	No Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect
Connection and Isolation Valve Sites				
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Adverse Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Adverse Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRDIS, NHL	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Effect

NRDIS: National Register of Historic Places, District Listing
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area
NHL: National Historic Landmark

4.7.6.2 Alternative 4

Direct/Physical Impacts to Launching and Receiving Sites

Fernald Property

For reasons described in **Section 4.7.6.1**, the Program would have a permanent, direct adverse effect on the Walter E. Fernald State School (WLT.AB).

Tandem Trailer and Park Road East

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct adverse effect on the Hultman Aqueduct (WSN.O).

Park Road West

The Hultman Aqueduct (WSN.O) would be physically impacted by the Program at the Park Road West site, as one valve chamber would be connected to the aqueduct, and an isolation valve would be installed to the east (see **Figure 4.7-4** and **Figure 4.7-5**). The resource is significant partly because it represents period engineering techniques, and the proposed work would not be extensive enough to diminish this broader significance. The rest of the Hultman Aqueduct's significance lies in its historic and present role as part of the water supply system in the greater Boston area, and this would not be diminished by connecting the aqueduct to new water infrastructure. Rather, the proposed valve chamber connections to the aqueduct would be important components in the continued operation of the water system. Thus, the Program would have no permanent, direct adverse effect on the Hultman Aqueduct.

Highland Avenue Northwest/Southwest and Northeast/Southeast

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites. Therefore, no permanent, direct impacts to historic resources would be expected at this location.

American Legion

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on Morton Street (BOS.YB).

Direct/Physical Impacts to Connection and Isolation Valve Sites

School Street

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on the St. Mary's Roman Catholic Church Complex (WLT.AM).

Cedarwood Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE. Therefore, no permanent, direct impacts to historic resources would be expected at this location.

Hegarty Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on Pumping Station #1 (WEL.311).

St. Mary Street Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct adverse effect on the Sudbury Aqueduct Linear District (NEE.F).

Newton Street Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE. Therefore, no permanent, direct impacts to historic resources would be expected at this location.

Southern Spine Mains

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on the Olmsted Park System (BOS.IO) or the Arnold Arboretum (BOS.MF).

Hultman Aqueduct Isolation Valve

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct adverse effect on the Hultman Aqueduct (WSN.O).

Table 4.7-19 summarizes potential permanent, direct effects (or lack thereof) to historic resources under Alternative 4.

Table 4.7-19 Permanent, Direct Impacts to Historic Properties, Alternative 4

Program Site	Historic Resource	MHC No.	Designation	Direct Impacts
Launching and Receiving Sites				
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	Adverse Effect
Tandem Trailer and Park Road East	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect
Park Road West	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect
Connection and Isolation Valve Sites				
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Adverse Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRDIS, NHL	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect

NRDIS: National Register of Historic Places, District Listing
NHL: National Historic Landmark
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area

Indirect/Nonphysical Impacts to Launching and Receiving Sites

Fernald Property

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, adverse indirect effect on the Walter E. Fernald State School (WLT.AB).

Tandem Trailer and Park Road East

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O).

Park Road West

The Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O) at the Park Road West site because it is wholly underground at this location (see **Figure 4.7-7** and **Figure 4.7-8**).

Highland Avenue Sites

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites. Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

American Legion

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on Morton Street (BOS.YB).

Indirect/Nonphysical Impacts to Connection and Isolation Valve Sites

School Street

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, adverse indirect effect on the St. Mary's Roman Catholic Church Complex (WLT.AM).

Cedarwood Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE. Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

Hegarty Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect adverse effect on Pumping Station #1 (WEL.311).

St. Mary Street Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on the Sudbury Aqueduct Linear District (NEE.F).

Newton Street Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE. Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

Southern Spine Mains

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on the Olmsted Park System (BOS.IO) or the Arnold Arboretum (BOS.MF).

Hultman Aqueduct Isolation Valve

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O).

Table 4.7-20 summarizes potential permanent, indirect effects (or lack thereof) to historic resources under Alternative 4.

Table 4.7-20 Permanent, Indirect Impacts to Historic Properties, Alternative 4

Program Site	Historic Resource	MHC No.	Designation	Indirect Impacts
Launching and Receiving Sites				
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	No Adverse Effect
Tandem Trailer and Park Road East	Hultman Aqueduct	WSN.O	Eligible	No Effect
Park Road West	Hultman Aqueduct	WSN.O	Eligible	No Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect
Connection and Isolation Valve Sites				
School Street	St. Mary’s Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Adverse Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Adverse Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRDIS, NHL	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Effect

NRDIS: National Register of Historic Places, District Listing
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area
NHL: National Historic Landmark

4.7.6.3 Alternative 10

Direct/Physical Impacts to Launching and Receiving Sites

Fernald Property

For reasons described in **Section 4.7.6.1**, the Program would have a permanent, direct adverse effect on the Walter E. Fernald State School (WLT.AB).

Park Road West Large Connection

For reasons described in **Section 4.7.6.2**, the Program would have no permanent, direct adverse effect on the Hultman Aqueduct (WSN.O).

Highland Avenue Sites

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites. Therefore, no permanent, direct impacts to historic resources would be expected at this location.

American Legion

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on Morton Street (BOS.YB).

Direct/Physical Impacts to Connection and Isolation Valve Sites

School Street

For reasons described in **Section 4.7.6.1**, the Program would have no permanent direct effect on the St. Mary's Roman Catholic Church Complex (WLT.AM).

Cedarwood Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE. Therefore, no permanent, direct impacts to historic resources would be expected at this location.

Hegarty Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on Pumping Station #1 (WEL.311).

St. Mary Street Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct adverse effect on the Sudbury Aqueduct Linear District (NEE.F).

Newton Street Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE. Therefore, no permanent, direct impacts to historic resources would be expected at this location.

Southern Spine Mains

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on the Olmsted Park System (BOS.IO) or the Arnold Arboretum (BOS.MF).

Hultman Aqueduct Isolation Valve

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, direct effect on the Hultman Aqueduct (WSN.O).

Table 4.7-21 summarizes potential permanent, direct effects (or lack thereof) on historic resources under Alternative 10.

Table 4.7-21 Permanent, Direct Impacts to Historic Properties, Alternative 10

Program Site	Historic Resource	MHC No.	Designation	Direct Impacts
Launching and Receiving Sites				
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	Adverse Effect
Park Road West	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect
Connection and Isolation Valve Sites				
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Adverse Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRDIS, NHL	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Adverse Effect

NRDIS: National Register of Historic Places, District Listing
NHL: National Historic Landmark
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area

Indirect/Nonphysical Impacts to Launching and Receiving Sites

Fernald Property

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect adverse effect on the Walter E. Fernald State School (WLT.AB).

Park Road West Large Connection

For reasons described in **Section 4.7.6.2**, the Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O).

Highland Avenue Northwest/Southwest and Northeast/Southeast

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the APEs at any of the Highland Avenue sites. Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

Newton Street Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Newton Street Pumping Station APE. Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

American Legion

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on Morton Street (BOS.YB).

Indirect/Nonphysical Impacts to Connection and Isolation Valve Sites

School Street

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect adverse effect on the St. Mary's Roman Catholic Church Complex (WLT.AM).

Hegarty Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect adverse effect on Pumping Station #1 (WEL.311).

Cedarwood Pumping Station

As stated in **Section 4.7.6.1**, no historic properties that are listed in or eligible for listing in the State/National Registers are within the Cedarwood Pumping Station APE. Therefore, no permanent, indirect impacts to historic resources would be expected at this location.

St. Mary Street Pumping Station

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on the Sudbury Aqueduct Linear District (NEE.F).

Southern Spine Mains

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on the Olmsted Park System (BOS.IO) or the Arnold Arboretum (BOS.MF).

Hultman Aqueduct Isolation Valve

For reasons described in **Section 4.7.6.1**, the Program would have no permanent, indirect effect on the Hultman Aqueduct (WSN.O).

Table 4.7-22 summarizes potential permanent, indirect effects (or lack thereof) to historic resources under Alternative 10.

Table 4.7-22 Permanent, Indirect Impacts to Historic Properties, Alternative 10

Program Site	Historic Resource	MHC No.	Designation	Indirect Impacts
Launching and Receiving Sites				
Fernald Property	Walter E. Fernald State School	WLT.AB	NRDIS, NRMPS	No Adverse Effect
Park Road West Large Connection	Hultman Aqueduct	WSN.O	Eligible	No Effect
American Legion	Morton Street	BOS.YB	NRDIS, NRMPS	No Effect
Connection and Isolation Valve Sites				
School Street	St. Mary's Roman Catholic Church Complex	WLT.AM	NRDIS, NRMPS	No Adverse Effect
Hegarty Pumping Station	Pumping Station #1	WEL.311	Eligible	No Adverse Effect
St. Mary Street Pumping Station	Sudbury Aqueduct Linear District	NEE.F	NRDIS, NRTRA	No Effect
Southern Spine Mains	Olmsted Park System	BOS.IO	NRDIS	No Effect
Southern Spine Mains	Arnold Arboretum	BOS.MF	NRDIS, NHL	No Effect
Hultman Aqueduct Isolation Valve	Hultman Aqueduct	WSN.O	Eligible	No Effect

NRDIS: National Register of Historic Places, District Listing
NRMPS: National Register Multiple Property Submission
NRTRA: National Register Thematic Resource Area
NHL: National Historic Landmark

4.7.7 Avoidance, Minimization, and Mitigation Measures

As stated in **Section 4.7.5** and **Section 4.7.6**, no construction-period impacts or adverse indirect effects to historic resources are expected to result from the Program. Where resources in the APE that are listed in or eligible to be listed in the State/National Registers may be directly (physically) affected by the Program in adverse ways, avoidance, minimization, or mitigation measures have been identified.

4.7.7.1 Alternative 3

The demolition of three contributing resources within the Walter E. Fernald State School (WLT.AB) 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 is near the perimeter of the property and away from its historic core (see **Figure 4.7-1**). Thus, Program-related activities would not jeopardize the listing of the Walter E. Fernald State School (WLT.AB) historic district. The MWRA would continue consultation with the MHC to identify ways to avoid, minimize, or mitigate direct adverse effects to the Walter E. Fernald State School.

4.7.7.2 Alternative 4

The only historic resource that would be directly and adversely affected by the Program under Alternative 4 is the Walter E. Fernald State School (WLT.AB); any avoidance, minimization, or mitigation measures related to this impact are described in **Section 4.7.7.1**.

4.7.7.3 Alternative 10

The only historic resource that would be directly and adversely affected by the Program under Alternative 10 is the Walter E. Fernald State School (WLT.AB); any avoidance, minimization, or mitigation measures related to this impact are described in **Section 4.7.7.1**.

4.8 Hazardous Materials, Materials Handling, and Reuse

This section includes a comprehensive analysis of the Program's potential environmental impacts relative to hazardous materials on and in the vicinity of the proposed sites, and the associated materials handling, and reuse related to the DEIR Alternatives. Specifically, it describes how contaminated soil or groundwater encountered during construction will be managed in accordance with Massachusetts General Law Chapter 21E (M.G.L. c. 21E), "Massachusetts Oil and Hazardous Material Release Prevention Act," and the Massachusetts Contingency Plan (MCP).

4.8.1 Resource Definition

Hazardous substances include oil, hazardous material, and hazardous waste, and are defined as those substances that may constitute a present or potential threat to human health, safety, welfare, or the environment. The handling of materials includes supplies such as concrete, steel, or dirt that is brought to a construction site and those that are removed from a site, such as excavated material.

4.8.2 Regulatory Framework

In the Commonwealth of Massachusetts, the management of hazardous substances and petroleum products released into the environment is generally governed by the MCP per 310 Code of Massachusetts Regulations (CMR) Section 40.0000.[1] When a hazardous substance impacts (or potentially impacts) an environmental medium, a release (or threat of release) of oil and/or hazardous materials is said to occur.

The MCP defines a "release" as "spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment." A threat of release "means a substantial likelihood of a release of oil and/or hazardous materials which requires action to prevent or mitigate damage of health, safety, public welfare, or the environment which may result from the release." The MCP defines a "disposal site" as the place or area where an uncontrolled release of oil and/or hazardous materials has come to be located.

Hazardous substances are defined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and listed at Title 42 of the United States Code (U.S.C.) as hazardous wastes or unlisted solid wastes that exhibit specific characteristics such as ignitability, corrosivity, reactivity, or toxicity characteristics.[2]

The Occupational Safety and Health Administration (OSHA) Hazardous Waste Operation and Emergency Response (HAZWOPER) regulations provide safe and proper storage, handling, transportation, and disposal protocols for working with hazardous materials during construction. Title 29 of the Code of

1 Commonwealth of Massachusetts, 310 Code of Massachusetts Regulations 40.0000: Massachusetts Contingency Plan, updated April 2, 2020, https://www.mass.gov/doc/310-cmr-400000-massachusetts-contingency-plan/download (accessed August 3, 2022).

2 United States Code, Title 42, The Public Health and Welfare, Section 9601, "Definitions;" Section 101(14) provides definitions for terms used throughout CERCLA.

Federal Regulations (CFR) Sections 1910.120[3] and 1926.65[4] govern hazardous waste operations and emergency response under OSHA.

The disposal of Asbestos-Containing Material (ACM) is managed in the Commonwealth of Massachusetts under 310 CMR 16.05.[5] Prior to handling, removing, storing, transporting, or disposing of ACM, notification to MassDEP is required, and specific work practices are required to avoid fiber releases.

The OSHA worker protection rules are applicable to any amount of lead detected in building materials, including lead-based paint. RCRA regulations regulate wastes containing lead as hazardous waste if leachable lead is present per 40 CFR 261.21-261.24.

4.8.3 Methodology

The following section describes the methodology used to identify existing oil and hazardous materials (OHM) in the Study Area for the three DEIR Alternatives.

4.8.3.1 Study Area

A 500-foot search radius was established from the Limit of Disturbance (LOD) associated with each proposed site. The 500-foot radius was used for screening purposes to identify potential state-listed disposal sites relative to each launching, receiving, connection, and isolation valve site. The radius was determined by using the address/location aid field in the MassDEP Bureau of Waste Site Cleanup (BWSC) database[6] in association with the EEA Data Portal and associated Waste Site Cleanup File Viewer.[7] The purpose of the 500-foot radius was to identify nearby disposal sites where existing or residual contamination has the potential to migrate and impact environmental conditions (i.e., soil or groundwater) within the LOD. It is assumed for this evaluation that contamination from disposal sites greater than 500 feet away would be unlikely to migrate and impact environmental conditions within the temporary construction area LOD and limits of permanent easements. Additionally, it is unlikely for disposal sites located over the tunnel alignment to impact environmental conditions within the tunnel alignment based on the depth of the tunnels (200 to 400 feet below ground surface), and therefore these disposal sites were not evaluated.

3 Code of Federal Regulations, Title 29, Labor, Part 1910, Occupational Safety and Health Standards, Subpart H, Hazardous Materials, Standard 1910.120, Hazardous Waste Operations and Emergency Response, amended July 25, 2022.

4 Code of Federal Regulations, Title 29, Labor, Part 1926, Safety and Health Regulations for Construction, Subpart D, Occupational Health and Environmental Controls, Standard 1926.65, Hazardous Waste Operations and Emergency Response, amended July 25, 2022.

5 Commonwealth of Massachusetts, 310 Code of Massachusetts Regulations 16.00: Site Assignment Regulations for Solid Waste Facilities, November 15, 2019, https://www.mass.gov/regulations/310-CMR-1600-site-assignment-regulations-for-solid-waste-facilities (accessed August 3, 2022).

6 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 (accessed August 5, 2022).

7 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs Data Portal, Waste Site Cleanup File Viewer, Search for Waste Site & Reportable Releases, https://eeaonline.eea.state.ma.us/portal#!/search/wastesite (accessed August 4, 2022).

4.8.4 Existing Conditions

Disposal sites are regulated under the MCP. As part of the existing conditions assessment, the MassDEP BWSC database of disposal sites and the EEA Waste Site Cleanup File Viewer were reviewed to identify reported OHM 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 OHM has been 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.

A visual inspection was also conducted at select sites to assess for sources of OHM that may have resulted in undocumented releases of OHM. The potential impacts at each site were determined based on the number of disposal sites identified during the existing conditions assessment.

The presence of a disposal site indicates that OHM may be present in the soil and/or groundwater; therefore special consideration would need to be taken during construction to properly manage these materials to prevent adverse impacts. Details of the existing disposal sites at each launching, receiving, connection, and isolation valve site are summarized below.

4.8.4.1 Launching and Receiving Sites

Fernald Property

Ten state-listed disposal sites were identified in the Study Area associated with the proposed Fernald Property receiving site (disposal sites within 500 feet of the construction area LOD). The 10 disposal sites are listed in **Table 4.8-1** and shown on **Figure 4.8-1**. Two of these sites are located within the LOD.

Table 4.8-1 Disposal Sites in the Fernald Property Study Area

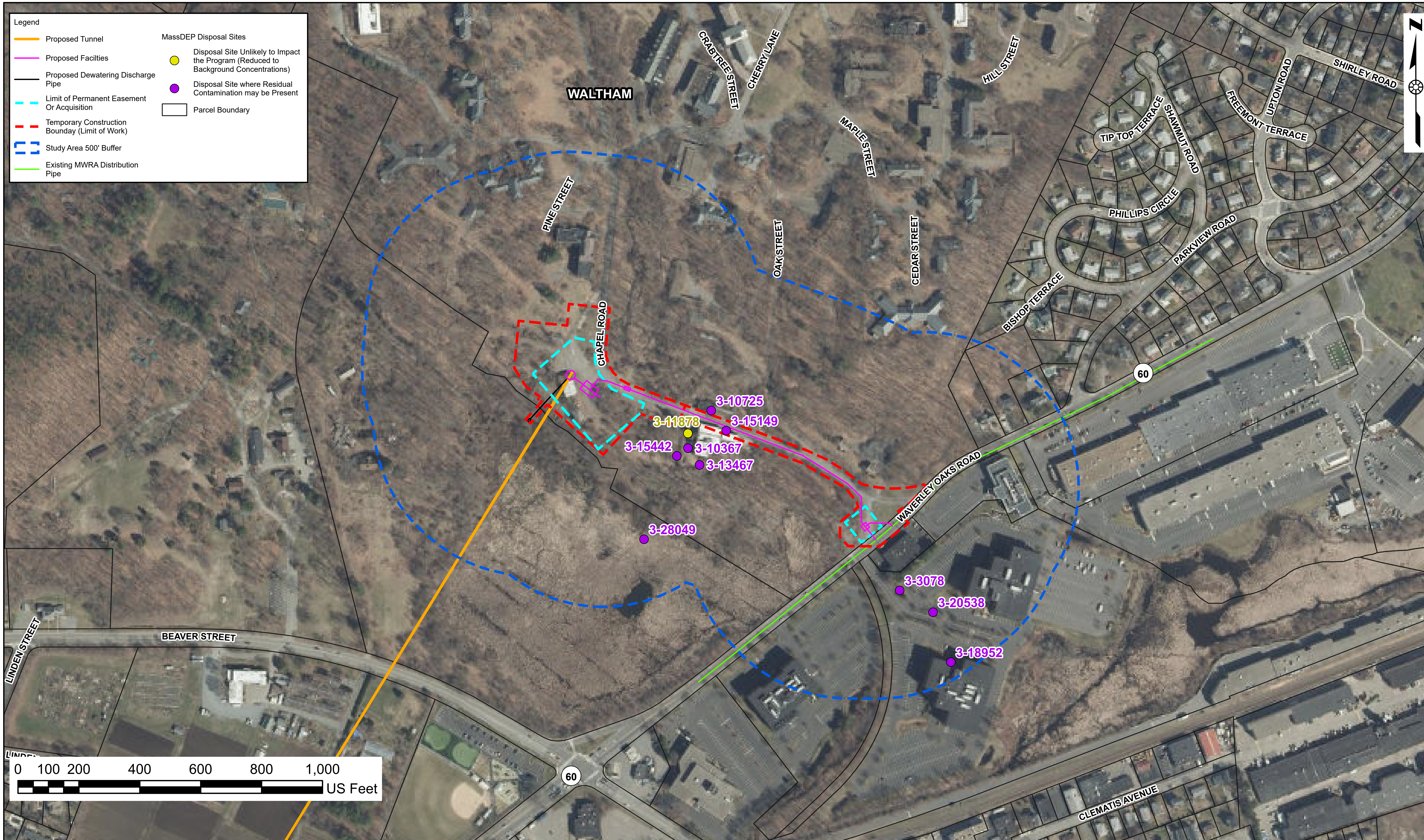
Release Tracking Number (RTN)	Site Name/Location Aid	Address	Regulatory Status [1]	Distance to the Fernald Property Site LOD
3-10367	Within Complex on Chapel Street at Power Plant	200 Trapelo Road	Class C1 Response Action Outcome (RAO)	50 Feet
3-10725	Fernald State School	200 Trapelo Road	Class A2 RAO	Within LOD
3-13467	Power Plant Near Waverly Oaks Entrance	200 Trapelo Road	Class A3 RAO	100 Feet
3-15442	Powerplant	200 Trapelo Road	Class A2 RAO	100 Feet
3-15149	Powerplant	200 Trapelo Road	Class B1 RAO	Within LOD
3-18952	No Location Aid	313 Waverly Oaks Road	RTN Closed	500 Feet
3-20538	UTM 4694592N 318350E	313 Waverly Oaks Road	RTN Closed	450 Feet
3-3078	Former Shell Product Dist. Plant	313 Waverly Oaks Road	Class A3 RAO	250 Feet
3-28049	University of Massachusetts	225-227 Beaver Street	Temporary Solution Statement	500 feet
3-11878	Rear Gate Waverly Oaks Road	200 Trapelo Road	Class A1 RAO Statement	25 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, but still apply to certain disposal sites governed under the MCP. Class A indicates remedial work was completed and a level of "no significant risk" was achieved. Class B indicates "no significant risk" exists and no remedial work was necessary. Class C indicates a temporary cleanup and that, although the site does not present a "substantial hazard," it has not reached a level of no significant risk and the site must be evaluated every five years to determine if a Class A or Class B RAO is possible. All Class C sites are expected eventually to receive a Class A or B RAO. 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 nine of the 10 disposal sites indicates that residual contamination may be present and must be managed appropriately during construction. A summary of the disposal sites within the Study Area associated with the proposed Fernald Property receiving site are provided below:

- **Fernald State School, 200 Trapelo Road**: The following two disposal sites with Release Tracking Numbers (RTNs) are documented within the proposed Fernald Property receiving site LOD:
  - **RTN 3-10725**: This RTN was assigned to a Threat of Release due to two failed underground storage tank (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.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, MA

Hazardous Materials
Fernald Property Receiving
Figure 4.8-1
Source: MassGIS, VHB, MWRA

This page intentionally left blank

- **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.

Three state-listed disposal sites located outside the LOD of the proposed Fernald Property receiving site are also associated with the former Fernald State School. These sites include:

- **RTN 3-10367**: A suspected release of approximately 15 to 20 gallons of No. 6 fuel oil from three USTs 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 AUL due to residual concentrations of petroleum constituents present in the soil. 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 Waverly Road, RTNs 3-18952, 3-20538, and 3-3078, approximately 250 feet south of the LOD**: Between 1939 and 1992, the 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 detection 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 an Activity and Use Limitation (AUL) (i.e., deed restriction) to reduce future exposures to the residual concentrations of metals and petroleum constituents present in the soil.
- **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 the soil and in the wetland areas in October 2008, 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.

The remaining disposal site associated with RTN 3-11878 is associated with a Class A1 RAO Statement, where concentrations of OHM were reduced to background conditions.

Visual Inspection

On April 12, 2022, a visual site inspection was conducted of the Fernald Property to assess for the presence of OHM. Interior portions of the buildings located within or abutting the LOD were inaccessible for a visual inspection. An abandoned powerplant structure, an electrical substation, and a garage structure were observed to abut the LOD along Chapel Road.

According to historical MassDEP documentation, the power plant was constructed in 1921 and operated as a coal-powered plant until the early 1930s. Although access to the interior portions of the building was not possible, no evidence of a storage tank such as vent/fill pipes was observed along the exterior of the building. Various miscellaneous debris was noted near the power plant, including discarded car parts and a discarded propane tank, which appeared to be empty.

An electrical substation containing several electrical transformers abuts Chapel Road to the north. Based on historical aerial imagery, the substation has been present since at least the 1970s. The transformers were noted to be in poor condition with heavy rusting and visual staining. It does not appear this substation is currently in use. Based on the age and condition of the substation, there is the potential that electrical equipment in the substation contained polychlorinated biphenyls (PCBs) that could have resulted in undocumented releases of OHM if not properly maintained.

The northern portion of the LOD contains three sheds, a barn foundation, and a garage that would be demolished prior to construction. Based on the ages of these structures, there exists the potential presence of hazardous building materials, including ACMs and lead-based paint. Based on observations during the site visit, a large volume of debris and evidence of dumping was noted in this portion of the property, including numerous 55-gallon drums, discarded car parts, tires, and other debris. Large stockpiles of soil and debris, the source of which is unknown, were observed in this portion of the property. Evidence of fill materials, including asphalt and trash, was observed in the stockpiles. One propane aboveground storage tank (AST) was also observed adjacent to the garage structure. Based on the evidence of dumping in this portion of the Fernald Property, the fill of unknown origin, and the historical storage of OHM both on and near the construction area LOD, there is the potential for an undocumented release of OHM to have impacted soil and/or groundwater conditions within Fernald Property.

Tandem Trailer and Park Road East

Three state-listed disposal sites were identified in the Study Area associated with the Tandem Trailer and Park Road East sites (disposal sites within 500 feet of the construction area LOD). The three disposal sites in the Study Area are listed in **Table 4.8-2** and shown on **Figure 4.8-2**. No disposal sites were identified within the construction area LOD.

Table 4.8-2 Disposal Sites in the Tandem Trailer and Park Road East Sites Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Tandem Trailer and Park Road East Sites LOD
3-28554	I-90 Eastbound Mile Marker 123	I-90 to Interchange Toll Booth	Class A1 RAO	150 Feet
3-20708	100 East of Interchange 15 Tolls	I-90 West	Class A2 RAO	200 Feet
3-33645	I-90 to I-95 Interchange Toll Booth	I-90 East	Permanent Solution with No Conditions	200 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.

Based on a review of the online MassDEP disposal site files and the EEA Waste Site Cleanup File Viewer, one of the three disposal sites would have to be considered and appropriately managed during construction, as summarized below:

- **RTN 3-20708, approximately 200 feet west of the LOD**: In August 2004, a release of 10 gallons of diesel fuel occurred along I-90 West. In October 2004, the disposal site achieved regulatory closure through the submittal of a Class A2 RAO Statement; however, residual petroleum contaminants remained in the soil at the disposal site.

The disposal site associated with RTN 3-28554 is associated with a Class A1 RAO Statement, where concentrations of OHM were reduced to background conditions. RTN 3-33645 is associated with a Permanent Solution with No Conditions, indicating that response actions were sufficient to achieve a level of No Significant Risk for all current and foreseeable future uses of the site without the need to restrict the use of the property.

Visual Inspection

On April 12, 2022, a visual site inspection was conducted on the Tandem Trailer and Park Road East sites to assess for the presence of OHM. The Tandem Trailer site consists of both undeveloped forested land and an asphalt-paved parking area used for tandem trailer parking and storage of construction debris, materials, and equipment. On a portion of the Tandem Trailer site, evidence of discarded household trash and several dumpsters containing primarily cardboard and wood debris were observed. Three empty 250-gallon plastic totes labeled as Urtek 4R Resin were observed in the parking lot. No obvious indications of a release, such as staining or odors, were observed near these totes.

The Park Road East site primarily consists of a grassy field. A propane tank was noted along one of the abutting structures; however, no additional sources of OHM were observed.

Based on the limited volume of debris and lack of surficial staining, conditions indicative of an undocumented release of OHM were not observed at the Tandem Trail and Park Road East sites.

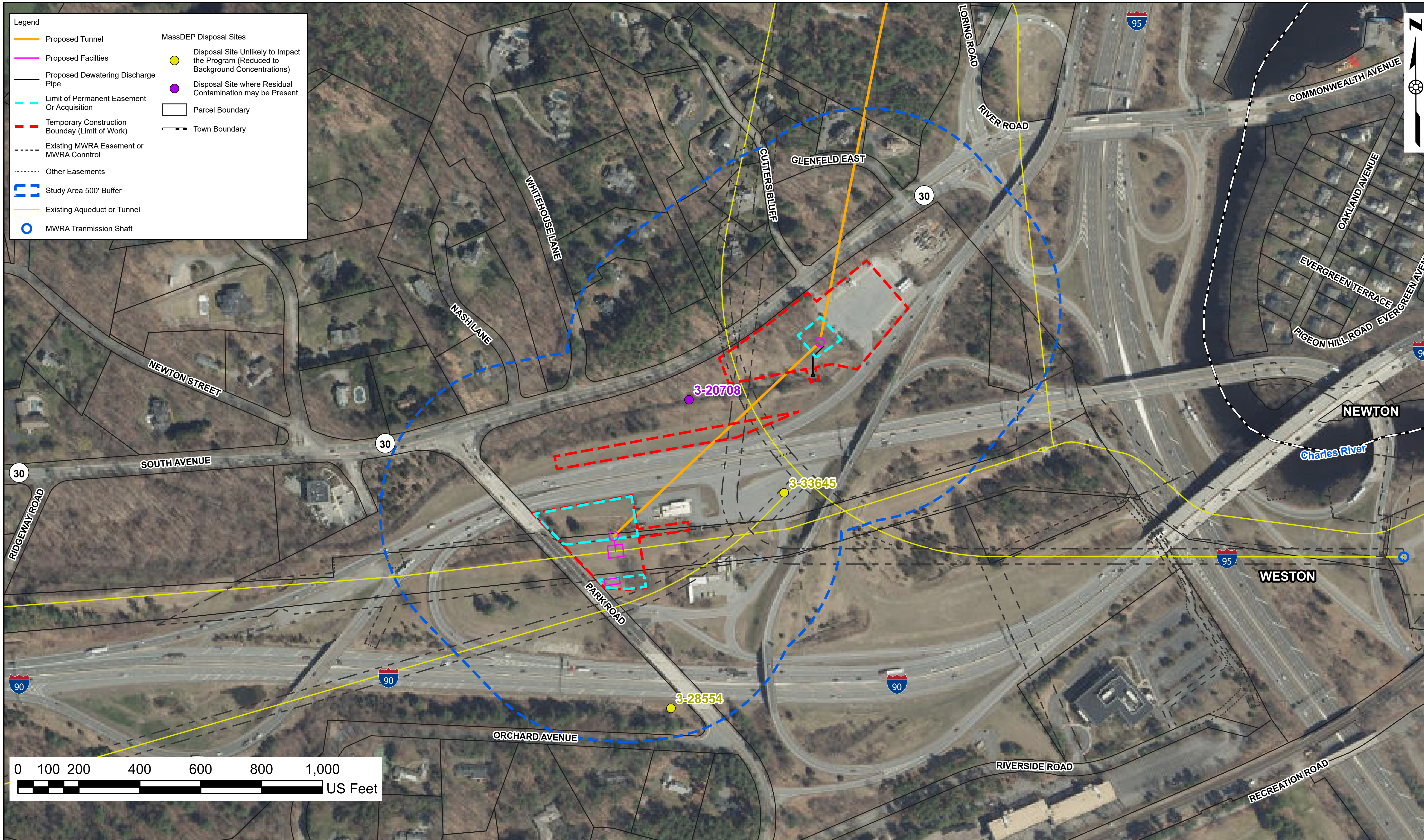
Bifurcation

Six state-listed disposal sites were identified in the Study Area associated with the Bifurcation site (disposal sites within 500 feet of the construction area LOD boundary). The six disposal sites are listed in **Table 4.8-3** and shown on **Figure 4.8-3**. No disposal sites were identified within the construction area LOD.

Table 4.8-3 Disposal Sites in the Bifurcation Site Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Bifurcation Site LOD
3-28554	I-90 Eastbound - Mile Marker 123	I-90 to Interchange Toll Booth	Class A1 RAO	150 Feet
3-24103	I-90 Eastbound - Mile Marker 123	I-90 East	Class A2 RAO	300 Feet
3-12657	I-90 Eastbound - Mile Marker 123	I-90 East	Class A1 RAO	170 Feet
3-13508	At Route 128 and I-90 on Ramp	Riverside Road (Facility #83)	Class B1 RAO	500 Feet
3-33645	I-90 to I-95 Interchange Toll Booth	I-90 East	Permanent Solution with No Conditions	230 Feet
3-21970	Riverside Office Park	20 Riverside Road	Class A2 RAO	400 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.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

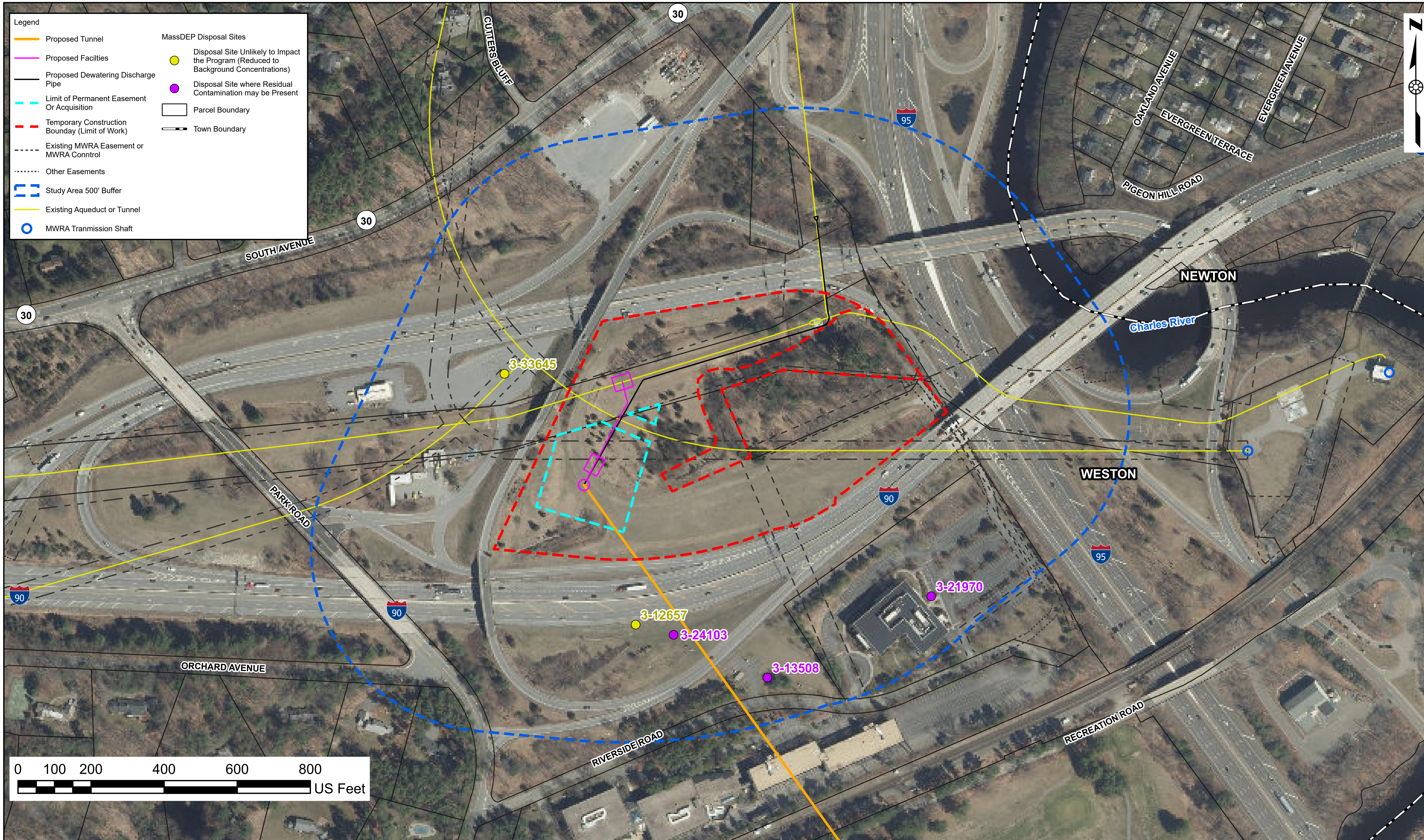
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Hazardous Materials
Tandem Trailer/Park Road East Launching
Figure 4.8-2

Weston, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Hazardous Materials
Bifurcation Launching
Figure 4.8-3

Weston, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank

Based on a review of the MassDEP online files and the EEA Waste Site Cleanup File Viewer, the regulatory closure status of three of the six disposal sites would have to be considered and appropriately managed during construction; a summary of the disposal sites where residual contamination may be present is provided below:

- **RTN 3-24103, I-90 eastbound, approximately 300 feet south of the LOD**: A release of approximately 10 gallons of diesel fuel occurred along I-90 eastbound in August 2003. The release achieved regulatory closure through the submittal of a Class A2 RAO Statement in October 2004; however, residual concentrations of petroleum constituents remained in the soil at the disposal site.
- **RTN 3-13508, Riverside Road Facility #83 at Route 128 and I-90 ramp, approximately 500 feet south of the LOD**: In March 1996, elevated concentrations of antimony were identified in groundwater at this property. The disposal site achieved regulatory closure through the submittal of a Class B1 RAO Statement in September 1996, indicating that no response actions were required but residual concentrations of antimony remained in groundwater.
- **RTN 3-21970, Riverside Office Park, 20 Riverside Road, approximately 400 feet south**: In July 2002, petroleum-impacted soil and buried drums were encountered at this property. The disposal site achieved regulatory closure through the submittal of a Class A2 RAO Statement in July 2003; however, residual petroleum contaminants remained in the soil at the disposal site.

The disposal sites assigned RTNs 3-12657 and 3-28554 are associated with a Class A1 RAO Statement, where concentrations of OHM were reduced to background conditions. RTN 3-33645 is associated with a Permanent Solution Statement with No Conditions, indicating that a level of No Significant Risk was achieved for all current and foreseeable future uses of the site.

Park Road West

Two state-listed disposal sites were identified in the Study Area associated with the Park Road West site (disposal sites within 500 feet of the construction area LOD); these two sites are listed in **Table 4.8-4**. No disposal sites were identified within the LOD.

Table 4.8-4 Disposal Sites in the Park Road West Site Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Park Road West Site LOD
3-28554	I-90 East - Mile Marker 123	I-90 to Interchange Toll Booth	Class A1 RAO	150 Feet
3-24262	Overpass	I-90 East at Route 128	Class A1 RAO	300 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.

The two disposal sites associated with RTNs 3-28554 and 3-24262 are associated with Class A1 RAO Statements, where concentrations of OHM were reduced to background conditions and therefore are unlikely to impact environmental conditions within the Park Road West site. The Park Road West receiving site (Alternative 4) is shown in **Table 4.8-4** and the Park Road West large connection site (Alternative 10) is shown in **Table 4.8-5**. The same disposal sites apply to both the receiving site and the large connection site (see **Figure 4.8-4** and **Figure 4.8-5**).

Highland Avenue Northwest

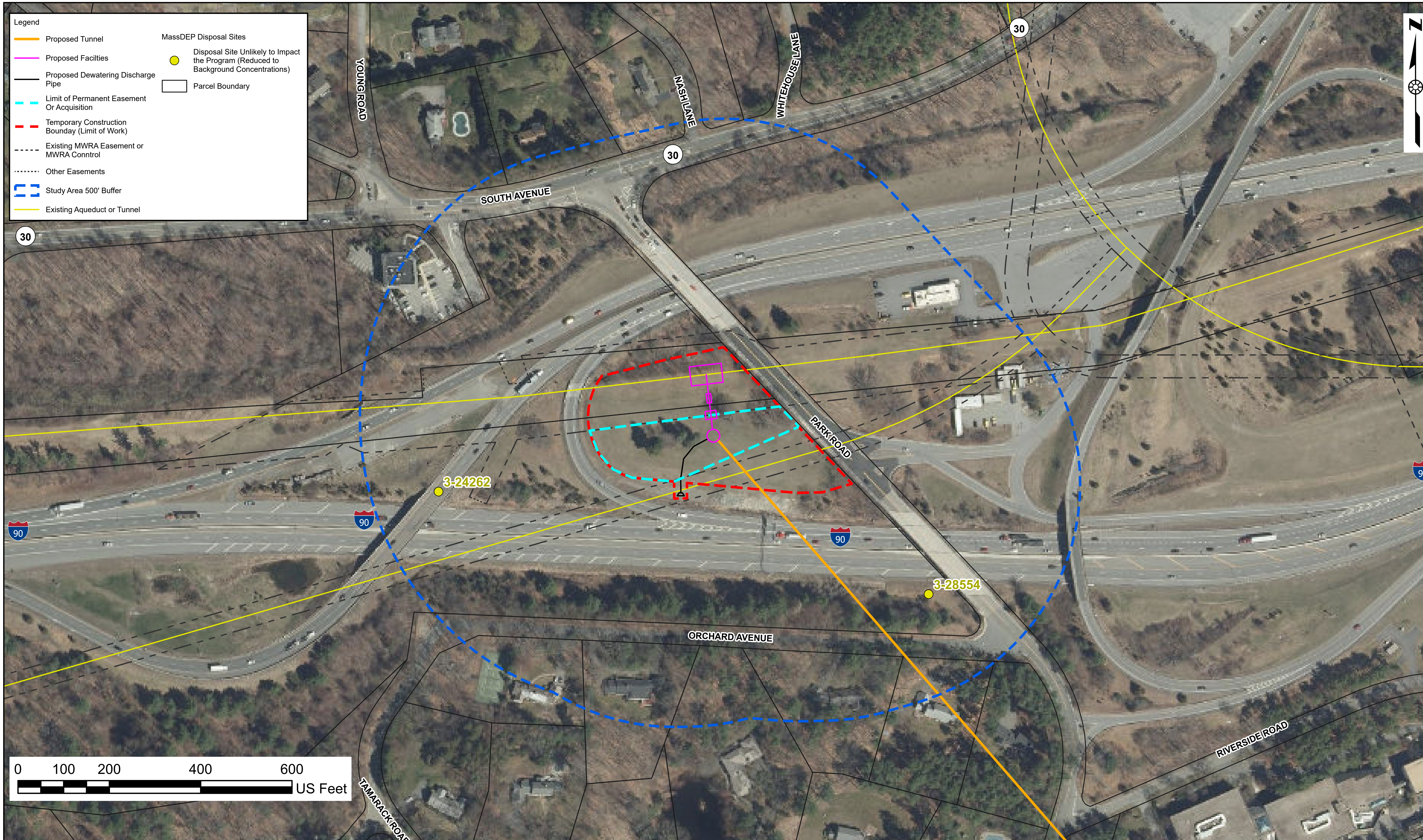
Seven state-listed disposal sites were identified in the Study Area associated with the Highland Avenue Northwest receiving site (disposal sites within 500 feet of the construction area LOD), which includes the proposed dewatering discharge pipeline to the Charles River. The seven sites are listed in **Table 4.8-5** and shown on **Figure 4.8-6**. Four of the seven sites are abutting the LOD.

Table 4.8-5 Disposal Sites in the Highland Avenue Northwest Site Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Highland Avenue Northwest Site LOD
3-4213	Former Auto Repair Shop	52 Wexford Street	Permanent Solution with No Conditions	Abutting
3-26824	Former Auto Repair Shop	52 Wexford Street	Permanent Solution with No Conditions	Abutting
3-13980	No Location Aid	5 TV PL	Class A2	Abutting
3-23686	No Location Aid	237 Highland Avenue	Class B1 RAO	250 Feet
3-36733	Wash World	557 Highland Avenue	Permanent Solution with No Conditions	200 Feet
3-14365	No Location Aid	5 TV PL	Class A1 RAO	250 Feet
3-31599	At 56 Brook Street	Brook Street	Class A1 RAO	Abutting

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.

Based on a review of the online MassDEP disposal site files and the EEA Waste Site Cleanup File Viewer, five of the seven disposal sites would have to be considered and appropriately managed during construction.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

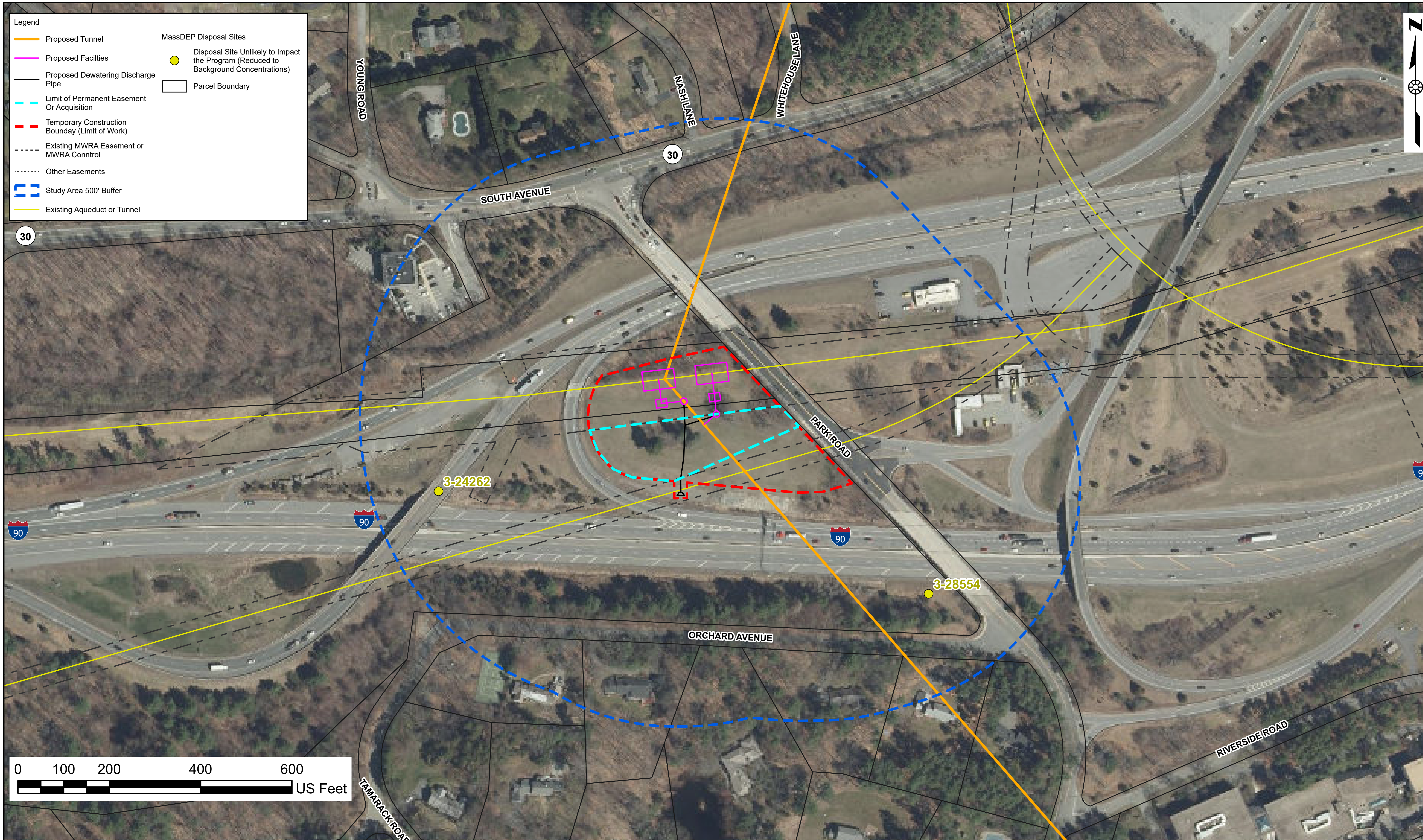
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Hazardous Materials
Park Road West Receiving
Figure 4.8-4

Weston, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Weston, MA

Hazardous Materials
Park Road West Large Connection
Figure 4.8-5

Source: MassGIS, VHB, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

Hazardous Materials
Highland Avenue Northwest Receiving
Figure 4.8-6

Needham, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank

A summary of the sites where residual contamination may be present is provided below:

- **RTNs 3-4213 and 3-26824, Former Automotive Repair Shop, 52 Wexford Street, abutting the LOD**: This property was listed as a Location to Be Investigated in January 1993 due to the detection of volatile organic compounds (VOCs) in groundwater, and RTN 3-4213 was assigned to the release. In May 2007, approximately 0.7 feet of Non-Aqueous Phase Liquid (NAPL) was measured in a monitoring well, and secondary RTN 3-26824 was assigned to this condition. RTN 3-26924 was linked to primary RTN 3-4213, and all response actions were conducted under the primary RTN. Regulatory closure was achieved through the submittal of a Permanent Solution Statement with No Conditions in December 2018; however, residual concentrations of VOCs remained in the soil and in groundwater.
- **RTN 3-13980, 5 TV Place, abutting the LOD to the north**: In July 1996, a release of No. 2 fuel oil occurred from a UST at the property. The release achieved regulatory closure through the submittal of a Class A2 RAO Statement in August 1996; however, residual concentrations of petroleum constituents remained in the soil.
- **RTN 3-23686, 237 Highland Avenue, approximately 250 feet east of the LOD**: Elevated concentrations of petroleum constituents were detected in the soil and groundwater at the property in October 2003. The disposal site achieved regulatory closure through the submittal of a Class B1 RAO Statement, indicating that no response actions were performed because a Condition of No Significant Risk had been achieved. Residual concentrations of petroleum constituents remained in the soil and groundwater.
- **RTN 3-36733, Wash World, 557 Highland Avenue, approximately 200 feet to the west of the LOD**: Concentrations of petroleum constituents were detected in the soil above reportable concentrations near a UST in March 2021. The disposal site achieved regulatory closure through the submittal of a Permanent Solution Statement with No Conditions in August 2021; however, residual concentrations of petroleum constituents remained in the soil.

The remaining two disposal sites associated with RTNs 3-14365 and 3-31599 are associated with Class A1 RAO Statements, where concentrations of OHM were reduced to background conditions.

Highland Avenue Northwest/Southwest

Eight state-listed disposal sites were identified in the Study Area associated with the Highland Avenue Northwest/Southwest sites (disposal sites within 500 feet of the construction area LOD), which includes the proposed dewatering discharge pipeline to the Charles River. The eight sites are listed in **Table 4.8-6** and shown on **Figure 4.8-7**. Four of the eight sites were abutting the LOD. Seven of the eight sites are also included in the Study Area associated with the Highland Avenue Northwest site (Alternative 3 receiving site), as described in the previous section. The Highland Avenue Northwest/Southwest sites, which would function of a launching site in Alternatives 4 and 10, results in the inclusion of one additional disposal site (RTN 3-12568), which was not already discussed.

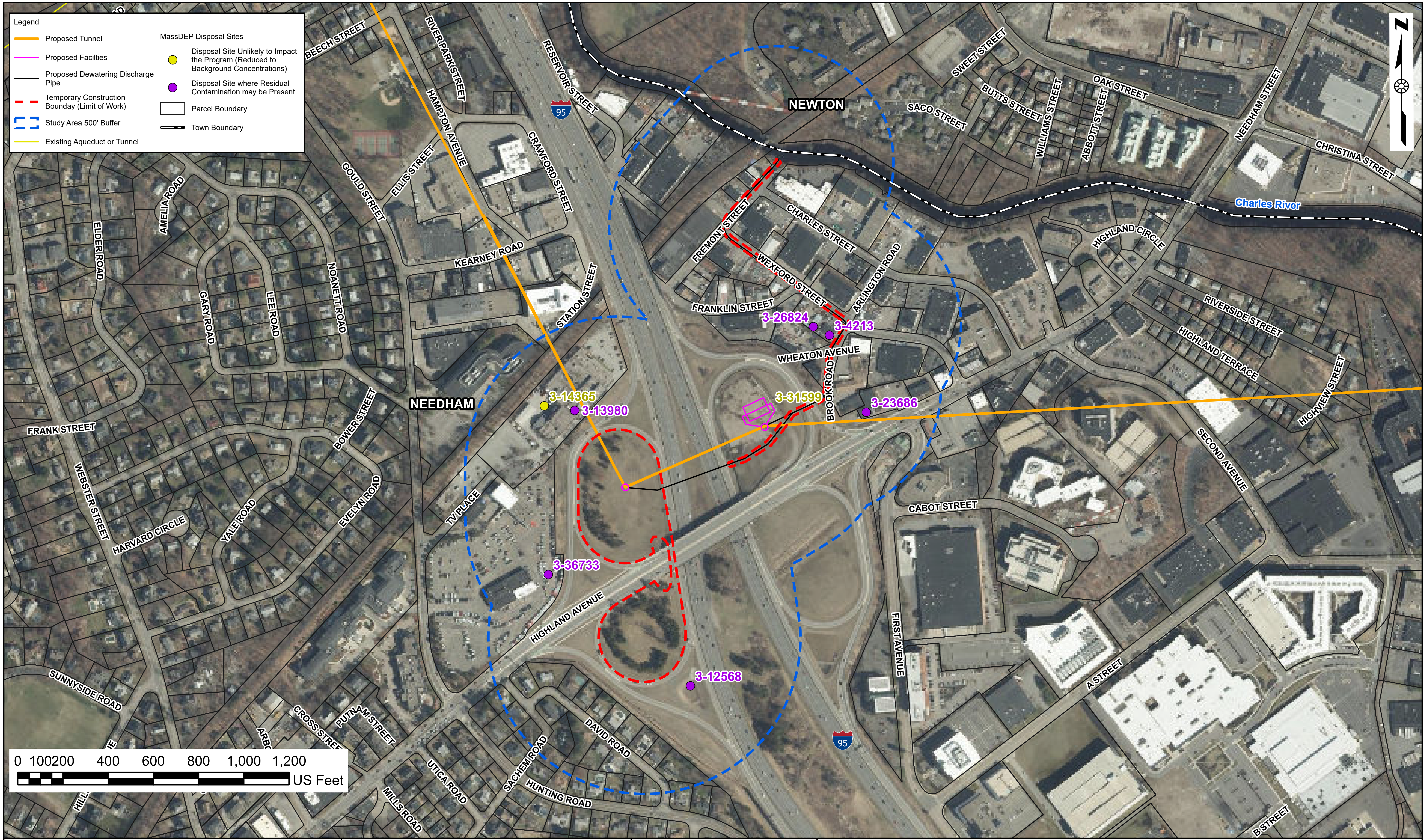
Table 4.8-6 Disposal Sites in the Highland Avenue Northwest/Southwest Sites Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Highland Avenue Northwest/Southwest Sites LOD
3-4213	Former Auto Repair Shop	52 Wexford Street	Permanent Solution with No Conditions	Abutting
3-26824	Former Auto Repair Shop	52 Wexford Street	Permanent Solution with No Conditions	Abutting
3-12568	Route 128A at Highland Avenue	I-95 South	Class A2 RAO	Abutting
3-13980	No Location Aid	5 TV PL	Class A2	Abutting
3-23686	No Location Aid	237 Highland Avenue	Class B1 RAO	250 Feet
3-36733	Wash World	557 Highland Avenue	Permanent Solution with No Conditions	200 Feet
3-14365	No Location Aid	5 TV PL	Class A1 RAO	250 Feet
3-31599	At 56 Brook Street	Brook Street	Class A1 RAO	Abutting

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.

Based on a review of the online MassDEP disposal site files and the EEA Waste Site Cleanup File Viewer, six of the eight disposal sites would have to be considered and appropriately managed during construction. A summary of the sites where residual contamination may be present is provided below:

- **RTNs 3-4213 and 3-26824, Former Automotive Repair Shop, 52 Wexford Street, abutting the LOD**: This property was listed as a Location to Be Investigated in January 1993 due to the detection of VOCs in groundwater, and RTN 3-4213 was assigned to the release. In May 2007, approximately 0.7 feet of NAPL was measured in a monitoring well, and secondary RTN 3-26824 was assigned to this condition. RTN 3-26924 was linked to primary RTN 3-4213, and all response actions were conducted under the primary RTN. Regulatory closure was achieved through the submittal of a Permanent Solution Statement with No Conditions in December 2018; however, residual concentrations of VOCs remained in the soil and in groundwater.
- **RTN 3-12568, Route 128A at Highland Avenue, I-95 South, abutting the LOD to the south**: A release of approximately 100 gallons of diesel fuel occurred along Route 128A and was reported to MassDEP in June 1995. The release achieved regulatory closure through the submittal of a Class A2 RAO Statement in August 1995; however, residual concentrations of petroleum constituents remained in the soil.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Needham, MA

Hazardous Materials
Highland Avenue Northwest/Southwest Launching
Figure 4.8-7

Source: MassGIS, VHB, MWRA

This page intentionally left blank

- **RTN 3-13980, 5 TV Place**, abutting the LOD to the north: In July 1996, a release of No. 2 fuel oil occurred from a UST at the property. The release achieved regulatory closure through the submittal of a Class A2 RAO Statement in August 1996; however, residual concentrations of petroleum constituents remained in the soil.
- **RTN 3-23686, 237 Highland Avenue**, approximately 250 feet east of the LOD: Elevated concentrations of petroleum constituents were detected in the soil and groundwater at the property in October 2003. The disposal site achieved regulatory closure through the submittal of a Class B1 RAO Statement. Residual concentrations of petroleum constituents remained in the soil and groundwater.
- **RTN 3-36733, Wash World, 557 Highland Avenue**, approximately 200 feet west of the LOD: Concentrations of petroleum constituents were detected in the soil above reportable concentrations near a UST in March 2021. The disposal site achieved regulatory closure through the submittal of a Permanent Solution Statement with No Conditions in August 2021; however, residual concentrations of petroleum constituents remained in the soil.

The disposal sites associated with RTNs 3-14365 and 3-31599 are associated with Class A1 RAO Statements, where concentrations of OHM were reduced to background conditions.

Highland Avenue Northeast/Southeast

Five state-listed disposal sites were identified in the Study Area associated with the Highland Avenue Northeast/Southeast sites (disposal sites within 500 feet of the construction area LOD), which includes the proposed dewatering discharge pipeline to the Charles River. The five sites are listed in **Table 4.8-7** and shown on **Figure 4.8-8**. Two of the five sites were abutting the LOD.

Table 4.8-7 Disposal Sites in the Highland Avenue Northeast/Southeast Sites Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Highland Avenue Northeast/Southeast Sites LOD
3-4213	Former Auto Repair Shop	52 Wexford Street	Permanent Solution with No Conditions	Abutting
3-26824	Former Auto Repair Shop	52 Wexford Street	Permanent Solution with No Conditions	Abutting
3-10658	No Location Aid	180 First Ave	Class A2 RAO	300 Feet
3-23686	No Location Aid	237 Highland Avenue	Class B1 RAO	250 Feet
3-31599	At 56 Brook Street	Brook Street	Class A1 RAO	Abutting

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.

Based on a review of the online MassDEP disposal site files and the EEA Waste Site Cleanup File Viewer, four of the five disposal sites would have to be considered and appropriately managed during construction. A summary of the sites where residual contamination may be present is provided below:

- **RTNs 3-4213 and 3-26824, Former Automotive Repair Shop, 52 Wexford Street, abutting the LOD**: This property was listed as a Location to Be Investigated in January 1993 due to the detection of VOCs in groundwater, and RTN 3-4213 was assigned to the release. In May 2007, approximately 0.7 feet of NAPL was measured in a monitoring well, and secondary RTN 3-26824 was assigned to this condition. RTN 3-26924 was linked to primary RTN 3-4213, and all response actions were conducted under the primary RTN. Regulatory closure was achieved through the submittal of a Permanent Solution Statement with No Conditions in December 2018; however, residual concentrations of VOCs remained in the soil and in groundwater.
- **RTN 3-10658, 180 First Avenue, approximately 300 feet south of the LOD**: In January 1993, a release was identified from a UST. The release achieved regulatory closure through the submittal of a Permanent Solution Statement with No Conditions in December 2018; however, residual concentrations of petroleum-impacted soil remained at the disposal site.
- **RTN 3-23686, 237 Highland Avenue, approximately 250 feet east**: Elevated concentrations of petroleum constituents were detected in the soil and groundwater at the property in October 2003. The disposal site achieved regulatory closure through the submittal of a Class B1 RAO Statement, indicating that no response actions were performed because a Condition of No Significant Risk had already been achieved. Residual concentrations of petroleum constituents remained in the soil and groundwater.

The remaining disposal site associated with RTN 3-31599 is associated with a Class A1 RAO Statement where concentrations of OHM were reduced to background conditions.

American Legion

No state-listed disposal sites were identified in the Study Area associated with the American Legion site (disposal sites within 500 feet of the construction area LOD), as shown on **Figure 4.8-9**.

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

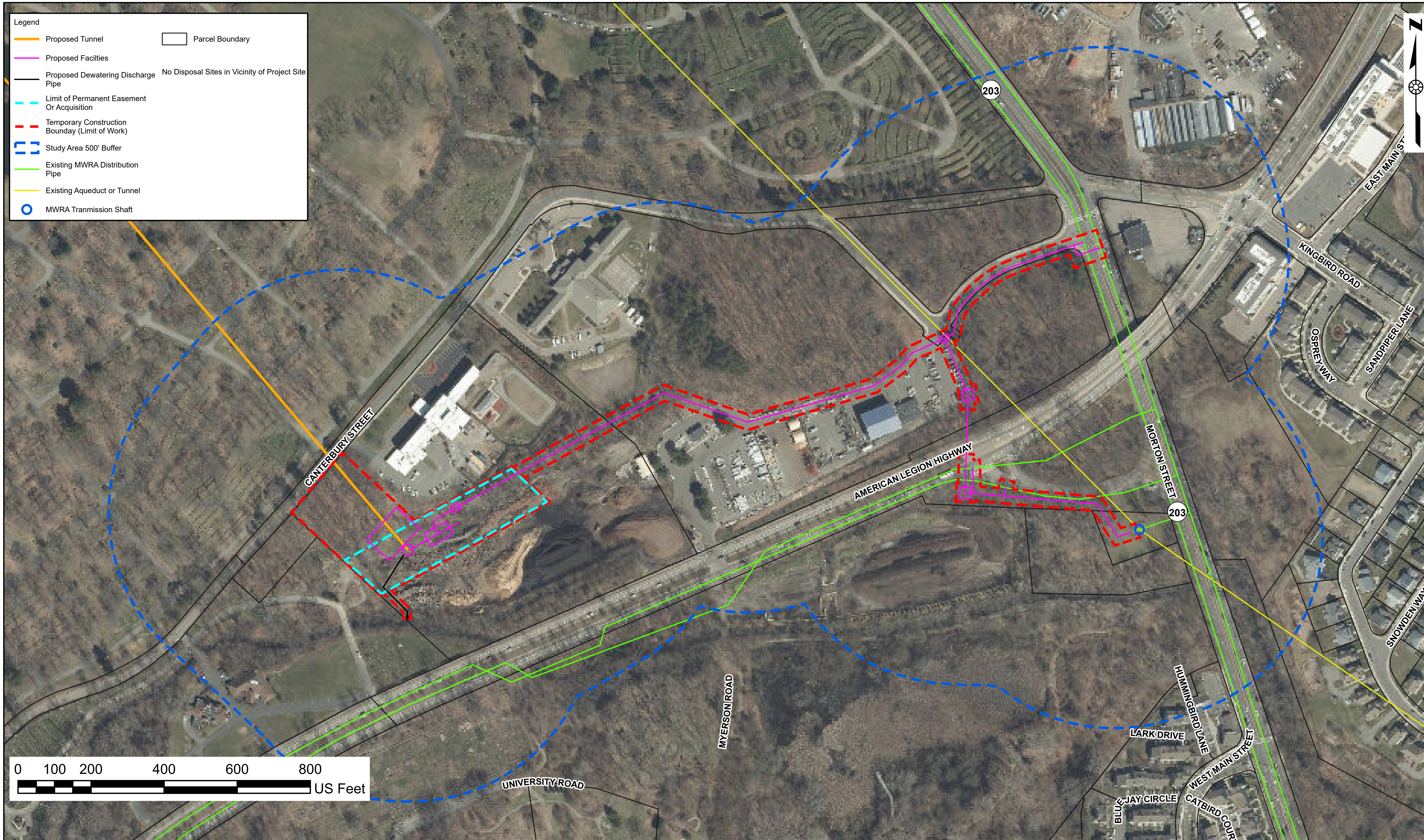
CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Hazardous Materials
Highland Avenue Northeast/Southeast Launching
Figure 4.8-8

Needham, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Boston, MA

Hazardous Materials
American Legion Receiving
Figure 4.8-9

Source: MassGIS, VHB, MWRA

This page intentionally left blank

4.8.4.2 Connection Sites and Isolation Valve

School Street

Four state-listed disposal sites were identified in the Study Area associated with the School Street site (disposal sites within 500 feet of the construction area LOD). These sites are listed in **Table 4.8-8** and shown on **Figure 4.8-10**. No disposal sites were identified within the construction area LOD.

Table 4.8-8 Disposal Sites in the School Street Site Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the School Street Site LOD
3-12877	NYNEX Office	30 Spring Street	Class A2 RAO	260 Feet
3-20803	Main Street and School Street	35 to 39 Rear Spring Street	Class A2 RAO	275 Feet
3-36671	Former Industrial/Residential Properties	73 Pond Street	RTN Closed	450 Feet
3-36624	Commercial Property	73 Pond Street	Tier 1[8]	450 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.

Based on a review of the online MassDEP disposal site files and the EEA Waste Site Cleanup File Viewer, all four disposal sites would have to be considered and appropriately managed during the construction phase. A summary of the sites where residual contamination may be present is provided below:

- **RTN 3-12877, NYNEX Office, 30 Spring Street, approximately 260 feet south**: A release of petroleum constituents was identified at the property in August 1995 during the removal of a UST. The release achieved regulatory closure in June 1996 through the submittal of a Class A2 RAO Statement; however, residual concentrations of petroleum constituents remained in the soil and groundwater.
- **RTN 3-20803, Main and School Street, 35 to 39 Rear Spring Street, approximately 275 feet south**: A release of fuel oil occurred from an AST in June 2001. The release achieved regulatory closure in February 2002 through the submittal of a Class A2 RAO Statement; however, residual concentrations of petroleum constituents remained in the soil and groundwater.
- **RTNs 3-36671 and 3-36624, Former Industrial Property, 73 Pond Street, approximately 450 feet northwest of the LOD**: Concentrations of VOCs were detected in the soil and groundwater at the property in November 2020, and RTN 3-36624 was assigned to the release. Indoor air and soil gas sampling conducted on a downgradient property (11 Pond Street) detected concentrations of tetrachloroethene (PCE), and a secondary RTN 3-36671 was assigned to the release condition. RTN 3-36671 was linked to primary RTN 3-36624, and all response actions are actively being conducted

8 Tier 1 classification indicates that a disposal site has been active under the MCP for over a year and has been Tier Classified. This regulatory designation indicates that assessment activities are ongoing and regulatory closure has not been achieved.

under the primary RTN. The disposal site is classified as a Tier 1 disposal site based on ongoing assessment activities.

Cedarwood Pumping Station

Two state-listed disposal sites were identified in the Study Area associated with the Cedarwood Pumping Station site (disposal sites within 500 feet of the construction area LOD). These two sites are listed in **Table 4.8-9** and shown on **Figure 4.8-11**. No disposal sites were identified within the construction area LOD.

Table 4.8-9 Disposal Sites in the Cedarwood Pumping Station Site Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Cedarwood Pumping Station Site LOD
3-20842	Former Fuller Home	South Street	Class A1 RAO	130 Feet
3-20843	Former Fuller Home	South Street	Class A1 RAO	130 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.

Based on a review of the MassDEP online disposal site files and the EEA Waste Site Cleanup File Viewer, both RTNs are associated with Class A1 RAO Statements, where concentrations of OHM were reduced to background conditions and are therefore unlikely to impact environmental conditions within the Cedarwood Pumping Station site.

Hegarty Pumping Station

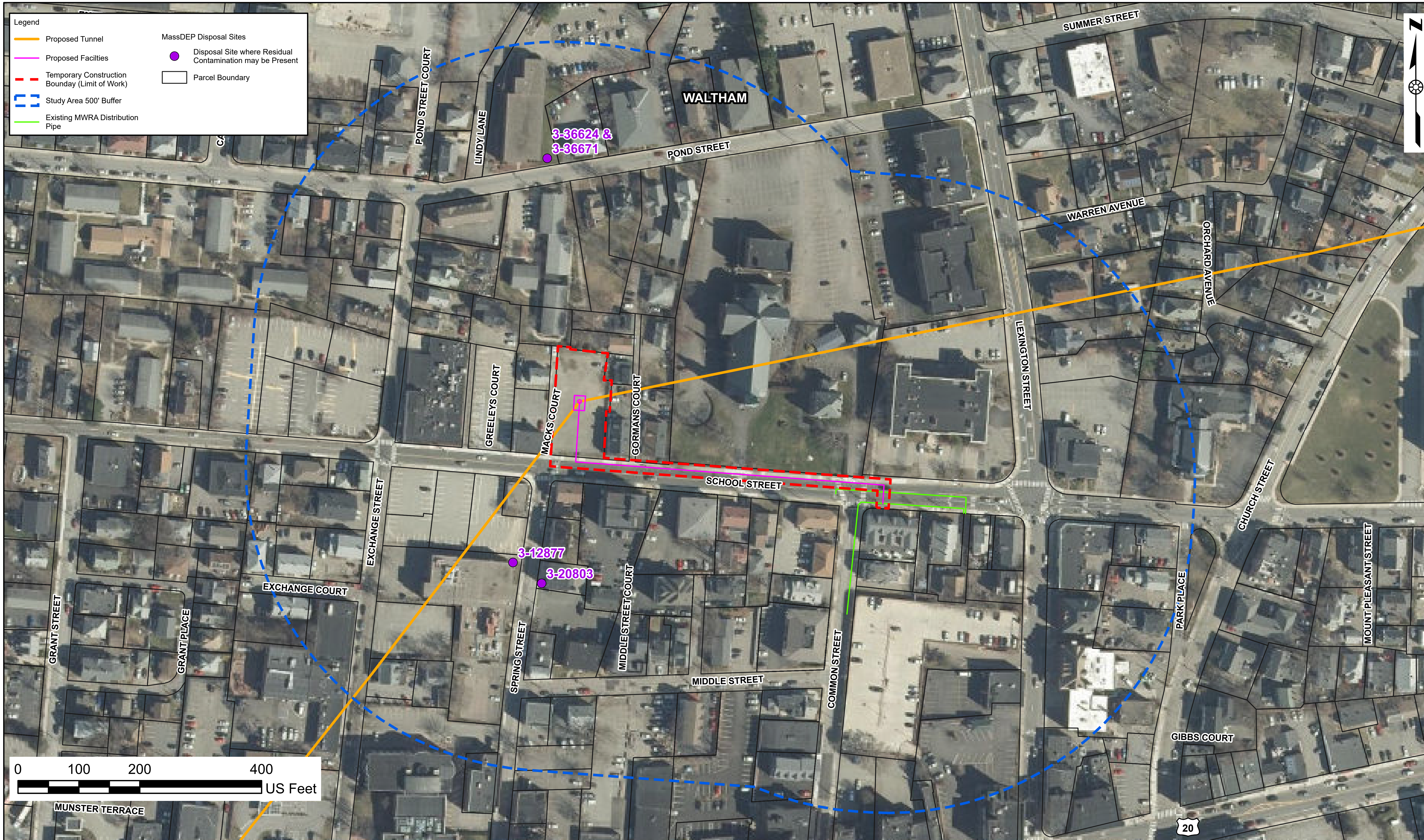
No state-listed disposal sites were identified in the Study Area associated with the Hegarty Pumping Station site (disposal sites on or within 500 feet of the construction area LOD). See **Figure 4.8-12.**

St. Mary Street Pumping Station

No state-listed disposal sites were identified in the Study Area associated with the St. Mary Street Pumping Station site (disposal sites on or within 500 feet of the construction area LOD). See **Figure 4.8-13.**

Newton Street Pumping Station

Seven state-listed disposal sites were identified in the Study Area associated with the Newton Street Pumping Station site (disposal sites on or within 500 feet of the construction area LOD). These seven sites are listed in **Table 4.8-10** and shown on **Figure 4.8-14**. Four of the seven sites are within the LOD.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, MA

Hazardous Materials
School Street Connection
Figure 4.8-10
Source: MassGIS, VHB, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

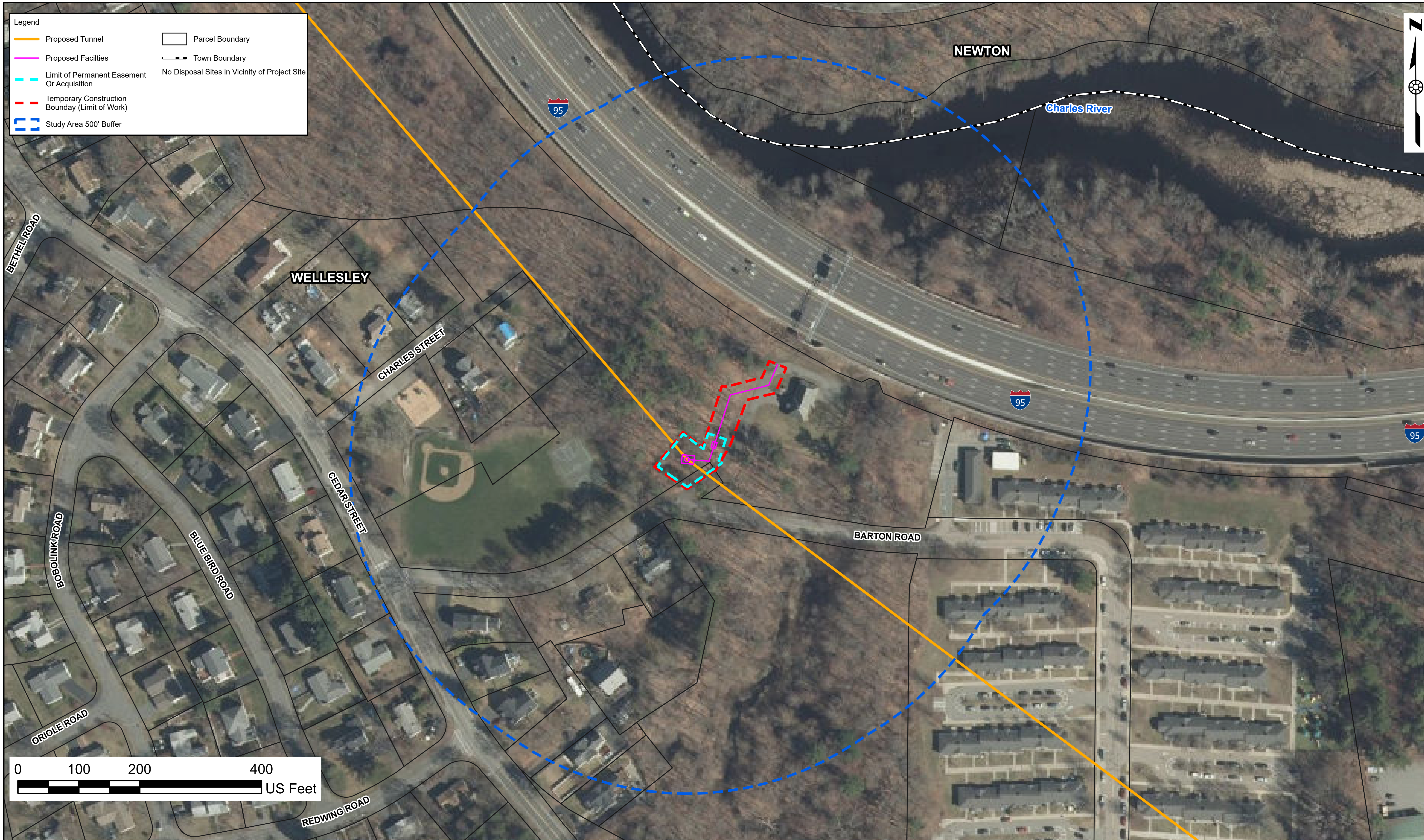
CDM Smith in association with vhb
Jacobs
Green International Affiliates, Inc.

Hazardous Materials
Cedarwood Pumping Station Connection
Figure 4.8-11

Waltham, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wellesley, MA

Hazardous Materials
Hegarty Pumping Station Connection
Figure 4.8-12

Source: MassGIS, VHB, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Hazardous Materials
St. Mary Street Pumping Station Connection
Figure 4.8-13

Needham, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental
Impact Report

in association with

Hazardous Materials
Newton Street Pumping Station Connection
Figure 4.8-14

Brookline, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank

Table 4.8-10 Disposal Sites in the Newton Street Pumping Station Site Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Newton Street Pumping Station Site LOD
3-30824	MWRA Newton Street Pumping Station	321 Newton Street	Class A2 RAO	Within
3-19818	No Location Aid	320 Newton Street	Class A2 RAO	200 Feet
3-14954	MWRA Newton Street Pumping Station	321 Newton Street	Class A2 RAO	Within
3-11035	At Grover Street	320 Newton Street	Class B1 RAO	200 Feet
3-10351	Newton Street Pumping Station	321 Newton Street	RAO	Within
3-4204	Ewon Service Station 3 5034	320 Newton Street	Class B1 RAO	200 Feet
3-2993	James R. Devito, Inc.	321-331 Newton Street	Class A2 RAO	Within

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.

Based on a review of the online MassDEP disposal site files and the EEA Waste Site Cleanup File Viewer, all seven of the state-listed disposal sites would have to be considered and appropriately managed during construction since residual contamination may be present. A summary is provided below:

- **RTNs 3-30824, 3-14954, 3-10351, and 3-2993, MWRA Newton Street Pumping Station, 321 Newton Street**, within the construction area LOD: RTNs 3-2993, 3-10351, and 3-14954 are associated with USTs that were formerly located west of a retaining wall at the Newton Street Pumping Station property. All three RTNs have been permanently closed with a Class A2 RAO Statement, where residual concentrations of OHM remain in the soil and/or groundwater, except for RTN 3-10351 where the class of RAO is unknown. RTN 3-30824 was assigned in February 2012 following the identification of NAPL in groundwater and achieved regulatory closure through the submittal of a Class A2 RAO Statement. Although all these releases have achieved regulatory closure, residual concentrations of petroleum constituents remained in the soil and groundwater.
- **RTNs 3-19818, 3-11035, and 3-4204, 320 Newton Street, approximately 200 feet southeast of the LOD**: RTNs 3-11035 and 3-4204 have been permanently closed with a Class B1 RAO Statement, where residual concentrations of OHM remain in the soil and/or groundwater. RTN 3-19818 was assigned in July 2000 due to the detection of petroleum constituents in the soil and groundwater and achieved regulatory closure through the submittal of a Class A2 RAO Statement. Although these three releases have achieved regulatory closure, residual concentrations of petroleum constituents remained in the soil and groundwater.

Southern Spine Mains

Two state-listed disposal sites were identified within a 500-foot radius of the LOD associated with the Southern Spine Mains site. These sites are listed in **Table 4.8-11** and shown on **Figure 4.8-15**.

Table 4.8-11 Disposal Sites in the Southern Spine Mains Site Study Area

RTN	Site Name/Location Aid	Address	Regulatory Status	Distance to the Southern Spine Mains Site LOD
3-20933	Arnold Arboretum	125 Arborway	Class A2 RAO	Abutting
3-18176	No Location Aid	Washington Street	Class A1 RAO	450 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.

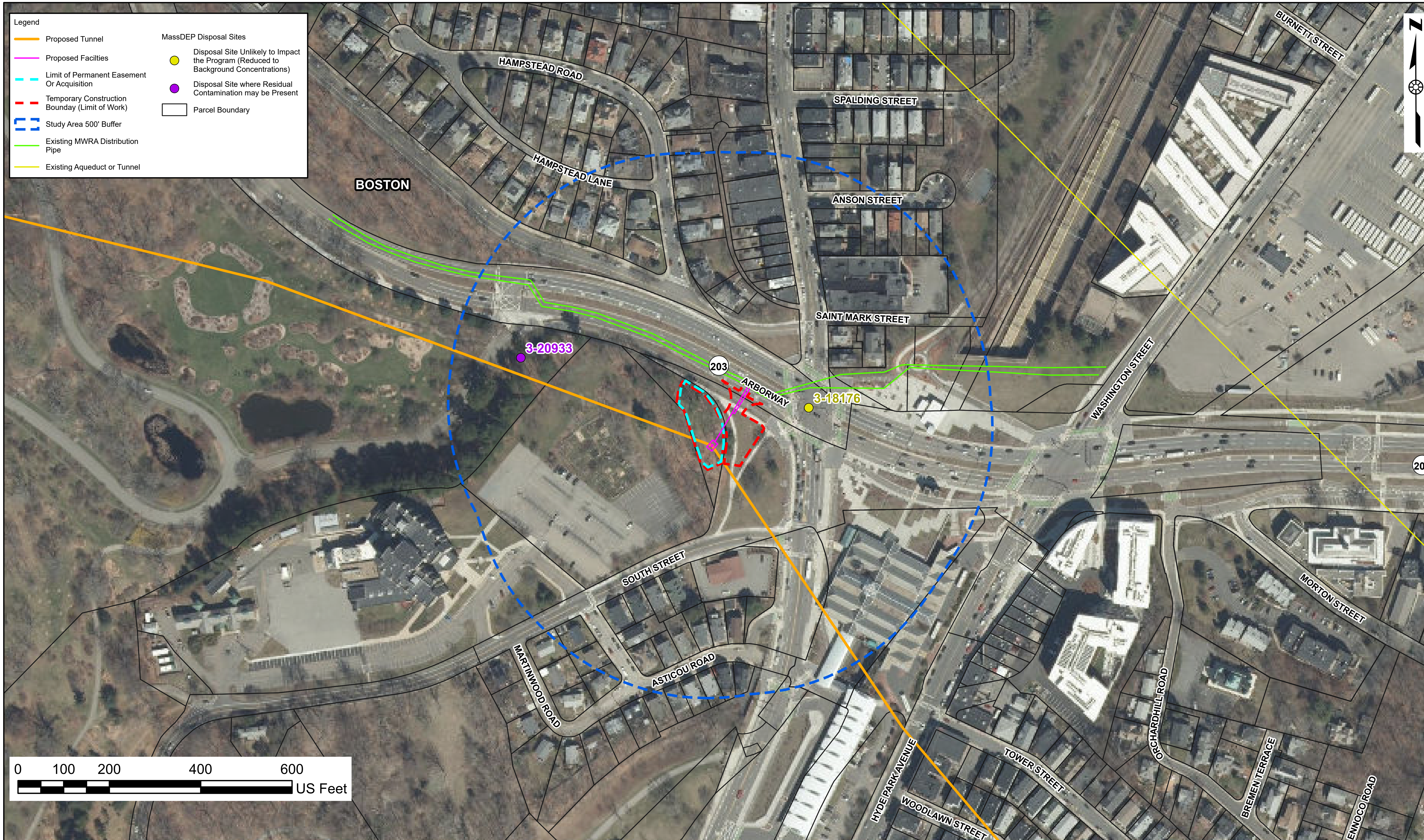
Based on a review of the online MassDEP disposal site files and the EEA Waste Site Cleanup File Viewer, one of the two disposal sites would have to be considered and appropriately managed during construction. A summary of the site where residual contamination may be present is provided below:

- **RTN 3-20933, Arnold Arboretum, 125 Arborway, abutting the LOD to the west**: In July 2001, a release of 15 gallons of an unknown product occurred at the property. The release achieved regulatory closure with the submittal of a Class A2 RAO Statement, indicating that residual concentrations of contaminants were present. Additional details regarding the response action performed were not provided in MassDEP documentation.

The remaining disposal site assigned RTN 3-18176 is associated with a Class A1 RAO Statement, where concentrations of OHM were reduced to background conditions.

Hultman Aqueduct Isolation Valve

No state-listed disposal sites were identified within the Study Area associated with the Hultman Aqueduct Isolation Valve site (see **Figure 4.8-16**).



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

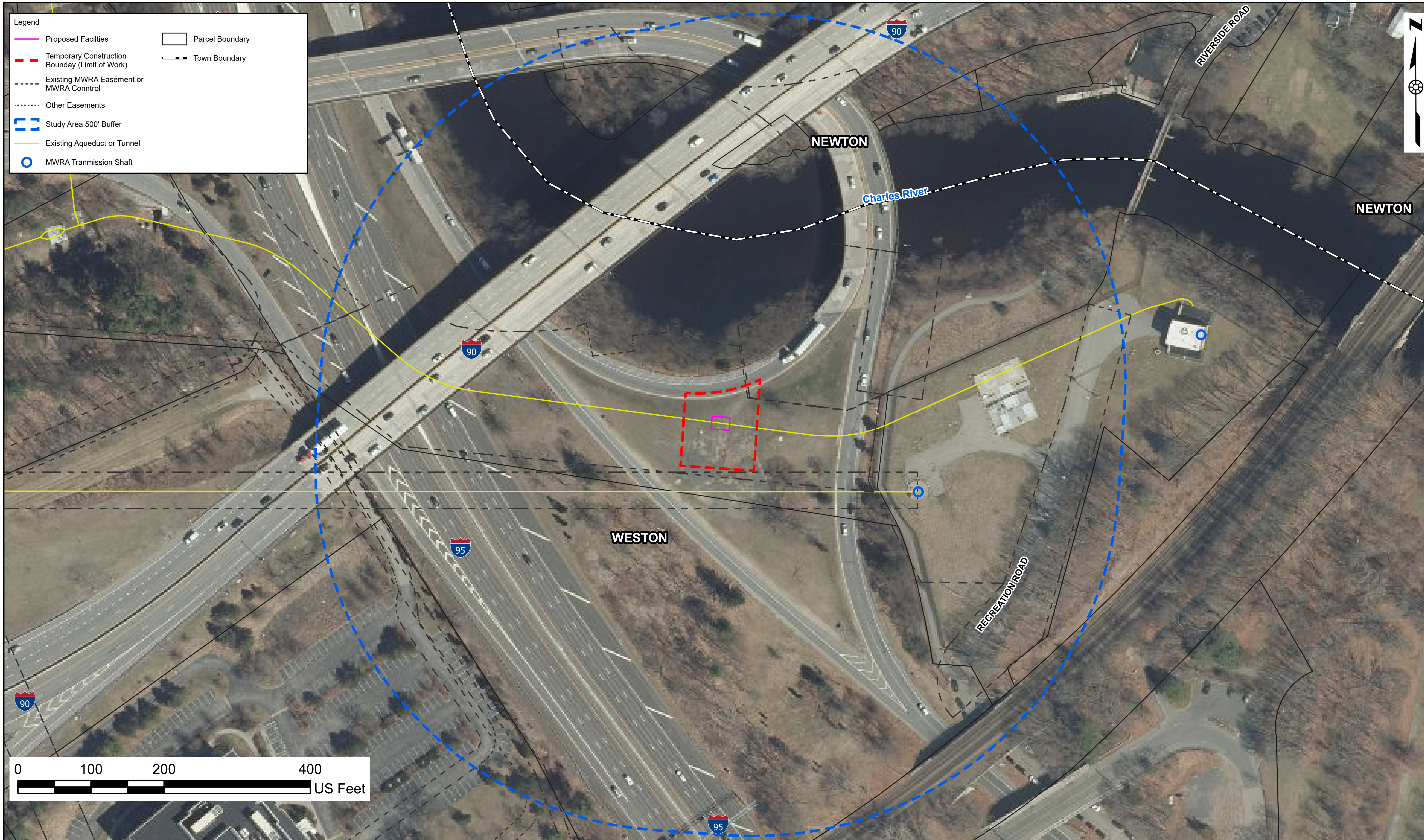
CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

Hazardous Materials
Southern Spine Mains Connection
Figure 4.8-15

Boston, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN

Hazardous Materials
Hultman Aqueduct Isolation Valve
Figure 4.8-16

Weston, MA

Source: MassGIS, VHB, MWRA

This page intentionally left blank

4.8.5 Construction Period Impacts

During tunnel excavation, a large volume of rock and excavated material would be generated that would require proper management during construction. 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. All volumes of excavated material are presented as bulked cubic yards.

Under all three DEIR Alternatives, the tunnel alignment is 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 sources; however, naturally present 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 **Section 4.8.7)**.

Groundwater dewatering would be required during construction and would require proper management to avoid impacts to the surrounding environment. Several proposed construction sites are near state-listed disposal sites, as discussed in the Existing Conditions assessment in **Section 4.8.4**. These state-listed disposal sites have the potential to impact groundwater and would require proper handling during construction if encountered. Prior to being discharged, dewatering effluent would be managed in accordance with applicable regulatory requirements, as described in **Section 4.8.7**. 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 **Section 4.8.7.2**). Therefore, no significant impact from the generation of building materials is anticipated.

4.8.5.1 Alternative 3

During construction of Alternative 3, approximately 938,000 cubic yards of excavated material would be removed from the tunnel and would ultimately require off-site disposal or reuse at another location. The estimated breakdown of excavated material to be removed under Alternative 3 is:

- Tandem Trailer site: 303,000 cubic yards

- Bifurcation site: 205,000 cubic yards
- Highland Avenue Northeast/Southeast sites: 430,000 cubic yards

In accordance with MassDEP's antidegradation policy, soil that has contamination levels below MassDEP's residential thresholds could be reused at an off-site location with no adverse human or environmental impacts; contaminated soils would be handled in accordance with local and state regulations. Minor adverse environmental effects would be associated with off-site disposal of contaminated soils. To prevent future impacts to human health and the environment, these soils would be stored using appropriate containment in a properly licensed/permitted disposal facility. Additional minor adverse impacts include vehicle emissions and fuel usage associated with soil transportation, as detailed in **Chapter 4, Section 4.11**, **Air Quality and Greenhouse Gas Emissions**. A breakdown of the soil disposal quantities and the groundwater dewatering impacts for each construction and connection site is provided in the following sections.

Launching and Receiving Sites

Fernald Property

A receiving shaft would be constructed at the Fernald Property for all three DEIR Alternatives. As part of construction for the receiving shaft and near-surface vaults and piping excavations, approximately 8,000 cubic yards of soil would be excavated that would require off-site disposal or reuse. Based on the age of the building, ACMs, including roof flashing, tiles, and other materials as well as lead-based pain and other hazardous building materials, may be present in the building materials for the buildings that would be undergoing demolition including the potential demolition of an electrical substation. A hazardous building material assessment would be conducted as discussed in **Section 4.8.7.2**.

Based on the existing conditions assessment, 10 state-listed disposal sites were identified within the Study Area associated with the Fernald Property, nine of which have the potential to impact soil and groundwater within the construction area LOD. Excavations associated with the surficial piping excavations along Chapel Road are directly abutting the disposal sites associated with RTNs 3-10725 and 3-1549. The primary contaminants of concern include petroleum constituents in the soil and groundwater and metals in the soil. During a visual inspection, additional conditions that may have resulted in undocumented releases of OHM were observed on site. Therefore, 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 OHM requiring proper management during construction.

During construction, dewatering effluent may be temporarily discharged to the wetlands along 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 need to be implemented during the discharge to these wetlands to avoid exacerbating the contaminated sediments as further discussed in **Section 4.8.7**. 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 to facilitate discharge. Additionally, coordination with the LSP-of-record for RTN 3-28049 should be conducted prior to discharging to the wetlands along Clematis Brook.

Tandem Trailer and Park Road East

A launching shaft is proposed at the Tandem Trailer site for Alternatives 3 and 4, which would be supported by the Park Road East site. As part of construction for the launching shaft, approximately 15,000 cubic yards of soil would require disposal during construction of the Tandem Trailer site and approximately 6,000 cubic yards of soil would require disposal during construction of the Park Road East site. Prior to being discharged, groundwater encountered during construction of the shaft and the tunnel would be managed in accordance with applicable regulatory requirements (see **Section 4.8.7**). It is anticipated that treated discharges at the Tandem Trailer site would be directed to Seaverns Brook.

Based on the existing conditions assessment, three state-listed disposal sites were identified within the Study Area associated with the Tandem Trailer and Park Road East sites. One of the three has the potential to impact soil conditions within the construction area LOD. Therefore, soil encountered during construction activities could potentially contain petroleum constituents associated with RTN 3-20708 that would require proper management during construction to avoid adverse human or environmental impacts (see **Section 4.8.7**). No groundwater impacts are anticipated.

Bifurcation

A launching shaft would be constructed at the Bifurcation site under only DEIR Alternative 3. As part of construction of the launching shaft, approximately 20,000 cubic yards of soil generated during construction of the valve chamber and the piping excavations would require disposal. It does not appear that rock removal would be required. Groundwater is relatively shallow and would likely be encountered during construction. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulatory requirements (see **Section 4.8.7**). It is anticipated that treated discharges from the Bifurcation site would be directed to Seaverns Brook.

Based on the existing conditions analysis, five state-listed disposal sites were identified within the Study Area associated with the Bifurcation site; three have the potential to impact environmental conditions within the LOD. The contaminants of concern associated with the three sites include petroleum constituents in the soil (RTNs 3-21970 and 3-24103) and antimony in the groundwater (RTN 3-13508). Soil generated during construction activities would require proper management to avoid adverse human or environmental impacts. 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.

Highland Avenue Northwest

A receiving shaft would be constructed at the Highland Avenue Northwest site only under Alternative 3. As part of construction, approximately 12,000 cubic yards of soil generated during construction of the shaft would require disposal. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulatory requirements (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the Charles River by way of a new pipeline constructed within city streets as shown **Figure 4.8-6.**

Based on the existing conditions assessment, seven state-listed disposal sites were identified within the Study Area associated with the Highland Avenue Northwest receiving shaft; five of the seven sites have the potential to impact environmental conditions within the LOD. Contaminants of concern associated with the sites include primarily petroleum constituents in the soil and groundwater, as well as VOCs in groundwater (RTN 3-4213). Soil and groundwater generated during construction would require proper management to avoid adverse human or environmental impacts. 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.

Highland Avenue Northeast/Southeast

A tunnel launch shaft would be constructed at the Highland Avenue Northeast site under Alternative 3. As part of construction, approximately 12,000 cubic yards of soil generated during construction would require disposal. Prior to being discharged, groundwater encountered during construction of the shaft structure as well as the near-surface piping (including the permanent discharge pipe to the Charles River) would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the Charles River by way of a new pipeline constructed within city streets as shown **Figure 4.8-8.**

Based on the existing conditions assessment, five state-listed disposal sites were identified in the Study Area associated with the Highland Avenue Northeast/Southeast launching site. Four sites have the potential to impact environmental conditions within the LOD. Contaminants of concern associated with the state-listed disposal site include primarily petroleum constituents in the soil and groundwater as well as VOCs in groundwater (RTN 3-4213). Soil and groundwater generated during construction would require proper management to avoid adverse human or environmental impacts. 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.

American Legion

For all DEIR Alternatives, a receiving shaft and near surface vaults and piping would be constructed at the American Legion site requiring approximately 15,000 cubic yards of soil generated during the construction of the near surface vaults and piping excavation would require off-site disposal. Prior to being discharged into Canterbury Brook, which flows along the perimeter of the site, dewatering discharges during construction of the shaft and surface connections would be managed in accordance with applicable regulatory requirements (see **Section 4.8.7**).

Based on the existing conditions assessment, no state-listed disposal sites were identified within the Study Area associated with the American Legion site. Therefore, OHM concentrations in the soil and groundwater generated during construction activities would likely be below regulatory thresholds and would have no adverse human or environmental impacts during construction.

Connection and Isolation Valve Sites

School Street

For all three DEIR Alternatives, a connection shaft would be constructed at the School Street property, including a new 550-foot-long water pipeline that would connect to an existing 24-inch water main at Common Street. As part of construction for the connection shaft and pipeline, approximately 1,900 cubic yards of soil would require disposal during construction at the School Street property. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the municipal stormwater management system in School Street, as allowed by the regulations.

Based on the existing conditions assessment, four state-listed disposal sites were identified within the Study Area associated with the School Street site, all of which could potentially impact soil and groundwater within the construction LOD. The active disposal site associated with RTN 3-36624 is characterized by VOC-impacted groundwater that flows in a southeasterly direction. Due to the potential to encounter impacted groundwater during construction, dewatering effluent treatment and a USEPA NPDES DRGP to facilitate discharge would likely be required.

Cedarwood Pumping Station

For all three DEIR Alternatives, a connection shaft, including a 180-foot-long pipeline, would be constructed at the Cedarwood Pumping Station. As part of construction for the connection shaft and pipeline, approximately 1,300 cubic yards of soil would require disposal during construction. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges at the site would be directed into the wetlands adjacent to the site.

Based on the existing conditions assessment, two state-listed disposal sites were identified within the Study Area associated with the Cedarwood Pumping Station site, both of which are unlikely to impact soil and groundwater within the construction LOD. Soil and groundwater generated during construction activities are anticipated to be below residential thresholds and would result in no adverse human or environmental impacts during construction.

Hegarty Pumping Station

Under all three DEIR Alternatives, a connection shaft, including a 130-foot-long pipeline, would be constructed at the Hegarty Pumping Station site. As part of construction of the connection shaft and pipeline, approximately 1,300 cubic yards of soil generated during construction of the chambers and the piping would require disposal. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges at the site would be directed into Rosemary Brook.

Based on the existing conditions analysis, no state-listed disposal sites were identified within the Study Area associated with the Hegarty Pumping Station site. Therefore, OHM concentrations in the soil and groundwater generated during construction activities would likely be below regulatory thresholds and would have no adverse human or environmental impacts during construction.

St. Mary Street Pumping Station

For all three DEIR Alternatives, a connection shaft and pipeline connections would be constructed at the St. Mary Street Pumping Station. As part of construction, approximately 1,300 cubic yards of soil generated during the construction of the connection shaft would require disposal. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the municipal stormwater management system in St. Mary Street, as allowed by the regulations.

Based on the existing conditions assessment, no state-listed disposal sites were identified within the Study Area associated with the St. Mary Street Pumping Station connection site. Therefore, OHM concentrations in the soil and groundwater generated during construction activities would likely be below regulatory thresholds and have no adverse human or environmental impacts during construction phases of the St. Mary Street Pumping Station site.

Newton Street Pumping Station

Under all three DEIR Alternatives, a connection shaft and pipeline connections would be constructed at the Newton Street Pumping Station site requiring approximately 1,300 cubic yards of soil generated during the construction of the connection shaft would require disposal. Encountering groundwater during the associated connecting pipeline installation is less likely, but depending on final installation depths, trench dewatering may be necessary. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the municipal stormwater management system in Newton Street, as allowed by the regulations.

Based on the existing conditions assessment, seven state-listed disposal sites were identified within the Study Area associated with the Newton Street site, all of which have the potential to impact environmental conditions within the construction area LOD. The contaminants of concern include primarily petroleum constituents in the soil and groundwater; therefore, soil and groundwater generated during construction activities would require proper management to avoid adverse human or environmental impacts. 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.

Southern Spine Mains

For all DEIR Alternatives, a connection shaft and pipeline connections would be constructed at the Southern Spine Mains site. As part of construction for the connection shaft, approximately 2,300 cubic yards of soil generated during construction would require disposal. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the municipal stormwater management system in the Arborway, as allowed by the regulations.

Based on the existing conditions assessment, two state-listed disposal sites were identified within the Study Area associated with the Southern Spine Mains connection site. One has the potential to impact environmental conditions within the LOD. The contaminants of concern associated with the site are petroleum constituents, but limited information was obtained regarding the extent or condition of the release. Therefore, it is conservatively assumed that petroleum-impacted soil or groundwater may be encountered during construction, requiring proper management to avoid adverse human or environmental impacts. 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.

Hultman Aqueduct Isolation Valve

For all DEIR Alternatives, an isolation valve would be installed at the Hultman Aqueduct Isolation Valve site. As part of construction for the isolation valve, approximately 900 cubic yards of soil generated during construction would require disposal. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulations (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the catch basin located in the interchange, as allowed by the regulations.

Based on the existing conditions assessment, no state-listed disposal sites were identified within the Study Area associated with the Hultman Aqueduct Isolation Valve. OHM concentrations in the soil and groundwater generated during construction activities would likely be below regulatory thresholds and would have no adverse human or environmental impacts during construction.

Lead-based joints are present on the Hultman Aqueduct; therefore, appropriate measures will be taken during construction for workers' safety and to facilitate proper management procedures as discussed in **Section 4.8.7**.

4.8.5.2 Alternative 4

During construction of Alternative 4, approximately 947,000 cubic yards of excavated material would be removed from the tunnel and would ultimately require off-site disposal. A breakdown of the estimated amounts is provided below:

- Tandem Trailer site – 303,000 cubic yards
- Highland Avenue Northwest/Southwest sites – 214,000 cubic yards
- Highland Avenue Northeast/Southeast sites – 430,000 cubic yards

The construction period impacts outlined under Alternative 3 for launching and receiving sites are the same as those for Alternative 4 except for the Bifurcation site and the Highland Avenue Northwest receiving site, which are not included under Alternative 4. The impacts associated with the Park Road West site and the Highland Avenue Northwest/Southwest launching site associated with Alternative 4 are described below. The construction period impacts are the same for connection sites as described in Alternative 3.

Park Road West

A receiving shaft and pipeline connections would be constructed at the Park Road West site only under Alternative 4. As part of construction, approximately 9,500 cubic yards of soil generated during the construction of the near surface valves and the piping excavations would require disposal. Groundwater is relatively shallow and would likely be encountered during excavation for the valve structures and surface piping. Prior to being discharged into nearby highway drainage swales, which flow to Seaverns Brook, dewatering discharges would be managed in accordance with applicable regulations (see **Section 4.8.7**).

Based on the existing conditions assessment, two state-listed disposal sites were identified in the Study Area associated with the Park Road West site. Concentrations of OHM were reduced to background conditions at both disposal sites and therefore are unlikely to impact environmental conditions. The Park Road West site is anticipated to generate 9,500 cubic yards of excess soil; comparatively, the Bifurcation site would generate 20,000 cubic yards.

Highland Avenue Northwest/Southwest

Under Alternatives 4 and 10, a launching shaft would be constructed at the Highland Avenue Northwest/Southwest sites. Approximately 12,000 cubic yards of excess soil would require disposal during construction. Dewatering discharges would be directed into appropriate siltation controls (e.g., sedimentation basins, silt bags, and frac tanks) and then discharged into the Charles River.

Impacts associated with the construction of the launching shaft are the same as described under Alternative 3. Prior to being discharged, groundwater encountered during construction would be managed in accordance with applicable regulatory requirements (see **Section 4.8.7**). It is anticipated that treated discharges would be directed into the Charles River by way of a new pipeline constructed within city streets as shown on **Figure 4.8-7.**

Based on the existing conditions assessment, eight state-listed disposal sites were identified within the Study Area associated with the Highland Avenue Northwest/Southwest launching site; six of the eight sites have the potential to impact environmental conditions within the LOD. Contaminants of concern associated with the sites include primarily petroleum constituents in the soil and groundwater, as well as VOCs in groundwater (RTN 3-4213). Soil and groundwater generated during construction would require proper management to avoid adverse human or environmental impacts. 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.

4.8.5.3 Alternative 10

During construction of Alternative 10, approximately 948,000 cubic yards of excavated material would be removed from the tunnel and ultimately disposed of offsite. A breakdown of the amounts is provided below:

- Highland Avenue Northwest/Southwest sites – 518,000 cubic yards
- Highland Avenue Northeast/Southeast sites – 430,000 cubic yards

The construction-period impacts for Alternative 10 are the same as the construction-period impacts outlined under Alternative 3 except for the Tandem Trailer site, the Park Road East site, the Bifurcation site, and the Park Road West receiving site, which are not included under Alternative 10. The impacts for the Highland Avenue Northeast/Southeast launching site outlined under tunnel Alternative 3 are the same as those for Alternative 10. The impacts for the Highland Avenue Northwest launching site outlined under tunnel Alternative 3 are the same as those for the Northwest/Southwest launching site considered in Alternative 10. The impacts associated with the Park Road West large connection site under Alternative 10 are described below.

Park Road West (Large Connection)

A large connection shaft would be constructed at the Park Road West site only under Alternative 10. As part of construction, approximately 8,500 cubic yards of soil (overburden) generated during the construction of the near surface valves and the piping excavations would require disposal. Prior to being discharged into nearby highway drainage swales, which flow to Seaverns Brook, dewatering discharges would be managed in accordance with applicable regulations (see **Section 4.8.7**).

The existing conditions assessment identified two disposal sites associated with RTNs 3-28554 and 3-24262. Concentrations of OHM were reduced to background conditions at these two sites and therefore they are unlikely to impact environmental conditions within the Park Road West site. Soil generated during construction would require proper management to avoid adverse human or environmental impacts. No soil or groundwater impacts are therefore anticipated associated with this site.

4.8.6 Final Conditions

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

4.8.6.1 Alternative 3

The Program would likely have a positive effect on confirmed areas of soil and groundwater contamination within the Program Study Area. Reuse of as much excavated soil as possible, including impacted soil with concentrations below the applicable MCP standards, would be the preferred option and would limit the impacts associated with off-site disposal, including vehicle emissions and fuel consumption. Remediation of soil that cannot be reused would most likely consist of soil excavation and off-site disposal.

4.8.6.2 Alternative 4

The Final Conditions would have the same impacts as Alternative 3.

4.8.6.3 Alternative 10

The Final Conditions would have the same impacts as Alternative 3.

4.8.7 Avoidance, Minimization, and Mitigation Measures

Due to the presence of documented releases of oil and/or hazardous materials near and/or within the proposed launching, receiving, connection, and isolation valve sites, 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 DEIR 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. 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.

4.8.7.1 Management of Impacted Soil

A Program-wide Soils and Materials Management Plan (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 BMPs for stockpiles as well as other BMPs developed specifically for construction sites.

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).

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 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 (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 that oversee response actions at disposal sites within the Program Areas to coordinate work.

4.8.7.2 Management of Hazardous Building Materials and Demolition Debris

Based on their age, ACMs, including roof flashing, tiles, and other materials, may be present in the buildings that would be undergoing demolition at the Fernald Property. Lead-based paint, mercury, and PCBs may also be present in building materials and/or fixtures. In addition, the Hultman Aqueduct contains lead-based joints; disposal and handling will be managed with appropriate safety measures. 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.

4.8.7.3 Management of Impacted Groundwater

OHM-impacted groundwater encountered during Program construction would be managed in accordance with applicable regulations. A USEPA NPDES Construction General Permit or a USEPA DRGP 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. Based on the existing conditions assessment, an DRGP would likely be required for overburden excavations at the Fernald School, the Highland Avenue Northwest/Southwest sites, the Highland Northeast/Southeast sites, the Newton Street Connection, School Street, Bifurcation, and the Southern Spine Mains under all alternatives. Although OHM-impacted groundwater is not anticipated to be encountered at the other connection, launching, and receiving sites, 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 including triggers for using a NPDES DRGP as opposed to the 2022 CGP are provided in **Chapter 4, Section 4.6, Wetlands and Waterways**.

4.8.7.4 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 **Chapter 2, 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.