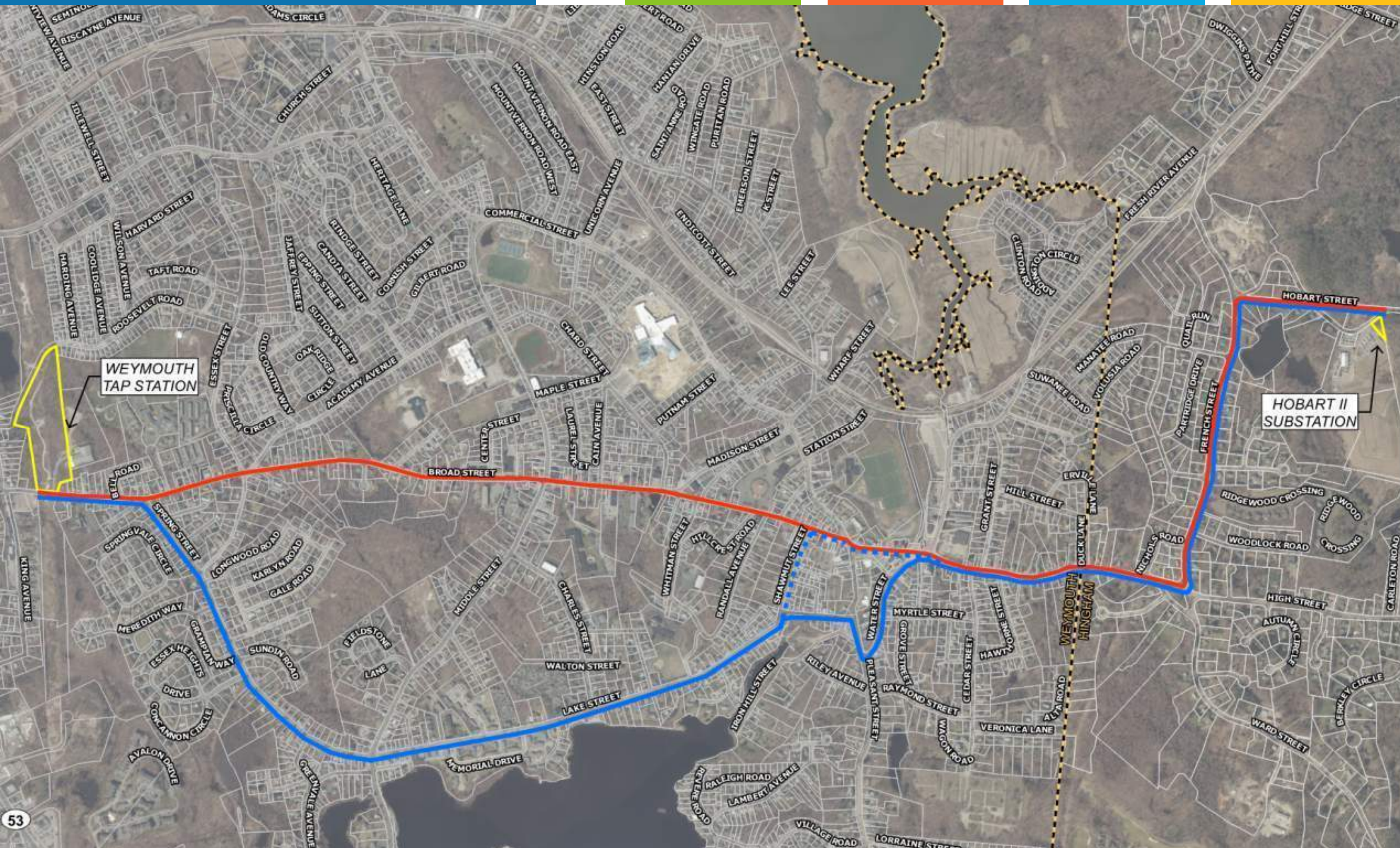

Hingham Municipal Lighting Plant

Analysis to Support Petitions in front of the Energy Facilities Siting Board
EFSB 24-01/DPU 24-135

Hingham and Weymouth, Massachusetts

Hingham Electrical Infrastructure Reliability Project

November 2024

Tighe&Bond

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GLOSSARY OF ACRONYMS

ACEC	Areas of Critical Environmental Concern
AIS/GIS	Air Insulated Switchgear/Gas Insulated Switchgear
AUL	Activity and Use Limitation
BES	Bulk Electric System
BMPs	Best Management Practices
BLSF	Bordering Land Subject to Flooding
BPS	Bulk Power System
BVW	Bordering Vegetated Wetland
CBO	Community Based Organization
Chapter 91	The Massachusetts Public Waterfront Act, G.L. Chapter 91
dBA	Decibels
dbh	Diameter at Breast Height
DCR	Department of Conservation and Recreation
DCT	Double Circuit Tower
DPU	Department of Public Utilities
DPW	[Town of Hingham] Department of Public Works
DRGP	USEPA NPDES Dewatering and Remediation General Permit
EE	Energy Efficiency
EFSB	Massachusetts Energy Facilities Siting Board
EJ	Environmental Justice
EMF	Electric and Magnetic Fields
EOEEA	Massachusetts Executive Office of Energy and Environmental Affairs
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
GM	General Manager
GWSA	Global Warming Solutions Act
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
HMLP	Hingham Municipal Lighting Plant
Hz	Hertz
ICES	International Committee on Electromagnetic Safety
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IOU	Investor owned Utilities
kcmil	A unit of area, equal to the area of a circle with a diameter of one mil (one thousandth of an inch)
kV	Kilovolt
LF	Linear Feet
LSCSF	Land Subject to Coastal Storm Flowage
LSP	Licensed Site Professional
LTE	Long-term Efficiency

MACRIS	Massachusetts Cultural Resources Inventory System
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MassGIS	Massachusetts Bureau of Geographic Information
MCP	Massachusetts Contingency Plan
MF	Magnetic Field
mG	Units of milligauss (or one-thousandth of 1 gauss)
M.G.L.	Massachusetts General Law
MHC	Massachusetts Historical Commission
MUTCD	Manual on Uniform Traffic Control Devices
MVA	megavolt amperes
MW	megawatt
MWPA	Massachusetts Wetlands Protection Act
MWRA	Massachusetts Water Resources Authority
NEP	New England Power Company d/b/a National Grid
NERC	North American Electric Reliability Corporation
NGRID	National Grid
NPCC	Northeast Power Coordinating Council, Inc.
NPDES	National Pollutant Discharge and Elimination System
NRDIS	National Register Districts
NTAs	Non-transmission alternatives
OHM	Oil or Hazardous Material
ORW	Outstanding Resource Waters
OSHA	Occupational Safety and Health Administration
POI	Point of Interconnection
PPA	Proposed Plan Application
PTF	Pool Transmission Facilities
PVC	Polyvinyl Chloride
RAO	Response Action Outcome
ROW	right-of-way
RTN	Release Tracking Number
Siting Board	Massachusetts Energy Facilities Siting Board
sf	Square Feet
SWPPP	Stormwater Pollution Prevention Plan
TMP	Traffic Management Plan
ULSD	Ultra-low sulfur diesel
URAM	Utility Related Abatement Measure
USEPA	United States Environmental Protection Agency
XLPE	Cross-linked Polyethylene

SECTION 1

Section 1
Project Overview

1.1 Siting Board Jurisdiction

Pursuant to G.L. c. 164, § 69J, Hingham Municipal Lighting Plant ("HMLP") submits this analysis ("Analysis") to the Energy Facilities Siting Board ("Siting Board" or "EFSB") in support of its petition to construct certain facilities to ensure the reliability of the transmission system serving the Town of Hingham.

As set forth in HMLP's Petition to Construct, pursuant to G.L. c. 164, § 69J, HMLP proposes to construct, operate, and maintain (1) a proposed approximately 3.2-mile underground 115 kilovolt (kV) transmission line in the Towns of Weymouth and Hingham ("New Line"); and (2) a proposed enclosed substation located at the transfer station site at Old Hobart Street in the Town of Hingham ("New Substation" or "Hobart II"). HMLP also seeks approval of a proposed open-air switching station or tap station in Weymouth ("New Tap Station"), which would be constructed, owned, and operated by NSTAR Electric Company d/b/a Eversource Energy ("Eversource") within an existing transmission corridor on land owned by Eversource. (The proposed New Line, New Substation and New Tap Station are referred to collectively as the "Project".) The New Line, New Substation and New Tap Station are each more fully detailed below.

As required by G.L. c. 164, § 69J, the Project as more fully described herein is necessary to provide a reliable energy supply for the Commonwealth while minimizing cost and environmental impacts. Specifically, the Project is needed for reliability purposes because the entire Town of Hingham presently is susceptible to an extended outage in the event of N-1 and N-1-1 contingencies. Moreover, while not needed for capacity purposes in the near term, the proposed Project offers the distinct benefit of addressing peak load growth associated with electrification necessary to meet the Town of Hingham's and Commonwealth's climate goals.

As described in greater detail herein, the Project components comprise:

- The New Line, approximately 3.2 miles in length, beginning at the New Substation to be sited at the Town of Hingham Transfer Station, continuing underground primarily along public ways in the Towns of Hingham and Weymouth, and terminating at a point of interconnection (POI) with the New Tap Station located within an existing Eversource transmission corridor in Weymouth.
- The New Substation, which will be located on an approximately 24,000 square feet ("sf") undeveloped area in the northeastern corner of the 9.7-acre Town of Hingham Transfer Station off Old Hobart Street and in close proximity to HMLP's existing Hobart Substation. Structures, equipment, and site improvements will include a new Gas Insulated Switchgear ("GIS") substation, circuit breakers, bus work, protection and communications equipment, fencing and a retaining wall. Although not needed for capacity purposes at this time, the New Substation footprint is large enough to accommodate the addition of a new transformer and new switch gear when needed. Underground stormwater management BMPs are

proposed within adjacent driveways, for a total impact area associated with the substation of approximately 31,000 sf.

- The New Tap Station, an open-air substation including air-insulated switchgear, an electrical control enclosure, two electric overhead-to-underground transition structures, two 210-foot underground transmission interconnections between the existing lines and the New Tap Station, one tangent pole, fencing and an additional parking area on an approximately 2.5 acre portion of a 11.6-acre Eversource parcel off Broad Street in Weymouth.[1]

A USGS map and an Aerial map showing the New Line, New Substation and New Tap Station are provided as Figure 1-1 and Figure 1-2, respectively.

1.2 Hingham Municipal Lighting Plant

HMLP is a municipal electric light department, one of over 40 such light departments in Massachusetts and 2,000 nationwide. The Town of Hingham has a population of 24,284 (as of 2020), and HMLP currently serves approximately 10,500 electric meters. HMLP has the capacity to serve about 80 MVA peak demand, and HMLP's peak load to date was 57 MVA on August 29, 2018.

HMLP is governed by a three-member elected municipal light board. *See* G.L. c. 164, § 55. Pursuant to G.L. c. 164, § 56, HMLP's General Manager ("GM") is appointed by the Light Board and, subject to the Board's direction and control, is responsible for the day-to-day operations of HMLP, the supervision of the plant, power supplies and employees, and ensuring that HMLP is providing reliable electric service to all of the residents and businesses of the Town of Hingham.

Unlike investor-owned utilities ("IOUs"), municipal light departments possess their own ratemaking authority. Their rates are not subject to suspension and investigation by the Department of Public Utilities ("DPU") prior to taking effect. Instead, light department rates are largely determined pursuant to a statutory formula, based on a budget prepared by the GM and approved by the Light Board. *See* G.L. c. 164, §§ 57, 58. While municipal light departments are financially and operationally distinct from the towns that own them, in some areas, such as expanding plant, acquiring property and financing it, municipal light departments can only finance significant projects through their towns, via the bonding process set forth at G.L. c. 44, §8(8), which requires Town Meeting approval. *See* G.L. c. 164, §§ 34, 40. Further, title to real property is typically acquired and held by the Town, which places it under the custody and control of the light department for light department purposes. *See* G.L. c. 40, § 3. The Supreme Judicial Court has held that "[m]unicipal lighting plants are municipal property and a "debt for plant" is a municipal debt." *Municipal Light Comm'n. of Taunton v. State Employees' Group Insurance*

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1 Both the New Substation and the New Tap Station are ancillary facilities to the New Line and, therefore, are included within HMLP's Section 69J Petition for approval. Because Eversource will construct, own and operate the Tap Station, Eversource is a co-petitioner to the petition for zoning relief filed on this date pursuant to G.L. c. 40A, § 3.

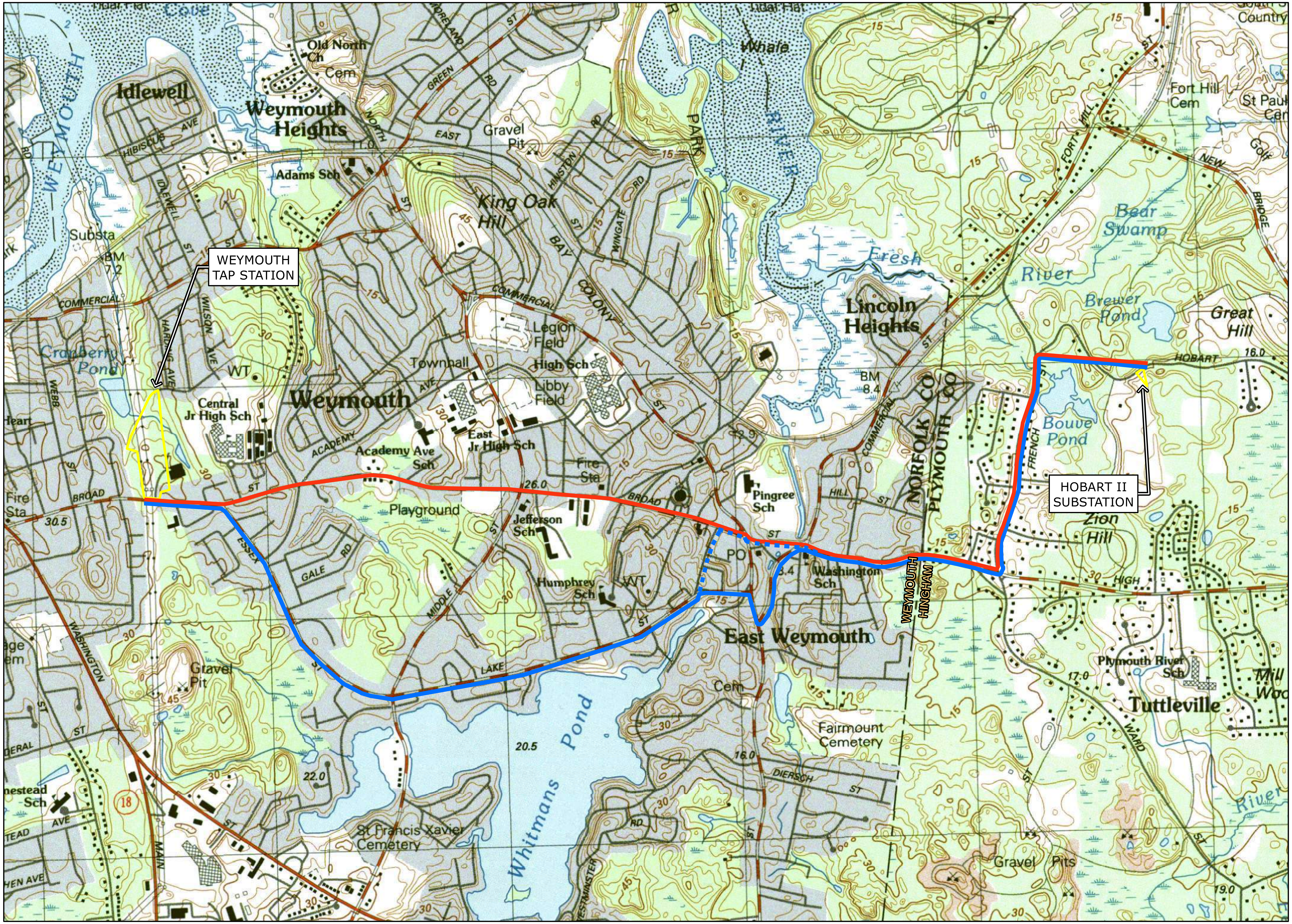

Figure 1-1
PREFERRED ROUTE & NOTICED ALTERNATE ROUTE

LEGEND

- Broad Street (Preferred)
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites

LOCUS MAP

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NOTES

1. Based on MassGIS Color Orthophotography (2023)

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

November 2024

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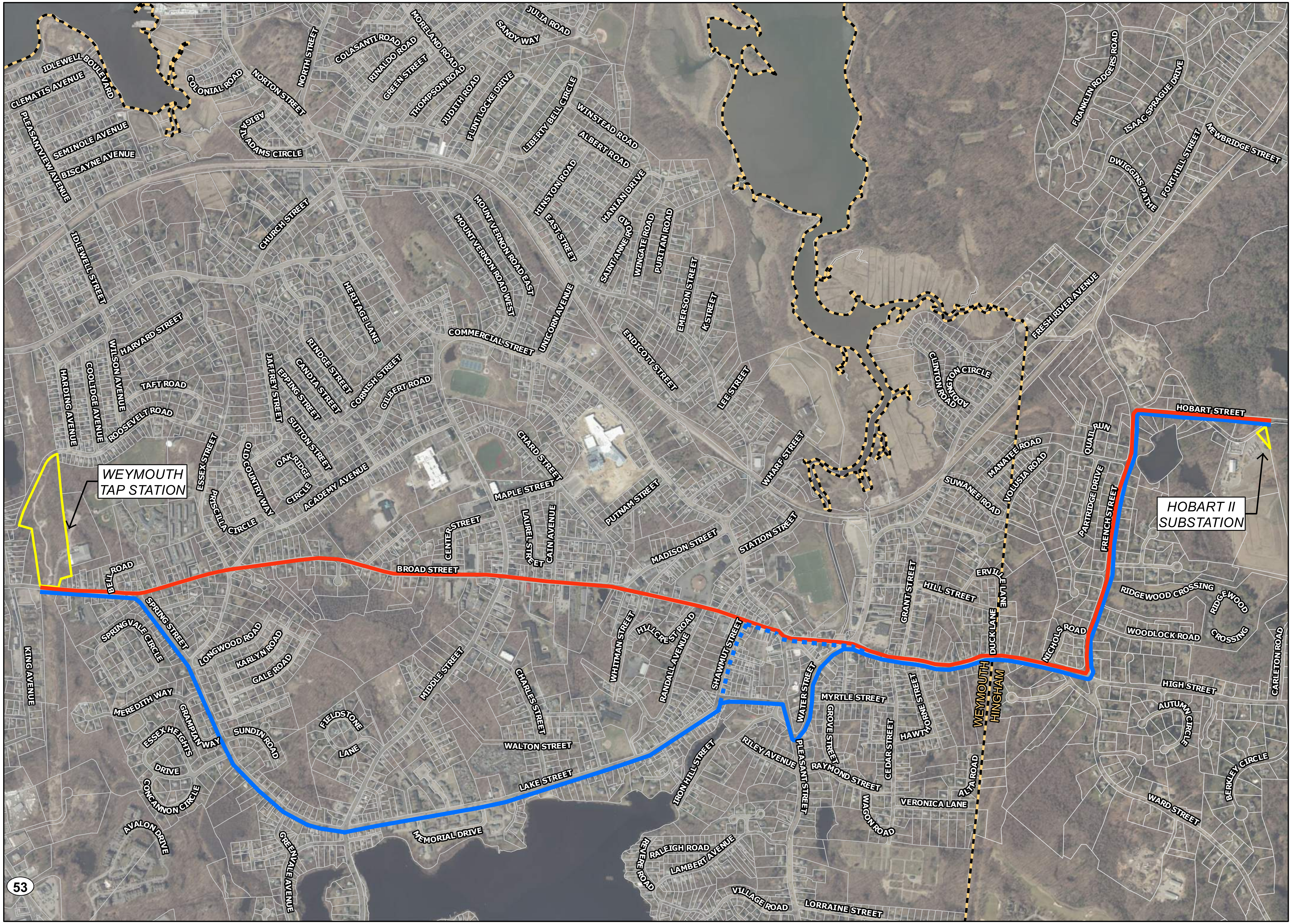


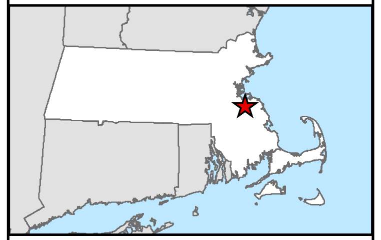
FIGURE 1-2
PREFERRED ROUTE & NOTICED ALTERNATE ROUTE

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
October 2024

LEGEND

- Broad Street (Preferred)
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites
- Town Boundary
- Parcel Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2021)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate,
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.

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Comm'n., 344 Mass. 533, 536 (1962). Accordingly, as discussed in Section 4 addressing the site selection process for the New Substation, unlike an IOU, HMLP is constrained by the statutes governing its operations in relation to the Town of Hingham when it comes to acquiring sites for new projects.

1.3 Project Need

The Project is designed to provide a long-term, integrated solution to address a significant reliability need in the Town of Hingham. As set forth in Section 2 herein, HMLP currently is served by a single bulk power substation known as "Hobart Substation". HMLP's current substation and distribution system is designed to allow for loss of a single 115/13.8kV transformer while still retaining the capability to serve the highest load demand of the Town.

Hobart Substation is presently fed via two overhead 115kV transmission lines covering a distance of approximately 3.3 miles, which are supported by wood and metal structures, including 22 double-circuit towers ("DCTs"), where the two transmission lines share the same single pole. This configuration is susceptible to N-1 contingency events that can result in simultaneous loss of service from both transmission lines, *i.e.*, if even a single DCT pole supporting the two lines falls or is otherwise disabled, service to Hobart Substation would be interrupted and all Hingham customers would be subjected to an extended outage. Moreover, an extended outage also could occur in the event of a N-1-1 contingency, *i.e.*, if one transmission line is out of service for maintenance and there is an outage event on the remaining transmission line. Unlike larger distribution systems, there are no alternative supply options available to HMLP to restore customers from another substation. Consequently, loss of service to Hobart Substation results in loss of service to the entire town. Indeed, approximately 10,500 HMLP metered-customers, which includes approximately 24,000 residents, as well as a number of medical facilities, schools, municipal offices and public safety buildings, would be without electricity in Hingham in the event of either of these N-1 or N-1-1 outage events.

As discussed in greater detail in Section 2, these N-1 and N-1-1 contingencies are a significant and *current* reliability concern. These reliability needs are not dependent on load growth[2] and, as such, should be addressed at once.

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[2] Because HMLP's existing Hobart Substation presently has the ability to serve 80 MVA on a firm basis with any single transformer out of service, and HMLP projects limited load growth over the next 10 years, the proposed Project is not needed for capacity purposes. However, given the climate change goals of both the Town of Hingham and the Commonwealth, HMLP determined that it was reasonable and prudent to select a substation site and lay out its proposed substation to accommodate a new transformer and switchgear when load growth warrants these additions. HMLP has estimated the technical potential for system peak winter load with full electrification and indeed that projected winter peak exceeds the current system capability. As such, while not needed for capacity purposes in the near-term, the proposed Project offers the distinct benefit of addressing peak winter load over the long term in the high electrification case.

As set forth in greater detail in Section 2.3, below, HMLP seeks to comply with the following reliability and planning standards when planning its transmission system:

- NERC TPL-001-4 Transmission System Planning Performance Requirements;
- NPCC Regional Reliability Reference Directory # 1, "Design and Operation of the Bulk Power System";
- ISO-NE Planning Procedure 3, "Reliability Standards for the New England Area Pool Transmission Facilities"; and
- ISO-NE Planning Procedure 5-3, "Guidelines for Conducting and Evaluating Proposed Plan Application Analyses."

The standards issued by NERC, NPCC and ISO-NE all include evaluation of reliability performance under certain contingency events. Such standards include assessment of the impacts associated with single contingency events that result in loss of both circuits installed on DCTs (N-1 contingency events, such as loss of a single DCT), as well as loss of one circuit followed by loss of a second circuit (N-1-1 contingency events, such as when one transmission line is out of service for maintenance and there is an outage event on the remaining transmission line). HMLP has determined that under its current system configuration, either of these contingency events could result in loss of service to its entire service area for an extended period of time. Outages involving loss of both existing transmission lines (N-1 DCT events or N-1-1 events) could result in customer interruptions lasting anywhere from 8 hours to one week or more. N-1-1 events due to one line out for maintenance or damages to one of these transmission lines followed by loss of a second circuit could result in an outage lasting 8 - 48 hours. Moreover, a fallen transmission tower (N-1 DCT event) could result in an outage lasting one week or more depending upon the degree of damage to the adjacent towers and availability of replacement equipment. These system reliability needs are current and require immediate resolution.

1.4 Project Alternatives

As set forth in Section 3 herein, HMLP has comprehensively identified and analyzed a wide range of alternatives to address the identified need for the Project including: (1) a No-Build Alternative; (2) transmission alternatives; and (3) non-transmission alternatives ("NTAs") such as new generation, energy efficiency, demand response programs, solar and battery storage systems, and distributed generation.

HMLP eliminated the No-Build Alternative because its current system does not meet NERC, NPCC and ISO-NE standards. Unlike larger utilities, which typically have multiple substations within an area and can backstop their customer circuits via distribution tie circuits from other substations, HMLP is limited to one substation. There are no other backstop transmission or distribution options available to HMLP, and a single N-1 or N-1-1 event would interrupt power to the Town for an extended period of time.

HMLP identified and analyzed seven transmission alternatives, and as detailed in Section 3.3.4, below, after reviewing each alternative with respect to whether each would meet HMLP's identified reliability need, as well as the reliability, cost and environmental impacts of each alternative, HMLP determined that only two alternatives met the identified need and were deemed viable – (1) the Project; and (2) a 4.2-mile underground line from National Grid's (NGRID) Abington Station to a new HMLP substation site at the South

Hingham Industrial Park.[3] Moreover, after fully analyzing these two alternatives with respect to reliability, environmental and construction impacts, and costs -- both construction costs and distribution system-related costs -- HMLP concluded that the proposed Project was the superior transmission alternative.

As described in Section 3.3.4 of the Analysis, HMLP determined that construction and operation of the Project, *i.e.*, the New Line, New Substation and New Tap Station, is the best transmission approach to meeting the identified need based on a balancing of reliability, cost, and environmental impacts. Moreover, by virtue of its comprehensive analysis of Project alternatives, HMLP determined that (1) its New Line would sectionalize Eversource line #478-502 in Weymouth and that a new tap station would be constructed on Eversource-owned property along or in the vicinity of the Eversource ROW in Weymouth; and (2) that a new substation would be constructed in Hingham in an area near HMLP's Hobart Substation.

Finally, as set forth in Section 3.3.5 of the Analysis, HMLP identified and analyzed a range of non-transmission alternatives for meeting the identified need, including (1) conservation efforts or interruption of firm and non-firm load; (2) wind resources; and (3) solar with batteries, and determined that such non-transmission alternatives (individually or in combination) did not meet the identified need or would be prohibitively expensive to construct.

1.5 Preferred Route and Noticed Alternative Route

As set forth in Section 4 below, HMLP first employed a comprehensive site selection process to select a site for a proposed substation in Hingham and a site for a proposed tap station in Weymouth. Then, once the sites for the Hingham substation and Weymouth tap station were chosen, a comprehensive route selection process was used to select a preferred and noticed alternative routes that would connect the new Hobart II Substation in Hingham and new Eversource tap station in Weymouth. With respect to routes, as required by the EFSB, HMLP (1) developed and applied a reasonable set of criteria to identify and evaluate routes in a manner that ensures that no routes were overlooked or eliminated that, on balance, are clearly superior to the proposed route; and (2) identified at least two noticed routes with some measure of geographic diversity.

The Preferred Route for the Project, the Broad Street Route, is an approximately 3.2-mile underground route primarily along public ways, that exits the proposed Hobart II Substation at the Hingham transfer station and runs west on Hobart Street, turns south on French Street, then turns west on High Street and continues west into Weymouth on High Street which becomes Broad at Commercial Street. Broad Street is then followed for

[3] This 4.2-mile transmission alternative was designated as Option 3 and initially identified and analyzed by HMLP in 2018. HMLP later identified and analyzed a 5.12-mile variation of this transmission alternative (Option 3 Variation) which follows roadways to the extent practicable and reduces impacts within wetlands and rare and endangered species habitat. A detailed description of Option 3 and Option 3 Variation, and how these alternatives were derived, are set out in Section 3.3.4.3 of this Analysis.

approximately 9,300 feet until ending at the Weymouth Tap Station Site located within an existing Eversource transmission corridor.

The Noticed Alternative Route, the Lake Street Route, is an approximately 3.7-mile underground route that exits the proposed Hobart II Substation in Hingham and runs west on Hobart Street, then turns south on French Street and turns west on High Street. The Noticed Alternative Route then continues west into Weymouth continuing on High Street which becomes Broad Street. This route then turns south down Water Street, turning north on Pleasant Street, and travels west on Lake Street, and northwest on Essex Street, which transitions to Spring Street. The route turns west onto Broad Street and continues west on Broad Street to the Weymouth Tap Station site within an existing Eversource transmission corridor. HMLP is also presenting a Variation of its Noticed Alternative Route which follows the same route out of the proposed Hobart II Substation to Broad Street in Weymouth. Then, instead of turning south down Water Street, the variation follows Broad Street west and turns south on Shawmut Street and turns southwest onto Lake Street where it continues to follow the Noticed Alternative Route to the Weymouth Tap Station site.

1.6 Summary of Project Schedule and Cost

HMLP developed a project schedule based on estimates of regulatory review times, municipal bidding and procurement requirements, and industry-based expectations regarding equipment delivery and construction periods for similar facilities. Assuming timely receipt of all necessary permits and authorizations, construction of the New Line, New Substation, and New Tap Station is anticipated to commence in Spring 2027. Construction is anticipated to occur over a two-year period, with energization of the New Line expected in the Spring 2029. The estimated construction schedule assumes that the selected site contractor(s) will simultaneously employ several active work zones associated with each of the routes, in consultation with the affected municipalities.

HMLP developed project costs for the project which are summarized in Table 1-1. The costs reflect the best information on costs available for this Project at the time of filing. The current planning grade estimates are (-25% /+50%).

TABLE 1-1 Project Cost Estimates

Project Components	Cost Components
Tap station (based on Eversource costs)	$38.1 M
Transmission line	$47.7 M
Hobart 2 GIS station and interties	$18.9 M
Total Estimated 2024 Project Cost	**$104.7 M**

1.7 Agency and Community Outreach

HMLP is committed to working with municipal officials, local residents, businesses, and other interested stakeholders in both Hingham and Weymouth to provide clear, transparent, and updated information regarding the Project. For this Project, in addition to its outreach efforts regarding the proposed substation in Hingham and the proposed underground line in Hingham and Weymouth, HMLP has worked closely with Eversource on outreach specifically focused on the proposed tap station off Broad Street in Weymouth.

In fact, HMLP – both on its own and in collaboration with Eversource – has held or participated in 32 meetings between December 14, 2020 and June 4, 2024 with officials, residents and businesses in both Hingham and Weymouth to discuss the different elements of the Project. Indeed, more than half of those meetings were scheduled for the intended purpose of obtaining feedback from stakeholders regarding different options for siting the proposed substation and proposed tap station and for specific feedback on the two identified routes and other route options. See Section 4.1.5.

A list of outreach meetings with stakeholders in both Hingham and Weymouth is provided as Table 4-1. More information is provided herein regarding HMLP's outreach activities, including public open houses, meetings with Hingham and Weymouth public officials, and the Hingham Electric Infrastructure Reliability Project ("HEIRP") Project-specific website (www.HEIRP.com).

Hingham Pre-Town Meeting Outreach Meetings

In order to secure custody and control of a portion of the Town of Hingham transfer station property, HMLP needed to propose a warrant article for consideration by Town Meeting to authorize the Select Board to transfer custody and control of the proposed Hobart II substation site to HMLP.[4] G.L. c. 40, §§ 3, 15A. Only after being duly authorized by Town Meeting may the Select Board transfer custody and control of a portion of municipally-owned property held for one municipal purpose (*i.e.*, as in this case, for Department of Public Works purposes) to another board—in this case, the Hingham Municipal Light Board, for another municipal purpose, such as light plant purposes.

Beginning in December 2020 and continuing through the Spring of 2022, HMLP held multiple meetings with Town of Hingham agency heads, the Hingham Conservation Commission, the Hingham Select Board and Hingham Advisory Committee to receive feedback on various substation sites as part of the process for obtaining Town Meeting approval. On April 30, 2022, Town Meeting voted to authorize the Town, acting through the Select Board, to transfer custody and control of the parcel of land at the Town's transfer station to HMLP.

Public Open Houses

As set out in Table 4-1, HMLP conducted a series of Open Houses in both Weymouth and Hingham to provide residents and businesses with information regarding the Project and to obtain feedback from all stakeholders regarding two potential routes under

[4] HMLP is also required to obtain Town Meeting approval to borrow funds for some portion of the project. G.L. c. 44, § 8(8). HMLP may seek Town Meeting approval of borrowing as early as Spring 2025.

consideration by HMLP – the Broad Street Route and the Lake Street Route – as well as with respect to the proposed Hingham substation and Weymouth tap station sites.

HMLP held community meetings by Zoom for Hingham stakeholders to the proposed substation site on October 18, 2021 and November 18, 2021. Notice for these meetings included mailing letters to the stakeholders, specifically to abutters within 300 feet of the proposed substation location. On October 20, 2021, HMLP sought to further raise public awareness by emailing to the Boston Globe and the Patriot Ledger as well as to hyperlocal news websites including the Hingham Anchor and Wicked Local a press release announcing the launch of a project-specific website at www.HEIRP.com.

HMLP held in-person Open Houses in Weymouth at the Tufts Public Library in Weymouth on August 25, 2022 and September 13, 2022. On September 28, 2022, HMLP held an in-person Open House at the Hingham Public Library. And, on October 12, 2022, HMLP held a Zoom Open House for both Hingham and Weymouth residents and stakeholders.

Notice for these meetings was provided as follows: HMLP mailed notice to abutters within 300 feet of the preliminary Preferred and Notice Alternative Routes and within ¼ mile of both the substation and tap station sites, emailed to all HMLP customers (for the Hingham Open House and Zoom Open House), issued press releases to the Boston Globe and the Patriot Ledger as well as to hyperlocal news websites including the Hingham Anchor and Wicked Local, and posted on the Hingham Electric Infrastructure Reliability Project "HEIRP" website and HMLP's social media channels.

On January 25, 2024, January 26, 2024, and March 19, 2024, Eversource – with HMLP in attendance - held outreach events in Weymouth in the vicinity of the proposed Weymouth Tap Station site. Two Focused Meetings (January 25th and January 26th) were held at Union Towers in Weymouth and an evening Community Open House was held at the Crossroads Church in Weymouth on March 19, 2024. Two weeks prior to these events, Eversource's Project Services team was invited by the Union Towers facility's director to attend two scheduled coffee hours to create awareness and to engage with as many diverse residents as possible. Union Towers was selected as a meeting location after a focus area review and at the suggestion of the director. There are over 150 units of affordable housing for elderly and people over 50 with disabilities, and some of the residents are also linguistically isolated. Two weeks prior to the March 19th event, Eversource's Project Services team coordinated a pop-up event at Jimmy's Diner on Broad Street, Weymouth, to create awareness for the scheduled Community Open House. The team engaged with local diners during the busy breakfast/lunch hours at this popular eatery, answering questions about the proposed project and handing out invitations. Project Services also completed door-to-door outreach to nearby residents and businesses and brought the invitations to nearby community gathering spaces (churches, restaurants, libraries, housing authority, etc.) to encourage them to post it in advance. The invitation was also mailed to over 3,500 Weymouth residents along the proposed route and sent to local elected officials. A Cantonese interpreter was utilized at the January 25, 2024 Focused Meeting and both Spanish and Portuguese interpreters were present for the Community Open House on March 19, 2024. Project information handouts were available in English, Portuguese, Traditional Chinese and Spanish. The event was also promoted on the www.HEIRP.com website and HMLP's social media channels.

Meetings with Hingham Officials /Planning Board and Zoning Board Informal Process

In addition to the meetings held with Hingham officials from December 2020 through Spring 2022 to address HMLP's proposed substation site in anticipation of Town Meeting, HMLP held two meetings on February 15, 2023 and September 12, 2023 – a meeting with the Town's Planning Director and a follow-up meeting with the Town's Planning Director, the Town Manager and a member of the Select Board - to discuss HMLP's plans to seek a zoning exemption from the DPU/EFSB with respect to its proposed New Substation at the Town's transfer station site. As a result of these meetings, HMLP agreed to submit its plans for the substation to the Hingham Planning Board and Hingham Zoning Board of Appeals for informal review with the goal of providing the Siting Board with any recommendations and conditions issued by those Boards with respect to the substation.

On April 12, 2024, HMLP submitted design information on its proposed substation to the Hingham Planning Board and Zoning Board of Appeals as part of this informal review process. The Boards subsequently scheduled a joint public meeting on the proposal for June 4, 2024. The Boards published notice of the meeting in the Hingham Journal on May 16, 2024 and May 23, 2024, and provided notice to abutters within 300 feet of the transfer station property. In addition, HMLP advised customers of the June 4, 2024 meeting (via letter and bill insert) and posted information regarding the meeting on its HEIRP website. HMLP also issued a press release regarding the Project and the joint public meeting scheduled for June 4th, which was published in the Hingham Anchor on May 20, 2024. Due to a typographical error, a portion of the Zoom meeting ID was inadvertently left off the HMLP mailer and the GM Update on the HEIRP website. The correct information was published in the newspapers, on a press release uploaded to the HEIRP website, the Town of Hingham's website and abutters mailings. HMLP has posted a video recording of the June 4, 2024 meeting on its HEIRP website.

The June 4, 2024 meeting included approximately 38 attendees including Board members and members of the public, who were invited to make comments and ask questions. The Boards reviewed the project, indicated no opposition to the proposed substation, and voted to recommend conditions for the Select Board to consider in connection with their transfer of the custody and control of the Substation parcel to HMLP. The Boards' recommendations are provided as Appendix 1-1 herein and are included as Exhibit G in the joint zoning exemption petition submitted by HMLP and Eversource. HMLP intends to comply with the Boards' recommended conditions.

As is the case with Weymouth, outreach with Hingham regarding the Project is ongoing and will continue through permitting and construction.

Meetings with Weymouth Officials

Between April 6, 2021 and March 12, 2024, HMLP held 10 meetings with Weymouth officials, including the Mayor and his staff, the Weymouth Planning Director, the Weymouth Conservation Commission, the Weymouth Department of Public Works, and various members of the Town Council.

HMLP's May 3, 2022 meeting with the Weymouth Conservation Commission also included representatives from the Fore River Watershed Association and the Town's Herring Warden.

At these meetings, HMLP discussed and obtained feedback regarding its identified routes, timing of construction and potential impact on other Weymouth projects, construction methods, and, in the case of the May 3, 2022 meeting, impacts on the Town's herring run. In discussions with Town officials and correspondence with the Planning Director, HMLP discussed the need to petition the DPU/EFSB for a zoning exemption for the tap station. Weymouth officials expressed no opposition to or opinion on the plans of HMLP and Eversource to seek zoning relief pursuant to G.L. c. 40A, § 3.

As is the case with Hingham, outreach with Weymouth regarding the Project is ongoing and will continue through permitting and construction.

<u>HEIRP Website/Project Updates</u>

HMLP maintains an HEIRP website with updated information and materials regarding the Project. Among other things, the HEIRP website includes information on the need for the Project; maps and details regarding the proposed and alternative transmission line routes for the project, the proposed Hingham substation site and the proposed Eversource tap station site in Weymouth; details regarding the outreach and regulatory and permitting processes for the Project; and Q & A regarding the Project.

HMLP also has issued three GM Updates regarding the Project – in March 2023, March 2024 and May 2024. These GM Updates, which are designed to provide the latest information regarding the Project and identify upcoming events, are mailed or emailed to all HMLP customers, and uploaded to the HEIRP website.

The HEIRP website also offers residents and businesses in Hingham and Weymouth an opportunity to provide feedback regarding the Project.

Going forward, HMLP plans to employ the HEIRP website as a means of providing information regarding all state and local permitting, including notices of public hearings, and as a repository for all regulatory filings and information. Ultimately, HMLP expects that the HEIRP website will include all construction-related information, including hotline numbers for questions and registering concerns, and operate as a central access point for all Hingham and Weymouth residents and businesses to obtain the latest information on the Project.

1.8 Project Team

In addition to the Hingham Municipal Lighting Plant (see Section 1.2, *supra*), the Project Team includes the following:

NSTAR Electric Company d/b/a Eversource Energy (Co-Petitioner to the Petition for Zoning Relief)

NSTAR Electric Company is a Massachusetts corporation and a wholly-owned subsidiary of Eversource Energy, which operates New England's largest energy delivery system. The Company transmits and delivers energy to approximately 3.7 million electric and natural gas customers in Connecticut, Massachusetts, and New Hampshire. In Massachusetts, Eversource Energy's electric service territory includes 140 municipalities covering an area of approximately 3,192 square miles.

Tighe & Bond (Environmental Consultant)

Tighe and Bond is an engineering and environmental consulting firm based in Westfield, Massachusetts. Tighe and Bond's engineers, scientists, planners and regulatory specialists have completed environmental assessment, modeling, licensing and permitting for multiple large-scale energy infrastructure projects throughout the Northeast. Tighe & Bond conducted the routing and siting analyses and the assessment of environmental impacts for the Project and is providing local, state, and federal environmental permitting support.

LIG Consultants, P.C. (Engineering Design Consultant)

LIG Consultants, P.C. is an electrical engineering, energy consultant and project management firm base in Canton Massachusetts. LIG provides services to private and public entities. LIG designs transmission, substation distribution and renewable energy projects. LIG presently operates in states nationwide. LIG has provided engineering analysis, estimates and schedule projections for the project.

Cape Power Systems Consulting (Transmission Planning Consultant)

Charles P. Salamone P.E. is the sole member of Cape Power Systems Consulting and he is an independent consultant specializing in transmission and distribution system planning with a focus on transmission and distribution system design, local and regional reliability criteria application, interconnection analysis, transmission project development and regulatory review support. Mr. Salamone is a registered professional engineer in the state of Massachusetts and a senior member of IEEE.

Duncan & Allen NE (Regulatory and Siting Counsel)

Duncan & Allen NE is an energy regulatory law firm based in Massachusetts representing municipal utilities and municipal utility cooperatives, transmission and clean energy developers, retail suppliers and other stakeholders before the Siting Board, the Department of Public Utilities, and other state and local agencies.

1.9 Conclusion

HMLP proposes to construct and operate a 3.2-mile underground 115kV transmission line in public ways in the Towns of Hingham and Weymouth and a New Substation at the transfer station property adjacent to its existing Hobart Substation in Hingham. In addition, as part of this Project, Eversource would construct, own and operate a New Tap Station within an existing Eversource transmission corridor in Weymouth.

As detailed in this Analysis, together these three elements comprise HMLP's proposed Project which will meet a current reliability need for HMLP. And, while the proposed Project is not needed for capacity purposes in the near term, the site for the New Substation selected by HMLP is large enough to accommodate a new transformer and new switchgear and, as such, offers the distinct benefit of addressing peak winter load over the long term in the high electrification case.

Like all utilities, HMLP has an obligation to reliably serve its customers. HMLP can only meet this obligation through construction and operation of the Project. For the reasons described in greater detail in the subsequent sections of this Analysis, the proposed Project is consistent with the Siting Board's statute and satisfies all Siting Board standards regarding need, project alternatives, site and route selection, and minimization of environmental impacts and costs under G.L. c. 164, § 69J, and therefore, should be approved by the Siting Board.

SECTION 2

Section 2
Project Need

2.1 Introduction

HMLP, a municipally owned electric utility, provides electricity to approximately 10,500 HMLP metered-customers, which includes approximately 24,000 residents, as well as a number of medical facilities, schools, municipal offices and public safety buildings within the Town of Hingham, Massachusetts.

HMLP is served by a single bulk power substation known as "Hobart Substation", located at 190 Old Hobart Street in Hingham, adjacent to the Town landfill and recycle center. HMLP's current substation and distribution system is designed to allow for loss of a single 115/13.8kV transformer while still retaining the capability to serve the highest load demand of the Town.

Hobart Substation currently is fed via two overhead 115kV transmission lines covering a distance of approximately 3.3 miles, which are supported by both wood and metal structures, including 22 DCTs, where the two transmission lines share the same single pole. This configuration is susceptible to contingency events that can result in simultaneous loss of service from both transmission lines interrupting service to Hobart Substation. Likewise, if even a single DCT pole supporting the two lines falls or is otherwise disabled, service to Hobart Substation would be interrupted and all customers within the town of Hingham would be subjected to an extended outage. A fallen transmission tower could result in an outage lasting a week or more depending on the degree of damage to the adjacent towers and availability of replacement equipment. An interruption of service to all Hingham customers lasting from 8 hours to 48 hours could also occur if one transmission line is out of service for maintenance or as a result of a single circuit outage event and there is an outage event on the remaining transmission line. Unlike larger utilities, there are no alternative supply options available to HMLP to restore customers from another substation. Consequently, loss of service to Hobart substation results in loss of service to the entire town.

Based on the conditions noted above, HMLP has concluded that, due to the reliability of service concerns identified, there is an existing need to mitigate the potential for loss of service to the town of Hingham, MA.

2.2 Description of the Existing Transmission System Supply

Hobart Substation receives 115kV supply from the New England Transmission System and steps the voltage down via three 24/32/40 MVA power transformers and feeds the town through its 13.8 kV electric distribution system. The existing Hobart Substation presently has the ability to serve 80 MVA on a firm basis with any single transformer out of service using the 55 degree C rating of the remaining transformers. Existing annual peak demand load for the town is approximately 57 MVA, and presently load growth is projected to be limited.

Hobart Substation occupies approximately 20,000 square feet (slightly less than a half-acre). The site is located adjacent to Old Hobart Street on one side, and on all other sides by access and exit drives to the Town of Hingham Transfer Station. The existing substation is an open air design. Within the substation footprint there are transmission termination structures and switches that feed a 115kV cross bus to allow connections to three (3) transformers which step the power down from 115kV to 13.8kV. The 13.8kV power provides distribution to the Town via 13.8 kV switchgear and distribution circuits that exit the substation underground. Design of the existing station has leveraged the space very effectively; however, there is limited space available within the fence line for additional structures. HMLP has evaluated expansion of the substation in its existing location and has determined that to expand the substation contiguously would require encroachment into the existing transfer station access roads or trash loading areas. Moreover, this expansion approach was not acceptable to the Public Works Department, and the Town Select Board. These restrictions drove HMLP's proposal to locate any new equipment separate and apart from the existing substation footprint.

Hobart Substation is presently interconnected to two Eversource 115kV transmission lines (Line numbers 478-503 and 478-508) which are part of the New England Transmission System. These two lines serving Hobart Substation originate from a tap located in Weymouth on the Eversource 115kV transmission lines that run between Edgar Station and Holbrook Substation.

The initial 2.3-mile section of the two 115kV lines presently serving Hobart Substation begins at the Eversource tap point on the Eversource ROW (for circuits 478-503 and 478-508), runs along the Greenbush rail line, and terminates at the East Weymouth Substation on North Wharf Street in Weymouth. This 2.3-mile section and the East Weymouth Substation are owned and maintained by NGRID. This initial 2.3-mile section is a mix of (23) separate monopoles and seven (7) DCTs.

HMLP owns and maintains the transmission lines along the second section of the two 115kV lines from East Weymouth Substation to Hobart Substation, a distance of 1.1 miles. This second section of the two lines comprises a total of 19 structures, 15 of which are DCTs. In total, HMLP owns and maintains a mix of both metal towers and wood towers, including a mix of metal DCTs and wood DCTs. The HMLP-owned portion of the two lines run adjacent to the active Greenbush rail line and then travels along local Hingham roadways to get to Hobart Substation.[5]

Although the current transmission supply has adequate single line outage (N-1 contingency event) capacity, as noted above, the transmission lines are on the same structures for a distance of over a mile from NGRID's East Weymouth substation to Hobart Street as well as on portions of the NGRID-owned lines from the Eversource tap to East Weymouth. This configuration is susceptible to DCT failure outage events (N-1 contingency event) that can result in simultaneous loss of service for both transmission lines causing an extended outage which could last anywhere from 8 hours to a week or more for the entire Town of Hingham. An outage lasting from 8 hours up to 48 hours could also occur if one transmission line is out of service (due to maintenance or a single

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[5] The 1.1-mile portion of the line from East Weymouth Substation to Hobart Substation was approved by the Energy Facilities Siting Council, predecessor to the EFSB, in 1986. *See* EFSC Docket 85-65, 14 DOMSC 7 (1976).

line contingency) and there is an event on the remaining transmission line (N-1-1 contingency event). In such an outage event, approximately 10,500 HMLP metered-customers, which includes approximately 24,000 residents, as well as a number of medical facilities, schools, municipal offices and public safety buildings, would be without power for an extended period of time.

Figure 2-1 is a one-line diagram showing the interconnection of the existing Hobart Substation to the 115kV circuit numbers 478-503 and 478-508 which are part of the New England Transmission System. The loss of both interconnecting circuits due to a single (N-1) DCT contingency or due to overlapping (N-1-1) contingencies completely isolates the substation from the rest of the transmission system. This would leave Hobart Substation out of service and cut off electric power supply to the entire Town of Hingham.

Table 2-1 below shows the number, types and ownership of structures for the existing 478-503 and 478-508 transmission circuits serving HMLP.

TABLE 2-1 Number and Type of Structures on the 478-503 and 478-508 Circuits Supplying HMLP

Transmission Structures & Ownership	Single Circuit Metal Structures	Double Circuit Tower Wood Structures	Double Circuit Tower Metal Structures	Totals
NGRID	23	--	7	30
HMLP	4	3	12	19
Totals	27	3	19	49

Finally, where the existing Hobart Substation presently has the ability to serve 80 MVA on a firm basis with any single transformer out of service, and HMLP projects limited load growth over the next 10 years, the proposed Project is not currently needed for capacity purposes. However, given the climate change goals of both the Town of Hingham and the Commonwealth, HMLP determined that it was reasonable and prudent to select a substation site and lay out its proposed substation to accommodate a new transformer and switchgear when load warrants these additions. HMLP has estimated the technical potential for system peak winter load with full electrification and that winter peak exceeds the current system capability. As such, while not needed for capacity purposes in the near-term, the proposed Project offers the distinct benefit of addressing peak winter load over the long term in the high electrification case.

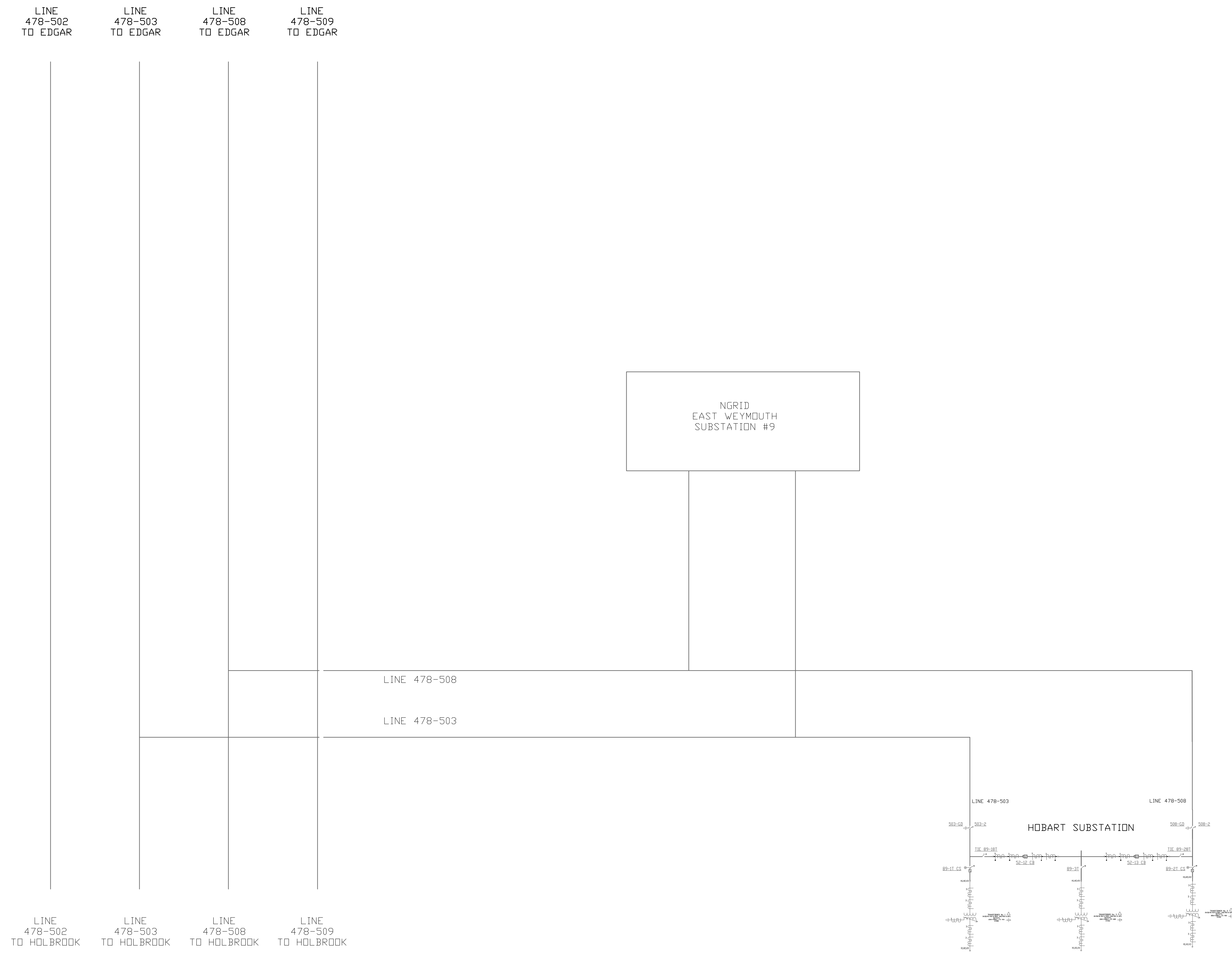

Figure 2-1 Existing Hobart Substation One Line Diagram

PRELIMINARY FOR EFSB FILING

FIRM NAME: LIG CONSULTANTS, P.C.
FIRM REG. #:
PROF. ENG.: THOMAS CONVERSE
ENG. LIC. #: 37447
SIGNATURE:
SIGNATURE DATE:

REV	DATE	DESCRIPTION	DRW	APR'D

HMLP

LIG CONSULTANTS P.C.

HINGHAM MUNICIPAL LIGHT PLANT
115 KV HOBART SUB STATION – EXISTING
ONE LINE

SIZE D
SHEET 1 of 1
DATE: 3/20/2024
SCALE: NTS
DWG NO: EFSB ESK-1-3
FILE:

2.3 Methodology for Analyzing System Reliability

HMLP provides electric supply to the Town of Hingham as a municipal electric supplier and has determined it is appropriate to follow national and regional reliability criteria. While HMLP does not operate Bulk Electric System[6] facilities or Pool Transmission Facilities[7], it does, as a Load Serving Entity and Transmission Operator as defined by NERC[8], follow good utility practice and on this basis appropriately considers national and regional reliability standards as establishing a sound basis for assessing its system with respect to the reliability and adequacy of the system it maintains and operates. While HMLP is not required under any state or federal regulation to follow these standards, HMLP has determined that it is appropriate to assess its system reliability performance based on these standards as part of its efforts to provide its customers with the same level of reliability as other customers across the state. More specifically, HMLP strives to adhere to the reliability standards and criteria that are established under the oversight of NERC, which is charged with ensuring the reliability of transmission systems across most of North America. NERC oversees a number of regional councils, one of which is the NPCC, covering New York, New England and eastern Canada. NPCC has a number of "control areas" which includes the New England transmission system that is under the control of ISO New England (ISO-NE). ISO-NE operates the various transmission networks owned by electric utilities in New England as a single transmission system. The standards established by NERC, NPCC and ISO-NE have been developed to ensure that the electric power system serving New England, which includes HMLP, is designed and constructed to provide adequate and reliable electric power to customers. NERC establishes a general set of rules and criteria applicable to all geographic areas. NPCC establishes a set of rules and criteria that are particular to the northeast, and also encompass the more general NERC standards. In turn, ISO-NE develops standards and criteria that are specific to New England, but are also coordinated with NPCC. HMLP seeks to comply with the following reliability and planning standards when planning its transmission system:

- NERC TPL-001-4 Transmission System Planning Performance Requirements;
- NPCC Regional Reliability Reference Directory #1, "Design and Operation of the Bulk Power System";
- ISO-NE Planning Procedure 3, "Reliability Standards for the New England Area "Pool Transmission Facilities"; and
- ISO-NE Planning Procedure 5-3, "Guidelines for Conducting and Evaluating Proposed Plan Application Analyses."

These standards all include evaluation of reliability performance under certain contingency events. These standards include assessment of the impacts associated with single contingency events that result in loss of both circuits installed on DCTs (N-1 contingency events) as well as loss of one circuit followed by loss of a second circuit (N-1-1 contingency

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6 Bulk Electric System facilities are defined by NERC as networked facilities operating at 100 kV or greater that have the potential for regional impacts.

7 Pool Transmission Facilities are defined by ISO-NE as regional networked facilities operating at 69 kV or higher that integrate the New England transmission systems.

8 NERC definition of entities that provide electric service can be found at https://www.nerc.com/pa/Stand/MOD%20V0%20Revision%20RF%20DL/Glossary.pdf#search=glossary%20of%20terms.

events). As set forth below, HMLP has determined that either of these contingency events could result in loss of service to its entire service area.

2.4 Consistency with Transmission Standards

The reliability standards referenced in Section 2.3 above all call for consideration of such contingency events when evaluating the reliability of service of the transmission system. The configuration of the transmission facilities connected to HMLP are not considered Pool Transmission Facilities as they are radial in nature and are not an integral part of the interconnected transmission network serving New England. As such, there are no other transmission network facilities to rely upon to help address any such outage events.

HMLP has encountered a number of events in the past that either resulted in a Town-wide power outage or put the Town of Hingham at risk of interrupting all customers. A significant past outage event occurred in 1991 involving a failed insulator which resulted in tripping of both transmission circuits supplying Hobart substation interrupting service to the entire town for 24 hours. Another outage event lasting over 8 hours which placed the HMLP system at risk occurred during a severe weather event in December of 2017 which was the result of damage to portions of one of the two transmission lines serving HMLP and caused repairs to be needed during severe cold weather conditions. Also, as recently as 2022 one of the two transmission circuits supplying Hingham (circuit number 478-508) experienced an insulator failure which interrupted service from this line and required almost 24 hours to repair. Fortunately, interruption of service to Hingham customers served by this circuit was less than 15 minutes as loads were able to be transferred to an alternate transformer following the outage.

Given the past experience with such events, the radial nature of the existing transmission lines, as well as assessments enumerated in the above-referenced reliability standards, HMLP has concluded that additional energy resources are needed to maintain reliability of service for the Town of Hingham.

2.5 Summary of Project Need

The existing transmission configuration is susceptible to a number of N-1 and N-1-1 contingency events that can result in an extended outage to the entire Town of Hingham. An N-1 contingency event involving a fallen transmission tower could result in an outage lasting one week or more depending on the degree of damage to the adjacent towers and availability of replacement equipment. An extended outage could also occur for a N-1-1 contingency, i.e., if one transmission line is out of service for maintenance or as a result of a single line outage and there was an event on the remaining transmission line. HMLP has concluded that the impact of these potential contingency events as enumerated in the reliability standards referenced above is not consistent with these standards and is unacceptable from a reliability of service perspective. HMLP has reviewed several potential solutions to address this need and Section 3 of this filing describes HMLP's process for reviewing potential solutions and the preferred solution that has been identified and is the subject of these proceedings.

SECTION 3

Section 3
Project Alternatives

3.1 Introduction

In this section, HMLP describes the process it used to identify and evaluate a range of alternatives to address the reliability need identified in Section 2. As discussed in Section 2, a solution is needed to comprehensively address N-1 contingency events, *i.e.*, loss of both circuits installed on DCTs, and N-1-1 contingency events, *i.e.*, loss of one circuit followed by an additional contingency event involving a circuit, a generator, or a transformer.

Consistent with Siting Board precedent,[9] HMLP has identified and analyzed a number of potential project alternatives from the perspective of their ability to reliably meet the identified need with a minimum impact on the environment and at the lowest possible cost. Specifically, HMLP considered the following alternatives:

(1) a "No-Build" alternative;

(2) Transmission (or wires) alternatives; and

(3) Non-transmission alternatives ("NTAs"), including new renewable generation, energy efficiency ("EE") and energy storage technologies, either alone or in combination with renewable resources.

3.2 No-Build Alternative

Under the No-Action or "No Build" Alternative, HMLP would not construct any new facilities to address the reliability need identified in Section 2. The current transmission system serving HMLP would remain unchanged.

As discussed in Section 2, additional energy resources are needed here because HMLP seeks to operate its system consistent with certain transmission and reliability standards issued by NERC, NPCC and ISO-NE.[10] Specifically, with respect to HMLP's existing system, a failure of both supply circuits on a single DCT can leave all customers in Hingham without power. This is an unacceptable condition as any outage length for an event of this type could easily be 8 to 48 hours before at least one of the DCT circuits is restored and in the case of a fallen DCT structure, could take a week or more to restore power to the HMLP

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[9] The Siting Board requires a petitioner to show that, on balance, its proposed project is superior to such alternative approaches in terms of cost, environmental impact, and ability to meet the identified need. In addition, the Siting Board requires a petitioner to consider reliability of supply as part of its showing that the proposed project is superior to alternative project approaches. *New England Power Company d/b/a National Grid*, EFSB 19-04/D.P.U. 19-77/19-78, at 18-29 (2021); *NSTAR Electric Company d/b/a Eversource Energy*, EFSB 19-03/D.P.U. 19-15, at 24 (2021).

[10] *See* Section 2.3, *supra*, for references to the specific reliability standards that are considered as applicable to the HMLP system.

system. Unlike large investor-owned utilities, which typically have multiple substations within an area and can backstop their customer circuits via distribution tie circuits from other substations, HMLP is limited to one substation. There are no other backstop transmission or distribution options available to HMLP, and a single DCT N-1 event would interrupt power to the Town for an extended period of time (anywhere from 8 hours to a week or more depending upon the severity of the event) due to the lack of switching alternatives. As such, there are no temporary measures or solutions available to HMLP which could defer this reliability need. Similarly, an outage event or maintenance requirement that takes one of the two circuits supplying HMLP out of service for an extended duration (anywhere from 8 to 48 hours) could result in loss of service to the entire town if the second remaining transmission line were to experience an outage event (*i.e*., an N-1-1 contingency). And, again, no backstop transmission or distribution options are available to HMLP which would prevent the identified N-1-1 events from interrupting power to the Town for an extended period of time.

HMLP thus eliminated the No-Build Alternative because it would not provide a solution to the identified, existing transmission reliability needs of the Town of Hingham.

3.3 Transmission Alternatives

3.3.1 Assessment Factors for Transmission Alternatives

The process for identification of a transmission solution started with development of conceptual solutions, followed by high-level assessments of those solutions for suitability and satisfactorily addressing the identified need, followed by detailed design assessments of the remaining viable alternatives. HMLP evaluated a range of possible transmission alternatives based on their ability to meet the identified need as established in Section 2 of the Petition, and more specifically, the ability to continue to serve customers in the Town of Hingham upon loss of both existing circuits to the Town. As a basis of design, HMLP's baseline requirements for transmission alternatives are as follows:

- The transmission alternative should have the capacity to operate and serve the existing firm load capability of the Town (approximately 80 MVA[11]).
- The transmission alternative should be able to be implemented in a manner to operate within industry and regulatory guidelines and requirements to serve the Town.
- The transmission alternative should mitigate N-1 DCT contingency events as well as N-1-1 contingency events.
- Any transmission alternative should be able to serve the load capacities of the Town for 8 to 48 hours at a minimum, and the preferred solution should be able to be operated over the full duration of time while repairs, modifications, or restrictions on the use of the existing transmission lines are completed.
- A transmission alternative should be able to be evaluated utilizing standard project alternative metrics such as cost, reliability, and environmental impact.

[11] The existing firm load capability for the HMLP system is 80 MVA as established by the existing bulk stepdown transformer's emergency ratings. The HMLP system peak load of 57 MVA occurred on August 29, 2018.

3.3.2 Assessment of Transmission Alternatives

As part of its analysis of transmission alternatives, HMLP considered different technical designs. New overhead transmission line alternatives were concluded to not be viable as there are no existing transmission line ROWs within the Town of Hingham. Consequently, HMLP limited its analysis primarily to underground alternatives.[12]

The 115kV underground transmission line would be installed in a conduit and cable system with three conduits. Each conduit would contain a single phase conductor. The conductor is proposed to be an XLPE type cable with a 750 kcmil copper conductor. The rating of the new cable is expected to be approximately 100 MVA.

3.3.3 Identification of Tap Locations (or Points of Interconnection (POIs)) for Transmission Alternatives

HMLP sought to identify locations within the area transmission system to create an additional tap point (for a third line) to Hingham.[13] HMLP determined that other than the existing lines serving Hingham, there are no other transmission lines within the Town of Hingham boundaries that could serve as an additional tap point. This led to the conclusion that an additional tap point would need to be located in an adjacent town or area close to the Town of Hingham.

HMLP identified lines owned by Eversource that are north of Hingham that run between Edgar Station in Weymouth to a substation in Holbrook (line numbers 478-502, 478-503, 478-508 and 478-509) which could be considered for possible tap points. Additionally, HMLP identified transmission lines to the south of Hingham owned by NGRID that are located in Whitman, Abington, Rockland, Hanover, Norwell, and Scituate (C3 and S9 lines) with a spur to North Abington (C3-99 line) that could serve as potential tap points.

3.3.4 Transmission Alternatives[14] Considered

Using the assessment factors and design criteria described above, HMLP considered the following transmission alternatives to meet the identified need:

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12 As detailed in Section 3.3.4.4, below, for one transmission alternative considered by HMLP (Option 4), a portion of the line would be overhead within an existing transmission ROW and another portion would be underground, and, as set forth in Section 3.3.4.6, for a second transmission alternative considered by HMLP, the replacement of the DCTs with single monopoles for each portion of the existing circuit where there are presently DCTs (Option 6A), poles for a separated overhead line would be placed within or adjacent to a transmission ROW.

13 As set forth in Sections 3.3.4.6 and 3.3.4.7 below, HMLP considered two transmission alternatives that did not involve new tap locations – (1) the replacement of the DCTs with single monopoles for each portion of the existing circuit where there are presently DCTs (Option 6A), and (2) placement of one of the existing transmission lines underground to eliminate the DCT contingency (Option 6B).

14 No distribution alternatives were considered as a means to address the identified need. As noted herein, there is only one substation in Hingham. Unlike large investor-owned utilities which often operate multiple substations in an area - and

(1) Underground transmission line from Eversource's Edgar Station to a new substation at Hingham Shipyard (Option 1).

(2) Underground transmission line from POI on Eversource circuit 478-502 in Weymouth to a new substation at a location near the existing Hobart substation in Hingham (the proposed Project) (Option 2).

(3) Underground transmission line from NGRID's North Abington Substation to a new substation at South Hingham Industrial Park (Option 3 and Option 3 Variation).

(4) Overhead and underground transmission line from NGRID's Norwell Substation to Union Street to Hobart Street (Option 4).

(5) Underground transmission line from POI on Eversource circuit 478-502 in Weymouth near MBTA ROW, then along MBTA Rail Line to Hobart Street (Option 5).

(6) Elimination of the DCTs (two approaches):

- Replacement of the DCTs currently serving HMLP with separate, single monopoles for each portion of the circuit where there are presently DCTs (Option 6A).

- Placement of one of the existing transmission lines serving HMLP underground to eliminate the DCT contingency (Option 6B).

The transmission line alternatives Options 1 through 5 overlaid with existing Eversource and NGRID transmission systems are depicted on Figure 3-1.

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can use distribution ties from adjacent substations upon loss of transmission lines or a substation - HMLP has no other substations to leverage in the event of a N-1 or N-1-1 contingency.

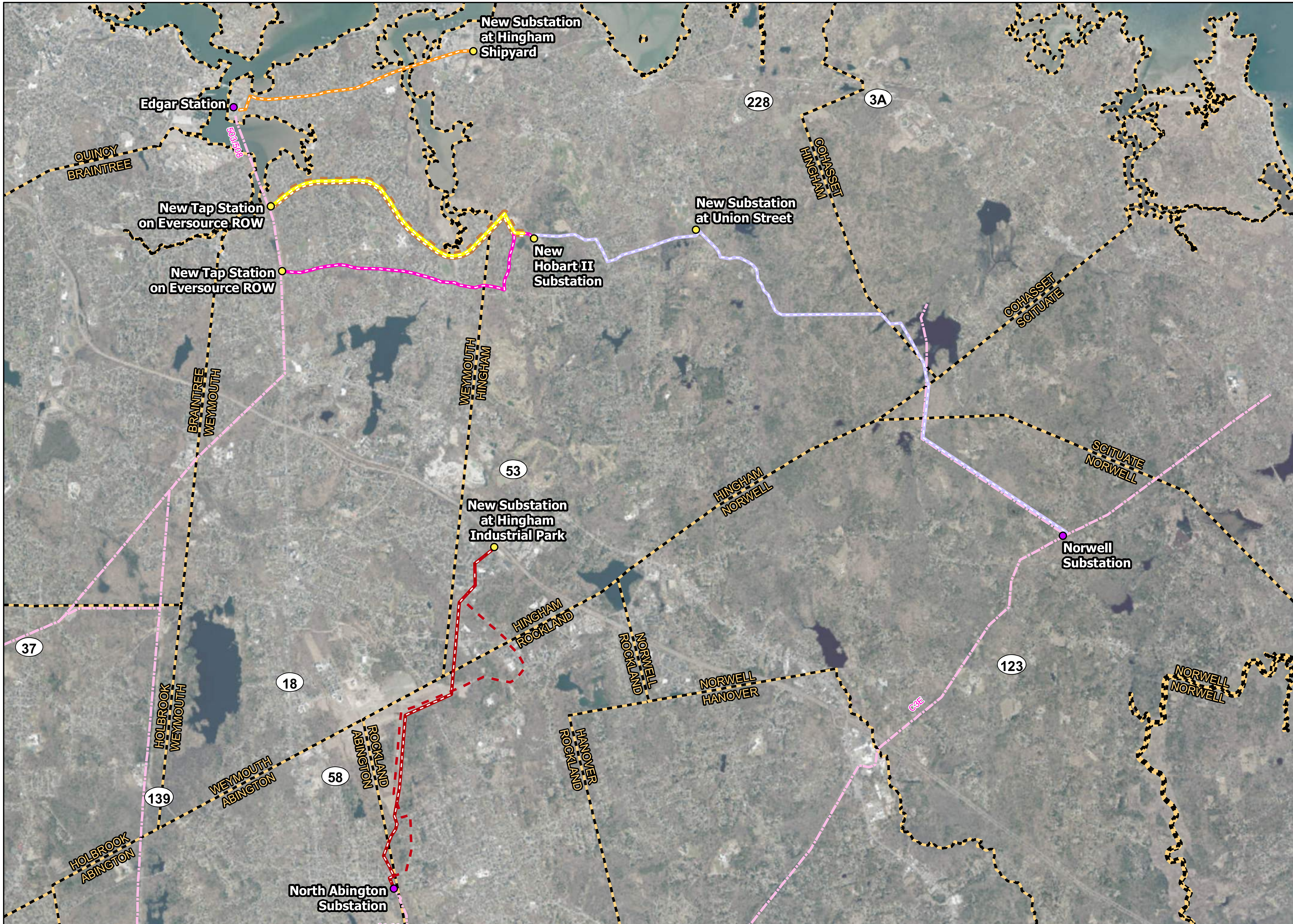


FIGURE 3-1 TRANSMISSION ALTERNATIVES

Hingham Electrical Infrastructure Reliability Project

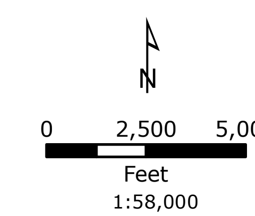
Hingham & Weymouth, MA

July 2024

LEGEND

- Existing Substation
- New Substation
- Option 1
- Option 2
- Option 3
- Option 3 Variation
- Option 4
- Option 5
- Option 6A
- Option 6B
- Existing Transmission
- Town Boundary

LOCUS MAP



NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Transmission Data Provided by MassGIS.

Tighe&Bond

V:\Projects\H\H5059\MXDs\Transmission Alternatives\Figure3-1_AltTransOptions_11x17.mxd [Exported By: EMainville, 7/29/2024, 9:57:00 AM]

H-5059

3.3.4.1 Underground Transmission Line from Edgar Station to Hingham Shipyard (Option 1)

This transmission alternative (Option 1) involves the installation of a new 115kV breaker and associated equipment at Eversource's Edgar Station in order to interconnect to the station's 115kV bus, the construction of a new substation at the Hingham Shipyard in the Town of Hingham, and an approximately 2.5-mile underground line between Edgar Station and the new substation at the Hingham Shipyard. Although a formal request to interconnect was not filed with Eversource, available information indicates that Edgar Station could accommodate this option, although an expansion of the Edgar Station 115kV bus configuration would be needed, which likely would be costly.

A geographic diagram of this project alternative (Option 1) is provided in Figure 3-2.

The underground corridor for this option would be along Route 3A, which is a major transportation corridor. The line would cross the Weymouth Back River, which is designated as an Outstanding Resource Water (ORW) and Area of Critical Environmental Concern (ACEC) south of the Route 3A bridge crossing and has protected open space on either side of the river: Abigail Adams State Park and Great Esker Park to the west and Back River Wildlife Sanctuary and Reservation to the east. If trenchless technology is required to cross the river, the construction may impact designated ORW, ACEC, or protected open space. Moreover, there is currently not an available municipal parcel in the vicinity of the Hingham Shipyard to site a new electric substation. Land is at a premium in this location, and it would be difficult to acquire private property[15] large enough for a new substation and related equipment, not to mention sufficient land to accommodate a transformer at a later date.

Moreover, the work necessary to integrate this transmission alternative with the existing distribution system would likely be significant as there are only two feeders in the area of Hingham Shipyard with limited street routes to connect to other feeders. Considerable feeder work would be required to extend remote circuits to this location if it is to serve as a back up to Hobart Substation. The additional work needed to integrate with the distribution system would increase the costs of this option significantly.

In sum, this alternative was deemed not to be a viable alternative because of (1) the extensive feeder work which would be necessary to integrate a new substation at the Hingham Shipyard with HMLP's distribution system; (2) the lack of available land at the Hingham Shipyard; (3) the considerable difficulties associated with construction along heavily-travelled Route 3A; and (4) potential impacts to protected open space or designated ORW/ACEC. Consequently, this alternative was eliminated from further consideration.

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[15] With no municipal land available in the vicinity of the Hingham Shipyard, HMLP would need the Town to purchase private property on its behalf, which would add considerable time, cost and complexity to this option relative to HMLP's preferred alternative.

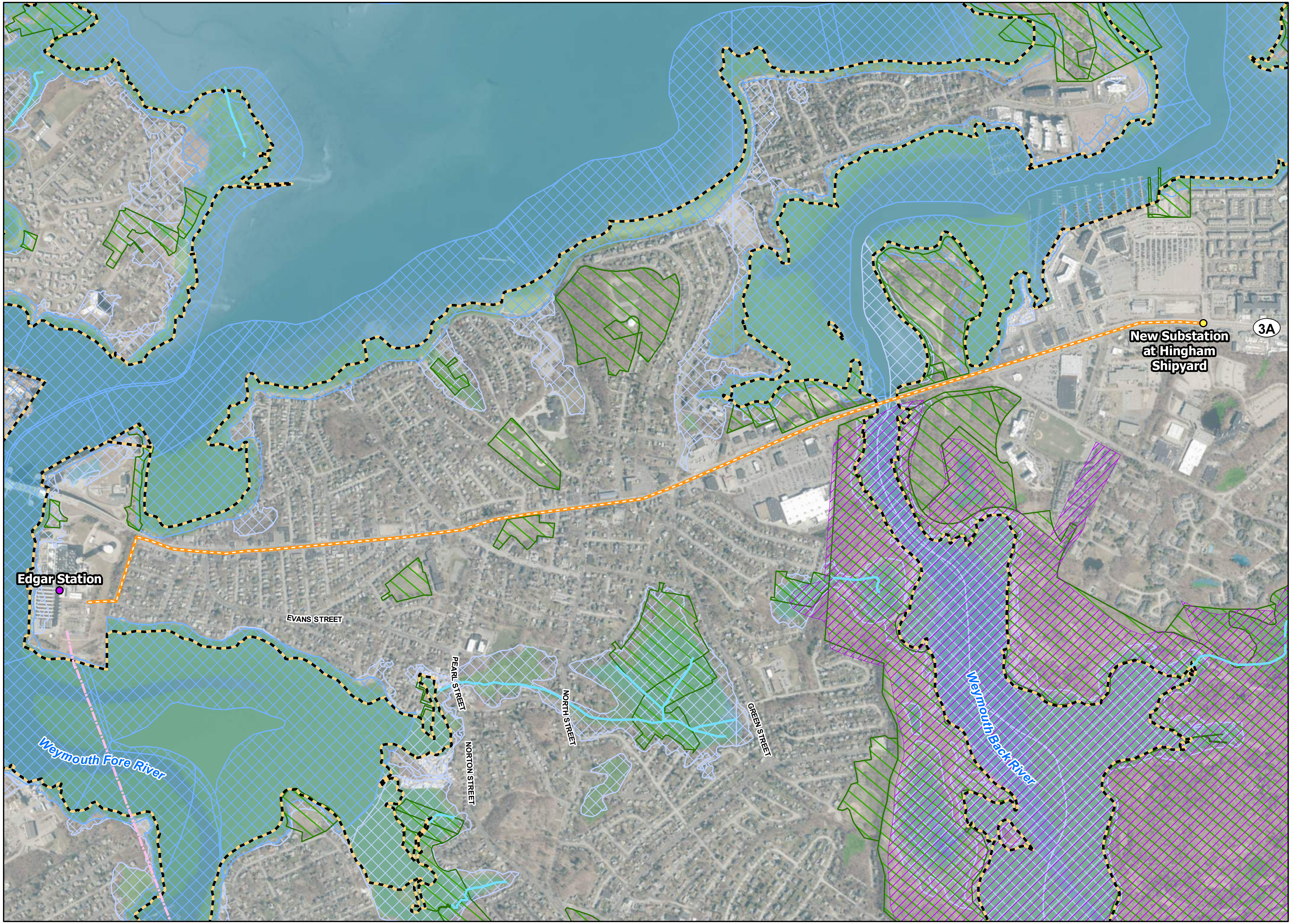


FIGURE 3-2 TRANSMISSION OPTION 1

Hingham Electrical Infrastructure Reliability Project

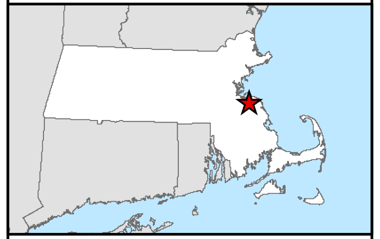
Hingham & Weymouth, MA

July 2024

LEGEND

- Existing Substation
- New Substation
- Option 1
- Existing Transmission
- Watercourse (not delineated)
- Town Boundary
- Area of Critical Environmental Concern (ACEC)
- Protected and Recreational Open Space
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Approximate Wetland (not delineated)*
- Open Water

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

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3.3.4.2 Underground Transmission Line from POI on Eversource Circuit 478-502 in Weymouth to Location Near Existing Hobart Substation in Hingham (the Proposed Project) (Option 2) (Proposed Project)

This transmission alternative (Option 2), which ultimately was selected by HMLP as its proposed project, involves bifurcation of Eversource's 478-502 in Weymouth, a new 115kV tap station to be owned and operated by Eversource, a new substation in Hingham in close proximity to the existing Hobart Substation, and an approximately 3.2-mile underground 115kV line between the two new stations.

The new substation is proposed to be built adjacent to the existing Hobart Substation. The work at the proposed Hobart II substation would include breakers and/or motor-operated switches, and a control house to allow for the ability to sectionalize the 115kV feeders into Hobart and feed the existing Hobart Substation via one of the existing lines from Weymouth and the new transmission line extension coming from Weymouth. One of the existing 115kV feeds from Weymouth would serve as a reserve or a standby feed to back up the existing and new transmission lines which follow separate routes.

A geographic facility layout and one line diagram of this project alternative (Option 2) are provided in Figure 3-3 and Figure 3-4.

HMLP requested an analysis from Eversource regarding the reliability and cost impacts of HMLP tapping existing transmission circuits 478-502 and 478-509 lines between Edgar Station in Weymouth and Holbrook Station. The results from the Eversource study indicated that a new 115kV interconnection to the 478-502 and 478-509 transmission supply circuits caused no adverse impacts and would require no reconductoring or uprating costs upstream of the POI. Following issuance of the Eversource study, HMLP requested that Eversource utilize a connection to the 478-502 line only, and sectionalize that line creating two line segments. HMLP and Eversource agreed to pursue that option. This proposed design for modification of the New England transmission system (*i.e.*, sectionalizing the 478-502 circuit) was reviewed and approved by ISO-NE on August 21, 2023 as part of their "Proposed Plan Application" (PPA) process.

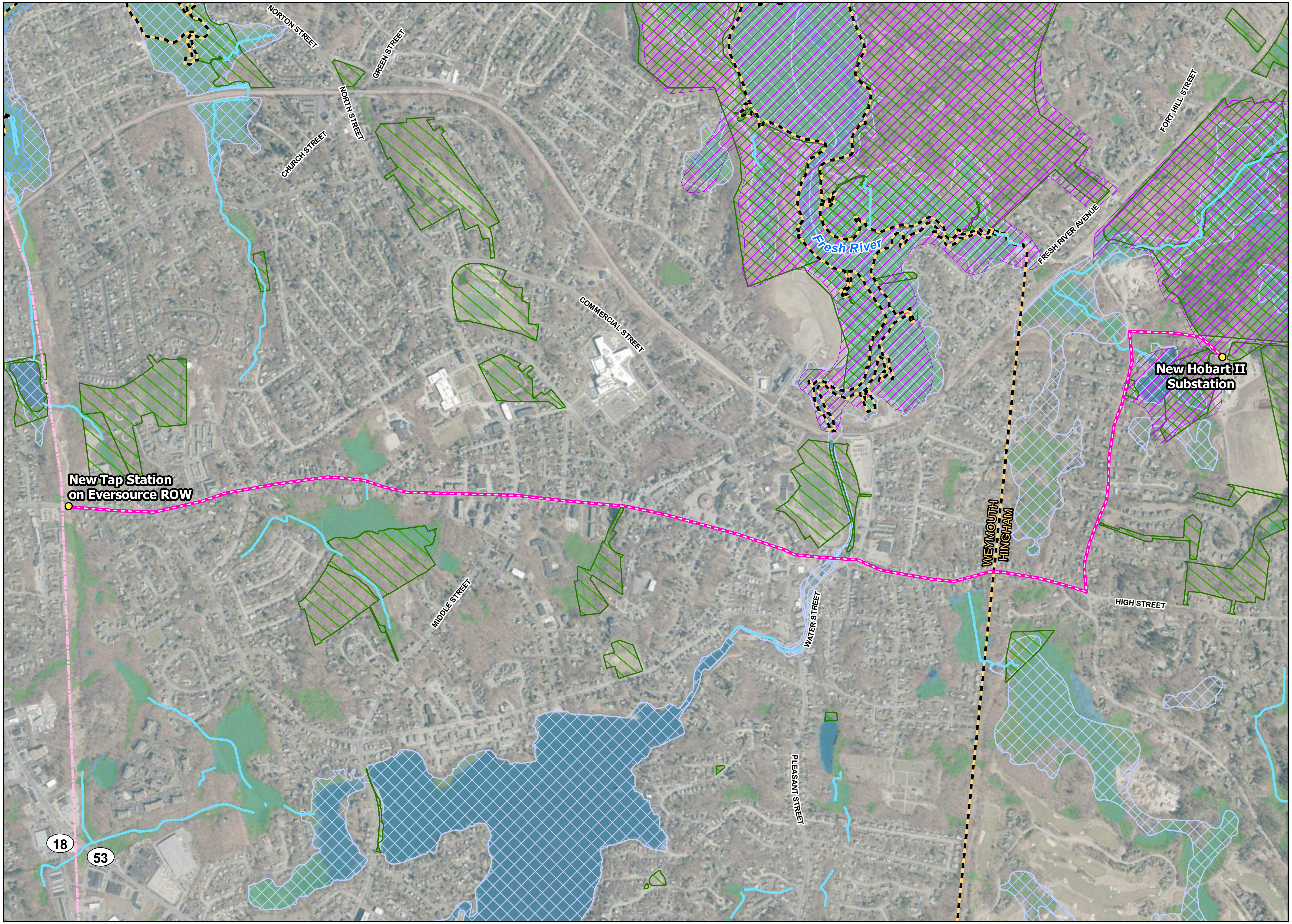

FIGURE 3-3
TRANSMISSION OPTION 2

Hingham Electrical Infrastructure Reliability Project

Hingham & Weymouth, MA

July 2024

LEGEND

- New Substation
- Option 2
- Existing Transmission
- Watercourse (not delineated)
- Town Boundary
- Area of Critical Environmental Concern (ACEC)
- Protected and Recreational Open Space
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Approximate Wetland (not delineated)*
- Open Water

LOCUS MAP

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Feet
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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

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H-5059

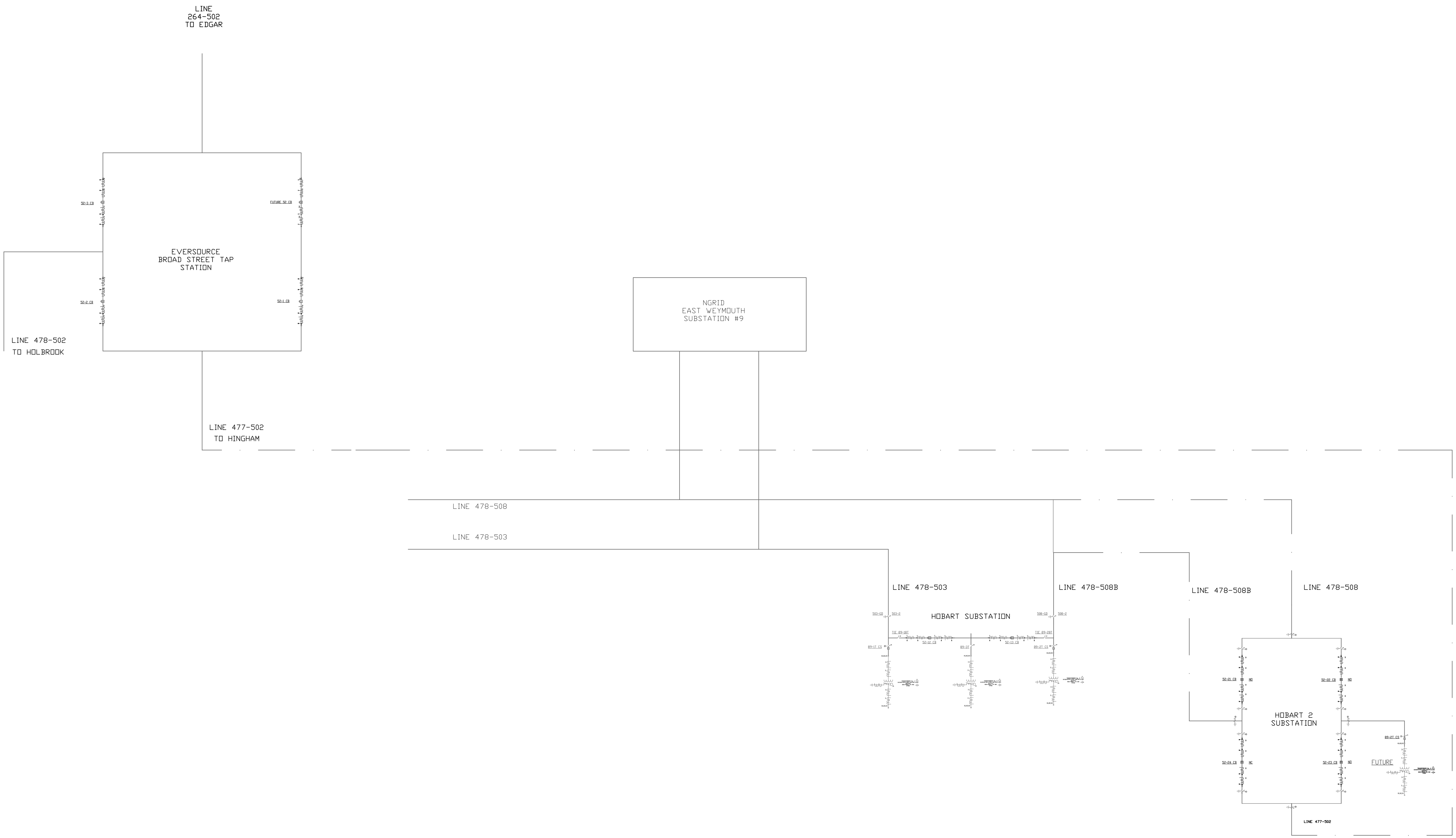

Figure 3-4
One Line Diagram Option 2

PRELIMINARY
FOR EFSB FILING

FIRM NAME: LIG CONSULTANTS, P.C.
FIRM REG. #:

PROF. ENG.: THOMAS CONVERSE
ENG. LIC. #: 37447
SIGNATURE:
SIGNATURE DATE:

REV	DATE	DESCRIPTION	DRW	APR'D

HMLP

LIG CONSULTANTS P.C.

HINGHAM MUNICIPAL LIGHT PLANT
HMLP RELIABILITY UPGRADES
ONE LINE

SIZE D
SHEET 1 of 1

DATE: 3/20/2024
SCALE: NTS
DWG NO: EFSB ESK-1-1
FILE:

The estimated cost for Option 2 is $104.7 Million[16] (See TABLE 3-1 below). These costs include construction of 3.25 miles of new solid dielectric 115kV cable in a duct bank along a new path as well as various 115kV breakers and switches at the new Eversource tap station in Weymouth, and a new substation adjacent to Hobart Station in Hingham.

TABLE 3-1 Estimated Cost of Option 2 (Preferred Solution)

OPTION 2 ELEMENTS	COST ESTIMATE
Tap station (based on Eversource costs)	$38.1 M
Eversource Transmission upgrades	$0
Hingham Transmission line	$47.7 M
Hobart 2 GIS station and interties	$18.9 M
Total Estimated 2024 Cost for Option 2	**$104.7 M**

From an environmental perspective, the location of the tap station is within an existing Eversource transmission corridor, set back from Broad Street and residential uses, and sited to minimize potential impacts to wetland resource areas and their associated buffer zones. The proposed Hobart II substation would be located within the Hingham Transfer Station property and is set back from residential properties. The transmission line would cross Herring Run Brook in Weymouth, within the Broad Street roadway ROW. Three smaller culvert crossings of unnamed hydrologic connections/streams are also along this route. The impacts associated with these crossings can be appropriately mitigated at a reasonable cost. Although the line would cross the designed ORW/ACEC for the Weymouth Back River, crossings would occur within previously disturbed road ROW. Further, this option avoids impacts to protected open space.

With respect to reliability, this option meets HMLP's reliability needs and also allows for the future expansion of the new substation to include an additional transformer to provide the ability to add distribution capacity as well as provide back up for the existing Hobart Street substation. Moreover, because the proposed Hobart II substation would be located in close proximity to the existing Hobart Station, compared to other transmission alternatives, the cost and complexity of integrating this option with HMLP's distribution system would be considerably less.

As discussed further in Section 3.3.4.8 below, HMLP selected this alternative as its proposed project because, on balance, it was preferable to other alternatives with respect to meeting the identified need, cost, and environmental impacts. Moreover, with respect to reliability, this alternative raises far less complex system integration issues when compared to other options.

16 Although the transmission alternatives discussed in this section were analyzed by HMLP in 2018, the costs presented in this section for all alternatives are 2024 costs.

3.3.4.3 Underground Transmission Line from NGRID's North Abington Substation to South Hingham Industrial Park (Option 3)

This transmission alternative (Option 3) would tap into NGRID's 115kV C3-99 overhead line at the North Abington substation in Abington. The transmission line associated with this option would be a 4.2-mile underground line extending from North Abington Substation, through the former Weymouth naval air station to a new HMLP substation site at the South Hingham Industrial Park.[17]

A geographic diagram and one line diagram of this project alternative (Option 3 and Option 3 Variation) is provided in Figure 3-5 and Figure 3-6 respectively.

NGRID's 115kV C3-99 line is a tap line from the 115kV C3 Line, which is a radial line supplied from the Auburn Street Substation #451 in Whitman. The C3 Line essentially parallels NGRID's S9 line, and the two lines supply several load serving substations in the South Shore area, including the North Abington substation #99, as well as substations at Plymouth Street #93 in Abington, Philips Lane #95 and Water Street #910 substations in Hanover, and Norwell substation #96 in Norwell. In the event of loss of either of the two lines, all of the load that is served by both lines would be picked up by the remaining line, either automatically or by way of post-contingency operator switching.

This transmission option would also require modifications to the North Abington substation #99 to accommodate the line extension. In addition to bus extensions and circuit breakers, these modifications likely would include the installation of dead-end structures, surge arresters, motor-operated disconnect switches, and remote SCADA control.

The proposed transmission line route for Option 3 follows a cross-country corridor that would have significant environmental impacts as it crosses through rare and endangered species habitat, wetland resource areas, and the Whitmans Pond and Old Swamp River/South Cove ORWs. The corridor also parallels and is adjacent to French Stream and crosses the Old Swamp River. The Option 3 Variation reroutes the majority of the line along existing roadways, thereby significantly reducing potential environmental impacts. A portion of the cross country corridor would cross the French Stream, bordering vegetated wetland, and mapped rare and endangered species habitat. Option 3 Variation additionally would cross designated ORWs and the Old Swamp River, but would do so within the previously disturbed Bill Delahunt Parkway ROW.

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[17] Option 3, like all transmission alternatives considered by HMLP, was first reviewed in 2018 and the estimated circuit length was 4.2 miles. More recently, HMLP identified a variation of this transmission alternative (hereinafter "Option 3 Variation") that would follow roadways to the extent practicable and reduce impacts within wetlands and rare and endangered species habitat, but this variation would be 5.12 miles long, adding additional costs and reliability-related exposure to this alternative.

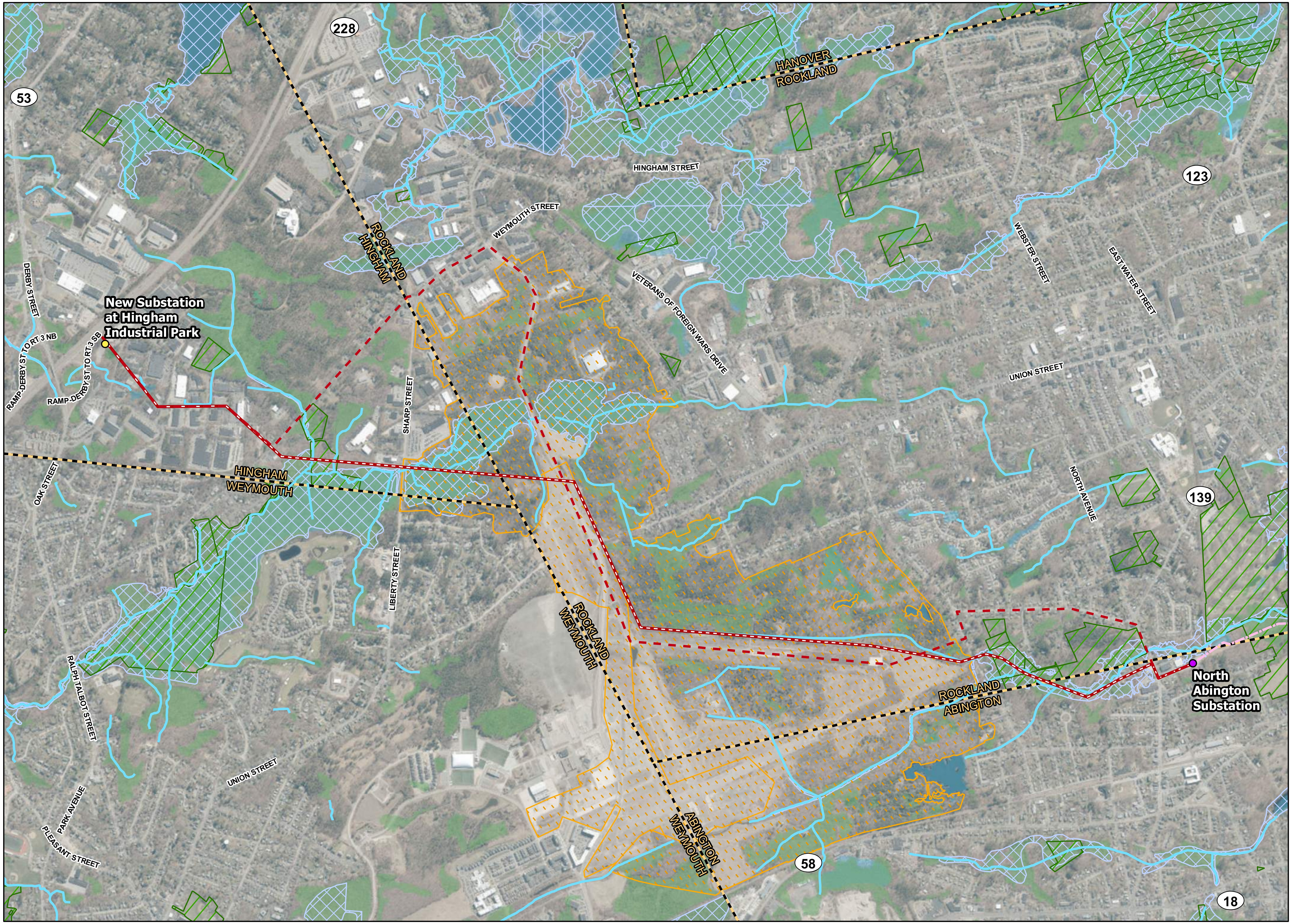


FIGURE 3-5 TRANSMISSION OPTION 3 AND OPTION 3 VARIATION

Hingham Electrical Infrastructure Reliability Project

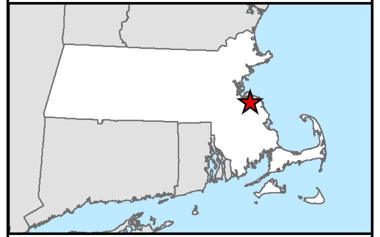
Hingham & Weymouth, MA

October 2024

LEGEND

- Existing Substation
- New Substation
- Option 3
- Option 3 Variation
- Existing Transmission
- Watercourse (not delineated)
- Town Boundary
- Area of Critical Environmental Concern (ACEC)
- Protected and Recreational Open Space
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Approximate Wetland (not delineated)*
- Open Water

LOCUS MAP



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Feet

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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

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Figure 3-6 One Line Diagram
Option 3 and Option 3 Variation

PRELIMINARY
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FIRM NAME: LIG CONSULTANTS, P.C.
FIRM REG. #:
PROF. ENG.: THOMAS CONVERSE
ENG. LIC. #: 37447
SIGNATURE:
SIGNATURE DATE:

REV	DATE	DESCRIPTION	DRW	APR'D

HMLP

LIG CONSULTANTS P.C.

HINGHAM MUNICIPAL LIGHT PLANT
North Abington to Industrial Park
ONE LINE

SIZE D
SHEET 1of1

DATE: 3/20/2024
SCALE: NTS
DWG NO: EFSB ESK-1-5

Option 3 (as well as Option 3 Variation) is similar to Option 1 in that it calls for construction of a new step-down station which requires integration of new distribution circuits into the existing HMLP system that is capable of carrying the entirety of the HMLP loads. The distribution system work necessary to integrate this transmission alternative with the existing distribution system would likely be significant as there are a limited number of feeders in the area of Hingham Industrial Park with limited street routes to connect to other feeders. Considerable feeder work would be required to extend remote circuits to this location if they are to serve as a back up to Hobart Substation. The significant work needed to integrate with the distribution system would increase the costs of this option.

HMLP requested an analysis from NGRID regarding the reliability and cost impacts of HMLP tapping NGRID's transmission lines. The NGRID analysis from October 2018 indicated that existing transmission circuit reconductoring of portions of its transmission lines would be required for this option as a result of adding the HMLP load to the lines during an outage event. The NGRID analysis identified that a DCT fault on the existing transmission lines serving HMLP followed by loss of the S9 line would transfer all of HMLP's load as well as all of the S9 line load onto the C3 Line. Based on the 2023 summer peak load forecast condition, this would result in overloading the segment of the C3 line between Auburn Street #451 and Plymouth #93 beyond its Summer Long Term Emergency ("LTE") rating. Since the C3 line is a Bulk Power System (BPS) line (as defined by NERC), this N-1-1 contingency condition needs to be respected, and NGRID's line segment would require reconductoring. Based on NGRID's estimate that 3.3 miles[18] of existing transmission line would need to be reconductored for both the C3 circuit as well as the S9 circuit for this option, HMLP calculated an additional cost of approximately $10 million, not including all other POI costs and other potential terminal point upgrades.

HMLP's total estimated cost for Option 3 is $145 Million (See TABLE 3-2), with the cost of Option 3A (Variation) estimated at $153.5 Million (See **Error! Reference source not found.**). This estimate includes the estimated costs associated with reconductoring of NGRID C3 and S9 circuits, construction of 4.2 miles of a 115kV underground transmission line (5.12 miles for Option 3 Variation), interconnection of the new 115kV transmission line to the North Abington substation and a new substation at the Hingham Industrial Park to step down the transmission voltage to 13.8kV. These costs do not include land acquisition costs for a new substation at the Hingham Industrial Park or at the NGRID tap in Abington, a transmission easement, or the additional HMLP distribution system upgrades necessary to provide backup capacity to serve the rest of Hingham.

---

[18] HMLP concluded that the total transmission line mileage that would require reconductoring includes 3.3 miles of the C3 circuit as well as 3.3 miles of the S9 circuit between Auburn substation and Plymouth Street substation, for a total of 6.6 miles. Although not specifically identified in the NGRID analysis, it was observed that the C3 and S9 circuits provide backup service for each other such that failure of either of these circuits results in all load being transferred to the remaining in-service circuit. The C3 and S9 circuits have similar ratings which led HMLP to the consideration that since the C3 circuit was found to be overloaded for loss of the S9 circuit followed by a DCT fault interrupting both of the Hingham supply circuits, an overload would also occur on the S9 circuit for loss of the C3 circuit followed by a DCT fault interrupting both of the Hingham supply circuits.

TABLE 3-2 Estimated Costs for Option 3

OPTION 3 ELEMENTS	COST ESTIMATE
Tap station in Abington	$ 9.3 M
Upgrades to the NGRID transmission lines	$10 M
Transmission line	$51 M
Hingham Industrial Park Substation	$75 M
Total Estimated 2024 Cost for Option 3	**$145.3 M**

TABLE 3-3 Estimated Costs for Option 3 Variation

OPTION 3 VARIATION ELEMENTS	COST ESTIMATE
Tap station in Abington	$9.3 M
Upgrades to the NGRID transmission lines	$10 M
Transmission line	$59.2 M
Hingham Industrial Park Substation	$75 M
Total Estimated 2024 Cost for Option 3 Variation	**$153.5 M**

As summarized in Section 3.3.4.8 below, the cost of Option 3 (or Option 3 Variation) as estimated by HMLP is significantly higher than the cost of Option 2. Moreover, Option 3 (and Option 3 Variation) would result in a somewhat lower level of reliability as it requires a longer underground transmission line than Option 2 (~1.8 miles longer underground cable) as well as an additional 2 miles of radial overhead transmission associated with the C3-99 line running from Plymouth Street substation to North Abington substation #99. Additionally, substantial distribution system costs would be required to fully integrate the new substation with the distribution system currently fed out of the existing Hobart substation based on a design that would allow the new substation to carry the entire Town of Hingham loads.

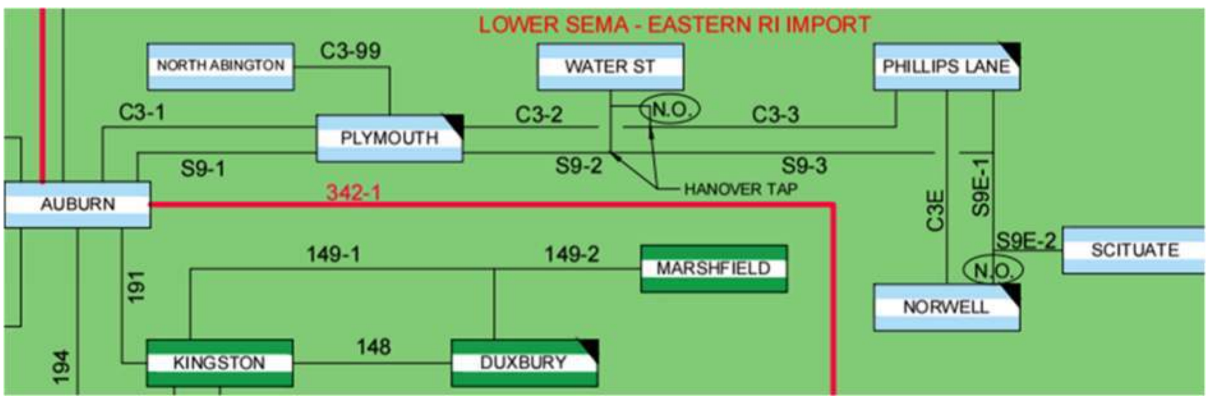
Finally, Option 3 Variation for the underground route to a new substation at the Hingham Industrial Park also has greater environmental impacts than Option 2 based on the longer underground route required and the cross country corridor segment that would cross through previously undisturbed wetland resource areas, including French Stream, and habitat for rare and endangered species. In addition, integrating the distribution system would require considerable feeder work to extend remote circuits to the Industrial Park and would likely result in further environmental impacts.

Accordingly, although Option 3 (as well as Option 3 Variation) satisfies the identified reliability need and is considered to be a feasible project alternative, as set out in Section 3.3.4.8 below, Option 2 was deemed superior to Option 3 (and Option 3 Variation) with respect to cost, reliability and minimizing environmental impacts

3.3.4.4 Underground Transmission line from Norwell Station to Union Street to Hobart Street (Option 4)

This transmission alternative (Option 4) would tap into NGRID's 115kV C3 Line near Norwell substation and extend the 115kV line northwest for approximately 7.5 miles. The 115kV C3 Line is a radial line supplied from the Auburn Street substation. The C3 Line essentially parallels the S9 Line, and the two lines supply several load serving substations in the South Shore area, including substations at Plymouth Street #93, North Abington #99, Philips Lane #95, Water Street #910, Norwell #96, and Scituate #915 (See Figure 3-7). In the event of loss of either of the two lines, all of the load that is served by both lines would be picked up by the remaining line, either automatically or by way of post-contingency operator switching.

Figure 3-7 One Line Diagram Showing NGRID's C3 and S9 Transmission Lines and Associated Substations



This transmission alternative would extend overhead from the existing NGRID Norwell substation #96 approximately 3 miles northwest along the existing NGRID ROW. The line then would diverge at the Aaron Reservoir onto a new overhead ROW extending west for 1.25 miles towards Union Street, then extend northwest along Union Street an additional 1.25 miles to a parcel at Union Street in Hingham, where a new substation could be constructed at a later date. From Union Street the line would be routed west along existing NGRID ROW and then north along Cross Street and west along Hobart Street (approximately 1.9 miles). The segment of the line within Cross Street and Hobart Street would be underground.

A new substation would be built at Hobart Street. The work at the proposed substation would include breakers and/or motor operated switches, and a control house to allow for the ability to sectionalize the 115kV feeders into Hobart and feed the existing Hobart substation via one of the existing lines from Weymouth, and the new C3 Transmission line extension. One of the existing 115kV feeds from Weymouth would serve as a reserve or a standby feed to back up the existing and new transmission lines which follow separate routes.

A geographic diagram of this project alternative (Option 4) is provided in Figure 3-8.

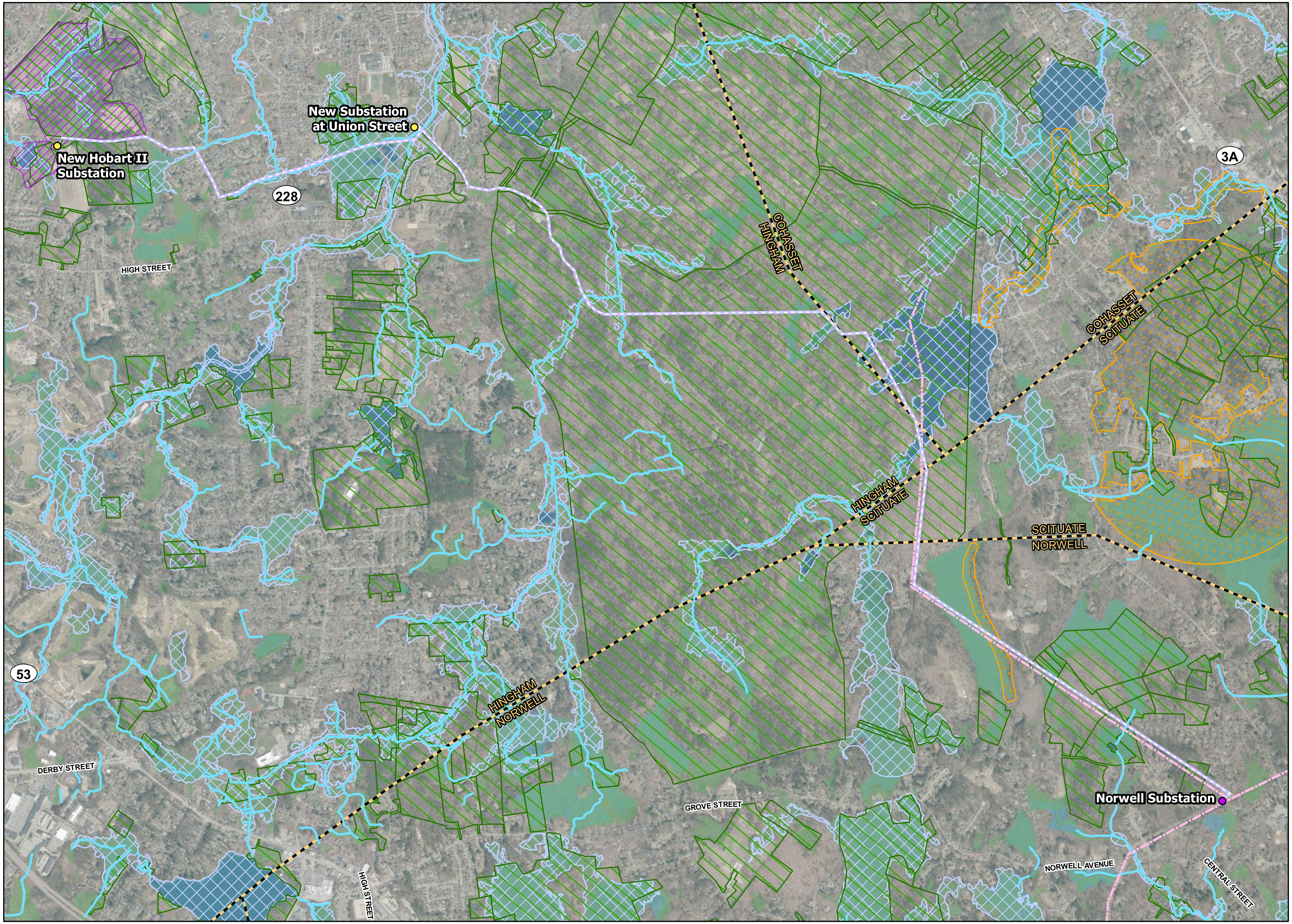


FIGURE 3-8 TRANSMISSION OPTION 4

Hingham Electrical Infrastructure Reliability Project

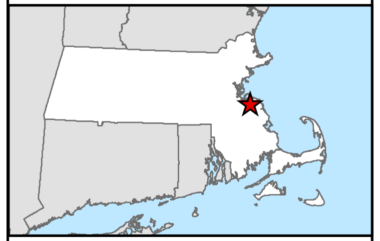
Hingham & Weymouth, MA

October 2024

LEGEND

- Existing Substation
- New Substation
- Option 4
- Existing Transmission
- Watercourse (not delineated)
- Town Boundary
- Area of Critical Environmental Concern (ACEC)
- Protected and Recreational Open Space
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Approximate Wetland (not delineated)*
- Open Water

LOCUS MAP



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Feet
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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

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HMLP requested an analysis from NGRID which included consideration of this option regarding the reliability and performance impacts of HMLP tapping NGRID's transmission lines. The NGRID assessment evaluated a similar set of contingency conditions where a DCT fault on the transmission circuits serving HMLP was followed by loss of the S9 transmission line. If all of HMLP's load were served by the C3 Line out of Norwell substation #96, for a 2023 summer peak load forecast condition, the segment of the C3 line running from Auburn Street substation #451 to Plymouth Street substation #93, as well as the segments running from Plymouth Street substation #93 to Philips Lane substation #95 and Philips Lane substation #95 to Norwell substation #96 would all exceed their summer LTE ratings. Since the C3 line is a BPS line, this N-1-1 contingency condition needs to be respected, and NGRID's line segments would require reconductoring. Additionally, since the C3 circuit and the S9 circuit provide backup service for each other and given that the two circuits have similar ratings, it was concluded that both the C3 and S9 circuits would need to be reconductored between Auburn Street substation #451 and Norwell substation #96. Based on these assumptions, the estimated total length of circuit reconductoring would be 24.8 miles (12.4 miles[19] x 2) for this option. HMLP has calculated the cost of these upgrades to be estimated at $36.6 Million, which does not include all other POI costs and other terminal point upgrades.

The new 7.5-mile transmission line required for this option would result in considerably greater construction costs and environmental impacts relative to other options, particularly within the segment required for a new overhead easement that runs cross country through previously undisturbed areas. This route crosses areas mapped as rare and endangered species habitat, extensive and interconnected wetland resource areas, designated ORW (Aaron River Reservoir and Lily Pond), as well as protected open space (Wampatuck State Park). A new transmission line easement within Wampatuck State Park would be subject to the provisions of Article 97 of the Massachusetts Constitution, including requiring a 2/3 vote of the Legislature. The segment of new overhead easement would require at least 11 new wetland resource area crossings within the Wampatuck State Park boundaries. Use of the existing NGRID ROW west of the Union Street Parcel

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19 The total transmission line mileage that would require reconductoring includes 3.3 miles of the C3 circuit between Auburn Street substation #451 and Plymouth Street substation #93; 3.1 miles of the C3 circuit from Plymouth Street substation #93 to Philips Lane substation #95; and 6 miles of the C3 circuit from Philips Lane substation #95 to Norwell substation #96. HMLP concluded that the total transmission line mileage that would require reconductoring includes 12.4 miles of the C3 circuit as well as 12.4 miles of the S9 circuit between Auburn Street substation #451 and Norwell substation #96, for a total of 24.8 miles. Although not specifically identified in the NGRID analysis, it was observed that the C3 and S9 circuits provide backup service for each other such that failure of either of these circuits results in all load being transferred to the remaining in-service circuit. The C3 and S9 circuits have similar ratings which led HMLP to the consideration that since the C3 circuit was found to be overloaded for loss of the S9 circuit followed by a DCT fault interrupting both of the Hingham supply circuits, an overload would also occur on the S9 circuit for loss of the C3 circuit followed by a DCT fault interrupting both of the Hingham supply circuits.

would also require significant environmental impacts as the ROW runs parallel to Tower Brook and crosses extensive wetland resource areas.

This option was eliminated from further consideration by HMLP because of (1) the significant costs associated with extensive circuit reconductoring of considerable portions of NGRID's lines, reconductoring that would be required to reliably integrate the HMLP load that could be placed upon the lines to serve Hingham during an outage event; (2) the cost of construction of a new 7.5-mile transmission line through environmentally challenging areas; and (3) the potential environmental impacts associated with construction in areas with rare and endangered species, wetland resources, ORW and protected open space.

3.3.4.5 Underground Transmission line from POI on Eversource Circuit 478-502 in Weymouth near MBTA ROW, then along MBTA Rail Line to Hobart Street (Option 5)

This transmission alternative (Option 5) includes a new 3.25-mile underground line, which would start at the Eversource ROW corridor near Broad Street (Lines 478-502/478-509), but would tap a different location than the proposed project (Option 2), one closer to the intersection between the Eversource ROW corridor and the MBTA ROW. This alternative would follow the MBTA rail line and a similar route to a new Hobart Street substation as the existing HMLP transmission lines.

A geographic diagram of this project alternative (Option 5) is provided in Figure 3-9.

There are significant constructability concerns regarding installation of a new underground transmission line along the MBTA tracks. The MBTA ROW is a major public transportation route for commuters, which includes overhead electric transmission lines that run parallel to the tracks within the ROW. Space between the rails and the electric transmission line is limited and the majority of the ROW is too narrow to support the Project's required width for the duct bank construction.

It is anticipated that areas where typical open trench excavation will occur will require an approximately 11-foot wide workspace area. Manhole and splice vault installations typically require an approximately 20-foot wide work area. Again, much of the MBTA ROW is narrow, and there is limited space between rails, other infrastructure associated with the railroad, and existing electric transmission infrastructure to support the required width for the duct bank construction.

It would not be feasible for the project to meet the requirements of the MBTA Railroad Operations Directorate, dated August 2014, which provides specifications for siting and construction of utilities along the rail lines. The MBTA Directorate requires that construction activity be limited to hours when the MBTA is not running (midnight to 5 a.m., at best) when in close proximity to rail. Construction equipment used for the project would be required to be brought into and removed from the site at the end of each construction period. For excavation longitudinally along the rail line, shoring would need to be installed prior to excavation. The time constraints and construction requirements would add months, if not years, to the project, which, in turn, would add significant costs.

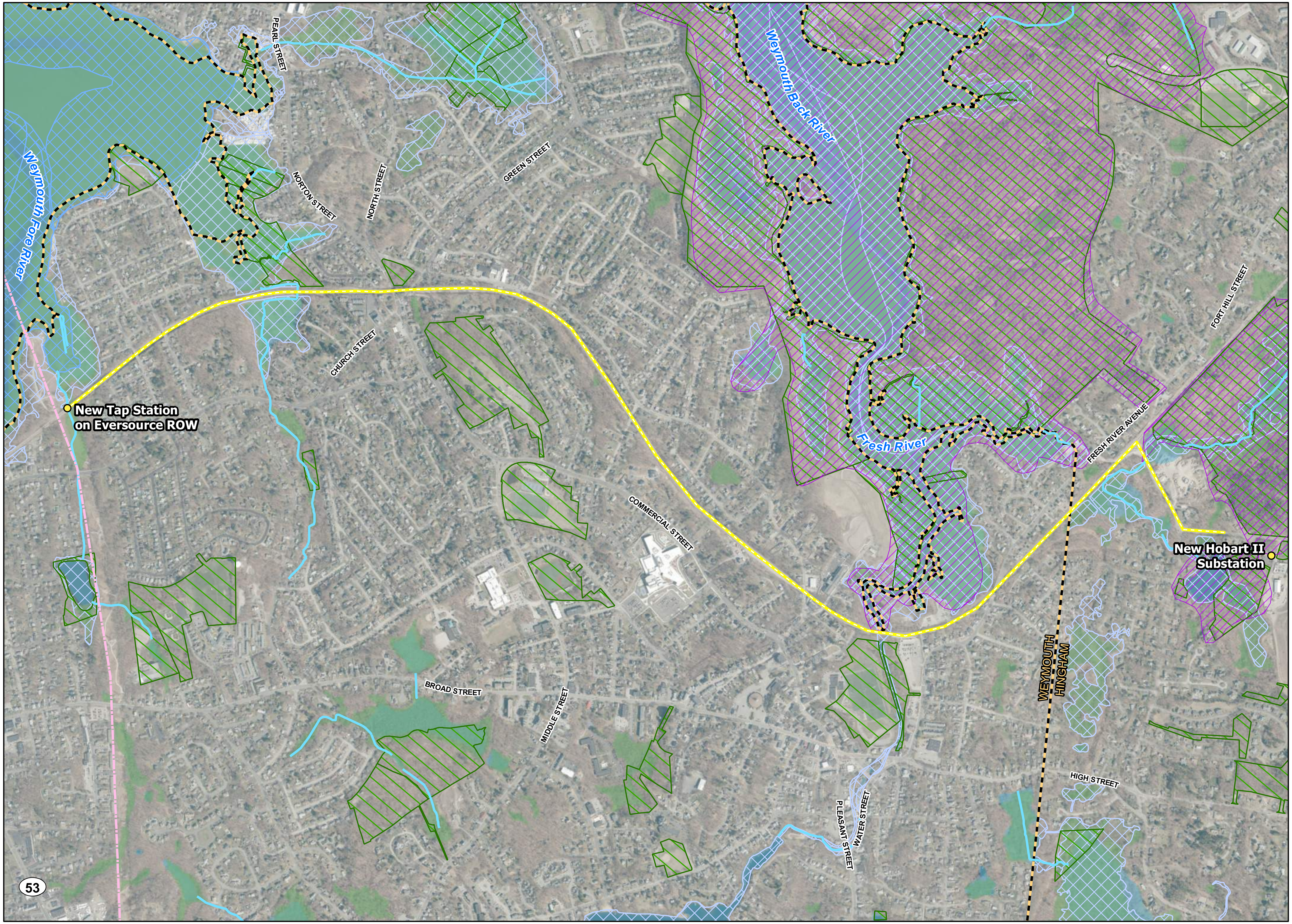


FIGURE 3-9 TRANSMISSION OPTION 5

Hingham Electrical Infrastructure Reliability Project

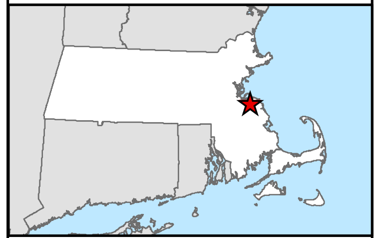
Hingham & Weymouth, MA

October 2024

LEGEND

- New Substation
- Option 5
- Existing Transmission
- Watercourse (not delineated)
- Town Boundary
- Area of Critical Environmental Concern (ACEC)
- Protected and Recreational Open Space
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Approximate Wetland (not delineated)*
- Open Water

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

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H-5059

In addition, at some point the proposed transmission line would need to cross a rail line(s). The crossing would need to be within a casing, and there is not adequate space for jacking and receiving pits within the MBTA ROW. The use of the MBTA ROW is not feasible due to the lack of space needed for jacking and receiving pits and the lack of space for installation of required manholes. For any manholes installed within the MBTA ROW, access to manholes would be restricted, severely impacting electrical system operations and maintenance.

From an environmental perspective, this option would require four (4) existing culvert crossings including the tidally influenced Weymouth Back River and stream/wetland crossings. As there is limited space within the MBTA right of way near these resources, temporary impacts to adjacent wetland resource areas may be unavoidable. Also, the crossings of the Weymouth Back River may require trenchless technologies to minimize impacts at the crossing locations.

As noted above, the location of the tap station would be near the intersection of the Eversource ROW with the MBTA ROW. The Eversource ROW in this area includes extensive wetland resource areas both north and south of the MBTA tracks, and finding a site for a new tap station would be challenging.[20]

In addition, HMLP identified five (5) bridge (non-environmental) crossings along the MBTA ROW -- Idlewell Street and Narraganset Avenue are railroad underpasses and North Street, Green Street, and at East Weymouth Substation (N. Wharf Street) are railroad bridges. The underpasses may limit the area alongside the railroad track to install the line. The bridges would need to be assessed to see if they can accommodate the transmission line. If not, a trenchless technology may be required to install the line under the bridges and roadways that the bridges cross. Accordingly, construction cost estimates for this alternative are considerably higher than for alternatives that avoid such bridge crossings.

This transmission alternative was not considered a viable alternative and was eliminated from further consideration because of the construction, siting and timing constraints associated with working within the narrow and active MBTA ROW and the considerable wetlands impacts associated with this tap station location.

3.3.4.6 Replacement of the DCTs with Single Monopoles for Each Portion of the Circuit Where There Are Presently DCTs (Option 6A)

This transmission alternative (Option 6A) would involve eliminating the DCT failure scenario by installing new monopoles to replace DCT structures along both the NGRID-owned and HMLP-owned portion of the lines currently serving Hingham. A review of the current pathways shows that HMLP owns 12 metal DCTs, and 3 wood DCTs, while NGRID owns and operates approximately 7 steel DCTs upstream of the HMLP-owned portion of the lines. (Table 2-2 provides an overview of poles, including DCTs, by ownership and composition (wood vs. metal), along the existing transmission feed.)

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20 The tap station for Option 5 also potentially could be sited near Broad Street as described in Option 2; however, extending the transmission line north within the Eversource ROW from Broad Street to the MBTA tracks would result in additional impacts to wetland resource areas.

A geographic diagram of this project alternative (Option 6A) as well as Option 6B is provided in Figure 3-10.

The HMLP portion of the line first was investigated to evaluate the possibility of replacing all DCTs with separate monopole single towers. HMLP's review showed that there is a curve on the section of track near East Weymouth Substation with limited room to add another pole along that section of rail track. Therefore, HMLP determined that in order to accomplish this transmission alternative, HMLP would need to install overhead poles in residential neighborhoods, or install poles on both sides of streets within Hingham. While both of these options are technically possible, HMLP determined they were unacceptable because of the visual impacts of new transmission poles on residential streets. Notably, in *Hingham Municipal Lighting Plant*, EFSC 85-65, 14 DOMSC 7, 25-27, 32 (1976), the Siting Council required HMLP to use single wooden DCTs for certain portions of the approved line. Adding additional pole structures in residential neighborhoods near Hobart Station likely would be poorly received by municipal officials and neighbors. Finally, even if it were feasible to install separate monopoles in neighborhoods near Hobart Substation in Hingham, this would not eliminate the current N-1 contingency because, as discussed herein, DCTs along the NGRID-owned upstream portion of the current route still would be present.

The NGRID portion of the line also was investigated to evaluate the possibility of adding separate monopole single towers upstream from East Weymouth Substation. HMLP's engineers independently conducted a high-level review of the NGRID-owned and operated upstream portion of the route, and that review showed that the DCTs currently follow the railroad tracks and likely were placed along portions of the line where there were curves in the track, and where there was not enough room or clearance along the tracks to place two single poles. Installation of additional monopoles on the NGRID portion of the current route is considered not practical at this time and was eliminated as an option since the solution involves significant construction constraints and also may require acquisition of private property along the rail route to allow for placement of new poles.

Finally, removing one of the lines from the DCTs and placing that line on separate monopoles would not meet the identified need, *i.e.*, this alternative addresses the N-1 DCT contingency, but does not address the N-1-1 contingency where one line has failed or is undergoing maintenance, and the second line experiences an outage.

In sum, HMLP eliminated this alternative from further consideration because it fails to address the identified need. Moreover, this alternative was deemed not to be viable because (1) HMLP likely would be required to acquire additional land on the NGRID portion of the line in Weymouth in order to install separate monopoles; and (2) installation of separate monopoles in Hingham would result in an increase in visual impacts that likely would not be acceptable to municipal officials and residents.

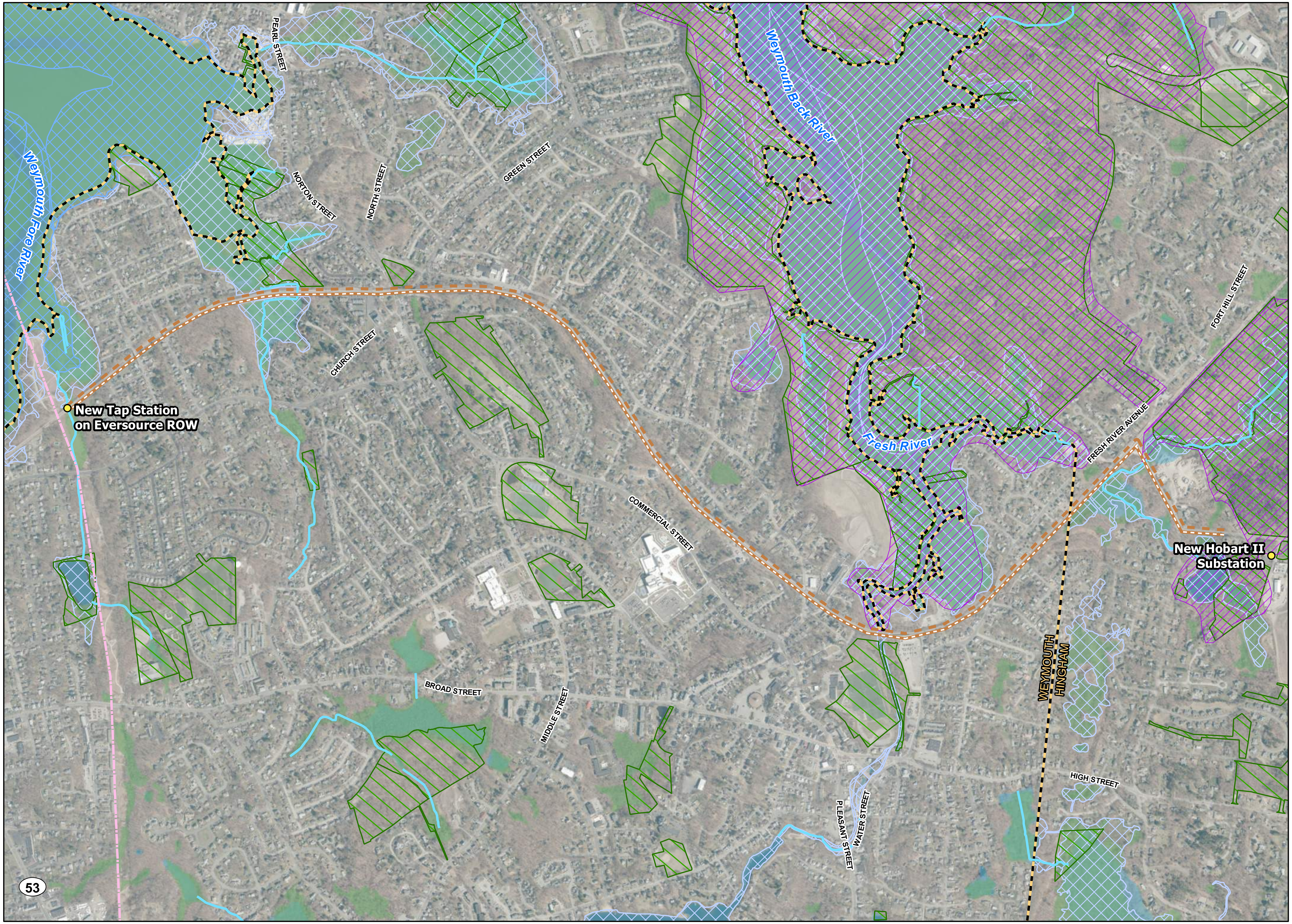


FIGURE 3-10
TRANSMISSION OPTION 6A/6B

Hingham Electrical Infrastructure Reliability Project

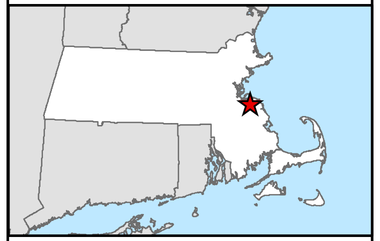
Hingham & Weymouth, MA

October 2024

LEGEND

- New Substation
- Option 6A
- Option 6B
- Existing Transmission
- Watercourse (not delineated)
- Town Boundary
- Area of Critical Environmental Concern (ACEC)
- Protected and Recreational Open Space
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Approximate Wetland (not delineated)*
- Open Water

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

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3.3.4.7 Placement of One of the Existing Transmission Lines Underground to Eliminate the DCT Contingency (Option 6B)

This transmission alternative (Option 6B) would involve installing an underground line adjacent to the existing lines to eliminate the DCT failure scenario. As with the consideration of replacing DCTs with separate overhead structures along the current route (Option 6A), to effectively remove the risk of a single tower failure, this underground plan would need to be implemented from Hobart Street and along the entire length of the railroad ROW to the Eversource ROW, *i.e.*, covering both the HMLP-owned and NGRID-owned portions of the existing line.

A geographic diagram of this project alternative (Option 6B) is provided in Figure 3-10.

As a threshold issue, like Option 6A, removing one of the existing lines and placing that line underground would not fully meet the identified need, *i.e.*, this alternative addresses the N-1 DCT contingency, but does not address the N-1-1 contingency where one line has failed or is undergoing maintenance, and the second line experiences an outage.

Four additional issues were identified regarding this alternative which were viewed as significant design and constructability impediments.

- First, between East Weymouth substations and the Eversource ROW, most of the single pole circuit structures are located adjacent to the track area but on opposite sides of the track. This configuration leaves very little room for installation of an underground duct bank. HMLP believes this creates a very difficult work condition to install an underground cable system, especially on an active railroad ROW. Moreover, addressing these construction constraints would add considerable cost to the project. These considerations all lead to a substantially higher cost estimate for this option.
- Second, this alternative would require four (4) existing crossings of wetland resource areas including the tidally influenced Weymouth Back River. As there is limited space within the MBTA right of way near these resources, temporary impacts to adjacent wetland resource areas may be unavoidable. These crossings, particularly the Weymouth Back River, may require trenchless technologies to minimize impacts at the crossing locations, resulting in construction cost increases.
- Third, HMLP identified five (5) bridge crossings (non-environmental) along the existing route - Idlewell Street and Narraganset Avenue are railroad underpasses, and North Street, Green Street, and at East Weymouth Substation (N. Wharf Street) are railroad bridges. The underpasses may limit the area alongside the railroad track to install the line. The bridges would need to be assessed to see if they can accommodate the transmission line. If not, a trenchless technology may be required to install the line under the bridges and roadways that the bridges cross. This also leads to the conclusion that construction cost estimates will be higher for this alternative than alternatives with routes that avoid such bridge crossings.
- Fourth, constructing an underground transmission line in a railroad ROW raises significant timing and coordination issues, as described for Option 5 in Section 3.3.4.5.

In sum, HMLP eliminated this alternative from further consideration because it fails to meet the identified need. Moreover, this alternative was deemed to be infeasible by HMLP because of the costs associated with mitigating environmental impacts and the impacts of multiple bridge crossings. Further, building along an active rail line creates construction and timing challenges and results in substantially higher costs under the best scenario.

3.3.4.8 Evaluation of Transmission Alternatives (Comparison of 7 Options)

In the previous sections, HMLP has provided the results of its investigation into the transmission alternatives that could potentially meet the need identified in Section 2 of the Petition. This investigation and analysis included extensive reviews of the designs, construction requirements, system integration requirements, environmental impacts and costs associated with all of the transmission alternatives. The results of HMLP's comparison of transmission alternatives are summarized in Table 3-4 below.

TABLE 3-4
Transmission Alternative Characteristics Summary

Alternative	Description	Total Line Length (Miles)	Contingency Events Mitigated	Design and Construction Characteristics	Viability or Cost Consideration
Transmission Alternative Option 1	Edgar Station to Hingham Shipyard	2.55	N-1 DCT N-1-1	Uncertainty around land availability and expansion costs associated with Edgar Station, difficulties associated with construction along heavily-travelled Route 3A, and potential impacts to protected open space or designated ORW/ACEC. See Section 3.3.4.1 above	Eliminated/Not Considered Viable
Transmission Alternative Option 2 (Preferred Project)	Broad Street to Hobart Street	3.11	N-1 DCT N-1-1	This is the preferred transmission alternative due to its constructability, reliability improvements, environmental impacts and overall costs. See Section 3.3.4.2 above.	$ 104.7M

Alternative	Description	Total Line Length (Miles)	Contingency Events Mitigated	Design and Construction Characteristics	Viability or Cost Consideration
Transmission Alternative Option 3/Option 3 Variation	North Abington Station to South Hingham Industrial Park	4.1 (5.12 for Option 3 Variation)	N-1 DCT N-1-1	Requires reconductoring NGRID's 115kV Transmission Lines C3 and S9 which involves over 6 miles of construction. See Section 3.3.4.3 above.	$ 145.3M ($153.5M for Option 3 Variation) (plus distribution system expansion costs)
Transmission Alternative Option 4	Norwell Station to Union St to Hobart Street	7.53	N-1 DCT N-1-1	Requires reconductoring NGRID's 115kV Transmission Lines C3 and S9 which involves over 24 miles of construction. Significa nt environmental impacts, including a new off-road easement in protected open space. See Section 3.3.4.4 above.	Eliminated/Not Considered Viable
Transmission Alternative Option 5	Broad Street to Tap to MBTA Rail Line to Hobart Street	3.25	N-1 DCT N-1-1	Restricted by construction, siting and timing constraints associated with working within the narrow and active MBTA ROW and the considerable wetlands impacts associated with tap station location. See Section 3.3.4.5 above	Eliminated/Not Considered Viable

Alternative	Description	Total Line Length (Miles)	Contingency Events Mitigated	Design and Construction Characteristics	Viability or Cost Consideration
Transmission Alternative Option 6A	Replace Double Circuit Towers with Single Pole Structures	3.11	N-1 DCT Does Not Mitigate N-1-1	Requires obtaining new right of way to accommodate circuit relocation. See Section 3.3.4.6 above.	Eliminated/Not Considered Viable
Transmission Alternative Option 6B	Relocate One of the Existing Overhead Circuits to Underground	3.11	N-1 DCT Does Not Mitigate N-1-1	Requires obtaining right of way from MBTA and construction along an active railway with 3 waterway crossings and 5 bridge crossings. See Section 3.3.4.7 above.	Eliminated/Not Considered Viable

As noted above, Options 1, 4, 5, 6A and 6B were eliminated from further consideration because they were not viable.

With respect to the remaining project alternatives, Option 2 is estimated to cost $40.6 Million less than Option 3 (and $48.8 Million less than Option 3 Variation). Moreover, as explained in Section 3.3.4.3 above, the reliability and environmental impacts associated with Option 3 (and Option 3 Variation) are notably less favorable, and these factors coupled with potentially substantial distribution system related costs led HMLP to conclude that its proposed transmission alternative, Option 2, is clearly superior to alternative transmission approaches in terms of cost, environmental impact, reliability and ability to meet the identified need.

3.4 Distribution Alternatives

HMLP has concluded that an alternative based solely on distribution system additions or modifications would not be viable as the town of Hingham has only one substation and loss of that substation due to a transmission system outage interrupts service to all distribution facilities serving the town.

As set forth above, no distribution alternatives were considered as a means to address the identified need. There currently is only one substation in Hingham. Unlike other large investor-owned utilities which often operate multiple substations in an area - and can use distribution ties from adjacent substations upon loss of transmission lines or a substation - HMLP has no other substations to leverage in the event of either a N-1 or N-1-1 contingency.

3.5 Non-Transmission Alternatives

As discussed in Section 3.3.1 above, HMLP's firm load capability is 80 MVA (Historical summer peak load is 57 MVA) and under N-1 or N-1-1 outages, alternative solution load carrying capacity must be able to supply at least as much as HMLP's existing firm load capability. Viable alternatives for addressing the identified need must provide at least 80 MVA of peak load capacity while continuing to be available under both N-1 and N-1-1 contingency conditions for anywhere from 8 hours to one week or more in duration. Therefore, any non-transmission alternative also must be able to serve up to 80 MVA and be available for extended periods of time -- for as long as from 8 hours up to a week or more -- which is considered to be the minimum amount of time necessary to ensure the availability of supply for the town of Hingham resulting from loss of transmission service.

HMLP considered the following non-transmission alternatives for meeting the identified need:

(1) Conservation efforts or interruption of firm and non-firm load

(2) Wind resource

(3) Solar with batteries

3.5.1 Conservation/Interruption of Firm and Non-firm Load (NTA Option 1)

This option does not meet the identified need because residents and businesses in Hingham would be without power when both lines are lost. Unlike larger utilities, HMLP cannot switch load to a "back-up substation"; thus, neither conservation nor so-called "rolling blackouts" – or some combination of the two – are feasible. Conservation or partial load interruption would not avoid interruption of service to all HMLP customers since the N-1 or N-1-1 outage would interrupt all service to the town.

3.5.2 Wind Resource (NTA Option 2)

A wind solution would require approximately 35 to 40 2.5MW turbines. Typical siting for a land-based wind turbine would require approximately 30-40 acres per turbine. HMLP is not aware of any proposed projects to construct this number of turbines as a single service territory solution, and there is no available land of this magnitude in Hingham. Existing tracts of undeveloped land within the Town are typically dense with environmental resources and/or are protected open space subject to Article 97. Construction of a land-based wind generation facility would result in significant land use impacts. Additionally, due to the intermittent nature of wind generation, battery storage capacity would also need to be included in the design.

Offshore wind was ruled out since there are no connections to the HMLP infrastructure that could be used to serve as a backstop to the existing transmission system. And, even if sufficient land were available, wind as a solution is intermittent which precludes it as an option absent additional energy storage capabilities. Further, offshore wind and interconnection to the existing transmission system would require extensive environmental permitting and impact mitigation.

This alternative was considered to be cost prohibitive given the equipment costs and land acquisition costs needed to site this number of wind generation units as well as battery storage capacity.

3.5.3 Solar/Battery (NTA Option 3)

Because solar is an intermittent resource, HMLP considered a non-transmission option combining solar with battery storage. Notably, battery storage systems typically only have two to four hours of availability; therefore, either individually or combined, this solution would require an extensive battery storage system that would be able to provide from 8 hours up to a week of firm supply to meet peak demand during a N-1 or N-1-1 contingency as outlined in Sections 1.3 and 3.5 above. In addition, a combination of solar and battery storage would require approximately 900 acres with a cost of over $160,000,000 for 80 MVA. Both the land requirements and the costs make this option infeasible as a solution. As described for the NTA Option 2 wind resource (see Section 3.5.2), existing tracts of undeveloped land within the Town are typically dense with environmental resources and/or are protected open space subject to Article 97. Construction of a solar generation and battery storage facility, or combination of separate facilities, would likely require substantial environmental impacts, permitting, and mitigation. Similarly, this alternative was considered cost prohibitive due to the equipment and land acquisition costs.[21]

3.5.4 Evaluation of Non-Transmission Alternatives (Comparison of 3 NTA Options)

The non-transmission alternatives considered by HMLP either do not meet the identified need as described in Section 2 or are significantly more expensive than the transmission alternatives that were developed. Moreover, it would not be possible for HMLP to acquire the land necessary to develop a wind option or multiple solar plus battery options that would meet the identified need. And, even if there was sufficient available land to site wind or multiple solar plus battery facilities in Hingham, the cost would be prohibitive and would result in greater land use and environmental impacts than the transmission alternatives.

Accordingly, HMLP eliminated all non-transmission alternatives from further consideration and HMLP determined that there is no non-transmission alternative (or combination of non-transmission alternatives) that meet the system reliability need identified in Section 2.

3.6 Conclusion on Project Alternatives

In Section 3.2, HMLP established that a no-build alternative did not meet the system reliability identified in Section 2 and leaves the Town of Hingham vulnerable to an extended outage.

In Section 3.3, HMLP identified and analyzed seven transmission alternatives (eight, including the Option 3 Variation) and eliminated five of those options – Option 1, Option 4, Option 5, Option 6, and Option 6A – because they are not viable alternatives to meet the identified need. Of the remaining viable alternatives, Option 2 – an underground transmission line from a new point of interconnection on Eversource circuit 478-502 in Weymouth to a new substation near the existing Hobart Substation in Hingham – was

[21] Similarly, a standalone battery system would fail to meet the identified need and would be infeasible. Indeed, a standalone battery system (absent a solar component) would have no opportunity or ability to recharge during an extended outage.

determined by HMLP to be clearly superior to Option 3 (and Option 3 Variation) in terms of cost, environmental impact, reliability and ability to meet the identified need.

Finally, in Section 3.4, HMLP determined that there is no non-transmission alternative (or combination of non-transmission alternatives) that meets the system reliability need identified in Section 2.

Accordingly, HMLP has established that, on balance, its proposed project (Option 2) is superior to alternative approaches in terms of cost, environmental impact, and ability to meet the identified need. In addition, HMLP has considered reliability of supply as part of its showing that its proposed project is superior to alternative project approaches.

SECTION 4

Section 4
Routing Analysis and Ancillary Facilities Site Selection

4.1 Introduction and Overview

As presented in Section 3, HMLP's proposed solution to address the reliability need identified in Section 2 involves the construction of a new 115kV underground transmission line from a new point of interconnection at Eversource-owned transmission lines in Weymouth and a new HMLP substation in Hingham. This Section describes the process by which HMLP identified and evaluated possible locations for a tap station in Weymouth and a substation in Hingham, as well as possible routes between the tap station and substation to determine the Preferred Route for the Project and a Noticed Alternative Route.

4.1.1 Standard of Review

The Siting Board has a statutory mandate to implement the policies of G.L. c. 164, §§ 69J-69Q to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost (G.L. c. 164, §§ 69H, 69J). Further, Section 69J requires the Siting Board to review alternatives to planned projects, including "other site locations." In implementing this statutory mandate, the Siting Board requires a petitioner to demonstrate that it has considered a reasonable range of practical project and siting alternatives and that the proposed facilities are sited at locations that minimize costs and environmental impacts while ensuring supply reliability. To do so, an applicant must satisfy a two-pronged test and demonstrate that it has: (1) developed and applied a reasonable set of criteria to identify and evaluate alternative routes in a manner that ensures that no routes were overlooked or eliminated that, on balance, are clearly superior to the proposed route; and (2) identified at least two noticed sites or routes with some measure of geographic diversity. *NSTAR Electric Company d/b/a Eversource Energy*, EFSB 19-06/D.P.U. 19-142/D.P.U. 19-143, at 39 (2022) ("*Eversource Mid-Cape*"); *New England Power Company d/b/a National Grid*, EFSB 19-04/D.P.U. 19-77/19-78, at 38-39 (2021) ("*NEP Beverly-Salem*"); *NSTAR Electric Company d/b/a Eversource Energy*, EFSB 19-03/D.P.U. 19-15, at 43 (2021) ("*Eversource Andrew/Dewar*"); *NSTAR Electric Company d/b/a Eversource Energy*, EFSB 17-02/D.P.U. 17-82/17-83 (2019) at 71 ("*Sudbury – Hudson*").

The following subsections describe the route selection process developed by HMLP in accordance with the above-cited requirements.

4.1.2 Routing Analysis Overview

HMLP assessed options to address the identified reliability need by connecting Hingham to the grid with a third 115kV transmission line that is geographically distinct from the existing two transmission lines. The process for the transmission line routing could not begin until the locations for a substation in Hingham and a tap station to connect to the Eversource transmission lines in Weymouth were identified.

Several sites were assessed in Hingham (for the New Substation), in proximity to the existing Hobart Substation, and in Weymouth (for the new Tap Station) along and in proximity to the Eversource transmission line right-of-way. The sites were carefully evaluated for a variety of factors as discussed below to determine the preferred sites for both the substation and tap station. Once these sites were determined, then the routing analysis for the transmission line commenced.

HMLP's methodology for siting the proposed new electric transmission line, referred to as a "routing analysis," is an adaptive and iterative approach to identify and evaluate possible routes for the proposed new transmission line in accordance with requirements described above. The routing analysis identified the route for the Project as the option that best balances minimization of environmental impacts (including developed and natural environment impacts and constructability constraints), cost and reliability. The analysis also identified a Noticed Alternative Route that provides a geographically distinct alternative to the Project, while also attempting to strike a balance of the aforementioned factors.

The routing analysis methodology presented herein uses previously established approaches for evaluating electric transmission routing options and is consistent with Siting Board precedent. In initiating the routing analysis, HMLP first established routing objectives (described in more detail in the following subsections).

4.1.3 Routing Analysis Objectives

The goal of HMLP's routing analysis was to identify a technically feasible route that achieved the required transmission system reliability improvements by interconnecting the proposed new tap station in Weymouth and the proposed new substation in Hingham. Additional consideration was given to the potential impacts the candidate solutions may have on the developed and natural environment. These objectives included:

- Comply with all applicable statutory requirements, regulations and state and federal siting agency policies;
- Achieve a reliable, operable and cost-effective solution;
- Maximize the reasonable, practical and feasible use of existing linear corridors (e.g., transmission line, highway, railroad, or pipeline ROWs);
- Minimize the need to acquire property rights; and
- Maximize the potential for direct routing options over circuitous routes.

4.1.4 Methodology

The routing analysis for the new line consisted of the following steps, discussed in more detail in subsequent sections:

- **Identification of Substation:** Focused on the identification of the new substation site within proximity of the existing "Hobart I" substation located in Hingham on Old Hobart Street.
- **Identification of Tap Station:** Focused on the identification of the new tap station site within proximity of the existing Eversource ROW located in Weymouth.
- **Identification of Project Study Area:** Identified a geographic area extending between the proposed Tap Station in Weymouth and the proposed Hobart II Substation in Hingham for purposes of commencing the routing analysis.
- **Development of Universe of Routes:** Identified numerous routing options and associated variations in the Project Study Area to develop a set of potential routes.

- **Identification of Potential Candidate Routes:** Identified and described the viable routes from the Universe of Routes (collectively referred to herein as "Candidate Routes") that met the need for the Project and were consistent with the objectives of HMLP's routing analysis.
- **Candidate Route Analysis:** Compared the potential for natural environment and built environment impacts and technical constructability constraints along the Candidate Routes.
- **Cost Analysis:** Compared the estimated costs for the Candidate Routes.
- **Reliability Analysis:** Compared the reliability of the Candidate Routes.
- **Selection of Routes:** Evaluated the results of the above analyses and identified a Preferred Route and a Noticed Alternative Route that best balance reliability, minimization of environmental impacts, constructability constraints and cost.

4.1.5 Stakeholder Input

In addition to the steps associated with route selection, HMLP representatives met with state and municipal officials, residents, business owners and other stakeholders to discuss the substation and tap station sites, as well as the Universe of Routes under consideration for the New Line, and to obtain input on these siting and routing options. This process began in 2020 and, as of the date of this filing, has included more than 32 meetings (see Section 1.7 for additional discussion of the meetings). The following table summarizes the input regarding siting and route selection obtained at these meetings.

TABLE 4-1
Stakeholder Input Used to Develop/Supplement Routing Analysis

Date	Participants	Input Received
12/14/2020	Hingham Department Heads	Input on potential substation sites
12/21/2020	Hingham Conservation Commission	Input on potential substation sites
2/17/2021	Hingham Select Board	Input on potential substation sites
2/25/2021	Hingham Outreach Meeting	Input on potential substation sites
3/16/2021	Hingham Select Board	Input on potential substation sites
3/18/2021	Hingham Advisory Committee Meeting	Input on potential substation sites
3/23/2021	Hingham Advisory Committee Meeting	Input on potential substation sites
4/6/2021	Weymouth Mayor and staff	Initial meeting to present tap station site and route analysis. Mayor provided suggestions.
9/29/2021	Weymouth Mayor and staff	Follow-up meeting with the Mayor to discuss tap station site and updated route analysis
10/18/2021	Hingham Community Meeting	Input on proposed substation site

TABLE 4-1
Stakeholder Input Used to Develop/Supplement Routing Analysis

Date	Participants	Input Received
11/18/2021	Hingham Community Meeting	Input on proposed substation site
1/31/2022	Weymouth Mayor and staff	Follow-up meeting with the Mayor to discuss tap station site and updated route analysis
3/1/2022	Hingham Advisory Committee Meeting	Input on proposed substation site
4/5/2022	Weymouth Councilors (DiFazio, Mathews)	Discuss proposed routes and tap station sites
4/30/2022	Hingham Town Meeting	Authorized Select Board to transfer custody and control of parcel of land at the Town’s transfer station to HMLP for substation purposes
5/3/2022	Weymouth Conservation Commission, Fore River Watershed Association, Herring Warden	Discuss proposed routes and tap station sites
6/17/2022	Weymouth Councilors	Discuss proposed routes and tap station sites
8/25/2022	Weymouth Open House	Feedback on potential proposed routes and tap station site
8/31/2022	Weymouth Planning Director	Discuss proposed tap station sites, zoning relief and zoning exemptions
9/13/2022	Weymouth Open House	Feedback on potential proposed routes and tap station site
9/28/2022	Hingham Open House	Feedback on potential proposed routes and substation site
10/12/2022	Community Zoom Meeting	Feedback on potential proposed routes, tap station site, and substation site.
1/10/2023	Weymouth Mayor and staff	Discuss proposed routes and tap station sites
10/16/2023	Weymouth Mayor and staff	Discuss proposed routes and tap station sites
1/04/2024	Weymouth outreach – Union Towers I residents and management	Tabling to promote Focused Meeting on 01/25/24 at Union Towers I to discuss tap station site and proposed routes
1/05/2024	Weymouth outreach – Union Towers II, residents and management	Tabling to promote Focused Meeting on 01/26/24 at Union Towers II to discuss tap station site and proposed routes
1/25/2024	Weymouth outreach – Union Towers I, residents and management	Focused meeting on tap station site, and discussion of proposed routes (engaged Cantonese interpreters)

TABLE 4-1
Stakeholder Input Used to Develop/Supplement Routing Analysis

Date	Participants	Input Received
1/26/2024	Weymouth outreach – Union Towers II, residents and management	Focused meeting on tap station site, and discussion of proposed routes
3/11/2024	Weymouth outreach – Jimmy's Diner	Held a tabling event at popular eatery where Eversource engaged patrons to attend Open House on 04/19/24. Passed out invitations that included project information
3/12/2024	Weymouth Mayor and staff	Discuss proposed routes and tap station site
4/19/2024	Weymouth – Crossroads Church, Hingham and Weymouth abutters	Open House meeting focused on tap station site and proposed routes (engaged Spanish and Brazilian Portuguese interpreters)
6/4/2024	Joint Meeting Hingham Planning Board and Zoning Board of Appeals	Informal review of substation proposal; Boards voted to recommend conditions for the Select Board to consider in connection with their transfer of the custody and control of the Substation parcel to HMLP

Note: This table is an overview and does not provide details regarding all items discussed at the meetings listed. In addition, this table may have omitted additional meetings where some of the same routing related topics were discussed and/or conveyed to HMLP.

HMLP also contacted the Executive Office of Energy and Environmental Affairs Office of Environmental Justice & Equity for a list of Environmental Justice Community Based Organizations ("CBOs") in the project area. A letter with project information and an offer to meet to discuss the Project was mailed to each CBO in March 2023. No response was received.

4.2 Ancillary Facilities Site Selection

As described below, the first steps in HMLP's analysis were to identify the ancillary sites: a substation site in Hingham and a tap station site in Weymouth. A desktop analysis was conducted for several sites for each ancillary facility. The desktop analysis was performed to provide an evaluation of the physical space requirements and potential constraints to siting facilities on the identified lots. This desktop analysis exercise included review of multiple environmental criteria as well as space constrictions.

To evaluate the parcels for proposed development, the following criteria were analyzed using MassGIS data (Bureau of Geographic Information):

- **Areas of Critical Environmental Concern (ACEC)** – Places in Massachusetts that receive special recognition because of the quality, uniqueness and significance of their natural and cultural resources. These areas are designated by the state's EOEEA Secretary.

- **Certified Vernal Pools/Potential Vernal Pools** – Seasonal depressional wetlands that are covered by shallow water for variable periods from winter to spring but may be completely dry for most of the summer and fall.
- **Chapter 91** – Tideland jurisdiction under the jurisdiction of MassDEP under G.L. c. 91 and the Waterways Regulations in 310 CMR 9.00.
- **Environmental Justice Populations** – Neighborhoods where 25% of the households have an annual median household income that is equal to or less than 65% of the statewide median or 24% of its population is Minority or identifies as a household that has English Isolation.
- **Floodplain** – Area of low-lying ground adjacent to a stream or river that is formed mainly of river sediments and is subject to flooding. A type of wetland resource that floods following storms, prolonged rainfall, or snowmelt.
- **Historic and Archeological Resources –** Historical inventory cataloged by the Massachusetts Culture Resources Inventory System (MACRIS) MassGIS data layer maintained by the Massachusetts Historical Commission.
- **Land Use/Adjacent Land Use** – Land cover mapping from aerial imagery and land use derived from standardized assessor parcel information.
- **MassDEP Wetland/NWI Wetlands** – Includes open water, marshes, swamps, tidal flats, etc. Also includes hydrologic connections that appear to contain flowing water and flow into, out of, or between mapped wetlands.
- **NHESP Priority/Estimated Habitat Rare Species** – Habitat of state-listed rare species based on observations documented within the last 25 years.
- **Potential to Encounter Subsurface Contamination –** Active Tier Classified Tier I and II sites, Activity and Use Limitation (AUL) sites closed with ongoing maintenance conditions, Utility Related Abatement Measures (URAM) sites and Class C Temporary Solution sites.
- **Prime Farmland** - Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses.
- **Protected Open Space/Potential Article 97** – Boundaries of conservation land and outdoor recreational facilities in Massachusetts. Land defined as open space may be protected by Article 97 of Amendments to the Massachusetts Constitution.
- **Sensitive Receptors –** Police and fire stations, hospitals, schools, nursing homes/elder care, funeral homes, places of worship, daycares, and park and recreation facilities.
- **Surface Water Supply Watershed/Public Water Supply Protection Area –** Areas included in the Massachusetts Drinking Water Regulations, as Surface Water Supply Protection Zones and Groundwater Supply Protection Zones

The following sections describe the parcels assessed for both the proposed Hobart II Substation and the Weymouth Tap Station and the results of the desktop analysis.

4.2.1 Hobart II Substation

In order to maximize reliability, HMLP focused on selecting a site for the substation in proximity to the existing Hobart substation in Hingham. This proximity would allow for the two substations to be connected in a ring-bus configuration, where one substation could backfeed the other.

HMLP identified ten (10) town-owned parcels for consideration for a proposed substation.[22] An open-air substation requires approximately 1 to 1.5 acres of land. An enclosed substation requires as little as 15,000 square feet, but preferably a minimum of 20,000 square feet (approximately 1/2 acre).

Ten (10) municipal properties within the vicinity of the Hobart Substation were identified for desktop assessment. The parcels analyzed are shown on Figure 4-1 and in Table 4-2 below. None of the parcels or combination of parcels could accommodate the one acre of area needed for an open-air substation, so the analysis proceeded to identify areas that could accommodate an enclosed substation. An enclosed substation requires approximately ½ acre of land. These areas were used to assess potential sites available. The initial desktop analysis identified a few issues that required further consideration:

- The majority of sites were less than one acre, many less than ½ acre. The only site assessed with greater than one acre of land is the Town of Hingham Transfer Station site.
- Wetland resources further constrained most sites.

Recognizing that there are a limited number of Town-owned parcels in the vicinity of the existing Hobart Substation, combining adjacent town-owned parcels was evaluated to achieve maximum developable area for a potential substation.

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[22] As set forth in Section 1.2, as a municipal light department, HMLP does not hold title to real property in its name; rather, once acquired, it is placed under the custody and control of HMLP for light plant purposes by the Select Board after the Select Board has been duly authorized by Town Meeting. As such, HMLP faces certain obstacles with respect to acquiring privately-owned property. Because HMLP does not have authority to purchase privately-owned properties on its own, the Select Board first would need to be authorized by a Town Meeting vote to acquire land for HMLP's purposes. Depending on the costs of a privately-owned site (notwithstanding the scarcity of land available for development in Hingham), the purchase would likely need to be financed, which would require Town Meeting approval. Purchases of property by municipalities are subject to a lengthy public bidding process pursuant to G.L. c. 30B, § 16, which process might not lead to the most suitable site for a substation, causing delays and uncertainties and requiring additional requests for proposals. As such, by primarily focusing on sites already owned by the Town of Hingham, HMLP both (1) reduced costs, *i.e.*, custody and control of most Hingham-owned properties not needed for current Town purposes would be transferred to HMLP at no cost; and (2) removed uncertainties that HMLP would face by virtue of not having control over the manner and timing of a purchase.

Legend

- Culvert
- Non-Landfill Solid Waste Sites
- Field Delineated Non-Jurisdictional Swale
- Track or Trail
- Watercourse (not delineated)
- Field Delineated Wetland Boundary
- Field Delineated Wetland Area
- 25-foot Local Buffer Zone
- 50-foot Local Buffer Zone
- 100-foot Buffer Zone
- Protected and Recreational Open Space
- Solid Waste Landfill
- Area of Critical Environmental Concern (ACEC)
- 100 Year Flood Zone
- Potentially Productive Medium Yield Aquifer
- Approximate Wetland (not delineated)
- Open Water
- Site Parcels
- Parcel Boundary

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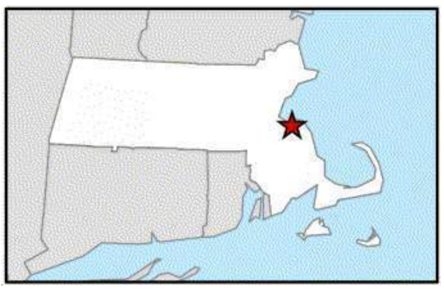
Feet

FIGURE 4-1
HOBART II SUBSTATION SITE ALTERNATIVES

Hingham Electrical Infrastructure Reliability Project
Hingham, Massachusetts

October 2024



Tighe&Bond

1. Based on MassGIS Color Orthophotography (2023).
2. Parcels (FY2022) downloaded from MassGIS and are approximate.
3. Data source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology

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H-5059

TABLE 4-2
Hobart II Substation Sites Assessed

Parcel Address	Parcel ID #	Size (Acres/sq. feet)	Description
211 Hobart	97-0-9	0.47 / 20,500	Square parcel. Directly north of Hobart Street and west of residential parcel.
213 Hobart	97-0-8	0.53 / 23,100	Directly north of Hobart Street
214 Hobart	106-0-19	0.46 / 20,000	South of Hobart Street. North of Bouve Pond and between 106-0-49 and 106-0-18
51 French	106-0-18	0.47 / 20,500	Corner of Hobart Street and French Street. North of Bouve Pond and between 106-0-19 and 106-0-17
0 Old Hobart	106-0-4	9.7 / 422,500	Existing transfer station parcel off Sam Ryder Road
206 Old Hobart	97-0-7	0.47 / 20,500	Square parcel between 97-0-8 and 97-0-4
212 Hobart	106-0-49	0.47 / 20,500	South of Hobart Street. West of residential parcel and north of Bouve Pond
204 Old Hobart	97-0-4	0.46 / 20,000	North of residential parcel and west of protected open space
49 French	106-0-17	0.46 / 20,000	East of French Street. North of residential parcel and west of Bouve Pond
0 Hobart	106-0-61	0.78 / 34,000	Triangle parcel northwest of the existing transfer station between Hobart Street and Sam Ryder Road

The wetlands mapped by MassGIS encroached onto many of the properties being analyzed as a possible site for the substation. In order to develop a more accurate picture of the impact of the wetland resources to the potential development of the parcels, a Tighe & Bond wetland scientist conducted a field delineation of wetlands to identify the limits of these resource areas. Information on wetlands constraints is provided below.

Wetland Constraints

The desktop analysis identified wetland resource areas as potentially significant constraints to development at the parcels analyzed. The locations of the wetlands as delineated in the field were incorporated into the maps, and the jurisdictional buffer zones to the wetlands were added. Based on communication with Loni Fournier, Senior Planner for the Hingham Conservation Commission, HMLP was informed that Conservation Commission approval for any work within the inner 50-foot buffer zone to a wetland, particularly if the buffer zone is previously undeveloped, would be extremely challenging, as the Conservation Commission regulates the buffer zone as a “no touch” resource area through the Town of Hingham Wetlands Protection Bylaw (General Bylaws of the Town of Hingham, Article 22).

HMLP attended a special meeting of Town of Hingham department heads on December 14, 2020 to discuss the potential substation locations. The wetland buffer zones were identified at that meeting as well, and it was recognized that the wetlands-related restrictions, specifically the 50-foot no touch buffer zone, resulted in elimination of potential sites, pushing the preferred location of the substation to the parcel 106-0-61.

In order to confirm the Conservation Commission's opinion on allowing work in the 50-foot buffer zone, HMLP met with the Conservation Commission informally at their December 21, 2020 meeting. HMLP presented the location of the sites that were being analyzed and the restrictions on those sites placed by the 50-foot buffer zone. The Conservation Commission confirmed that they would not approve work within the undisturbed inner 50-foot buffer zone to wetland resource areas. The Commission recognized that this requirement would push the potential substation to a location that was closer to residential abutters.

Summary of the Site Analysis

The site analysis incorporated the desktop analysis, field delineation, and input from the Conservation Commission. A summary of each site and the pros and cons of the sites are listed below. Adjacent parcels 106-0-19 and 106-0-18 were evaluated on the assumption that they could be combined to potentially provide the space necessary for the proposed substation. No other combination of parcels provided the adequate space and/or shape for the proposed substation. The usable area identified below is the contiguous area within the property that is not constrained by environmental resources, including the 50-foot wetlands buffer zone.

97-0-9: 211 Hobart Street

- Total Parcel Area: Approximately 20,500 square feet
- Site Constraints: Wetlands in the northwest corner of the parcel; 50-foot buffer zone extends into upland area
- Total Usable Area: Approximately 12,700 square feet
- Site Summary: Due to the presence of wetlands and buffer zones, there is not adequate area for an enclosed substation

97-0-8: 213 Hobart Street

- Total Parcel Area: Approximately 23,100 square feet
- Site Constraints: Wetlands along eastern half of site; 50-foot buffer zone extends into upland area
- Usable Area: Approximately 6,700 square feet
- Site Summary: Due to the shape of the parcel and presence of wetlands and buffer zones, there is not adequate area for an enclosed substation

97-0-7: 206 Old Hobart Street

- Total Parcel Area: Approximately 20,500 square feet
- Site Constraints: Wetlands along eastern half of site; 50-foot buffer zone extends into upland area
- Usable Area: Approximately 2,200 square feet
- Site Summary: Due to the presence of wetlands and buffer zones, there is not adequate area for an enclosed substation

97-0-4: 204 Old Hobart Street

- Total Parcel Area: Approximately 20,000 square feet
- Site Constraints: Wetlands extend through the middle of the site; 50-foot buffer zone extends into upland area
- Usable Area: Approximately 400 square feet
- Site Summary: Due to the presence of wetlands and buffer zones, there is not adequate area for an enclosed substation

106-0-18: 51 French Street / 106-0-19: 214 Hobart Street

- Total Parcel Area: Approximately 40,500 sf combined
- Site Constraints: Wetlands extend through the southeastern area of the site; 50-foot buffer zone extends into upland area
- Usable Area: Approximately 7,800 sf combined
- Site Summary: Due to the presence of wetlands and buffer zones, there is not adequate area for an enclosed substation

106-0-49: 212 Old Hobart Street

- Total Parcel Area: Approximately 20,500 square feet
- Site Constraints: The majority of the parcel is constrained by wetlands
- Usable Area: 0 square feet
- Site Summary: Due to the presence of wetlands and buffer zones, there is not adequate area for an enclosed substation

106-0-17: 49 French Street

- Total Parcel Area: Approximately 20,000 square feet
- Site Constraints: The entire parcel is constrained by wetlands
- Usable Area: 0 square feet
- Site Summary: Due to the presence of wetlands, there is not adequate area for an enclosed substation

106-0-61: 0 Hobart Street

- Total Parcel Area: Approximately 34,000 square feet
- Site Constraints: 50-foot wetlands buffer zone extends into the eastern portion of the site; the site is within the Weymouth Back River ACEC.
- Usable Area: Approximately 27,200 sf of usable area
- Site Summary: There is adequate area for an enclosed substation
- Public Input: This site was initially identified as the preferred option. Based on input from the public with significant concerns regarding the use of this property and its proximity to residences, additional analysis of the transfer station parcel was conducted

106-0-4: Old Hobart Street (Transfer Station Parcel – Preferred Substation Site)

- Total Site Area: Approximately 9.7 acres
- Site Constraints: The capped landfill and the active transfer station operation restricts the area on the site for expansion of Hobart Substation or construction of a new enclosed substation; moving existing transfer station equipment and

operations is difficult and limited due to the capped landfill, adjacent open space surrounding the transfer station, and site grades.

- Usable area: HMLP held a number of discussions with Randy Sylvester, the DPW Superintendent, who had initially stated that there was not available space on the transfer station site to accommodate an expansion or new enclosed substation.
- Site Summary: After receiving negative public input on the use of Parcel 106-0-61 for the substation, HMLP reevaluated potential options within the transfer station parcel. Moreover, in meetings with the Hingham Select Board and Advisory Committee in the first quarter of 2021, HMLP was encouraged to revisit the transfer station property. An approximately ½ acre area of undeveloped land was later identified at the northeastern corner of the transfer station parcel, adjacent to the exit road. This area has adequate capacity for the proposed substation and will not have a significant impact on the transfer station operations.

167-0-28: 308 Cushing Street (Former HMLP Facility)

This site is located approximately 2 miles from Hobart I Substation. This site was assessed in addition to the 10 sites in proximity to Hobart I Substation.

- Total Site Area: Approximately 2.3 acres
- Site Constraints: In order to connect this location to the main grid and tie the new substation to the existing Hobart Substation, approximately 7 additional miles of transmission main would need to be installed, including the installation of three transmission mains within Cushing Street. This additional length of underground electric transmission line reduces reliability and increases the potential for infrastructure failures.

After assessment of several parcels, a portion of the Hingham Transfer Station parcel was identified for the new Hobart II Substation.

4.2.2 Weymouth Tap Station

Based on the reliability assessment discussed in Section 3, HMLP focused on connecting to Eversource's transmission lines in Weymouth. HMLP's assessment of potential tap sites focused on properties within and adjacent to the existing Eversource electric transmission ROW. Five (5) lots in proximity to the intersection of the transmission line ROW and Broad Street were initially assessed. HMLP also performed a comprehensive assessment of an additional ten (10) parcels along the right-of-way in Weymouth.

Five (5) parcels were assessed at the intersection of the Eversource ROW with Broad Street in Weymouth. A desktop assessment was performed on three (3) parcels owned by public utility companies (National Grid and Eversource) north of Broad Street. These lots are depicted on Figure 4-2 and the assessment of these parcels is summarized in Table 4-3. In addition, the two (2) lots that make up the parking lot on the south side of Broad Street were also assessed (see Figure 4-2). These lots (parcels 20-283-34 and 20-283-3) are owned by Electroswitch. HMLP reached out to Electroswitch regarding the potential to acquire a portion of the parking lot for a tap station. Electroswitch indicated that it needed the parking area to serve its facility, and assessment of these lots was not pursued further.

The desktop analysis for the public utility owned parcels identified only the Eversource-owned parcel 20-220-1, a 11.67-acre parcel, as having adequate unconstrained area for a new tap station within an existing utility ROW. The two smaller lots adjacent to the ROW, owned by National Grid, were heavily constrained by wetland resources. One lot was less than ¼ acre. The larger lot (1.5 acres) was constrained by wetlands and a stream that restricts the entire frontage of the parcel from Broad Street. Furthermore, both of these lots directly abut residential properties.

To confirm there was not a better tap station site, the ROW bounded by the Weymouth Fore River to the north and Route 53 to the south was reviewed for potential tap station sites. Here, an additional ten (10) properties were identified for assessment. The parcels analyzed are shown on Figure 4-2 and the desktop analysis of all parcels is summarized in Table 4-3. The majority of parcels were heavily constrained by wetland resource areas. One parcel was protected open space. Four (4) parcels that are privately owned at the southern end of the study area have adequate space, but the connection to these lots would increase the length of the new transmission by one mile within roadways, or require wetland resource area crossings.[23]

The Eversource parcel (20-220-1) was determined to be the preferred site for the proposed tap station due to its proximity to the electric transmission lines, the availability of land that is less constrained by environmental resource areas, its current use as electric transmission infrastructure and its closer proximity to the proposed Hobart II Substation, which both reduces costs by shortening the length of transmission lines needed for the interconnection, and generally reduces impacts to the community associated with construction in public ways. Furthermore, the location on the ROW has no close residential or sensitive abutters.

TABLE 4-3
Weymouth Tap Station Sites Assessed

Parcel Address	Parcel ID #	Size (Acres/sq. feet)	Description
0 Commercial Street	16-152-5	7.7 / 334,976	Contains existing Eversource ROW. North side of Commercial Street and south of MBTA tracks. Significantly constrained by wetland resource areas.
219 Roosevelt Road	17-220-5	18.2 / 793,994	North of Broad St. Adjacent to existing Eversource ROW to the west. Contains Central Park (City of Weymouth). Protected open space land.
0-Rear Broad Street	21-220-8	6.4 / 278,784	North of Broad St. Adjacent to existing Eversource ROW to the west. Contains William A. Connell Sr. Recreation Center (DCR). Protected open space land. Significantly constrained by wetland resource areas.

23 Because of size constraints, wetlands impacts, distance from the proposed Hingham substation and/or lack of availability, HMLP did not seek local feedback on any of the identified alternate locations for the New Tap Station.

TABLE 4-3
Weymouth Tap Station Sites Assessed

Parcel Address	Parcel ID #	Size (Acres/sq. feet)	Description
0 Broad Street	20-220-1	11.6 / 505,300	Contains existing Eversource ROW. North side of Broad St. No significant wetland constraints.
0 Broad Street	20-220-4	1.5 / 65,340	North side of Broad St. Adjacent to existing Eversource ROW to the east. Constrained by wetland resource areas.
200 Broad Street	20-220-3	0.23 / 9,857	North side of Broad St. Adjacent to existing Eversource ROW to the east. Within buffer zone to wetland resource areas.
0 Broad Street	20-283-34	0.80 / 34,657	South side of Broad St. Electroswitch parking lot.
0 Broad Street	20-283-3	0.50 / 21,576	South side of Broad St. Electroswitch parking lot. Adjacent to existing Eversource ROW to the east.
0 Meredith Way	25-284-4	13.7 / 595,286	South of Broad St off of Meridith Way. Adjacent to existing Eversource ROW to the west. Adjacent to residences. Significantly constrained by wetland resource areas.
0 Off King Avenue	25-284-28	2.7 / 118,900	South of King Avenue. Adjacent to residences. Adjacent to existing Eversource ROW to the east. Constrained by wetland resource areas. Additional length of transmission line routed through Weymouth Streets or within ROW through wetlands resource areas.
0 Washington Street	25-328-12	3.5 / 152,460	East of Washington Street. Abuts existing Eversource ROW to the west. Additional length of transmission line routed through Weymouth Streets or within ROW through wetlands resource areas.
0 Washington Street	25-328-11	2.7 / 117,176	East of Washington Street. Contains existing Eversource ROW. Additional length of transmission line routed through Weymouth Streets or within ROW through wetlands resource areas.
396-Rear Washington Street	24-328-7	4.0 / 174,240	East of Washington Street. Adjacent to Eversource ROW to the east. Development on site includes commercial building and vehicle (boat) storage. Additional length of transmission line routed through Weymouth Streets or within ROW through wetlands resource areas.
0 Washington Street	25-328-4	5.6 / 243,936	East of Washington Street. Contains Eversource ROW. Additional length of transmission line routed through Weymouth Streets or within ROW through wetlands resource areas.
0 Washington Street	25-328-10	1.3 / 54,886	East of Washington Street. Adjacent to Eversource ROW to the east. Additional length of transmission line routed through Weymouth Streets or within ROW through wetlands resource areas.

LEGEND

- NHESP Potential Vernal Pools
- Existing Transmission
- Trains
- Watercourse (not delineated)
- 100-foot Buffer Zone
- 200-foot Riverfront Area
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Potentially Productive Medium Yield Aquifer
- Protected and Recreational Open Space
- Approximate Wetland (not delineated)
- Open Water
- Site Parcels
- Parcel Boundary

Tighe&Bond

1. Based on MassGIS Color Orthophotography (2023).
2. Parcels (FY2022) downloaded from MassGIS and are approximate.
3. Data source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology

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0 250 500

Feet

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FIGURE 4-2
WEYMOUTH TAP STATION SITE ALTERNATIVES

Hingham Electrical Infrastructure Reliability Project
Weymouth, Massachusetts

November 2024

J:\H\H5059 Transmission Reliability Upgrade\Desktop Analysis\Right of Way Properties\RightofWayProperties-10122023-rev3_11x17.mxd [Exported By: IDe Souza Barbosa, 11/12/2024, 11:29:57 AM]

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4.3 Identification of Project Study Area

Following the establishment of the routing objectives, HMLP reviewed the region between the proposed Weymouth Tap Station and the proposed Hobart II Substation and demarcated a geographic "Project Study Area," as depicted in Figure 4-3, within which to concentrate the investigation of potential routes.

The Project Study Area is located between the two end points in Weymouth and Hingham. The western boundary of the Project Study Area was the proposed interconnection with the HMLP transmission line at Broad Street in Weymouth. The eastern boundary of the Project Study Area is the proposed substation site, near the existing Hobart Substation off Hobart Street in Hingham. The northern boundary of the Project Study Area is the MBTA railway and the southern boundary of the Project Study Area is Lake Street (Whitmans Pond) in Weymouth and High Street in Hingham.

The Project Study area includes primarily residential areas and commercial corridors. There are several wetlands resource areas and protected open space (land protected by Article 97) within the Project Study Area, including William A. Connell Swimming Pool and Skating Rink, Central Park, House Rock Park and Hoffman Park in Weymouth and Cranberry Pond Conservation area, Brewer Reservation and More-Brewer Park in Hingham. The Project Study Area includes the Weymouth Back River ACEC.

4.4 Development of Routes

After defining the Project Study Area, HMLP initially identified and conducted a screening assessment of the Universe of Routes, eliminating any routes that did not fully meet the routing objectives. HMLP considered existing linear corridors (e.g., existing rail, electric ROWs and public roadway corridors) that appeared to be feasible to facilitate construction of the New Line and could provide a reasonably direct route between the Weymouth Tap Station and the Hobart II Substation. Following the screening process, the remaining routes were developed into complete and distinct Candidate Routes for further investigation and scoring under a number of criteria. The outcome of the routing analysis was the identification of the routes that best balance minimization of environmental impacts, constructability constraints and feasibility. Each of these steps in the routing analysis is discussed more fully below. The routes were further analyzed based on costs, reliability, Environmental Justice considerations and feedback received from stakeholders. Candidate Routes were discussed with municipal stakeholders beginning in Spring 2021. As the route crossed through the Town of Weymouth, HMLP met with the Mayor and his staff initially on April 6, 2021 to discuss the Universe of Routes and Tap Station location. Weymouth officials provided input into the Universe of Routes. HMLP continued to meet with the Mayor and his staff throughout the routing analysis process. See Table 4-1.

4.4.1 Identification of Universe of Routes

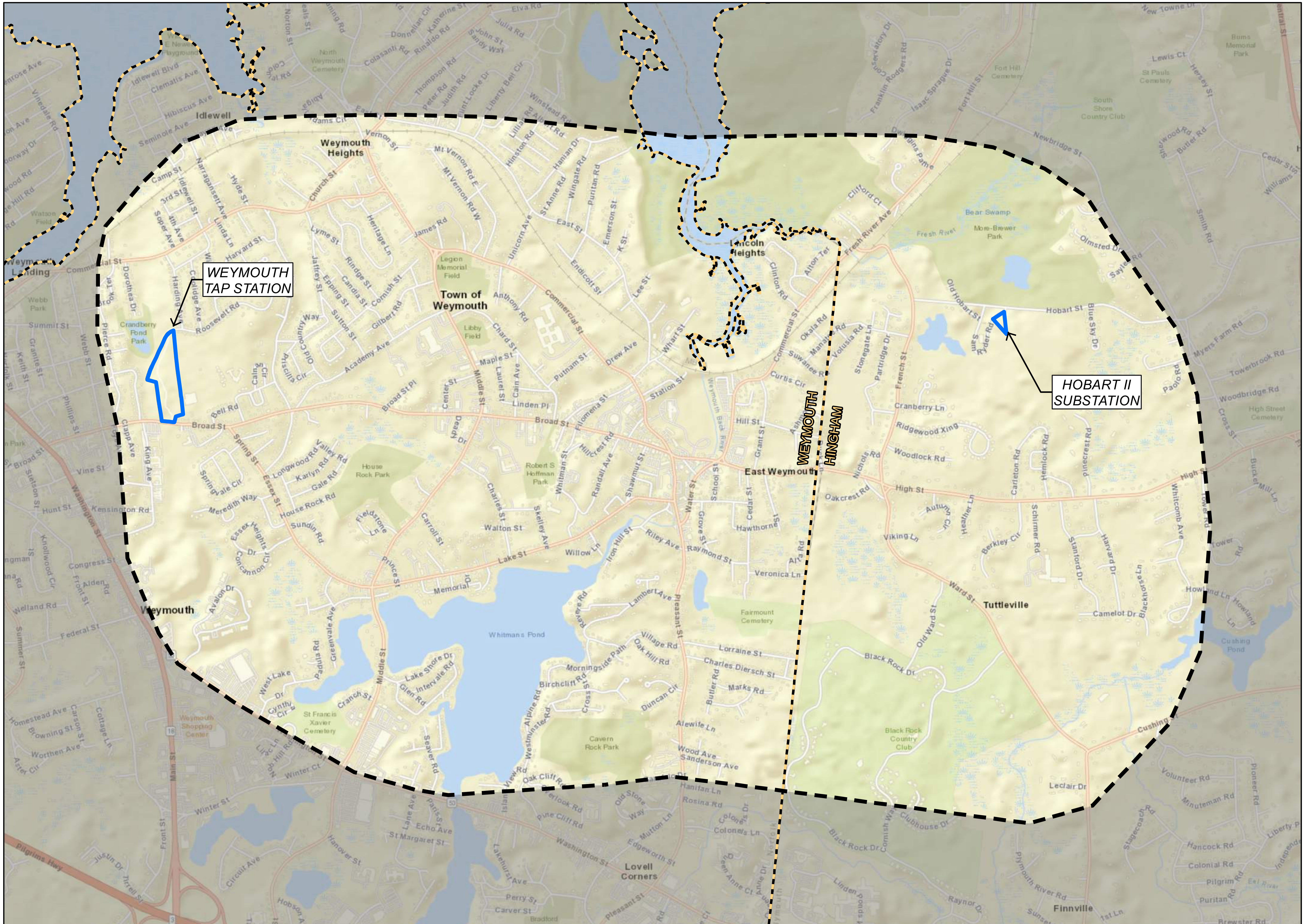
Using HMLP's routing objectives and in consideration of stakeholder input (including from the public and Town of Weymouth and Town of Hingham officials), HMLP reviewed USGS maps, MassGIS data and aerial photography and completed field reconnaissance to develop the Universe of Routes that could support a new underground line between the proposed Weymouth tap station and a new substation in Hingham. The Universe of Routes is shown on Figure 4-4. The Universe of Routes aimed to compile the more direct routes between the two end points within the Project Study Area. Table 4-4 provides an overview of the length, roads crossings and other features along each route. A summary of the Universe of Routes is presented below:

- ***Broad Street Route*** - This route heads east on Broad Street, until the intersection with Commercial Street. The route continues east on High Street, turns north on French Street, then finally east on Hobart Street.
- ***Broad Street Variation Route -*** This route heads east on Broad Street, until the intersection with Commercial Street. The route turns north on Commercial Street, then turns east on Suwanee Road which transitions to Volusia Road. The route turns east on Manatee Road, north on French Street, and finally east on Hobart Street.
- ***Commercial Street Route -*** This route heads east on Broad Street, turns north on Essex Street and continues down Commercial Street until the intersection with Broad Street. The route then continues east on Broad Street, north on French Street and finally east on Hobart Street.
- ***Lake Street Route -*** This route heads east on Broad Street, then southeast on Spring Street, which transitions to Essex Street. The route then travels east on Lake Street before turning south on Pleasant Street and turns north on Water Street. The route continues east on High Street, turns north on French Street, then finally east on Hobart Street.
- ***Lake Street Variation Route -*** This route heads east on Broad Street, then southeast on Spring Street, which transitions to Essex Street. The route then travels east on Lake Street before turning north onto Shawmut Street then east on Broad Street. The route continues east on High Street, turns north on French Street, then finally east on Hobart Street.
- ***MBTA Right of Way -*** This route heads west on Roosevelt Road, north on Wilson Ave, and continues east on Commercial Street. The route turns northeast on Church Street, then northeast on Green Street. The route then travels the Greenbush Commuter Rail Right of Way until Fort Hill Street. The route then travels south on French Street and finally east on Hobart Street.
- ***MBTA Right of Way Variation -*** This route heads east on Broad Street, north on Essex Street, onto Commercial Street, onto Church Street, and northeast onto Green Street. The route then travels the Greenbush Commuter Rail Right of Way until Fort Hill Street. The route then travels south on French Street and finally east on Hobart Street.

FIGURE 4-3
PROJECT STUDY AREA

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

October 2024



LEGEND

- Tap/Substation Site
- Project Study Area
- Town Boundary

LOCUS MAP

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Feet
1:18,000

NOTES

1. World Street Map Basemap Provided by ESRI
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.

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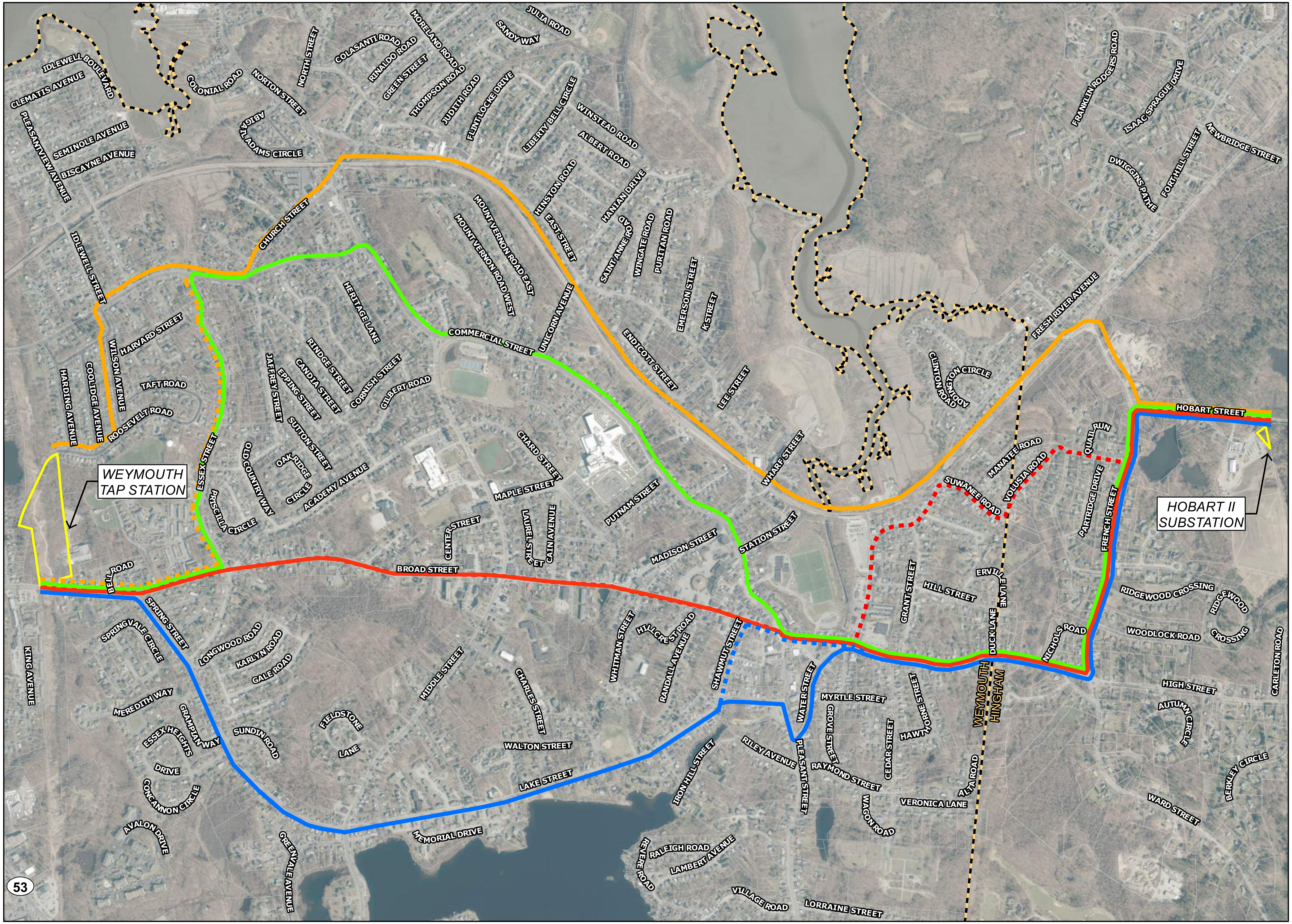


FIGURE 4-4
UNIVERSE OF ROUTES

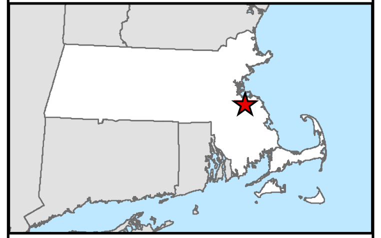
Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

October 2024

LEGEND

- Lake Street (Noticed Alternative)
- Broad Street (Preferred)
- MBTA ROW
- Commercial Street
- Broad Street Variation
- Lake Street Variation (Noticed Alternative Variation)
- MBTA ROW Variation
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.

Tighe&Bond

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H-5059

TABLE 4-4
Universe of Routes Summary

Candidate Route	Route Length (miles)	Streets	Major Waterbody Crossing	Major Conservation Areas
Broad Street	3.2	Broad Street, High Street, French Street Hobart Street	Herring Run Brook	Hoffman Park, Ridgewood Crossing Conservation Area, Brewer Reservation and More-Brewer Park
Broad Street Variation	3.1	Broad Street, High Street, Commercial Street, Suwanee Road, Volusa Road, Manatee Road, French Street, Hobart Street	Herring Run Brook	Hoffman Park, Ridgewood Crossing Conservation Area, Brewer Reservation and More-Brewer Park
Commercial Street	4.3	Broad Street, Spring Street, Essex Street, Academy Avenue, Middle Street, Shawmut Street, Lake Street, Commercial Street, High Street, French Street, Hobart Street	Herring Run Brook, Tide Mill Brook	More-Brewer Park, Central Park, King Oak Hill Park, Legion Memorial Field, Ridgewood Crossing Conservation Area, Brewer Reservation
Lake Street	3.7	Broad Street, Spring Street, Essex Street, Lake Street, Shawmut Street, Pleasant Street, Water Street, High Street, French Street, Hobart Street	Herring Run Brook	Hoffman Park, Ridgewood Crossing Conservation Area, More-Brewer Park
Lake Street Variation	3.6	Broad Street, Spring Street, Essex Street, Lake Street, Shawmut Street, Broad Street, High Street, French Street, Hobart Street	Herring Run Brook	More-Brewer Park, Lovell Playground, Central Park
MBTA Right of Way	3.7	Wilson Avenue, Roosevelt Road, Commercial Street, Wilson Avenue, Church Street, Green Street, French Street, Fort Hill Street, Hobart Street	Herring Run Brook, Tide Mill Brook, Fresh River	More-Brewer Park, Lovell Playground, Central Park
MBTA Right of Way Variation	4.1	Essex Street, Broad Street, Commercial Street, Church Street, Green Street, French Street, Fort Hill Street, Hobart Street	Herring Run Brook, Tide Mill Brook, Fresh River	More-Brewer Park, Lovell Playground, Central Park

4.4.2 Screening Methodology

The Universe of Routes identified by HMLP, with input from stakeholders, consisted of seven different route options that were advanced for screening. The initial screening process included reviewing publicly available data to consider existing abutting land uses and the presence of natural resources such as wetlands, waterways and rare species habitat. HMLP also reviewed the routes for constructability constraints, such as difficult bends or existing underground utility congestion. HMLP also considered information received from meetings with municipal officials and staff. Route options were eliminated from further consideration if they were found to be unsuitable for transmission line development.

4.4.2.1 Summary of Eliminated Routes

The MBTA ROW and MBTA ROW variation were screened as part of the universe of routes. The majority of the MBTA Route is within the MBTA ROW and is a major public transportation route for commuters. The ROW also includes overhead electric transmission lines that run parallel to the tracks within the ROW. Space between the rails and the electric transmission line is limited and the majority of the ROW is too narrow to support the Project's required width for the duct bank construction. As a result, the MBTA route and its variation were eliminated from further consideration because they could not support the Project objectives of providing reliable infrastructure in a timely and cost-effective manner due to construction feasibility constraints.

Considerations for constructability include the area available for construction and installation of the duct bank and manholes. Industry standard installation practice is to maintain a minimum of 18 inches of separation (vertical and horizontal) from abutting utilities. The trench width for a typical duct bank is 5 feet wide. It is anticipated that areas where typical open trench excavation will occur will require an approximately 11-foot wide work space area. Manhole and splice vault installations typically require an approximately 20-foot wide work area.

The entirety of the MBTA ROW associated with the MBTA Routes is a major public transportation route for commuters to and from the Boston area. Much of the ROW is narrow, and there is limited space between rails, other infrastructure associated with the railroad, and existing electric transmission infrastructure to support the Project's required width for the duct bank construction.

The project would not be able to meet the requirements of the MBTA Railroad Operations Directorate, dated August 2014, which provides specifications for siting and construction of utilities along the rail lines. Construction would be limited to hours when the T is not running (11PM to 5AM at best) when in close proximity to rail, which would be approximately two (2) miles of the MBTA routes. Construction equipment used for the project would be required to be brought into and removed from the site at the end of each construction period. For excavation longitudinally along the rail line, shoring would need to be installed prior to excavation. The time constraints and construction requirements would add months, if not years to the project.

In addition, at some point the proposed transmission line would need to cross a rail line(s). The crossing would need to be within a casing, and there is not adequate space for jacking and receiving pits within the MBTA ROW. The use of the MBTA ROW is not feasible due to the lack of space needed for jacking and receiving pits and the lack of space for installation of required manholes. For any manholes installed within the MBTA ROW, access to manholes would be restricted, severely impacting electrical system operations and maintenance.

Based on the constructability, and electrical system operations and maintenance concerns outlined above, the MBTA routes were eliminated from further consideration.

4.4.3 Identification of Candidate Routes

HMLP considered the five remaining Candidate Routes for detailed analysis and ranking, as described below and presented in Figure 4-5. All Candidate Routes would travel underground in existing public roadways. None of the candidate routes cross state highways or MBTA corridors. The five Candidate Routes are identified below.

- ***Candidate Route:*** Broad Street
- ***Candidate Route:*** Broad Street Variation
- ***Candidate Route:*** Commercial Street
- ***Candidate Route:*** Lake Street
- ***Candidate Route:*** Lake Street Variation

4.5 Analysis of Candidate Routes

To identify and evaluate potential routes, HMLP next scored each of the Candidate Routes based on several criteria that compare the relative levels of potential environmental, technical, and human built/developed impacts, and constructability constraints.

The other two steps of the process to identify the best routes include a cost analysis and a reliability analysis.

Section 4.5 presents details regarding the scoring analysis completed for the Candidate Routes. Sections 4.6 and 4.7 present the cost analysis and the reliability analysis completed for the Candidate Routes, respectively.

4.5.1 Criteria and Weight Assessment

HMLP evaluated and compared the Candidate Routes using a set of 14 criteria. The criteria were developed to reflect the defined routing objectives, public feedback, and environmental and constructability factors. The scoring criteria were grouped into the following three subcategories:

- Natural Environment Criteria compare existing conditions of, and potential impacts to, the natural environment.
- Technical Criteria compare route location and technical design factors that may add complexity to construction.
- Built Environment Criteria compare existing conditions of, and potential impacts to, development and surrounding population.

HMLP assigned the individual criteria weights based upon an assessment of the potential for temporary and permanent impacts and to reflect stakeholder input (including both municipality and public feedback as documented from the meetings identified in Table 4-1). The weighting scale ranges from 1 to 5, with 1 being the lowest weight and 5 being the highest weight (indicating greatest importance) that could be assigned to a particular criterion. For the routing analysis, lower total weighted ratio scores are better ranked.

The 14 criteria identified by HMLP to evaluate and compare each Candidate Route are outlined in Section 4.5.3.

4.5.2 Criteria Evaluation Methods

After identifying the criteria to assess each route and assigning weights for each criterion, HMLP completed a scoring evaluation for each Candidate Route. HMLP scored and ranked each Candidate Route to reflect its ease of constructability and its potential for impacts to the developed and natural environment. After gathering data for each Candidate Route, HMLP assessed each criterion and identified the Candidate Route that had the largest number for that criterion. All other routes were then compared against this number to arrive at a "ratio score" for each Candidate Route on a scale of 0 to 1.

For example, if Candidate Route X had 5 trees to be removed, Candidate Route Y had 10 trees, and Candidate Route Z had 15 trees, the ratio scores would be calculated as shown in the following table.

TABLE 4-5
Criteria Evaluation Summary

Candidate Route	Number of Trees	Ratio Score
Candidate Route X	5	5 ÷ 15 = 0.33
Candidate Route Y	10	10 ÷ 15 = 0.66
Candidate Route Z	15	15 ÷ 15 = 1.00

The lowest ratio score would equate to the route with the lowest potential for impact. For each criterion, the ratio score was then multiplied by its assigned weight to produce a weighted score that scaled the criterion by its relative importance.

The ratio and weighted scores for each criterion were added to arrive at "total ratio scores" and "total weighted scores." The total weighted scores were then sorted in order from low to high, to identify a given Candidate Route's "rank." The lowest weighted score would equate to the lowest potential for impact with emphasis on certain criterion as previously described in this section. The ranks developed in this routing analysis are based on the total weighted scores.

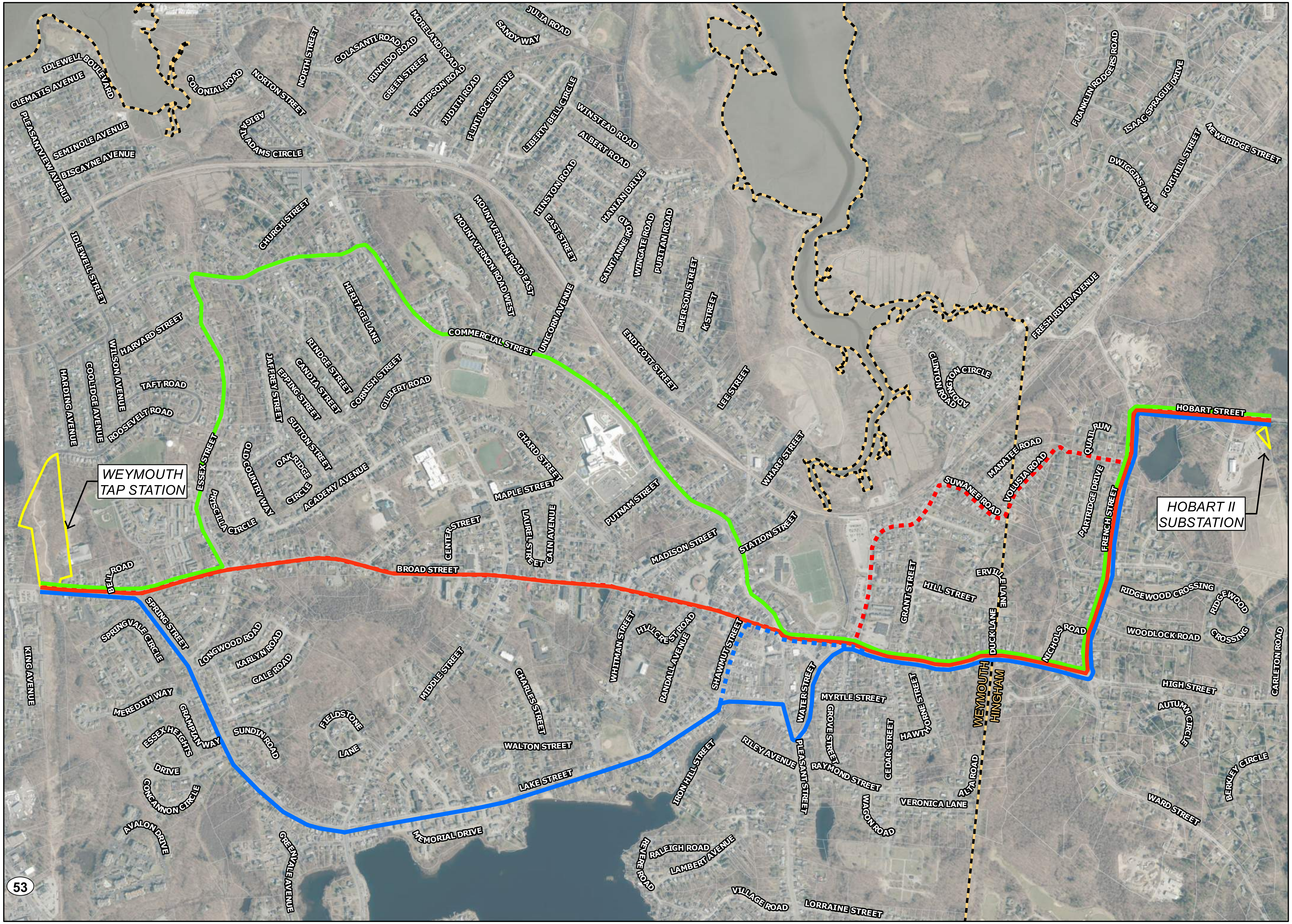


FIGURE 4-5
CANDIDATE ROUTES

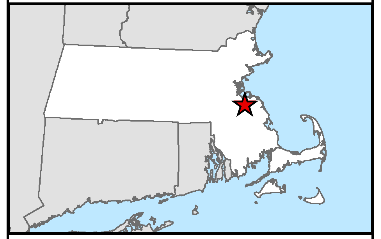
Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

October 2024

LEGEND

- Lake Street (Noticed Alternative)
- Broad Street (Preferred)
- Commercial Street
- Broad Street Variation
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.

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4.5.3 Natural Environment Criteria, Technical Criteria, and Built Environment Criteria Description

Natural Environment Criteria

Although the Project Study Area is located primarily in an urban/suburban or built environment, there are natural resources including wetland resource areas. Sources of information used to evaluate the natural resource environment criteria were existing map resources such as USGS topographic maps, MassGIS databases ("Bureau of Geographic Information") and recent aerial photography.

Five natural environmental criteria were included in the analysis:

- Permanently Protected Open Space/ Potential Article 97
- Public Shade Trees
- Wetland Resources
- Outstanding Resource Waters ("ORWs") or Areas of Critical Environmental Concern ("ACEC")
- Potential for Subsurface Soil Contamination

While these resources are present in the Project Study Area and can be important differentiators in route selection if affected during construction, the associated potential impacts will be limited. Environmental resources in the area are shown in Figure 4-6.

Permanently Protected Open Space and Potential Article 97

Land defined as open space may be protected by Article 97 of Amendments to the Massachusetts Constitution. Article 97 requires, in part, that certain land or easements taken or acquired for natural resource purposes shall not be used for other purposes unless the Massachusetts Legislature approves the change by a two-thirds vote. The ratio score for this criterion was calculated by dividing the total length of route segments adjacent to Article 97 lands along each Candidate Route by the greatest total length among all the Candidate Routes. This criterion was assigned a weight of 4 (on a scale of 1 to 5).

Public Shade Trees

In consideration of the potential for cutting or affecting shade trees along the Candidate Routes during the construction process, public shade trees within the public way, as defined by G.L. c. 87, were counted along the Candidate Routes. A field reconnaissance was conducted to count all trees within the public way along the route regardless of diameter at breast height or distance from proposed trench. The scoring ratio for this criterion was calculated based on the total number of shade trees counted for each Candidate Route divided by the highest number of shade trees found along all candidate routes. This criterion was assigned a weight of 4.

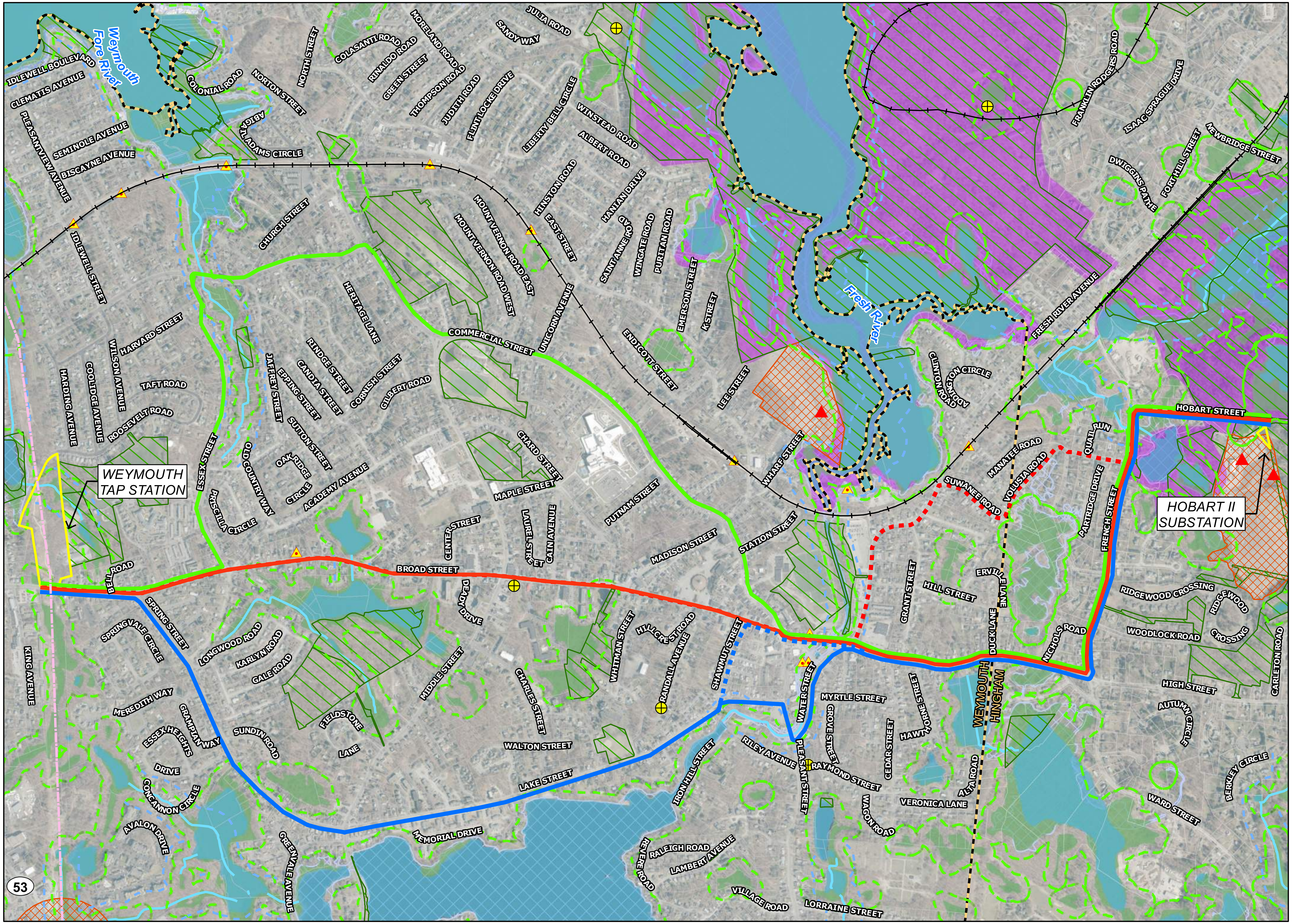


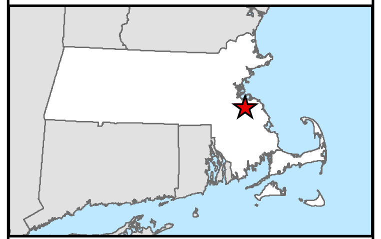
FIGURE 4-6
CANDIDATE ROUTES ENVIRONMENTAL RESOURCES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
November 2024

LEGEND

- MassDEP Oil and/or Hazardous Material Site (Chapter 21E)
- MassDEP Oil and/or Hazardous Material Site with AUL
- Non-Landfill Solid Waste Sites
- Existing Transmission
- Train
- Broad Street (Preferred)
- Broad Street Variation
- Commercial Street
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Watercourse (not delineated)
- 100-foot Buffer Zone
- 200-foot Riverfront Area
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Protected and Recreational Open Space
- Solid Waste Landfill
- Open Water
- Approximate Wetland (not delineated)
- Area of Critical Environmental Concern (ACEC)
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LOCUS MAP



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NOTES

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2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4. Environmental Resource data Provided by the Commonwealth of Massachusetts, MassGIS

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Wetland Resource Areas, Buffer Zone Crossings and Tidelands

The evaluation of wetland resources incorporates river crossings and wetland resource area crossings (including the Riverfront Area and Bordering Land Subject to Flooding ("BLSF")). The evaluation of the river crossing criterion involved reviewing MassGIS databases and conducting field reconnaissance to determine the number of rivers or waterbodies each Candidate Route would cross. In evaluating Candidate Routes, river crossing evaluations require consideration of crossing methods, including open trenching and trenchless methods, as well as options for available road bridge crossings. The evaluation of wetland crossings involved reviewing MassGIS and conducting field reconnaissance to determine the number of state-regulated resource areas, as defined in the Massachusetts Wetlands Protection Act regulations (310 CMR 10.00 *et seq.*), including Bordering Vegetated Wetland ("BVW") and River Bank and their associated 100-foot buffers, BLSF (100-year floodplain) and 200-foot Riverfront Area, that the proposed route would cross. The evaluation of Chapter 91 jurisdictional areas involved reviewing MassGIS data layers developed under G.L. c. 91. Approximate Chapter 91 jurisdiction was obtained by using a combination of contemporary high water, historic high water and landlocked tidelands to form the landward and seaward boundaries of landlocked tidelands. The ratio score was calculated by dividing the total number of wetland resource areas for each Candidate Route by the highest number of wetland resource areas found along all Candidate Routes. This criterion was assigned a weight of 4.

Outstanding Resource Waters or Areas of Critical Environmental Concern

The evaluation of ORWs and ACECs includes water body crossings and qualified land crossings. ACECs are places in Massachusetts that receive special recognition because of the quality, uniqueness and significance of their natural and cultural resources. These areas are designated by the state's Secretary of Energy and Environmental Affairs. ORWs are waters designated for protection under 314 CMR 4.06 and include Class A Public Water Supplies and their tributaries, certain wetlands and other waters as determined by MassDEP based on their outstanding socio-economic, recreational, ecological and/or aesthetic values. This criterion was assigned a weight of 4.

Potential to Encounter Subsurface Contamination

Trench excavation in urban and built environment areas poses a potential to encounter contaminated soil and groundwater that can affect worker safety and requires special soil and water management and disposal procedures under federal and state hazardous material regulations. Releases of oil and/or hazardous material to the environment are required to be reported to the Massachusetts Department of Environmental Protection's ("MassDEP") Bureau of Waste Site Cleanup in accordance with G.L. Chapter 21E and procedures established in the Massachusetts Contingency Plan ("MCP") (310 CMR 40.0000). MassDEP categorizes Oil or Hazardous Material ("OHM") sites based on the level of contamination present and the level of remediation completed. HMLP's route evaluation considered several groups of OHM sites that may have the potential to affect the Project based on their current status.

An online search of the MassDEP Waste Site List in combination with a review of MassGIS databases was performed to determine the potential for each Candidate Route to encounter subsurface contamination from historical releases or former land development practices. The MassDEP online database was used to collect information on listed MassDEP sites within 500 feet of the Candidate Routes with a release tracking number ("RTN").

Sites included in the search are: Active Tier Classified Tier I and Tier II sites, Activity and Use Limitation ("AUL") sites closed with ongoing maintenance conditions, Utility Related Abatement Measure ("URAM") sites and Class C temporary solution sites.

The following define each site category:

- *Tier Classified Sites:* The MassDEP Tier Classified OHM sites datalayer is a statewide point dataset containing the approximate location of OHM sites that have been: (1) reported; and (2) Tier Classified under G.L. Chapter 21E and the MCP. Location types featured in this datalayer include the approximate center of a site, the center of a building on the property where the release occurred, the source of contamination, or the location of an on-site monitoring well. This datalayer does not include: (1) contaminated sites that have not been reported to MassDEP; or (2) sites for which a Response Action Outcome ("RAO") has been submitted to MassDEP. Tier Classified sites are broken down into Tier I and Tier II sites as follows:
  - Tier I: Any disposal site which meets the criteria under 310 CMR 40.0520(2) at the time of Tier Classification
  - Tier II: Any disposal site which meets the criteria under 310 CMR 40.0520(4) at the time of Tier Classification.
- *AUL*: The MassDEP OHM sites with AUL datalayer is a statewide point dataset containing the approximate location of OHM sites where an AUL has been filed. An AUL provides notice of the presence of oil and/or hazardous material contamination remaining at the location after a cleanup has been conducted pursuant to Chapter 21E and the MCP. The AUL is a legal document that identifies activities and uses of the property that may and may not occur, as well as the property owner's obligation and maintenance conditions that must be followed to ensure the safe use of the property. Location types featured in this data layer include the approximate center of an AUL site, the center of a building on the property where the release occurred, the approximate center of the lot and source of contamination.
- *Class C RAO/Temporary Solution*: These are sites where there has been a temporary cleanup. Although the site does not present a "substantial hazard," it has not reached a level of no significant risk. The site must be evaluated every five years until such time that a Permanent Solution Statement is submitted.
- *URAM:* Sites subject to utility related abatement measures.

Each Candidate Route was assessed with regard to the number of these active sites located on property parcels within 500 feet of the Candidate Route. The raw scores for this criterion were determined based on the total number of these mapped active sites and the ratio score was calculated by dividing the total found for each individual route by the highest number of these sites found along the five Candidate Routes. This criterion was assigned a weight of 3.

Technical Criteria

Sources of information used to evaluate design/construction criteria included recent aerial photography, field reconnaissance, and engineering and construction expertise. In general, narrow roads can contribute to unavailable or tight space for the proposed pipe trench and manholes, which can constrict construction and increase open-trench and manhole excavation durations and traffic disruptions with lane and road closures. The number of turns or bends required for a route can significantly affect design and construction, especially in complex road intersections with dense underground utilities, causing delays and increasing costs as well as the possibility of requiring new property acquisitions. Requirements for installing the infrastructure using trenchless technology such as horizontal directional drilling ("HDD") can significantly impact cost and schedule. Four criteria were established to assess design and construction opportunities and constraints when evaluating the Candidate Routes, as follows:

- Existing Road and Right of Way Width
- Existing Utility Density
- Hard Angles
- High Impact Crossings

Existing Road/ROW Width

The existing roadway width determines the available workspace above grade to perform the primary construction activities (i.e., divert traffic, set up equipment, excavate trench and manhole areas, install pipe, backfill the trench and restore paving). A narrow roadway width of less than or equal to 30 feet generally has a greater probability of affecting traffic flow due to reduced lane widths and/or full closure of one or both lanes in the roadway. Road widths were estimated along the Candidate Routes by road-segment length using MassGIS maps and field reconnaissance.

The linear lengths of narrow road segments were recorded. The ratio score was calculated by dividing the total length of narrow road segment determined for each Candidate Route by the highest total length of all candidate routes. This criterion was assigned a weight of 4.

Existing Utility Density

The number of existing underground pipelines, utility conduits and related features such as manholes and catch basins, and the depth of these facilities in the roadway, affect the available space below grade to physically install the proposed transmission conduits and manhole system. Extensive utility density can significantly constrain available space, complicate the construction process, and increase construction duration, traffic disruption and costs. Utility density was assessed along candidate routes using data compiled from available records as provided by utility companies, including HMLP and National Grid, the Town of Weymouth GIS data, and Google Earth, and were up-to-date as of June 2021. Utility density was only assessed horizontally, as vertical data was not available at the time of analysis. The score for Existing Utility Density was calculated based on the following criteria: Usable Corridor Width, Utility Crossings and Heat Generating Sources. Useable Corridor Width assessed the maximum available underground space horizontally within each Candidate Route. Utility Crossings include utilities that perpendicularly intersect each Candidate Route, regardless of type, size or depth. Heat Generating Sources include electric utilities perpendicularly intersecting each Candidate Route, regardless of size or depth. The route options were first separately scored for each of the three criteria. A weighted ratio was then assigned to the calculated score based on its relative significance to the overall estimate of utility density. The weighted scores for all factors were then added up for each route to develop a single "utility density" score for the route. This criterion was assigned a weight of 5.

Hard Angles

Hard Angles were estimated along Candidate Routes and were defined as a turn in the route that exceeds 30 degrees. Additionally, an S curve, or two immediate turns in the route are included in this category. This criterion was assigned a weight of 4.

High Impact Crossings

High impact crossings are the more significant transportation corridor crossings where, because of the amount of traffic and traffic patterns, greater consideration of alternative construction methods such as HDD is warranted. High impact crossings were defined as a Candidate Route crossing over or under a bridge, railroad or highway. This includes trenchless crossing methods where the traditional open-cut trench method is infeasible (e.g., at crossings of water bodies or under highways and railroads) so alternative methods such as jack-and-bore or horizontal directional drilling are required. The ratio score for this criterion was calculated based on the total length of high impact crossings found along each individual route divided by the highest length of high impact crossings found along the five Candidate Routes. This criterion was assigned a weight of 5.

Built Environment Criteria

Built environment criteria compare existing conditions of, and potential impacts to, the developed environment and surrounding population. The five built environment criteria included in the scoring analysis are:

- Adjacent Land Uses - Residential
- Adjacent Land Uses – Commercial and Industrial
- Sensitive Receptors
- Historic and Archaeological Resources
- Traffic Impacts

Sources of information used in the built environment criteria evaluations were existing map resources (i.e., MassGIS, USGS topographic maps and aerial photography), technical expertise and field reconnaissance. The built environment land uses described in the following paragraphs, including residential, commercial and industrial land uses, and public transportation routes and facilities.

Land uses (residential, commercial/industrial) in the vicinity of the Candidate Routes are shown in Figure 4-7. Cultural resources are shown in Figure 4-8.

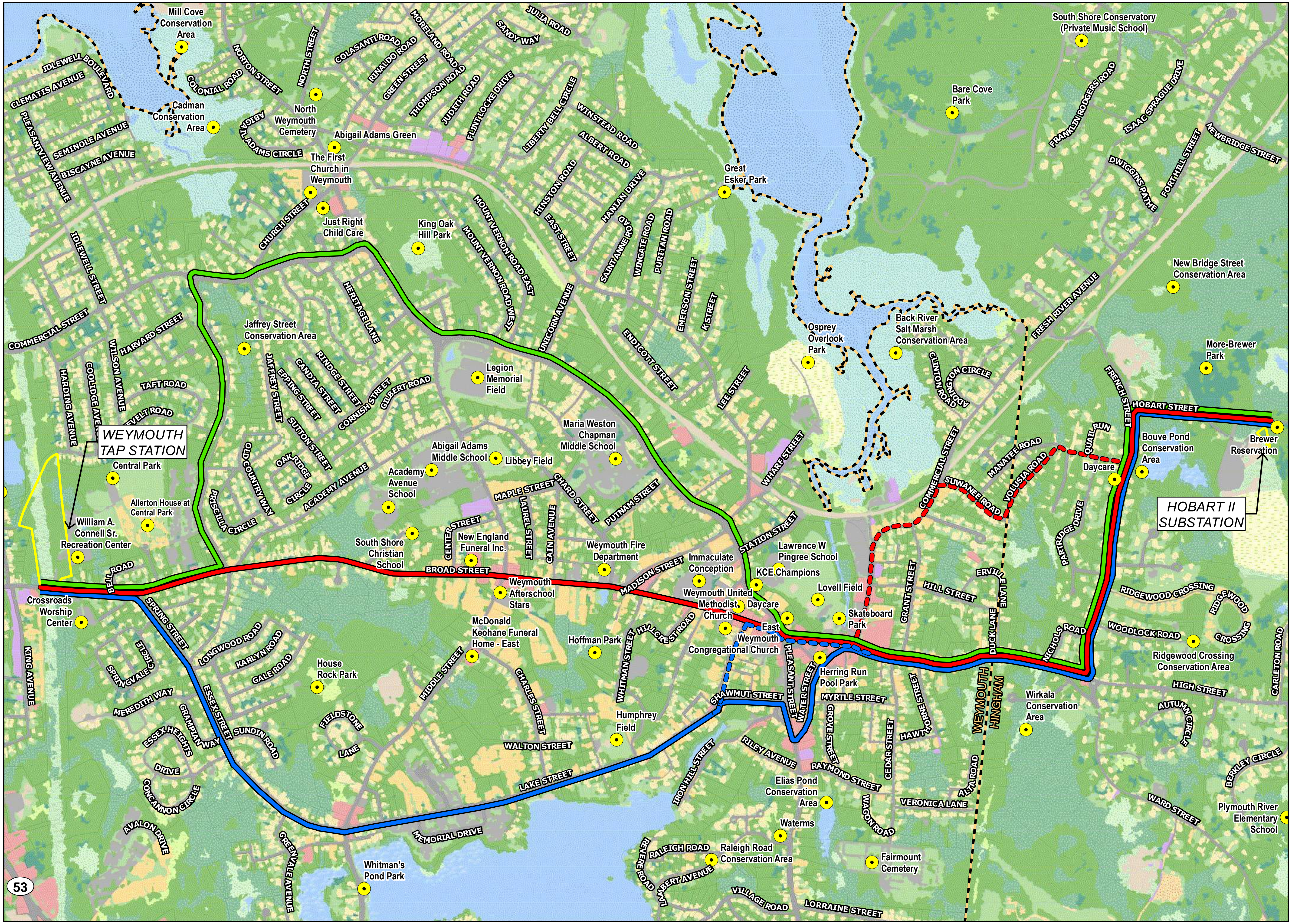

FIGURE 4-7
CANDIDATE ROUTES ADJACENT LAND USES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
October 2024

LEGEND

- Sensitive Receptor Location
- Lake Street (Noticed Alternative)
- Broad Street (Preferred)
- Lake Street Variation (Noticed Alternative Variation)
- Broad Street(Noticed Alternate Route Variation)
- Tap/Substation Sites
- Commercial Street
- Parcel Boundary
- Town Boundary

LAND COVER-LAND USE (2016)

- Residential - Single Family
- Deciduous Forest
- Residential - Multi-Family
- Evergreen Forest
- Residential - Other
- Grassland
- Scrub/Shrub
- Commercial
- Bare Land
- Industrial
- Forested Wetland
- Mixed Use - Primarily Residential
- Non-forested Wetland
- Other Impervious
- Saltwater Wetland
- Right-of-way
- Water
- Pasture/Hay
- Unconsolidated Shore
- Developed Open Space
- Aquatic Bed

LOCUS MAP

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NOTES

1. Based on MassGIS Color Orthophotography (2021)
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3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4.Land Use data Provided by the Commonwealth of Massachusetts, MassGIS
5. Sensitive Receptor Locations are derived from Hiingham and Weymouth parcel assessor tables, as well as School, Hospital, and LongTerm Care data from MassGIS.

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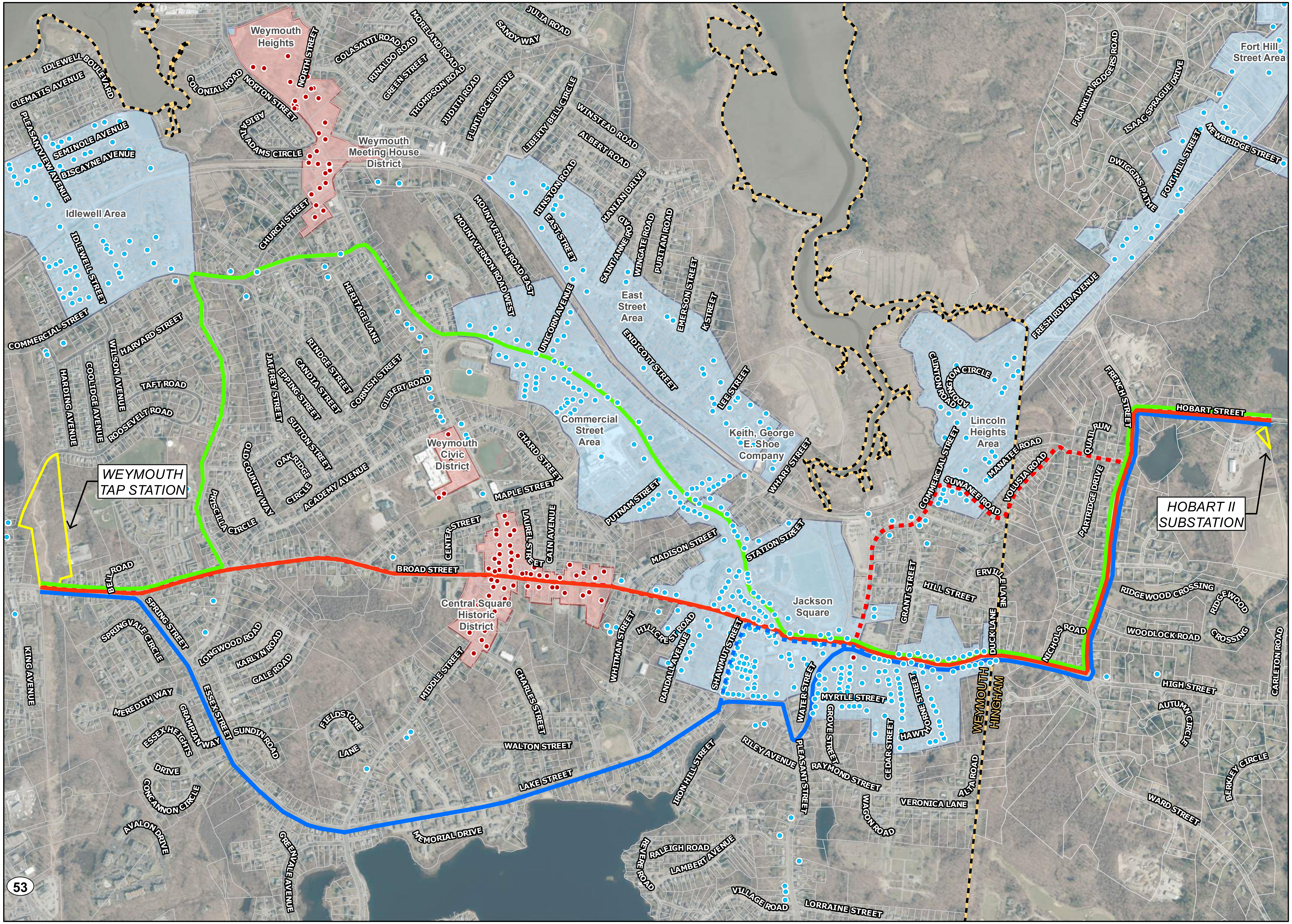


FIGURE 4-8 CANDIDATE ROUTES CULTURAL RESOURCES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

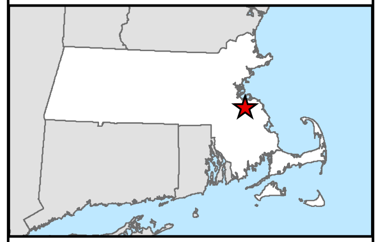
October 2024

LEGEND

MassHistoric Commission Inventory

- National Register of Historic Places
- Preservation Restriction
- Inventoried Property
- Broad Street (Preferred)
- Broad Street Variation
- Commercial Street
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites
- Town Boundary
- Parcel Boundary
- National Register of Historic Places
- Inventoried Property

LOCUS MAP



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4. Cultural Resource data Provided by the Commonwealth of Massachusetts, MassGIS, MHC

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Adjacent Land Uses - Residential

Residents along a Candidate Route could be subject to temporary access and traffic disruption, street closings, sound level increases and dust during construction. This criterion assesses the density of residences (single-family, multi-family, condominiums and mixed commercial and residential) on both sides of roadways along each route. The number of residential structures along street segments was counted using MassGIS mapping, parcel data, Google Street View imagery, aerial photography and field verification. The "unit" attribute information included in the parcel layer was used to assign a unit count to each identified residential structure. Internet searches were used to find or verify unit counts for some large multiple unit apartment or condominium complexes (such as the Tammy Brook Apartments on King Avenue in Weymouth). Parcel and building information changes continually so there is an inherent degree of time-based inaccuracy in addition to any data creation or data entry errors already present in the source data. A ratio score was calculated based on the total number of individual residences determined for each route divided by the highest number of residences found along the five Candidate Routes. This criterion was assigned a weight of 5.

Adjacent Land Uses – Commercial and Industrial

Similar to residences, commercial and industrial businesses along a Candidate Route could be affected by temporary construction impacts such as access and traffic disruption, street closings, sound level increases and potential dust. This criterion assessed the density of commercial and industrial businesses along each route by counting the number of buildings adjacent to the route roadway. The number of commercial/industrial buildings along the route were counted using MassGIS mapping, parcel data, aerial photography, Google Street View imagery and/or field verification to determine the number of units along each route. The ratio score for this criterion was determined based on the total number of individual commercial/industrial building units determined for each route divided by the highest number of commercial/industrial building units found along the Candidate Routes. This criterion was assigned a weight of 4.

Sensitive Receptors

Sensitive receptors could be affected by temporary construction impacts such as access and traffic disruption, road closings, sound level increases and potential dust. The number of sensitive receptors along the route were counted using MassGIS databases, aerial photography, Internet searches, Google Street View and field verification. Consistent with similar filings to the EFSB, the following sensitive receptors were assessed for each Candidate Route: police and fire stations, hospitals, schools, nursing homes/elder care (long term care), funeral homes, places of worship, daycares, and parks and recreational facilities. Police and fire stations, hospitals, schools, long-term care and parks and recreation facilities were determined using applicable MassGIS datalayers. Funeral homes and places of worship were identified using the latest available aerial imagery, internet searches and Google Street View. Daycare facilities were identified using the Massachusetts Early Education Search tool available through the Executive Office of Education's website. A ratio score was calculated based on the total number of sensitive receptors determined for each route divided by the highest number of sensitive receptors found along the Candidate Routes. This criterion was assigned a weight of 5.

Historic and Archeological Resources

Historic and archeological resources could be affected by temporary construction impacts such as access and traffic disruption, earth movement, street closings, sound level increases and dust. Historical inventory was evaluated using the Massachusetts Cultural Resources Inventory System ("MACRIS") MassGIS datalayer maintained by the Massachusetts Historical Commission ("MHC"). This data includes local and state listed historic structures, local historic districts and individual National Register-listed structures and districts.

The number of cultural resources was derived from the total number of historic sites and the number of historic districts or areas along each Candidate Route. MHC Inventory points were tallied within parcels that were directly adjacent to the property boundary of the public roadways along each Candidate Route. MHC Inventory Areas were quantified by tallying parcels within each area that are directly adjacent to the property boundary of the public roadway along each Candidate Route, excluding parcels that also contained historic sites, to avoid double counting. The ratio score was calculated by dividing the total number of cultural resources determined for each Candidate Route by the highest number of cultural resources found among all the Candidate Routes. This criterion was assigned a weight of 1.

Traffic Impacts

The potential for in-street trench construction to cause traffic related congestion was evaluated for each Candidate Route. The evaluation was based on information obtained from MassGIS, aerial photography, relevant traffic and signal data from municipal agencies, field reconnaissance and familiarity and experience with the traffic flow and operations in the general area.

Impacts can be caused by several factors, some of which can be anticipated and quantified (such as the effect of reducing travel lanes, eliminating a bus stop or closure of a sidewalk) and some factors that are temporary/unanticipated, such as weather conditions, crashes, other construction activity/detours in the area, and congestion on other area highways and routes that may reroute regional traffic onto local roadways. The analysis provides a relative comparison of the different routes using factors that are directly attributable to the congestion that could be caused by the construction activity. Presenting the review in the form of a relative comparison between routes using only pertinent factors removes the effect of temporary/unanticipated factors from the route selection process. Specifically, the typical multi-modal factors that were used in the review include functional classification of the roadways, publicly-available roadway and intersection traffic volumes, roadway cross-sectional elements (such as width, number of travel lanes, on-street parking, shoulders, sidewalks and the types of uses they serve), bus routes and ridership data from the MBTA, the number of major and minor traffic signals along the route, need to maintain loading/unloading areas for business deliveries and whether construction on a roadway segment would cause just lane closures or require detours via other streets. HMLP collected information from sources including the MBTA and MassDOT – Highway Division, and conducted field reconnaissance along each route to observe the general conditions along the routes. This information was evaluated to determine the potential for traffic congestion and parking and public transportation impacts for each route. Key factors considered included existing traffic volumes (where available), classification of major commuting routes, roadway width, number of travel lanes, existence of parking lanes and the presence of public transportation (bus routes or MBTA railway stations). More specifically, the following criteria, and assumptions behind them, represent the factors HMLP used to evaluate the potential for traffic and other transportation impacts during construction:

- Number of lanes: Roadways with multiple lanes (in each direction) are more likely to support construction without road closures, and are more likely to support "normal" traffic flow. Single lane roads are more likely to require a lane closure and alternating traffic, which leads to congestion. Roadways with single lanes received a higher impact score than multiple lane roadways due to the potential need for full roadway closures and detours during construction. For this project, none of the roadways have multiple lanes.
- Number of signalized intersections: Routes that travel through more signalized intersections than others can lead to more potential traffic impacts due to the need to address additional construction issues related to temporary signal modifications and the increased congestion that would result from the reduction of capacity at signalized locations. For example, the Broad Street route received a higher score in this category than a route with fewer signalized intersections.
- Sidewalks, Breakdown Lanes, Roadside Parking: The impact to on-street parking, pedestrian facilities, and loading areas was considered in the scoring system. Most roadways along the routes have sidewalks and some have parking lanes. Those routes with higher pedestrian activity, parking maneuvers, and curbside loading activity received a higher score due to a larger impact on more pedestrians, parking and commercial loading demand. For example, Broad Street is a busy commercial corridor with a lot of pedestrian activity and on-street parking demand. Therefore, it was assigned a higher score for this category than side streets with less pedestrian and parking activity.
- One-Way Streets: Streets that have one-way traffic flow require closures and detours and will therefore have a greater impact on traffic congestion than lane shifts on two-way streets. One-way streets are more likely to require closures or detours due to the overall width and the inability to reverse travel patterns. Roadways that require closures or detours received higher impacts scores than those that may only require a lane-shift or can remain open with the closure of a single lane. For this project, all Candidate Routes are located on two-way streets.
- Public Transportation Routes: Streets with public transportation features (bus stops/routes, train stops) require additional effort to avoid impacting mass transit and can require temporary relocation of stops. This affects additional areas of roadway with no benefit to Project construction, and was assumed to exacerbate traffic congestion due to disruption of normal traffic patterns. Routes that contain bus routes and have more bus stops than others received a higher impact score. There will be a need to address pedestrian access and the temporary location of bus stops. There will also be an impact on travel times for buses that travel on any of the proposed construction routes. For example, Broad Street contains numerous bus stops and MBTA Bus Routes and received a higher score than those roadways that do not have any public transportation routes.
- Commuter Routes: Routes used by commuters were assumed to be more likely to be affected by Project construction due to high traffic volumes during morning and evening commute hours, and often around mid-day (lunch time). Commuter routes were designated based on direct observation, general knowledge of the area, and input from the municipality. Traffic volumes related to busier commuter routes are a factor in determining the overall impact score. Routes with higher

traffic volumes were assigned a higher impact score, as more drivers will be affected and there will be more delay and congestion experienced by more people. For example, Commercial Street is a heavily used commuter route with high traffic volumes and had a higher impact score in this category than the low-volume side streets.

The route options were first separately scored for each of the review factors. A weighted ratio was then assigned to the calculated factor score based on its relative significance to the overall estimate of congestion potential. The weighted scores for all factors were then added up for each route to develop a single transportation impacts score for the route. This criterion was given a weight of 4.

A summary of the routing analysis criteria and associated weights are below in Table 4-6.

TABLE 4-6
Routing Analysis Criteria Weights Summary

	Criterion	Assigned Weight
Natural Environment	Permanently Protected Open Space / Article 97 Lands	4
	Public Shade Trees	4
	Wetland Resource Areas/River Crossings	4
	ORW/ACEC Crossings	4
	Potential to Encounter Subsurface Contamination	3
Technical/ Constructability	Existing Road/ROW Width	4
	Existing Utility Density	5
	Hard Angles (>30 degrees)	4
	High Impact/Trenchless Crossings	5
Built Environment	Adjacent Residential Land Uses	5
	Adjacent Commercial and/or Industrial Land Uses	4
	Sensitive Receptors	5
	Historical and Archaeological Resources	1
	Traffic Impacts	4

4.5.4 Candidate Route Environmental Analysis Summary

Table 4-7 provides an overview of all raw data, total ratio scores and total weighted scores for each Candidate Route.

TABLE 4-7 HMLP Candidate Route Evaluation Matrix

	Natural Environment Criteria						Technical/Constructability					Built Environmental Criteria						
Candidate Routes	Permanently Protected Open Space / Article 97 Lands	Public Shade Trees	Wetland Resource Areas/River Crossings	ORWs or ACEC Crossings	Potential to Encounter Subsurface Contamination (AUL, Tier Classified Sites, Class C RAO, URAM)	*Sub-Total Criteria Score*	Existing Road/ROW Width (length in feet along roads with width less than 30 feet)	Existing Utility Density	Hard Angles (>30 deg)	High Impact/ Trenchless Crossings	*Sub-Total Criteria Score*	Adjacent Residential Land Uses	Adjacent Commercial and/or Industrial Land Uses	Sensitive Receptors (Parks, Hospitals, Fire/Police, Elder Care, Schools, Daycare, etc)	Historical and Archaeological Resources (Districts plus Points)	Traffic Impacts	*Sub-Total Criteria Score*	**Total Criteria Score**
Broad Street	**3**	**27**	**6**	**5**	**4**		**6825**	**26.00**	**2**	**2**		**604**	**63**	**17**	**116**	**5.52**		
Ratio Score	0.6	0.5	0.9	0.8	0.8	*3.6*	0.4	0.7	0.4	0.7	*2.1*	0.7	1.0	1.0	0.8	1.0	*4.5*	10.2 **Ratio Score**
Weight	4	4	4	4	3		4	5	4	5		5	4	5	1	4		
Weighted Score	2.4	1.9	3.4	3.3	2.4	*13.4*	1.5	3.4	1.6	3.3	*9.9*	3.4	3.9	5.0	0.8	4.0	*17.1*	**40.5 Weighted Score**
Broad Street Variation	**3**	**49**	**7**	**6**	**4**		**4345**	**28.00**	**4**	**2**		**608**	**65**	**17**	**104**	**5.20**		
Ratio Score	0.6	0.8	1.0	1.0	0.8	*4.2*	0.2	0.7	0.8	0.7	*2.4*	0.7	1.0	1.0	0.7	0.9	*4.4*	11.1 **Ratio Score**
Weight	4	4	4	4	3		4	5	4	5		5	4	5	1	4		
Weighted Score	2.4	3.4	4.0	4.0	2.4	*16.2*	1.0	3.7	3.2	3.3	*11.2*	3.5	4.0	5.00	0.73	3.8	*17.0*	**44.3 Weighted Score**
Commercial Street	**5**	**58**	**5**	**5**	**2**		**10360**	**38.00**	**4**	**3**		**461**	**19**	**13**	**142**	**3.66**		
Ratio Score	1.0	1.0	0.7	0.8	0.4	*3.9*	0.6	1.0	0.8	1.0	*3.4*	0.5	0.3	0.8	1.0	0.7	*3.2*	10.6 **Ratio Score**
Weight	4	4	4	4	3		4	5	4	5		5	4	5	1	4		
Weighted Score	4.0	4.0	2.9	3.3	1.2	*15.4*	2.3	5.0	3.2	5.0	*15.5*	2.6	1.2	3.8	1.0	2.7	*11.3*	**42.2 Weighted Score**
Lake Street Variation	**3**	**34**	**4**	**6**	**5**		**17705**	**31.00**	**4**	**2**		**813**	**38**	**10**	**94**	**3.09**		
Ratio Score	0.6	0.6	0.6	1.0	1.0	*3.8*	1.0	0.8	0.8	0.7	*3.3*	0.9	0.6	0.6	0.7	0.6	*3.3*	10.4 **Ratio Score**
Weight	4	4	4	4	3		4	5	4	5		5	4	5	1	4		
Weighted Score	2.4	2.3	2.3	4.0	3.0	*14.0*	4.0	4.1	3.2	3.3	*14.6*	4.6	2.3	2.9	0.7	2.24	*12.8*	**41.5 Weighted Score**
Lake Street	**3**	**33**	**4**	**6**	**4**		**16140**	**31.00**	**5**	**2**		**878**	**22**	**9**	**69**	**3.14**		
Ratio Score	0.6	0.6	0.6	1.0	0.8	*3.5*	0.9	0.8	1.0	0.7	*3.4*	1.0	0.3	0.5	0.5	0.6	*2.9*	9.9 **Ratio Score**
Weight	4	4	4	4	3		4	5	4	5		5	4	5	1	4		
Weighted Score	2.4	2.3	2.3	4.0	2.4	*13.4*	3.6	4.1	4.0	3.3	*15.1*	5.0	1.4	2.6	0.5	2.28	*11.8*	**40.2 Weighted Score**

Table 4-8 presents a summary of the Candidate Routes ranked by total weighted score. The lowest total weighted score equates to the lowest potential for impact, with the emphasis on certain criteria as previously described in this section.

TABLE 4-8
Rank by Total Weighted Scores

Candidate Route	Route Length (miles)	Total Weighted Score	Rank
Broad Street	3.2	40.5	2
Broad Street Variation	3.1	44.3	5
Commercial Street	4.3	42.5	4
Lake Street	3.7	40.2	1
Lake Street Variation	3.6	41.5	3

As shown in Tables 4-7 and 4-8, the Lake Street Candidate Route has the lowest weighted score and would result in the lowest potential for impact of all the Candidate Routes evaluated. The Broad Street Candidate Route has the next lowest potential for impact. As the Weymouth Conservation Agent and Herring Run Warden requested HMLP to look at a variation of the Lake Street route near Water Street, HMLP carried both Lake Street Candidate Routes forward.

4.6 Cost Analysis

HMLP evaluated the order of magnitude cost estimates for total costs for each Candidate Route in order to rank the various Candidate Routes.

Many factors could affect the actual cost of a transmission line project, including cost and availability of materials and equipment, labor, the presence of contaminated soils and the potential for work hour restrictions imposed by the local community or other entities. Subsurface conditions such as the type and depth of soil and rock that must be excavated in order to place the duct bank could also significantly affect project cost. In addition, the cost is influenced by the density of underground utilities.

A summary of the order of magnitude cost estimates is provided below in Table 4-9. Broad Street Variation has the lowest projected cost overall. The next lowest projected Candidate Route cost is Broad Street.

TABLE 4-9
Candidate Route Cost Estimates

Candidate Route	HMLP Transmission Line Costs[1]	Rank Based on Cost	Percent different than lowest cost option
Broad Street	$47.7M	2	+3.2
Broad Street Variation	$46.2M	1	0
Commercial Street	$64M	5	+38.5
Lake Street	$49.2M	3	+6.5
Lake Street Variation	$55.1M	4	+19.3

[1] Cost per mile for the transmission line is $14.7 M; As the Tap Station costs and Substation costs are the same for each route, only the transmission line costs were compared.

4.7 Reliability Analysis

HMLP considered whether there was a difference in the Candidate Routes with regard to reliability. All Candidate Routes are underground and have relatively small differences in design that would not result in any substantial difference in the level of reliability risk.

4.8 Selection of Preferred and Noticed Alternative Routes

Table 4-10 provides a comprehensive summary of all Candidate Routes and their relative rankings with respect to the natural environment, technical constructability, built environment, overall score and cost.

TABLE 4-10
Ranking Summary of Candidate Routes

Candidate Route	Natural Environment	Technical Constructability	Built Environment	Total	Cost
Broad Street	13.4	9.9	17.1	40.9	$47.7M
Broad Street Variation	16.2	11.2	17.0	41.8	$46.2M
Commercial Street	15.4	15.5	11.3	47.5	$64M
Lake Street	13.4	15.1	11.8	39.6	$49.2M
Lake Street Variation	14.0	14.6	12.8	41.6	$55.1M

HMLP balanced considerations of environmental impacts, reliability and costs in identifying routes to meet the identified need of the Project. Substantial feedback has been provided to HMLP from various agencies reflecting more detailed nuances in route selection that are further articulated in Section 5.

The Lake Street Route has the lowest overall scoring rank with the Broad Street Route being closely ranked with the second lowest overall score. HMLP had extensive consultations with Town of Weymouth and Town of Hingham officials and held multiple open houses during the routing analysis. Town of Weymouth officials indicated that the timing of the projects is important, as there are plans to construct street improvements along Lake Street prior to the construction of the proposed Transmission Line. In addition, there are more residences along Lake Street, including Environmental Justice housing units directly adjacent to the Lake Street Routes. Regarding the Broad Street route, there is proposed redevelopment within Jackson Square. Input received from open houses indicates a concern along the Broad Street Route for impacts to traffic along Broad Street during construction. As the two routes ranked very close in score, the Broad Street Route is the Preferred Route and the Lake Street Route is the Noticed Alternative Route and advanced for further analysis in Section 5. As the Weymouth Conservation Agent and Herring Run Warden requested HMLP to look at a variation of the Lake Street route near Water Street, HMLP carried both Lake Street Candidate Routes forward. While the Broad Street Route is the Preferred Route, HMLP is prepared to move forward with either the Broad Street Route or the Lake Street Route (or its variation).

The Preferred Route and Noticed Alternative Route are shown in Figure 4-9.

4.9 Conclusion

In accordance with the Siting Board's standard of review, after employing a comprehensive process to select sites for its substation in Hingham and the tap station in Weymouth, HMLP objectively and comprehensively developed and assessed a wide array of potential routes and design variations within the bounds of the Project Study Area. At the conclusion of this process, HMLP identified a Preferred Route and a Noticed Alternative Route that best balance impacts, constructability and costs and enable HMLP to meet the identified need.

A more detailed examination and comparison of the Preferred Route and Noticed Alternative Route is presented in Section 5 of this Analysis.

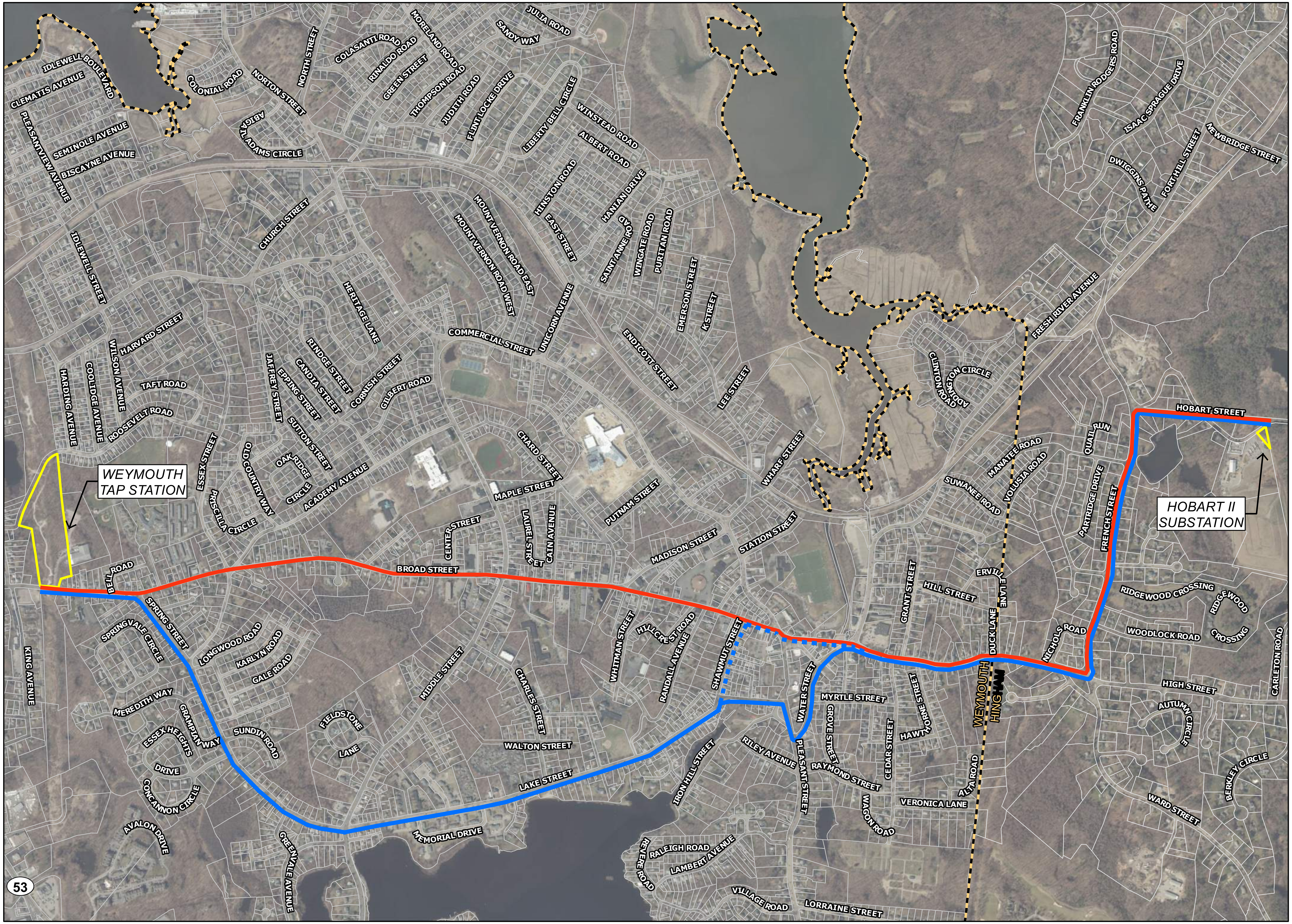


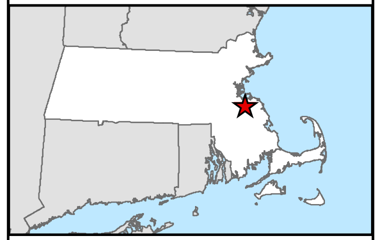
FIGURE 4-9 PREFERRED ROUTE & NOTICED ALTERNATE ROUTE

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
October 2024

LEGEND

- Broad Street (Preferred)
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites
- Town Boundary
- Parcel Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2021)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.

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SECTION 5

Section 5
Comparison of Preferred and Noticed Alternative Routes and Ancillary Facilities

This section provides a detailed analysis and comparison of the potential environmental impacts and mitigation measures, costs and reliability of the Preferred Route and Noticed Alternative Route for the Project. The potential for environmental impacts associated with the proposed Weymouth Tap Station and proposed Hobart II Substation in Hingham is also provided.

5.1 Route Descriptions

Descriptions of the Preferred Route and the Noticed Alternative Route are provided below.

5.1.1 Preferred Route

The total length of the Preferred Route, the Broad Street Route, is approximately 17,100 linear feet (about 3.2 miles) of which approximately 11,040 linear feet (2.1 miles) are in Weymouth and approximately 6,100 linear feet (1.1 miles) are in Hingham. This route exits the proposed Hobart II Substation in Hingham and runs west on Hobart Street, turns south on French Street, then turns west on High Street and continues west into Weymouth on High Street which becomes Broad Street. Broad Street is followed for approximately 8,500 feet until ending at the Weymouth Tap Station Site at the Eversource Right-of-Way. The segments of the route within Hingham are identical for the Preferred Route and Noticed Alternative Route.

The Broad Street Route crosses Herring Run Brook and is in the vicinity of several major conservation areas, including the Ridgewood Crossing Conservation Area. Existing road widths range from 25 feet (French and Hobart Street) to 40 feet (Broad Street), with a medium existing utility density. There are eighteen MBTA bus stops along the MBTA Bus Route 222 which follows portions of Broad Street and High Street.

The predominant adjacent land use is residential, with some commercial and industrial uses, one school, three places of worship, and parks and recreation facilities including Robert S. Hoffman Park and Connell Rink and Pool. Wetland resources in the vicinity of the Preferred Route include the 100-year floodplain, and Herring Run Brook. This route also crosses a portion of the Weymouth Back River ACEC. Work within wetland resource areas is within developed and previously disturbed areas. There are two known sites with potential to encounter subsurface contamination near the Preferred Route.

Representative photographs taken in 2024 of existing conditions along the Preferred Route and an overview map showing the photograph locations are provided in Appendix 5-1. A description of existing environmental and cultural (historic and archeological) resources and adjacent land uses along the Preferred Route are provided in Section 5.4 and depicted in Figures 5-1, 5-2, and 5-3 using aerial photography and data layers available from MassGIS and field reconnaissance.

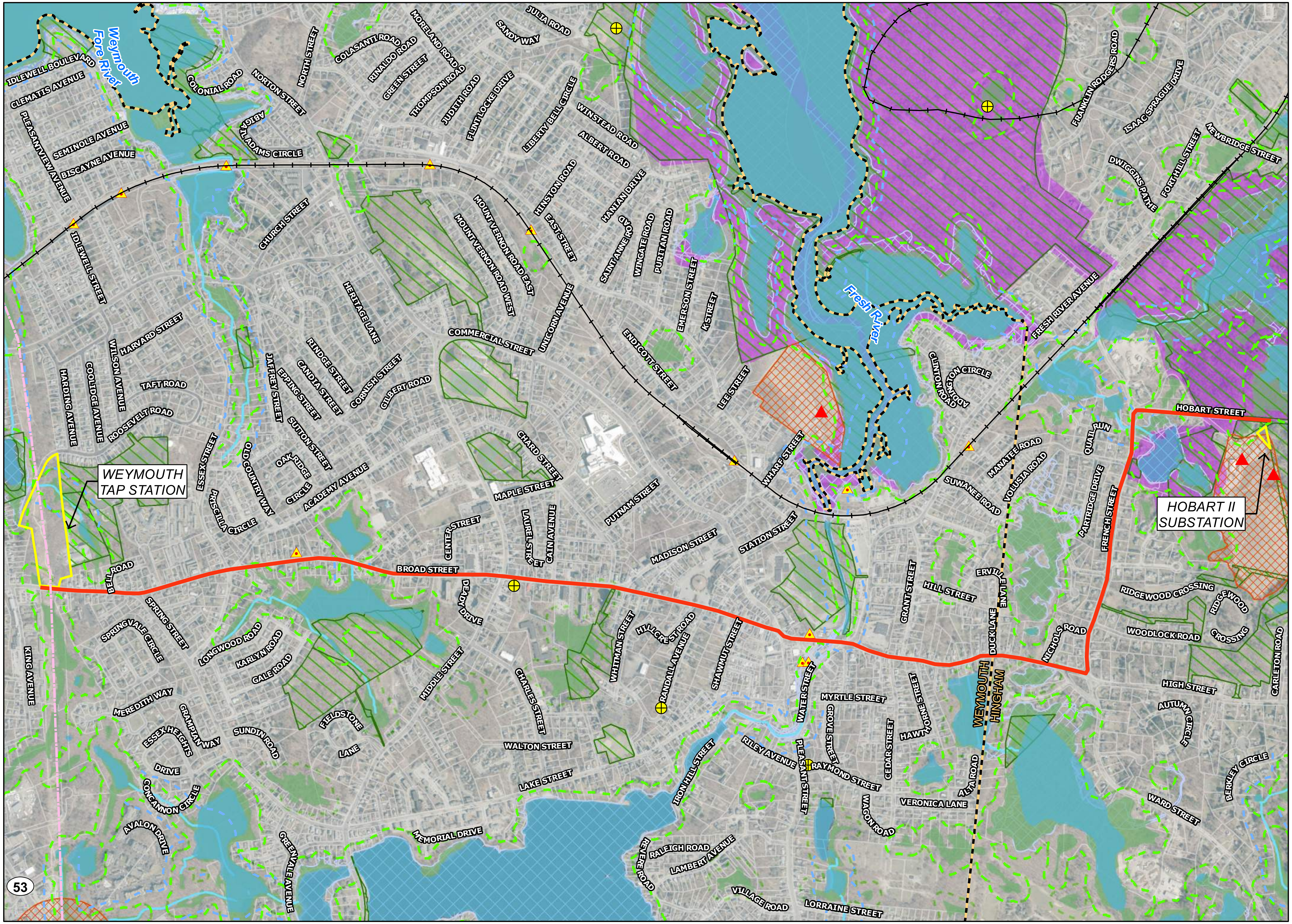


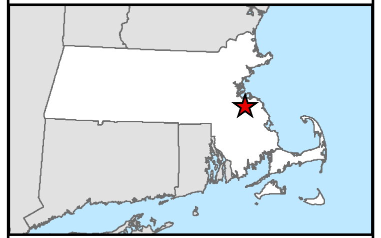
FIGURE 5-1
PREFERRED ROUTE ENVIRONMENTAL RESOURCES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
November 2024

LEGEND

- MassDEP Oil and/or Hazardus Material Site (Chapter 21E)
- MassDEP Oil and/or Hazardus Material Site with AUL
- Non-Landfill Solid Waste Sites
- Existing Transmission
- Train
- 100-foot Buffer Zone
- 200-foot Riverfront Area
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Solid Waste Landfill
- Protected and Recreational Open Space
- Watercourse (not delineated)
- Approximate Wetland (not delineated)
- Open Water
- Area of Critical Environmental Concern (ACEC)
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4. Environmental Resource data Provided by the Commonwealth of Massachusetts, MassGIS

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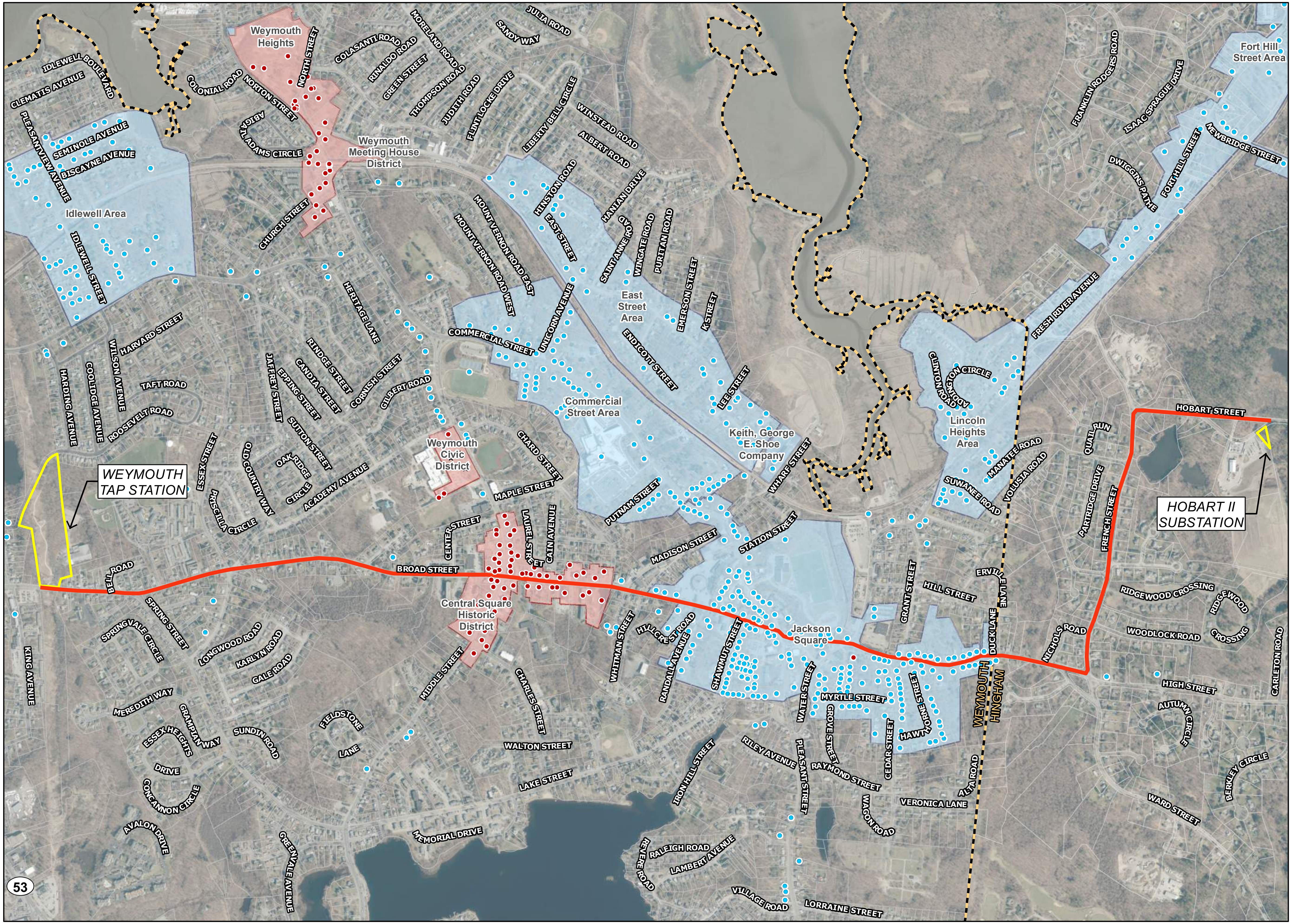


FIGURE 5-2
PREFERRED ROUTE CULTURAL RESOURCES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

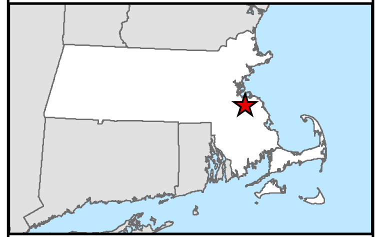
October 2024

LEGEND

MassHistoric Commission Inventory

- National Register of Historic Places
- Preservation Restriction
- Inventoried Property
- National Register of Historic Places
- Inventoried Property
- Broad Street (Preferred)
- Tap/Substation Sites
- Town Boundary
- Parcel Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4. Cultural Resource data Provided by the Commonwealth of Massachusetts, MassGIS, MHC

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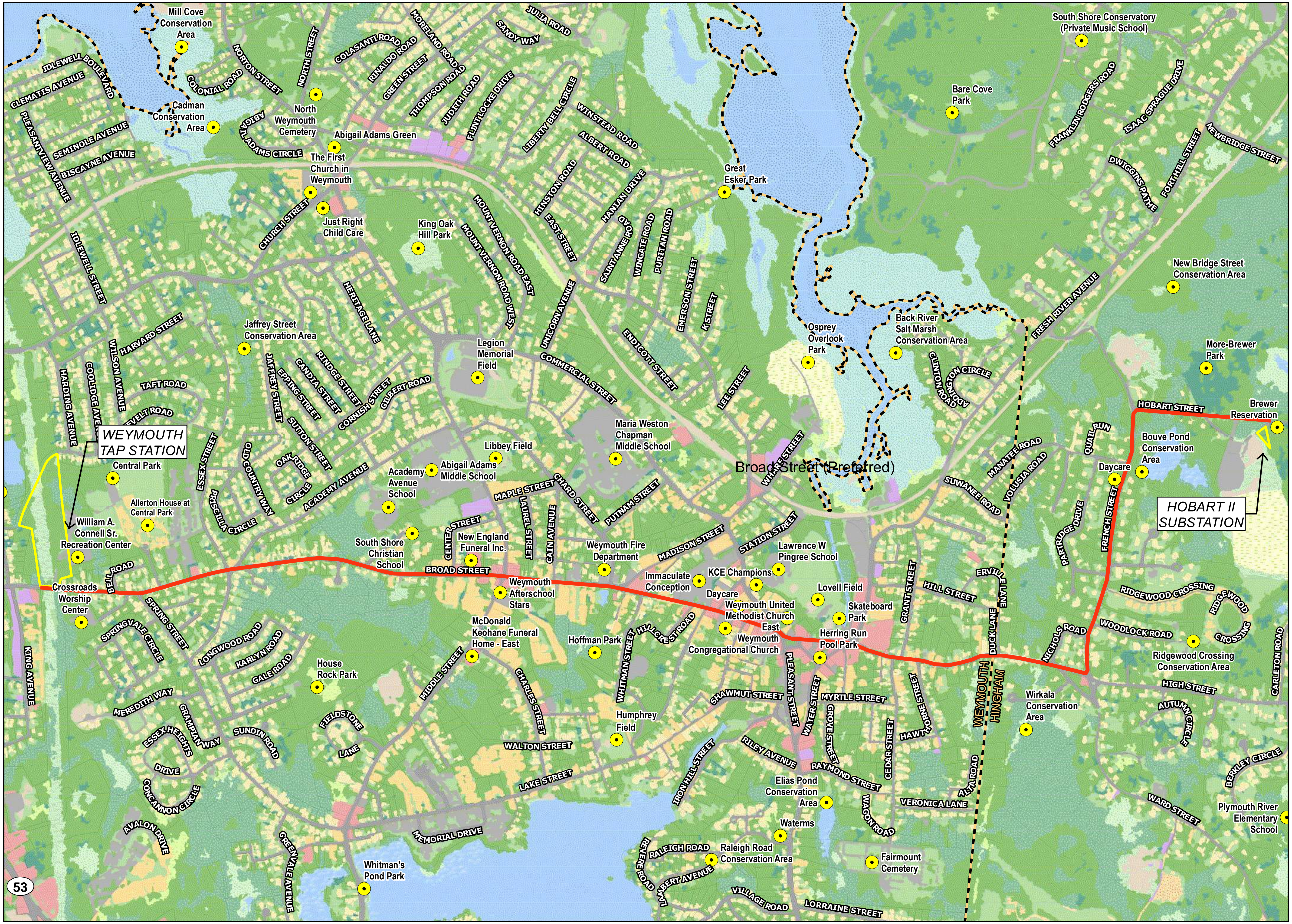
FIGURE 5-3
PREFERRED ROUTE ADJACENT LAND USES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
October 2024



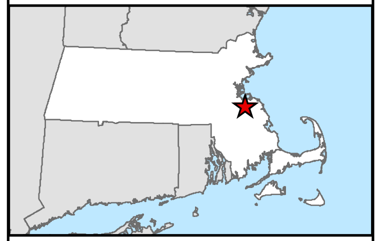
LEGEND

- Sensitive Receptor Location
- Broad Street (Preferred)
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LAND COVER-LAND USE (2016)

- Residential - Single Family
- Residential - Multi-Family
- Residential - Other
- Commercial
- Industrial
- Mixed Use - Primarily Residential
- Other Impervious
- Right-of-way
- Pasture/Hay
- Developed Open Space
- Deciduous Forest
- Evergreen Forest
- Grassland
- Scrub/Shrub
- Bare Land
- Forested Wetland
- Non-forested Wetland
- Saltwater Wetland
- Water
- Unconsolidat... Shore
- Aquatic Bed

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2021)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4. Land Use data Provided by the Commonwealth of Massachusetts, MassGIS
5. Sensitive Receptor Locations are derived from Hingham and Weymouth parcel assessor tables, as well as School, Hospital, and LongTerm Care data from MassGIS.

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5.1.2 Noticed Alternative Route

The total length of the Noticed Alternative Route, the Lake Street Route, is approximately 19,600 linear feet (3.7 miles) of which approximately 13,500 linear feet (2.6 miles) are in Weymouth and approximately 6,100 linear feet (1.1 miles) are in Hingham. This route exits the proposed Hobart II Substation in Hingham and runs west on Hobart Street, then turns south on French Street and turns west on High Street. The route continues west into Weymouth continuing on High Street which becomes Broad Street. This route then turns south down Water Street, turning north on Pleasant Street, and travels west on Lake Street, and northwest on Essex Street, which transitions to Spring Street. The route turns west onto Broad Street and continues west on Broad Street to the Weymouth Tap Station site on Eversource's Right-of-Way. The Noticed Alternative Route is a combination of main and side streets and is relatively direct.

As the Lake Street Route runs parallel to Herring Run, the Weymouth Conservation Agent and Herring Run Warden requested that HMLP consider a variation to the Noticed Alternative Route to avoid Water Street. HMLP added a variation to the Noticed Alternative Route to follow Shawmut Street to Broad Street. This variation is also included in the assessment.

The predominant adjacent land use is residential, with some commercial and industrial uses and one school and one place of worship. The Noticed Alternative Route crosses Herring Run Brook. There are two known sites along the Noticed Alternative Route that have potential for subsurface contamination. Protected open space is present along the route, including More-Brewer Park and Humphrey Field.

The Noticed Alternative Route runs adjacent to Whitmans Pond, which is listed as an emergency surface water supply. This route also crosses a portion of the Weymouth Back River ACEC. The road widths range from 20 feet (Shawmut Street) to 40 feet (Broad Street. There are eleven MBTA bus stops along the Noticed Alternative Route. The overall existing utility density of the Lake Street route is slightly higher than the Preferred Route, having a medium-high density.

Representative photographs taken in 2024 of existing conditions along the Noticed Alternative Route and an overview map showing the photograph locations are provided as Appendix 5-1. A description of existing environmental and cultural (historic and archeological) resources and adjacent land uses along the Noticed Alternative Route is provided in Section 5.4 and depicted in Figures 5-4, 5-5, and 5-6 using aerial photography and data layers available from MassGIS and field reconnaissance.

FIGURE 5-4
NOTICED ALTERNATIVE ROUTE ENVIRONMENTAL RESOURCES

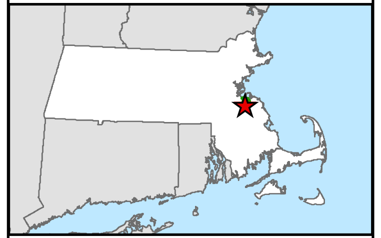
Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

November 2024

LEGEND

- MassDEP Oil and/or Hazardus Material Site (Chapter 21E)
- MassDEP Oil and/or Hazardous Material Site with AUL
- Non-Landfill Solid Waste Sites
- Lake Street (Noticed
- Lake Street Variation (Noticed Alternative Variation)
- Train
- Watercourse (not delineated)
- 100-foot Buffer Zone
- 200-foot Riverfront Area
- 100 Year Flood Zone
- 100 Year Flood Zone (Coastal)
- Area of Critical Environmental Concern (ACEC)
- Solid Waste Landfill
- Protected and Recreational Open Space
- Approximate Wetland (not delineated)
- Open Water
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LOCUS MAP



N

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Feet
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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4. Environmental Resource data Provided by the Commonwealth of Massachusetts, MassGIS

Tighe&Bond

V:\Projects\H\H5059\MXDs\Section 5\Figure5-4_AltRoutes_EVResources_11x17.mxd [Exported By: IDe Souza Barbosa, 11/11/2024, 12:18:28 PM]

H-5059

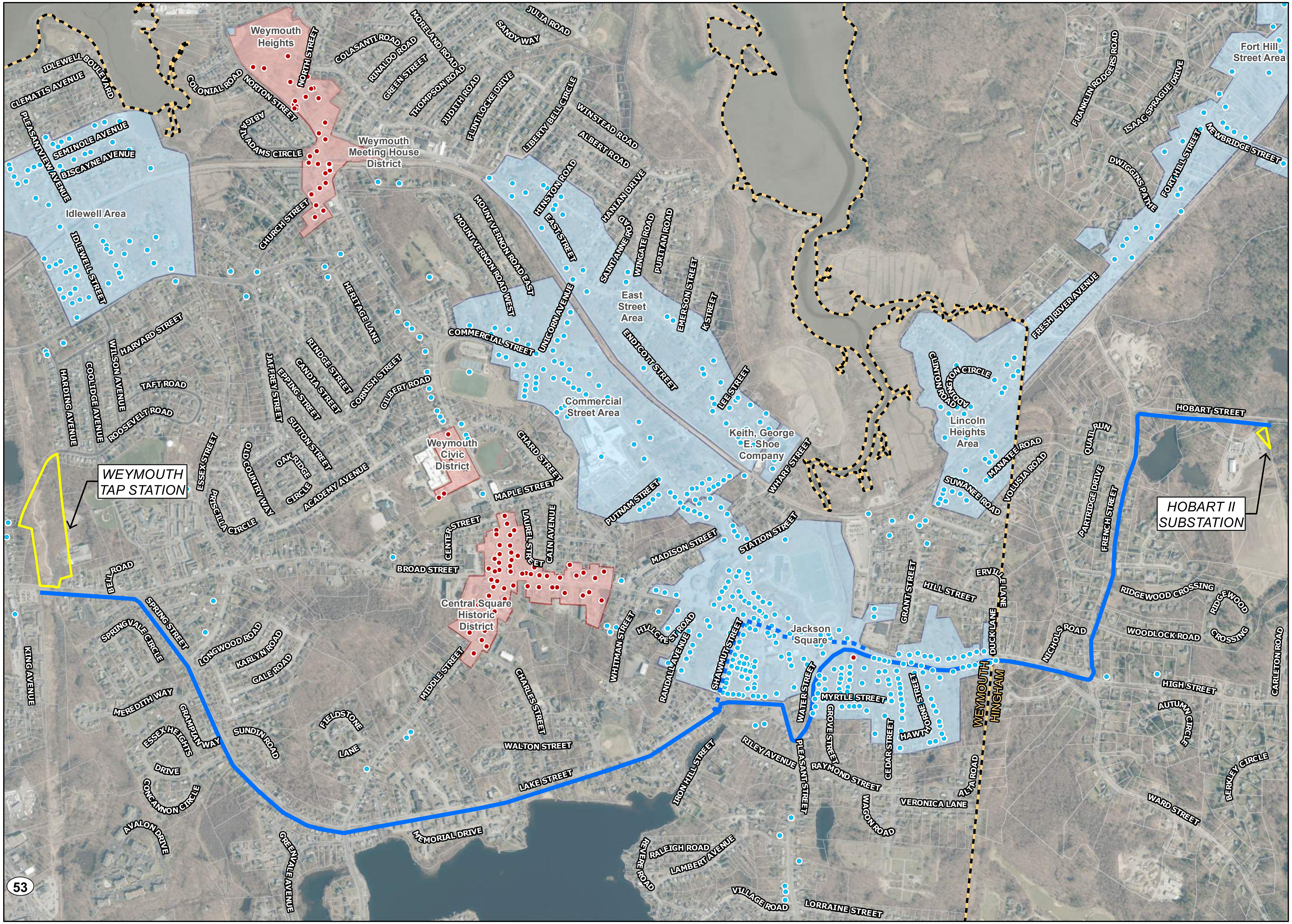


FIGURE 5-5 NOTICED ALTERNATIVE ROUTE CULTURAL RESOURCES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts

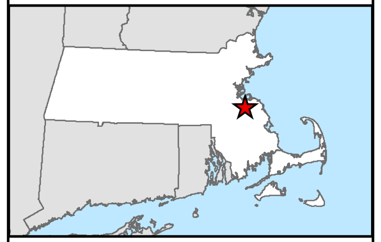
October 2024

LEGEND

MassHistoric Commission Inventory

- National Register of Historic Places
- ★ Preservation Restriction
- Inventoried Property
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites
- Town Boundary
- Parcel Boundary
- National Register of Historic Places
- Inventoried Property

LOCUS MAP



N

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NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4. Cultural Resource data Provided by the Commonwealth of Massachusetts, MassGIS, MHC

Tighe&Bond

V:\Projects\H\H5059\MXDs\Section 5\Figure5-5_AltRoutes_CulturalResources_11x17.mxd [Exported By: IDe Souza Barbosa, 10/30/2024, 4:35:29 PM]

H-5059

FIGURE 5-6 NOTICED ALTERNATIVE ROUTE ADJACENT LAND USES

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
October 2024

LEGEND

- Sensitive Receptor Location
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LAND COVER-LAND USE (2016)

- Residential - Single Family
- Residential - Multi-Family
- Residential - Other
- Commercial
- Industrial
- Mixed Use - Primarily Residential
- Other Impervious
- Right-of-way
- Pasture/Hay
- Developed Open Space
- Deciduous Forest
- Evergreen Forest
- Grassland
- Scrub/Shrub
- Bare Land
- Forested Wetland
- Non-forested Wetland
- Saltwater Wetland
- Water
- Unconsolidat... Shore
- Aquatic Bed

LOCUS MAP

0 500 1,000
Feet
1:12,228

NOTES

1. Based on MassGIS Color Orthophotography (2021)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate,
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4.Land Use data Provided by the Commonwealth of Massachusetts, MassGIS
5. Sensitive Receptor Locations are derived from Hiingham and Weymouth parcel assessor tables, as well as School, Hospital, and LongTerm Care data from MassGIS.

Tighe&Bond

5.2 Weymouth Tap Station

An open-air tap station is proposed along Eversource's existing transmission ROW property off Broad Street in Weymouth, on a 11.6-acre property owned by Eversource. The Weymouth Tap Station site is abutted by Eversource ROW to the west, Broad Street and electric transmission ROW, residential, industrial, and religious uses to the east, the Connell Memorial Pool and Rink and single-family residential uses to the north and single-family residential uses to the south. An aerial view of the proposed Tap Station is provided in Figure 5-7. The layout of the tap station site is provided as Figure 5-8.

5.2.1 Impacts and Mitigation Measures

For either the Preferred or Noticed Alternative Route, the Weymouth Tap Station will include the following activities and addition of equipment:

- Installation of soil erosion and sediment control Best Management Practices ("BMPs")
- Site clearing and grading within a defined limit of disturbance
- Upgrade of the existing gravel access road to support construction equipment
- Installation of stormwater management Best Management Practices consisting of a sediment forebay and stormwater basin
- The installation of an air-insulated switchyard ("AIS")
- Construction of an electrical control house
- Installation of security fencing
- Spreading of crushed stone within the security fence line
- Installation of three electric transition structures (two for the incoming 115kV transmission line and one for the new line to Hobart Substation)
- 210 feet of new transmission interconnections between the existing transmission lines and the New Tap Station
- Installation of one distribution tangent pole
- Four lightning masts (85 feet tall)
- Construction of associated parking
- Installation of vegetated screening

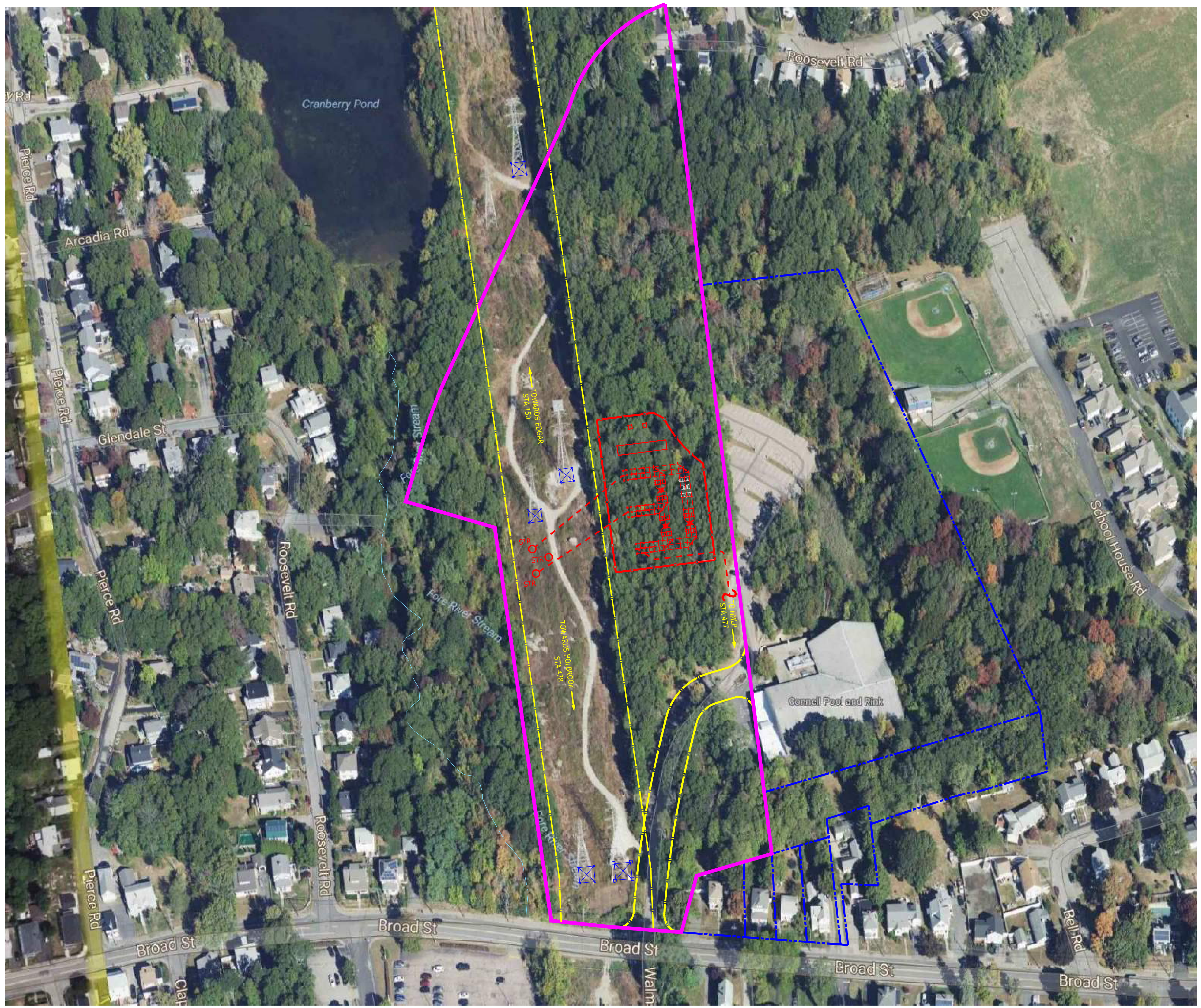


Figure 5-7
Aerial
Weymouth Tap Station Site

NOTE:

1. THIS PLAN IS FOR VISUAL PURPOSES ONLY AND IS APPROXIMATE. NOT BASED ON AN ACTUAL ON-THE-GROUND SURVEY.

REVISIONS DURING CONSTRUCTION

AS BUILT REVISIONS

NO.	DATE	DESCRIPTION	BY	CHK	APP	APP

TITLE OF REFERENCE DRAWINGS	NUMBER

EVERSOURCE ENERGY

STATION 264
MAP – LAYOUT
AERIAL SITE PLAN
EX
WEYMOUTH, MA

DR	CHKD	APP	APP
F. ROMANELLI	L. BUI	J. CURTIS	C. ARNIERI
DATE 01/26/2024	DATE	DATE	DATE .
H-SCALE NONE	V-SCALE NONE	STATION 264	
SOURCE FILE		DWG NO.	264-6601

ES VER: 01/2022

1/26/2024 7:55 AM – romanfd – N:\Adept Work Area\romanfd\STA 264 SDC 22-049\264-6601.dwg – As Built

LOCUS MAP

NOT TO SCALE

PROJECT DETAILS		
OWNER	NSTAR Electric Company dba Eversource Energy 247 Station Drive, Westwood MA, 02090	
ENGINEER	TBD	
SURVEYOR	SGC ENGINEERING LCC SURVEY AND MAPPING 501 Country Rd Westbrook Maine, 04092	
ZONING DISTRICT	RESIDENTIAL DISTRICT - R1	
GROSS FLOOR AREA	EXISTING = 0 , PROPOSED = 1200'	
INTENDED USE	ELECTRICAL SUBSTATION	
NUMBER OF PEOPLE INTENDED ON SITE	0	
NUMBER OF PARKING AREAS	3	

DIMENSION TABLES	MINIMUM	PROPOSED
FRONT YARD SETBACK	18 FT	614 FT
SIDE YARD SETBACK	10FT, 20FT OFF ANY DWELLING	54 FT EAST 225 FT WEST
REAR YARD SETBACK	24FT OR 1/5 OF LOT, WHICH EVER IS LESS	595 FT
BUILDING COVERAGE	30%	<0.5%

DIMENSION	MINIMUM	NSTAR LOT
LOT AREA	25,000 SF	506,957 SQ FT
FRONTAGE	NA	215 FT

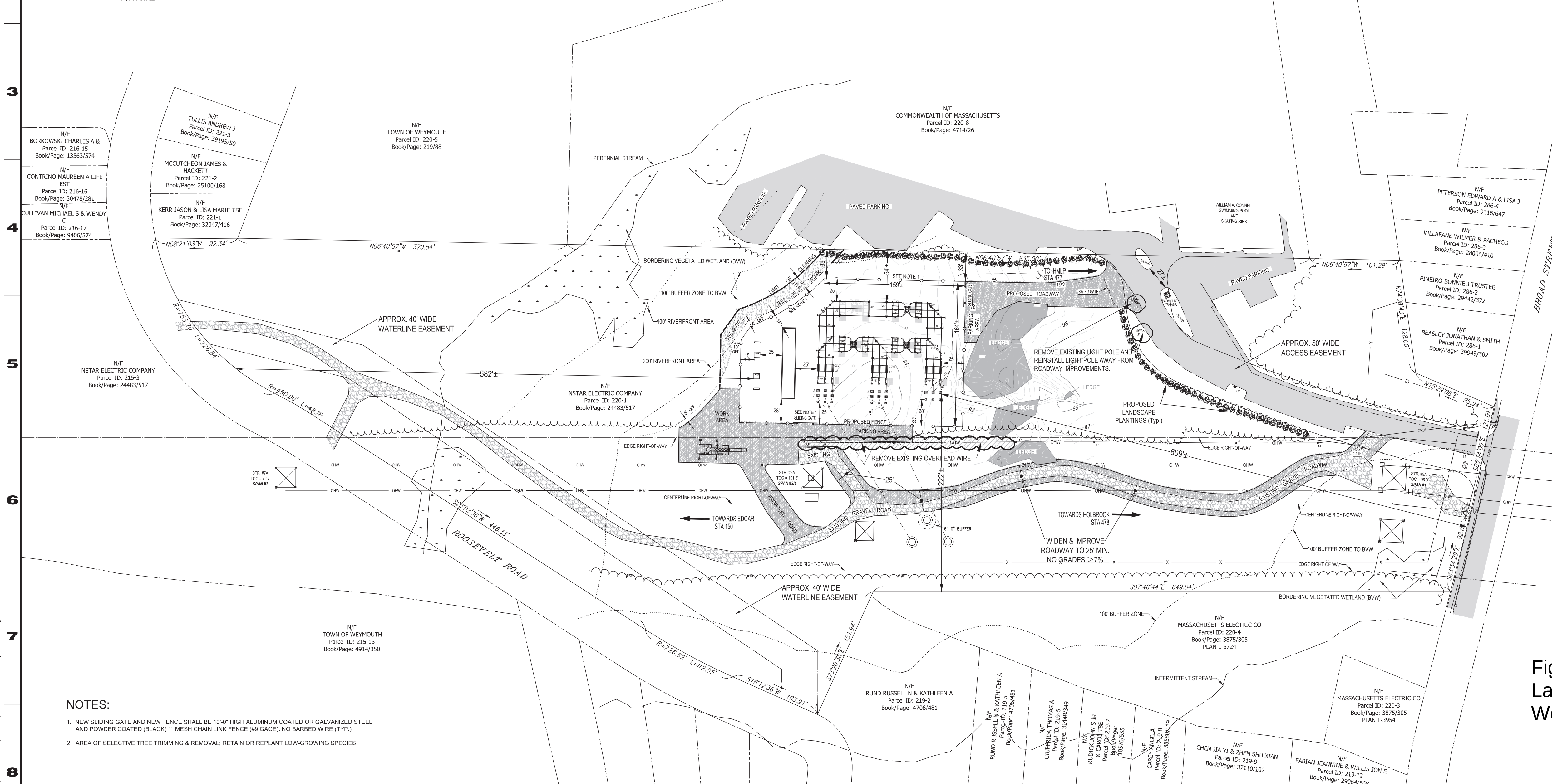
PROPOSED IMPROVEMENTS

INSIDE RIGHT OF WAY - AREA (Sq.Ft ±)

ROADWAY	12,968
PARKING AREA	519
WORK AREA	1993
TOTAL	15,480

OUTSIDE RIGHT OF WAY - AREA (Sq.Ft ±)

ROADWAY	6471
PARKING AREA	1728
WORK AREA	2605
TOTAL	10,804



NOTES:

1. NEW SLIDING GATE AND NEW FENCE SHALL BE 10'-0" HIGH ALUMINUM COATED OR GALVANIZED STEEL AND POWDER COATED (BLACK) 1" MESH CHAIN LINK FENCE (#9 GAGE). NO BARBED WIRE (TYP.)
2. AREA OF SELECTIVE TREE TRIMMING & REMOVAL; RETAIN OR REPLANT LOW-GROWING SPECIES.

CEII REMOVED

Figure 5-8
Layout of the
Weymouth Tap Station

SITING PLAN
REV 22 049 ADDITIONS

REVISIONS DURING CONSTRUCTION

NO.	DATE	DESCRIPTION	BY	CHK	APP	APP
A	1/26/24	SDC 22-049-INITIAL ISSUE	FDR	LB/JDC	CJA	

AS BUILT REVISIONS

TITLE OF REFERENCE DRAWINGS | NUMBER

EVERSOURCE ENERGY

TITLE: STATION 264
STATION GENERAL
EQUIPMENT LOCATION
EE
WEYMOUTH, MA

BY	CHKD	APP	APP
F. ROMANELLI	L. BUI	J. CURTIS	C. ARNIERI
DATE 01/26/2024	DATE	DATE	DATE
H-SCALE 1"=50'	V-SCALE 1/8	STATION 264	
SOURCE FILE		DWG NO. 264-6603	

Potential Environmental Impacts at Weymouth Tap Station

Land Use

The proposed Weymouth Tap Station is located on an approximately 11.6-acre Eversource-owned parcel of land. The parcel landscape consists of various sloping topography and areas of exposed surficial ledge. An Eversource transmission ROW, which currently includes two transmission lines and access roads, occupies approximately half of the site. The vegetation within this ROW is maintained in compliance with Eversource's Transmission Vegetation Management Plan. The remainder of the site is populated with a mixed hardwood forest. The Tap Station Site is bordered by Eversource transmission ROW, the Connell Memorial Rink and Pool, residences, undeveloped land owned by NGrid and Broad Street. The total area of land disturbance associated with the Tap Station would be approximately 2.5 acres. Nearby land uses are predominantly single-family residential, with some industrial and recreational uses. A church, Crossroads Worship Center, is located southeast of the site, across Broad Street.

The ROW will continue to be used for electric transmission purposes. Upon completion of construction, the site not otherwise used for the Tap Station and associated appurtenances will be restored by stabilizing disturbed soils and landscaped in a manner appropriate to the surroundings/neighborhood.

Wetland Resource Areas

The proposed Weymouth Tap Station is located within an existing transmission corridor. Wetland resource areas were delineated on August 2, 2022. Wetland boundaries were established in accordance with the provisions of the Massachusetts Wetlands Protection Act, the Weymouth Wetlands Protection Ordinance (Chapter 7, Section 301, Weymouth Code of Ordinances) and its implementing regulations, and the United States Army Corps of Engineers methodology based on the plant community, soils, hydrology, and other contributing factors, including topography. There is an unnamed waterway located to the north and east of the site that is shown as perennial on the latest USGS map. BVW was delineated adjacent to the unnamed waterway. The Tap Station site is primarily forested, and vegetation removal will be required prior to grading of the site. Vegetation removal is proposed within the outer 100-foot Buffer Zone to the BVW and the outer 200-foot Riverfront Area to the unnamed waterway. The proposed vegetation removal within the Riverfront Area is limited to 4,000 sf of impact. This impact is unavoidable to provide for a safe and secure perimeter to the Tap Station facility. In the Riverfront Area, selective tree trimming and removal will occur to meet safety and security standards and minimize disturbance to the resource area. A Notice of Intent will be filed with the Weymouth Conservation Commission requesting an Order of Conditions for this work.

Flood Zones

Based on the National Flood Insurance Rate Map, Panel 229, Map Number 25021C0229E, revised July 17, 2012, and the National Flood Insurance Rate Map, Panel 227, Map Number 25021C0227F, revised June 9, 2014, the Tap Station Site is not located within a designated Flood Zone. Construction and operation of the Tap Station would not be expected to exacerbate local flooding as on-site stormwater management systems will be installed to control stormwater runoff from new impervious surfaces on-site.

Stormwater Management

A stormwater management system will be developed to treat both the quality and the quantity of stormwater discharge from the site. The stormwater BMPs will include a sediment forebay and stormwater basin to address peak runoff from the Tap Station site.

Visual Impacts

The proposed Tap Station will be located along the central-eastern portion of the property. The Tap Station will be visible from the adjacent Connell Memorial Rink and Pool and its access road, with the access road partially located in the existing Eversource transmission ROW. The Tap Station includes a structure to house electrical control and relay panels and AIS. The tallest structures within the Tap Station site are four (4) lightning masts at 85 feet each. The Tap Station will be surrounded by a 10-foot-tall chain link fence. Three poles are proposed on the ROW adjacent to the transmission lines for the tap. These new poles will be consistent with the existing infrastructure within the ROW. The Tap Station equipment is proposed to be set back approximately 550 feet from Broad Street, so visual impacts along Broad Street will be limited. The closest residence to the Tap Station is approximately 405 feet and visual impacts to this residence (and other nearby residences) is expected to be minimal as the Tap Station is on the opposite side of the transmission ROW from the residence. As mentioned above, Eversource will provide landscaping and other visual mitigation and screening adjacent to the Tap Station to minimize visual impacts.

Noise

Work to construct the Tap Station will take place over an approximately 24-month period. Construction activities will include site preparation, including rock removal and grading, and the installation of new poles, electrical equipment, support structures and foundations. During this time, nearby residences may be affected by temporary elevated noise levels associated with a typical construction site. Construction will comply with the MassDEP regulations related to noise. To further mitigate construction noise at nearby residences, Eversource plans to:

- Require well-maintained equipment with functioning mufflers;
- Require strict compliance with MassDEP's Anti-Equipment Idling regulations;
- Operate stationary noise generating equipment away from nearby residences; and
- Work with the Town to schedule construction outside these hours where necessary.

HMLP and Eversource anticipate that these measures will appropriately minimize construction-related noise impacts in the areas near the Tap Station site. As no transformer is proposed at the Tap Station, no operational noise is anticipated.

Daytime and nighttime noise impacts from the proposed Project and anticipated equipment installations are predicted to fully comply with the applicable MassDEP noise policy.

Traffic

The proposed Tap Station is located off public roads, and traffic impacts associated with Tap Station construction are expected to be minor and temporary in nature. Access to the Tap Station site will be through the existing access road off of Broad Street, onto the gravel access road that runs parallel to the transmission lines in the Eversource ROW as well as through a new access road off of the Connell Memorial Rink and Pool driveway, which is on Eversource property. Eversource will coordinate construction activities with the adjacent Connell Memorial Rink and Pool so as to minimize impact on the facility operations.

After construction, the Project will not generate additional traffic. The Tap Station will not be a manned facility and Eversource staff will access the Tap Station as needed. No significant vehicular traffic is anticipated.

Public Shade Trees

The proposed construction of the Weymouth Tap Station is not anticipated to affect public shade trees. The portion of the site where the Tap Station is proposed is currently forested and will require removal of trees within the work area. Approximately 221 trees 6 inches or greater diameter at breast height ("dbh") will be removed at the Tap Station site. Eversource will provide landscaping and other visual mitigation and screening adjacent to the Tap Station to minimize visual impacts. Eversource will have preliminary conversations with Weymouth officials, abutters and community members regarding such landscaping and will evaluate input as the final landscaping plan is designed.

Potential to Encounter Subsurface Contamination

Per MassDEP's Waste Site & Reportable Releases site look-up tool, there are no releases reported at the Tap Station site.

Air Quality

The potential for fugitive dust and for emissions from equipment associated with construction activities at the Weymouth Tap Station will be mitigated as described in Section 5.4.3.

Electric and Magnetic Fields

The term "electric and magnetic fields" ("EMF") is used to describe fields created by electric voltage (electric fields) and electric current (magnetic fields). An electric field is present whenever voltage exists on an object and is not dependent on current. Similarly, a magnetic field is present whenever current flows in a conductor and is not dependent on voltage. When an object has voltage and carries current, it produces both an electric and magnetic field. HMLP, like all North American electric utilities, supplies electricity at 60 Hertz ("Hz") (60 cycles per second). Therefore, the electric utility system, and the equipment connected to it, produce 60-Hz (power-frequency) EMF.

Gradient Corporation performed an independent EMF assessment covering all elements of the proposed underground 115kV project, including the proposed Hobart II Substation and Weymouth Tap Station. AIS is to be used at the new Tap Station; MFs will diminish rapidly with distance from the tap station equipment and the Tap Station will not abut any residential properties (note that the closest residential properties on Broad Street, over 400 feet away, are in closer proximity to the Project's underground 115kV transmission line than the Tap Station), and the Project underground line would thus be expected to be a larger potential source of MFs at these properties than the more distant Tap Station. The closest residences on Roosevelt Road are on the other side of the Eversource ROW from the Tap Station, so the Tap Station would be expected to be a negligible source of MFs at these properties. In addition, engineering design diagrams indicate that the closest switchgear to the paved parking lot at the Connell Rink and Pool is to be located more than 50 feet from the parking lot edge, such that MFs from the tap station equipment will have diminished to minimal levels. It is well established that, for the types of electrical equipment present in the proposed Tap Station (e.g., aboveground buswork, switchgear), where conductors are arranged in close proximity to each other, that EMF levels decrease rapidly to low levels inside the fence line; and the strongest fields near the perimeter fence are expected to be associated with the transmission and distribution lines entering/exiting the station (IEEE, 2014). As a result, it is expected that MFs outside the fence lines of the new Tap Station will be dominated by MFs associated with the Project underground 115kV transmission line and other transmission or distribution lines entering/exiting the stations rather than equipment within the fence lines.

ACECs and ORWs

There are no ACECs or ORWs in proximity to the Tap Station Site.

Cultural Resources

Based on review of available records, no inventoried archaeological sites or historic properties on the Federal or State Register of Historic Places or the Massachusetts Historical Commission's Inventory of the Historic and Archaeological Assets of the Commonwealth are located on the Tap Station Site. As there are sites in proximity, the Petitioners are coordinating with the MHC to conduct field investigations on previously undeveloped portions of the site and will continue to coordinate with MHC on the results of this investigation. No impact to any historic or archaeological feature is anticipated in association with Tap Station construction or operation.

5.3 Hobart II Substation

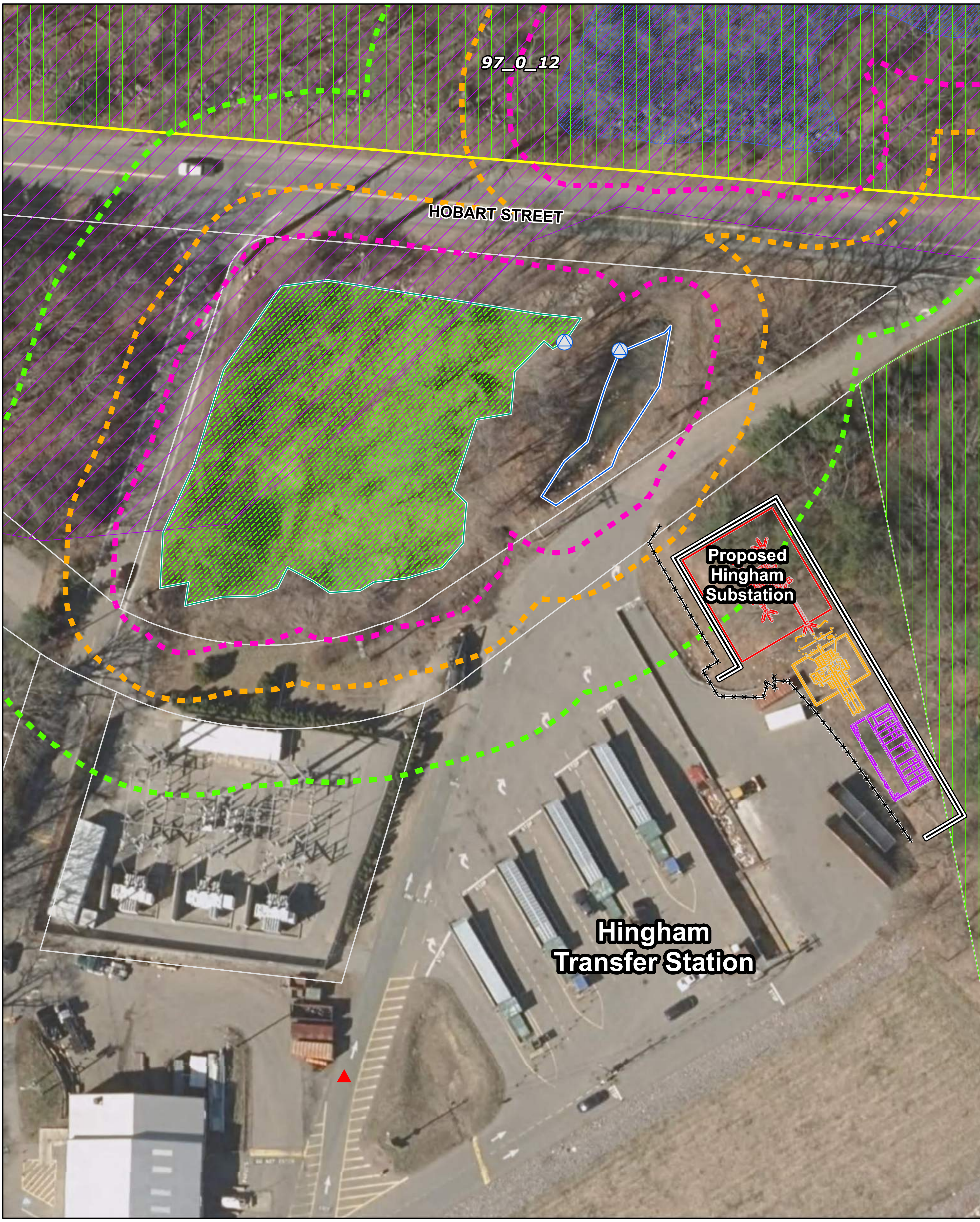
A new substation is proposed at the Hingham Transfer Station site, which is a 9.7-acre property owned by the Town of Hingham and located off Old Hobart Street in Hingham. The substation is proposed on an approximately ½ acre area of undeveloped land at the northeastern corner of the transfer station parcel, adjacent to the exit road. This area has adequate capacity for the proposed substation and will not have a significant impact on the transfer station operations.

The Hobart II Substation site in Hingham is abutted by the transfer station access road to the north, Brewer Reservation municipal conservation land to the east, the former Hingham landfill to the south, and the Hingham Transfer Station to the west. HMLP's existing Hobart I Substation is located at the northwestern corner of the transfer station site. Property uses near the proposed Substation are generally conservation land and transfer station/former landfill. An aerial view of the proposed Substation, along with environmental resources and land uses within 300 feet, is provided in Figure 5-9. The layout of the proposed Substation is provided as Figure 5-10.

For either the Preferred or Noticed Alternative Route, the Hobart II Substation will include the following activities and addition of equipment:

- Site clearing and grading within a defined limit of disturbance
- Construction of a retaining wall
- Construction of stormwater management system
- Construction of a gas-insulated switchgear ("GIS") substation within an enclosed structure
- Installation of fencing
- Installation of pad-mounted transformers
- Space for a future transformer and switchgear
- Space for roll-offs for use by the Town of Hingham Department of Public Works ("DPW") as part of transfer station operations

Circuit breakers and gas-insulated bus work installed at the Hobart II Substation will contain SF_6.



- Culvert
- Non-Landfill Solid Waste Sites
- Bank (Field Delineated)
- Wetland Boundary (Field Delineated)
- Wetlands Area (Field Delineated)
- 25-foot Buffer Zone
- 50-foot Buffer Zone
- 100-foot Buffer Zone
- Protected and Recreational Open Space
- Area of Critical Environmental Concern (ACEC)
- MassDEP Inland Wetlands
- Site Parcels
- Parcel Boundary
- Town Boundary
- Proposed Substation Building
- Proposed Switchgear
- Proposed Transformer
- Fencing
- Proposed Substation Walls

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Feet

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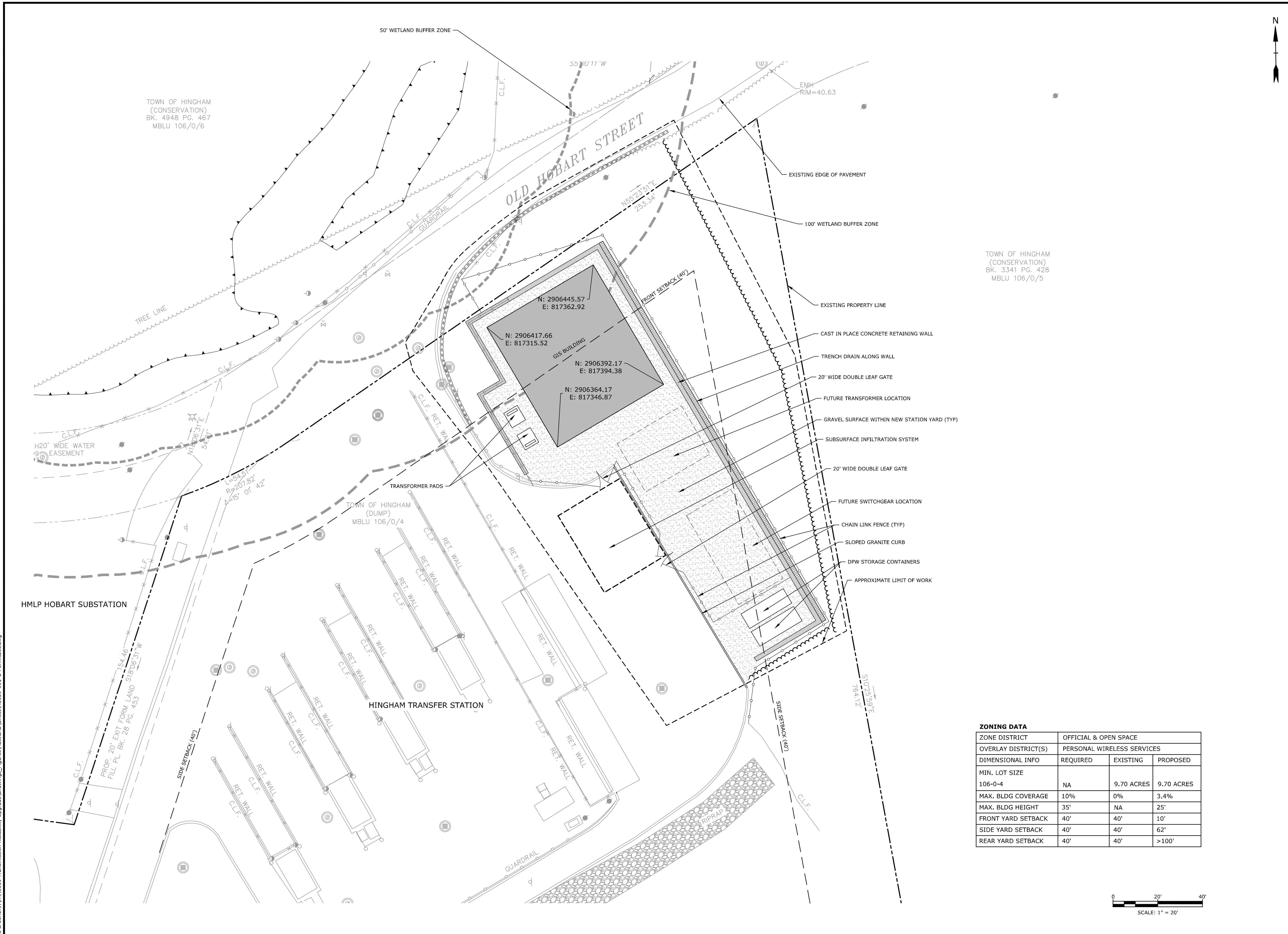
Tighe&Bond

1. Based on MassGIS Color Orthophotography (2019).
2. Parcels (FY2020) downloaded from MassGIS and are approximate.

FIGURE 5-9
POTENTIAL SUBSTATION SITES
DESKTOP ANALYSIS

Hingham, Massachusetts

September 2022



ZONING DATA

ZONE DISTRICT	OFFICIAL & OPEN SPACE		
OVERLAY DISTRICT(S)	PERSONAL WIRELESS SERVICES		
DIMENSIONAL INFO	REQUIRED	EXISTING	PROPOSED
MIN. LOT SIZE 106-0-4	NA	9.70 ACRES	9.70 ACRES
MAX. BLDG COVERAGE	10%	0%	3.4%
MAX. BLDG HEIGHT	35'	NA	25'
FRONT YARD SETBACK	40'	40'	10'
SIDE YARD SETBACK	40'	40'	62'
REAR YARD SETBACK	40'	40'	>100'

Last Saved: 4/3/2024
Plotted On:Nov 05, 2024-9:21am By: TJGrace
Tighe & Bond:J:\H\H5059 Transmission Reliability Upgrade\Drawings_Figures\AutoCAD\Sheet\H5059-001-C-PermitSet.dwg

Tighe&Bond

PERMIT DRAWINGS NOT FOR CONSTRUCTION

Hobart II Substation

Hingham Municipal Lighting Plant

Hingham, MA

Figure 5-10
Layout of the Hobart II Station

MARK	DATE	DESCRIPTION

PROJECT NO:	H5059-001
DATE:	02/13/2022
FILE:	H5059-001-C-PermitSet.dwg
DRAWN BY:	TJG
DESIGNED/CHECKED BY:	TJG
APPROVED BY:	TJA

SITE LAYOUT AND MATERIALS PLAN

SCALE: 1" = 20'

C-102

5.3.1 Impacts and Mitigation Measures

Potential Environmental Impacts at Hobart II Substation

Land Use

The Hobart II Substation site is located at the Hingham Transfer Station. The transfer station site is approximately 9.7 acres and is an active transfer station and capped landfill. The existing Hobart Substation is located on a separate parcel at the northwest corner of the transfer station. A portion of land in the northeast corner of the transfer station site has been identified for the proposed Hobart II Substation. This area is a forested embankment adjacent to the active transfer station operations that slopes from the existing paved area up to the bordering conservation area. The transfer station consists of truck loading areas, roll-off for refuse collection, scales, and driveway.

The Hobart II Substation site in Hingham is abutted by the transfer station access road and Hobart Street to the north, Brewer Reservation municipal conservation land to the east, the former Hingham landfill to the south, and the Hingham transfer station to the west. HMLP's existing Hobart Substation is located at the northwestern corner of the transfer station site. Property uses near the proposed Hobart II Substation are generally conservation land and transfer station/former landfill. The site was chosen after an extensive assessment focused on municipal properties in the vicinity of the existing Hobart Substation and input from the public.

The total area of disturbance associated with the substation is approximately 31,000 sf.

Wetland Resource Areas

Wetland resource areas in the vicinity of the Hobart II Substation site were delineated in December 15, 2020, and April 1, 2021. Wetland boundaries were established in accordance with the provisions of the Massachusetts Wetlands Protection Act, the Hingham Wetlands Regulations, and the United States Army Corps of Engineers methodology based on the plant community, soils, and hydrology.

The proposed Hobart II Substation is sited outside of the 50-foot buffer zone to a wetland resource area located across the transfer station access road. Approximately 7,100 sf of work is proposed between the 50-foot and 100-foot Buffer Zone of delineated BVW resource areas. A small area (approximately 660 sf) of work (minor grading and installation of erosion control measures) is proposed with the 50-foot Buffer Zone to BVW. Structural stormwater management BMPs will be implemented to treat and infiltrate stormwater runoff from the new impervious surfaces. No wetlands will be impacted by the Hobart II Substation construction, and no long-term impacts to such resources are anticipated associated with construction and operation of the substation. A Notice of Intent will be filed with the Hingham Conservation Commission requesting an Order of Conditions for this work.

Flood Zones

Based on the National Flood Insurance Rate Map, Panel 82, Map Number 25023C0082J, revised July 17, 2022, the new substation site is not located within a designated Flood Zone. Construction and operation of the Hobart II Substation would not be expected to exacerbate local flooding as on-site stormwater management systems will be installed to control stormwater runoff from new impervious surfaces on-site.

Stormwater Management

The proposed stormwater management system will treat both the quality and the quantity of stormwater discharge from the site. The system includes BMPs such as deep-sump, hooded catch basins, proprietary stormwater treatment units, and a subsurface infiltration system.

A brief description of the proposed BMPs incorporated into the stormwater management system are as follows:

- Deep-Sump, Hooded Catch Basins: Catch basins provided throughout the site collect stormwater runoff from the proposed parking areas and are connected to the project's stormwater collection system. The deep-sump and hooded outlet provide runoff an opportunity to separate from solids and floatable pollutants prior to discharge and are used as a pretreatment device throughout the project.

- Proprietary Treatment Devices: Structural stormwater treatment devices, proposed as Stormceptor 450i, are designed to mechanically separate pollutants from stormwater flows through centrifugal force and vortex separation. Units are proposed at the ends of both major treatment trains in the stormwater management system, prior to discharging into the subsurface infiltration system. Each unit has been sized in accordance with guidance provided by MassDEP to insure proper sediment removal efficiencies.

- Subsurface Infiltration System: The subsurface infiltration system consists of pre-fabricated chambers set in a bed of gravel. The system has been sized to infiltrate the required recharge volume. Once full, the subsurface infiltration system will discharge through an outlet manhole.

Visual Impacts

The Hobart II Substation's location within the Hingham transfer station property is approximately 100 feet from Hobart Street on a forested hillside. The proposed substation will be constructed on approximately ½ acre of land along the northeastern corner of the transfer station site. The Hobart II Substation includes:

- New Gas Insulated Substation (enclosed, approximately 54 feet x 64 feet by 25 feet in height)
- Circuit breakers
- Bus work
- Protection and communications equipment
- Stormwater management system
- Retaining wall
- Space for a future transformer
- Space for future switchgear

The substation is screened from Hobart Street by land that is part of the Brewer Reservation conservation area. The substation, which at 25 feet is the tallest structure within the Hobart II Substation site, will be visible from within the transfer station and from the Brewer Reservation. The substation will be enclosed in a steel building similar to the transfer station structures. The Substation will be surrounded by an 8-foot-tall chain link fence.

Noise

Work at the Hobart II Substation site will take place over an approximately 12-18 month period. Construction activities will include site preparation and the installation of a retaining wall, stormwater management system, the GIS building, new electrical equipment, support structures and foundations. The site has been chosen to minimize impacts to the nearby residences. The nearest resident is located to the west of the transfer station, approximately 400 feet from the proposed substation site. During construction, nearby residences may be affected by temporarily elevated noise levels associated with a typical construction site. Construction will comply with the Town of Hingham and MassDEP regulations related to noise. To further mitigate construction noise at nearby residences, HMLP plans to:

- Require well-maintained equipment with functioning mufflers
- Require strict compliance with MassDEP's Anti-Equipment Idling regulations
- Operate stationary noise generating equipment away from nearby residences
- Comply with municipal restrictions on construction hours when feasible
- Work with the Town to schedule construction outside these hours only where necessary.

HMLP anticipates that these measures will appropriately minimize construction-related noise impacts in the areas near the Hobart II Substation and comply with the applicable noise ordinances. No increase in operational noise is anticipated.

The primary sources of noise in the vicinity of the proposed substation include the existing Hobart Substation and the transfer station, which are immediately adjacent to the Hobart II Substation area and closer to residences. At this time, no transformer is proposed, so no new noise emission is anticipated from the site operations.

Daytime and nighttime noise impacts from the proposed Project and anticipated equipment installations are predicted to fully comply with the applicable Town of Hingham Noise Control By-law and MassDEP noise policy.

Traffic

The proposed Hobart II Substation will be located off public roads, and limited impacts to traffic are anticipated for the construction of the substation. Access to the substation site will be through the Hingham Transfer Station access road. Traffic impacts associated with substation construction are expected to be minor and temporary in nature. HMLP will coordinate construction activities with the DPW so as to minimize impact on the transfer station operations. To the extent practicable, construction that will require work that would disrupt the traffic flow within the transfer station will occur outside of the transfer station's hours of operations, which are currently between the hours of 7:00 AM and 4:00 PM Thursday through Sunday. At least three weeks prior to the start of any work, the HMLP will provide a construction schedule and traffic management plan to the Hingham Community Planning Department and Department of Public Works. Said construction schedule and traffic management plan will incorporate assurance that major deliveries and site work will minimize disruption to the transfer station operations. All construction vehicles shall be parked onsite. No construction vehicles will enter the premises before 7 AM on any given construction day.

After construction, the substation will not generate additional traffic. HMLP staff will access the new Hobart II Substation in a similar manner and timing as they currently access the existing substation, which is on average one trip per week unless there are outage or operational issues. The substation will be an unmanned facility. No additional vehicular traffic is anticipated.

Public Shade Trees

The proposed construction of the Hobart II Substation is not anticipated to affect public shade trees. The proposed Hobart II Substation site is on a forested hillside that is part of the Hingham transfer station. Approximately 63 trees of 6-inch dbh or greater are proposed to be removed prior to site grading.

Potential to Encounter Subsurface Contamination

Per MassDEP's Waste Site & Reportable Releases site look-up tool, there are no releases reported at the proposed substation site. The proposed substation is located on a solid waste transfer station site and adjacent to a capped landfill, the proposed substation site is not located in an area that was part of the active landfill.

Air Quality

The Hobart II Substation will not adversely affect air quality, either locally or long-range. The potential for fugitive dust and for emissions from equipment associated with construction activities at the Hobart II Substation will be mitigated as described in Section 5.4.3.

Electric and Magnetic Fields

As noted above, the term EMF is used to describe fields created by electric voltage (electric fields) and electric current (magnetic fields). An electric field is present whenever voltage exists on an object and is not dependent on current. Similarly, a magnetic field is present whenever current flows in a conductor and is not dependent on voltage. When an object has voltage and carries current, it produces both an electric and magnetic field.

HMLP, like all North American electric utilities, supplies electricity at 60 Hz (60 cycles per second). Therefore, the electric utility system, and the equipment connected to it, produce 60-Hz (power-frequency) EMF.

Gradient Corporation performed an independent EMF assessment covering all elements of the proposed underground 115kV project, including the proposed Hobart II Substation and Weymouth Tap Station. The proposed Hobart II Substation will have GIS, which will allow the conductors within the proposed substation to be placed closer together than for AIS, enhancing the rapid drop-off of Magnetic Field ("MF") levels with distance away from the equipment. It is well-established that, for the types of electrical equipment present in the proposed Substation (e.g., aboveground buswork, transformers, switchgear), where conductors are arranged in close proximity to each other, that EMF levels decrease rapidly to low levels inside the fence line; and the strongest fields near the perimeter fence are expected to be associated with the transmission and distribution lines entering/exiting the station (IEEE Guide for the Design, Construction, and Operation of Electric Power Substations for Community Acceptance and Environmental Compatibility, published by Institute of Electrical and Electronics Engineers, Inc. [IEEE], 2014). As a result, it is expected that MFs outside the fence lines of the new Substation will be dominated by MFs associated with the Project's underground 115kV transmission line and other transmission or distribution lines entering/exiting the stations rather than equipment within the fence lines.

Areas of Critical Environmental Concern ("ACEC") or Outstanding Resource Waters ("ORW")

The Weymouth Back River ACEC includes More-Brewer Park, which is to the north of Hobart Street from the transfer station, and Bouve Pond and Cranberry Pond Conservation Area, to the west of the transfer station. The Hobart II Substation will not impact ACEC or ORWs.

Cultural Resources

Based on review of available records, no inventoried archaeological sites or historic properties on the Federal or State Register of Historic Places or the Massachusetts Historical Commission's Inventory of the Historic and Archaeological Assets of the Commonwealth are located on, or immediately adjacent to the Project Site. As there are sites in proximity, HMLP is coordinating with the Massachusetts Historical Commission ("MHC") to conduct field investigations on previously undeveloped portions of land near the substation site and will continue to coordinate with MHC on the results of this investigation. No impact to any historic or archaeological feature is anticipated in association with Project construction or operation.

5.4 General Construction Best Management Practices for Preferred and Noticed Alternative Routes

The Preferred and Noticed Alternative Routes are both fully underground with construction in roadways for distances of approximately 3.2 miles and 3.7 miles, respectively.

This section of the analysis describes the general construction methods and anticipated mitigation measures for the underground cable segment of the Project. The cable will be installed using conventional techniques for the construction of cross-linked polyethylene ("XLPE") underground cables. Additional information describing the sequence of activities and other construction-related topics such as schedule, underground construction work hours and environmental compliance, monitoring and mitigation is provided below.

5.4.1 General Construction Methods for Underground Cable Installation

The proposed underground transmission cable will consist of 750 kcmil copper conductor, XLPE-insulated cable in a concrete encased manhole and duct bank system. The typical duct bank will consist of three 6-inch-diameter Polyvinyl Chloride ("PVC") conduits for the 115kV cables, one 4-inch-diameter PVC conduit for a protection and communications cable, and two 2-inch-diameter PVC conduits one to carry a ground continuity conductor and a possible temperature monitoring cable. The duct bank will be encased in a thermal concrete envelope.

For most duct bank configurations, the top of the duct bank will be approximately 30 inches below grade. The HDD configuration has a minimum burial depth of 48 inches below grade. Typical trench excavation for the duct bank will be up to 4 feet wide and 5 feet deep or more depending on site conditions. A typical trench diagram is provided as Figure 5-11, Typical Trench Cross Section.

There are four principal phases of construction for an underground cable project within streets:

1. Manhole/splice chamber installation;
2. Trenching, duct bank installation, and temporary pavement patching;
3. Cable pulling, splicing and testing; and
4. Final pavement restoration.

Installation of the underground transmission line will generally require a linear work zone along the construction corridor. It is anticipated that areas where typical open trench excavation will occur will require a minimum 11-foot-wide work space area and that deep excavation at some dense utility intersections (as determined during the detailed design phase) may require a minimum of 18-foot-wide work area. Manhole and splice vault installations typically require a minimum 20-foot-wide work area. HMLP will work with local authorities to develop traffic management plans to balance construction progress and traffic impacts to the community. These work areas will include temporary traffic control devices necessary to guide motorists safely past the work zone.

HMLP anticipates that each trench segment will be approximately 500 feet in length; however, longer or shorter work zones may be used based on the specific construction activities, soil conditions, traffic, and other site- specific conditions. It is important to note that trench construction is generally a linear progression, with tasks occurring concurrently or in progressive sequence. Approximate durations for activities anticipated to occur within each trench segment are summarized in Table 5-1 below.

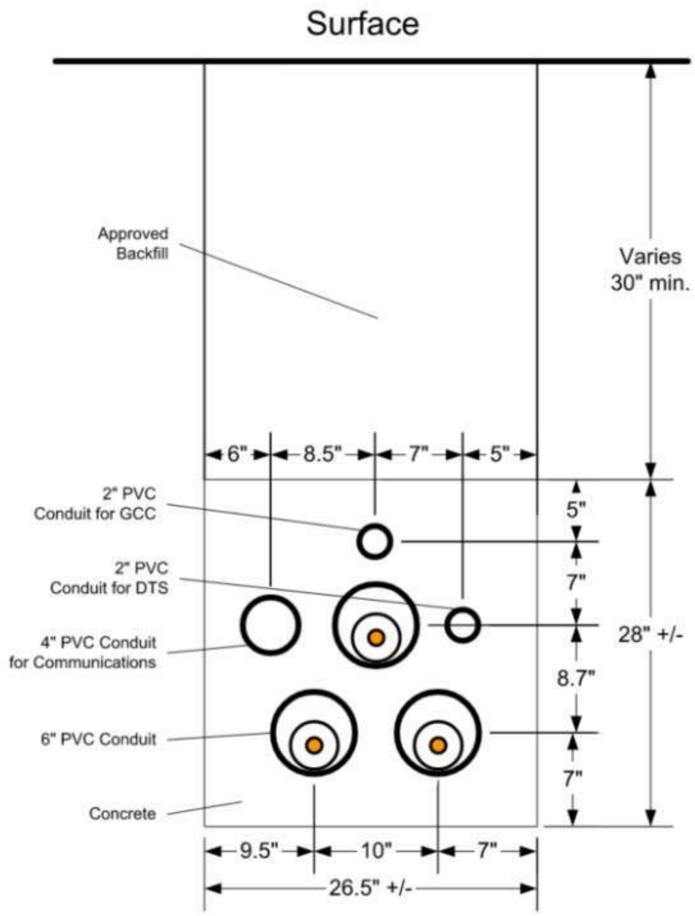


Figure 5-11
Typical Trench Cross Section

TABLE 5-1
Approximate Duration of Trench Segment Activities

Activity	Approximate Duration
Survey and Layout	One day
Pavement Cutting	One day
Trench Excavation and Shoring	Two to five days*
Conduit Installation	One to three days
Duct Bank Concrete Placement/Curing/Shoring Removal	Three to five days
Backfill/Temporary Pavement Placement	Two to three days

*Note that duration is dependent on the subsurface conditions, including presence of rock and other subsurface utilities

These durations are approximate and subject to change depending on field conditions, depth of the installation, utility congestion and traffic congestion. Moreover, all phases of construction will not necessarily be completed in one segment prior to advancing to another segment. There may be cases where work on an unfinished segment may be temporarily halted due to unforeseen conditions or to catch up in other areas, and work would continue on other segments. Once the unanticipated conditions are addressed, work would resume on the unfinished segment.

Each of these four phases is described in more detail below, followed by a discussion of specialized techniques for trenchless road and water crossings, which would be employed when warranted -- Pipe Jacking, and Horizontal Directional Drilling.

Manhole/Splice Chamber Installation

Manholes will be installed along the underground cable route to facilitate cable installation and splicing and to allow access for maintenance requirements and future repairs. Manhole size is determined by the space required to support pulling, splicing and supporting the cable within the manhole. For the Project, each manhole will be approximately 10 feet wide by 10 feet high and 26 feet long (exterior dimensions).

Manholes for this Project will typically be spaced approximately 1,500 to 1,800 feet apart. Factors contributing to final placement of the manholes include allowable pulling tensions, consideration of sidewall pressure on the cables as they are pulled around a bend, and the maximum length of a cable that can be transported on a reel based on the reel’s width, height and weight, and accessibility. For manhole installation, the duration of construction typically takes seven to ten construction days per location but may take longer if underground utility relocation is necessary. HMLP will work with the Towns of Hingham and Weymouth and utility companies regarding these relocations on a case-by-case basis as manhole locations are finalized. Additional time is required for pulling cable (approximately four to eight days at each manhole) and splicing cable (approximately five days at each manhole), as explained in further detail in this section.

Following the construction of the new transmission line, manhole inspections will be conducted by HMLP personnel on a periodic basis, normally every three to five years. During these inspections, operators inspect the condition of cable splices, the cable support brackets, the link box connections, and integrity of concrete walls, as well as the junction of conduits as they enter and leave the manhole. The manhole cover is also inspected to determine whether it is stable and flush with the road surface.

Trenching and Duct Bank Installation

The primary method for underground duct bank construction is open-cut trenching. Where construction takes place within roads, the width of the trench will be marked on the street, Dig Safe will be contacted, and the location of the existing utilities will be marked. The pavement will be saw cut. Saw cutting provides a clean break in the pavement and defines the extents of the trench for the next activity.

Following saw cutting, the existing pavement will be removed by pneumatic hammers or excavators and loaded into a dump truck with a backhoe/excavator. Pavement will be handled separately from soil, and will be recycled at an asphalt batching plant. Subsequently, a backhoe/excavator will excavate the trench to the required depth. In some areas, excavation may be done by hand or vacuum excavation methods to avoid disturbing existing utility lines and/or service connections. HMLP will work with utilities to maintain agreed-upon separation from other utility lines.

Once excavated, the trench will be sheeted and/or shored as required by soil conditions, Occupational Safety and Health Administration ("OSHA") safety rules, and local and state regulations.[24] Shoring is designed to permit passage of traffic adjacent to the trench and will allow for the trench to be covered with a steel plate to allow traffic over the trench during non-working hours.

HMLP does not anticipate any planned disruption to utilities along the proposed route. The route is being designed to avoid utility conflicts, to the extent possible. During construction, unforeseen utility conflicts are always possible and, if they arise, crews will work to address any conflict in the field. For instance, HMLP may slightly shift construction locations, if possible. Small branches or services to individual buildings may require relocation. HMLP and its contractors would notify and coordinate with the affected resident or business in advance should a disruption be required.

A "clean trench" or "live loading" method will be used for removal of excavated soils, where soil will be loaded directly into a dump truck for temporary off-site stockpiling or hauling to an off-site facility for recycling, re-use or disposal. The soil will not be stockpiled along the edge of the roadway, thus reducing the size of the required work area and reducing the potential for sedimentation and nuisance dust. Rock encountered during excavation will be removed by mechanical means and brought to an off-site facility for recycling, re-use or disposal.

Intersections tend to have the greatest concentration of underground utilities. Generally, the street intersection is excavated or test pitted in advance of the other work areas so obstructions can be precisely identified and the PVC conduit locations can be determined before the main trenching work crew reaches the intersection. Within intersections and other areas with identified or potentially significant subsurface utility congestion, temporary or permanent relocation of existing utilities may be required to install the cables.

Once the open trench is prepared, the conduits will be assembled and lowered into the trench. The area around the conduits will be filled with thermal concrete (3,000 pounds per square inch). After the concrete is placed in the trench, it will be back-filled with fluidized thermal backfill or native soil,[25] depending on local requirements, and a temporary pavement patch will be installed.

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[24] The Project will comply with applicable federal, state and local safety standards. For example, all construction sites will, at a minimum, adhere to the Federal Highway Administration's Manual to Uniform Traffic Control Devices ("MUTCD") to ensure that both vehicular and pedestrian traffic are safely routed around all street and curbside construction activities. This could include the use of cones, barricades, signage, electronic sign boards, or any combination of the above, as required by the MUTCD. When open trenches are not being actively monitored by on-site construction personnel, the trench will be either backfilled or engineered road plates will be utilized in order to prevent the public from accidentally accessing the trench.

[25] Engineered fluidized thermal backfill has distinct thermal characteristics, specifically with respect to thermal resistivity levels at low levels of moisture content, which native soils in this area may not possess. Limited use of native

Cable Installation and Testing

Prior to cable installation, each conduit will be tested and cleaned by pulling a mandrel (a close-fitting cylinder designed to confirm a conduit's shape and size) and swab through each of the ducts. When the swab and mandrel have been pulled successfully, the conduit is ready for cable installation.

Three 115kV high voltage cables will be installed between two adjacent manholes. To install each cable section, a cable reel or reels will be set up at the "pull-in" manhole and a cable puller will be set up at the "pull-out" manhole. Depending on the engineering, the pull may include multiple manholes for the pulls.

Following the initial pulling of the mandrel and pulling line through each duct, a hydraulic cable pulling winch and tensioner will be used to individually pull cable from the pull-in to the pull-out manhole. This process will be repeated until all cables have been installed.

Once adjacent cable sections are installed, they will be spliced together inside the manholes. Splicing high-voltage XLPE transmission cable is a time-consuming, complex operation. It typically requires 40 to 60 hours to complete the splicing of all three cables at each manhole. Each of the three phases will be spliced separately. The splicing activities will take place over four or five extended work days at each manhole location. Cable splicing is a 12-hour/day activity completed by specialized contractors. Extended work days for cable splicing would entail multiple work shifts that would extend into evening hours. The splicing operation requires a splicing van and a generator. The splicing van contains all of the equipment and material needed to make a complete splice. At times, an air conditioning unit will be used to control the moisture content in the manhole. The portable generator will provide the electrical power for the splicing van and air conditioning unit and will be muffled to reduce noise. Typically, the splicing van will be located over one manhole access. The air conditioner will be located near the second manhole access and the generator will be located in a convenient area that does not restrict traffic movement around the work zone.

In addition to the high voltage cable installation and splicing noted above, there are also some grounding and auxiliary control cables that will be installed within the duct system. There will be a grounding conductor installed within the duct system as well as routed through the manholes. This conductor will likely be installed under the same timeline with the high voltage cables as outlined above.

In addition to the high voltage and ground cables, there will be two sets of fiber optic cables that will be installed for communication and system protection of the cables. These conductors will likely be installed after the high voltage cable installation is complete.

Installation of the fiber optic cables is similar to the high voltage cables, though a smaller hydraulic cable pulling winch and tensioner may be used to individually pull the fiber optic cable from the pull-in to the pull-out manhole. This process will be repeated until all cables have been installed. It is typical to be able to pull fiber optic cables through more pulling manholes, and a greater distance due to the fact that the fiber reels have longer lengths of cable on them and allow for longer pulls. Therefore, the time in a particular manhole during the pulling process will take considerably less time and manhours than

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soils may be possible in certain locations around manholes where exceptional thermal performance is not required.

that of the high voltage cable. HMLP estimates the time to pull the fiber cables in would take approximately 34 days. The splicing activities for the fiber will take place over two work days at each splicing manhole -- for a splicing timeline of approximately 64 work days total. Similar to High voltage cables, the Fiber Optic Cable splicing is a 12-hour/day activity completed by specialized contractors. Extended work days for cable splicing would entail multiple work shifts that would extend into evening hours. The splicing operation requires a splicing van and a generator. The splicing van contains all of the equipment and material needed to make a complete splice. At times, an air conditioning unit will be used to control the moisture content in the manhole. The portable generator will provide the electrical power for the splicing van and air conditioning unit and will be muffled to reduce noise. Typically, the splicing van will be located over one manhole access. The air conditioner will be located near the second manhole access and the generator will be located in a convenient area that does not restrict traffic movement around the work zone.

Once the complete cable system is installed, it will be field-tested from the tap station and substation. At the completion of successful testing, the line will be energized.

Pavement Restoration

Upon Project completion, the roads will be restored in accordance with the Department's "Standards to be Employed by Public Utility Operators When Restoring and of the Streets, Lanes and Highways in Municipalities" (D.T.E. 98-22) ("Repaving Standards") and municipal standards.

Trenchless Crossing Techniques

Trenchless installations are used as necessary to minimize impacts to resource areas and utilities. A trenchless installation is proposed to cross Herring Run Brook and other infrastructure, including a flood control conduit, at Jackson Square in Weymouth.

Trenchless crossing techniques such as pipe jacking or Horizontal Directional Drilling ("HDD") may be required at crossing locations where there is some obstruction to open trenching such as a railroad, wetlands or high utility congestion. Section 5.5.4 addresses the location of a trenchless crossing that is known to the Project Team at this time. However, during test pitting or during construction, HMLP may encounter existing unmapped utilities at depths that require the proposed transmission line to be placed underneath them; in such cases, a trenchless crossing will be considered. Additionally, if HMLP encounters other significant unanticipated utility obstructions, and/or unidentified culverts, it may consider pursuing a trenchless crossing to avoid such obstructions. These techniques are described in further detail below.

- ***<u>Pipe Jacking</u>***

  The pipe jacking method is used to install a casing horizontally under a conflicting object where trenching cannot be accommodated or easily accommodated.

  This method is typically used for crossings of less than 200 feet and is typically used for crossings under railroads, ditches, streams and streets, and for crossing under shallower existing underground facilities. A pipe jacking installation is accomplished by digging a bore pit on one side of the feature to be crossed and a receiving pit on the other side. The bore pit houses the auger or other equipment to remove the spoils from within the pipe, and jacking equipment, while the receiving pit receives the pipe on the other side of the feature being crossed.

The casing is then jacked (pushed) in the bore hole as it is being drilled under the feature. Once in place, the casing is cleaned out, and smaller fiberglass reinforced epoxy or PVC pipes are installed inside the casing to contain the cables. When completed, the duct bank will mate up with the casing on each side of the crossing. Prior to cable installation, the casing is filled with thermally designed fluidized fill.

Once the pipe jacking equipment is in place, it must remain in place and the drill pits must remain open until the operation is completed.

- ***Horizontal Directional Drilling***

  HDD is typically used for comparatively deeper and longer crossings, such as those under interstate highways, major water bodies and railroads. This method commonly involves drilling a hole under a conflicting object from one side to the other, then pulling either a large High Density Polyethylene (HDPE) casing or several smaller HDPE pipes (in a bundle) back through the bore hole. HDD requires boring a hole and circulating a bentonite slurry, which helps support the opening and remove drill cuttings.

  An HDD installation generally requires a larger temporary construction footprint than pipe jacking because the boring equipment is larger, and the supporting equipment requires more space.

5.4.2 Construction Schedule and Hours

As previously noted, assuming receipt of all necessary permits and approvals, construction of the Project is anticipated to commence in Spring 2027, continuing over an 18 to 24-month period, with a target completion by the end of mid-2029.

Construction hours will be developed in accordance with local noise ordinances, which also include regulated construction hours (copies of which are provided in Appendix 5-2) and coordination with the Towns of Hingham and Weymouth. The Town of Hingham limits construction hours to 7:00 AM to 7:00 PM, Monday through Friday and 8:00 AM to 7:00 PM on Saturday and Sunday. The Town of Weymouth does not have limitations on construction hours. HMLP will coordinate with the Towns of Hingham and Weymouth to seek approval when work outside of these hours is necessary. HMLP will also coordinate with the Towns to determine areas where construction hours will be limited (e.g., in front of schools). In certain locations, night work may be requested to allow advancement of Project construction in areas with traffic congestion or where other construction projects are being advanced simultaneously.

In areas where manhole installations, cable splicing, and/or culvert crossings are not required, HMLP expects to spend approximately eight to ten days performing construction activities in front of any single abutter's property.

The duration of time spent in front of a specific abutter's property for manhole installation, cable pulling and high voltage cable splicing will be 16 to 20 days, broken out for each task as follows:

- Approximately 7 to 10 days for manhole installation;
- Approximately 4 days of pulling activity (two days in each pull direction); and
- Approximately 5 days for splicing.

The actual duration of these activities can vary based on a number of factors, including existing utility conditions and below-grade conditions.

HMLP anticipates that it may not be permitted to work within public roads during the winter months due to the winter moratorium for in-street construction. Some activities associated with construction, for example, splicing at manholes, may be allowed under the moratorium.

5.4.3 Construction Mitigation, Compliance, and Monitoring

Construction mitigation measures will help minimize the potential for temporary impacts to the human and natural environments. Typical mitigation for stormwater runoff and associated erosion and sedimentation, fugitive dust, construction vehicle emissions and soils and solid waste management are discussed below for underground line construction. Specific discussions of mitigation measures for other environmental impacts are provided in subsequent subsections. At least three weeks prior to the start of any work, HMLP will provide a construction schedule and traffic management plan to the Hingham Community Planning Department and Hingham and Weymouth Departments of Public Works. Said construction schedule and traffic management plan will incorporate assurance that major deliveries and site work will minimize disruption to the transfer station operations.

Stormwater Runoff, Erosion and Sedimentation Control

HMLP will develop and maintain a Stormwater Pollution Prevention Plan ("SWPPP") for the Project. The SWPPP will identify controls to manage construction-related stormwater discharges from the Project during construction. The SWPPP will include a construction personnel contact list, a description of the proposed work, stormwater controls and spill prevention measures, and inspection practices to be implemented. The SWPPP will be submitted to the Hingham Community Planning Department a minimum of three weeks prior to the start of any work. The Hingham Select Board may require, at the applicant's expense, the establishment of a consultant fee account to fund the cost of the SWPPP review. The contractor(s) will be required to adhere to the SWPPP during all phases of Project construction in accordance with the general conditions prescribed in the USEPA National Pollutant Discharge Elimination System ("NPDES") Construction General Permit.

HMLP will require that the construction contractor designate a construction supervisor or equivalent to be responsible for coordinating with the environmental monitor, to conduct regular inspections and to be responsible for compliance with permit requirements. This person will be responsible for providing appropriate training and direction to the other members of the construction crew regarding any aspect of the work as it relates to compliance with Project permits and approvals and construction mitigation commitments.

Additionally, construction personnel will undergo pre-construction training on appropriate environmental protection and compliance obligations prior to the start of construction of the Project. Regular construction progress meetings will be held to reinforce contractor awareness of these mitigation measures.

Periodically, an environmental monitor working on behalf of HMLP will conduct inspections of erosion and sediment controls and ensure compliance with federal, state and local permit requirements and conditions. Documentation identifying deficiencies of erosion control measures and other permit compliance matters will be immediately brought to the attention of the contractor for implementation of corrective measures.

A copy of the Final Order issued by the Siting Board, and copies of all other permits and approvals, will be reviewed by HMLP and provided to and reviewed by HMLP's contractor prior to construction as part of the contract documents. Contractors will be required to understand and comply with Siting Board and/or Department Orders and conditions and requirements for any other applicable Project permits and approvals. The contractors will be required to keep copies of these documents on site and available to all Project personnel during construction. These documents and applicable conditions will also be reviewed during the construction kick-off meeting in the field between HMLP representatives and contractor personnel.

In roads where work is to be performed adjacent to storm drains and where stormwater is directed to a storm drain, HMLP's contractors will install and maintain filter fabric barriers to prevent sediment from entering the storm drain system. When construction is complete at each location, the storm drain barriers will be removed.

Other measures to mitigate soil erosion will include the prompt removal of soils from the excavated trench. Soils will not be stockpiled along the road(s) but instead will be loaded directly into trucks to be hauled to an offsite disposal/re-use area, or to a temporary construction laydown area. This construction method will limit the potential for soils to be washed with stormwater into nearby storm drains.

In addition to the measures discussed above, the applicable conditions and provisions of the Final Order and other permits and approvals will be reviewed during Project meetings and will be discussed as needed during tailboard meetings, where construction personnel are briefed by their construction supervisor on the upcoming day's work and at that time will be reminded by HMLP representatives and the supervisor of any related specific compliance conditions.

Air Quality

Dust will be controlled at the construction sites by use of appropriate methods, including the use of dump trucks to move soil out of the construction zone, and by covering temporary soil stockpiles. HMLP may also require contractors to place water trucks with misters in or near the work areas during construction activities.

Water trucks and street sweeping will be used in combination within the roadway construction areas. In addition, HMLP will direct its contractors to retrofit any diesel-powered non-road construction equipment rated 50 horsepower or above to be used for 30 or more days over the course of the Project with USEPA-verified (or equivalent) emission control devices (e.g., oxidation catalysts or other comparable technologies). HMLP uses ultra-low sulfur diesel ("ULSD") fuel in its own diesel-powered construction equipment. ULSD has a maximum sulfur content of 15 parts per million as opposed to low sulfur diesel fuel, which has a maximum sulfur content of 500 parts per million. By using ULSD fuel, there is a 97 percent reduction in the sulfur content as compared to low sulfur diesel fuel. HMLP will also require contractors to use ULSD fuel in their diesel-powered construction equipment used for this Project.

HMLP and its contractors will also comply with state law (G.L. c. 90, § 16A) and MassDEP regulations (310 CMR 7.11(1)(b)), which limit vehicle idling to no more than five minutes. There are exceptions for vehicles being serviced, vehicles making deliveries that need to keep their engines running and vehicles that need to run their engines to operate accessories. There may be other times when idling is permitted as long as the idling is absolutely necessary (e.g., as a matter of safety). Supervisors and foremen at job sites are responsible for enforcement of these rules.

Where work is proposed off-street, there will be installation of anti-tracking pads and regular sweeping of the pavement of adjacent roadway surfaces during the construction period to minimize the potential for construction traffic to kick up dust and particulate matter.

Construction Wastes

Waste materials generated along the route during installation of the transmission duct bank and manholes will be promptly removed and re-used or properly disposed of at a suitable facility. The largest quantity of construction waste will likely be from soils excavated for the duct trenches and manholes. This material will be removed from the trench and hauled to an appropriate off-site disposal/re-use location or to a temporary construction laydown area for on-site re-use. Concrete and asphalt will be recycled at a local asphalt plant.

In the event there are contaminated soil or other regulated materials encountered along the route, soils will be managed pursuant to the URAM provisions of the MCP. HMLP will contract with a licensed site professional ("LSP") as necessitated by conditions encountered along the Project alignment, consistent with the requirements of the MCP at 310 CMR 40.0460 et seq.

Dewatering Protocols

It is not uncommon to encounter groundwater during construction of underground utility facilities. If feasible based on site-specific conditions, the least costly method when dewatering will typically be to recharge the groundwater back into the adjacent subsurface. This can either be done by discharging back within the open excavation/trench associated with the project/pipe installation or discharging to the nearby ground surface via a filter bag or dewatering corral (if necessary) allowing groundwater to infiltrate back into the soil.

For situations where on-site recharge of groundwater is not an option and manageable (<50,000 gallons) amounts of groundwater are expected to be generated, a vacuum truck can be used to pump out and appropriately dispose/recycle groundwater encountered. Sampling of water will be required to ensure proper disposal/recycling.

For locations where large amounts (>50,000 gallons) of groundwater are encountered and on-site recharge and off-site disposal are not feasible options, discharging into the municipal stormwater and/or sewerage systems may be an option. However, this activity must be coordinated with the municipality and USEPA beforehand and would not occur without written consent from the municipality and the USEPA.

Coverage under the USEPA NPDES Dewatering and Remediation General Permit (DRGP) would be required for surface water discharges. Permits would also be required for discharges to sanitary sewers such as municipality and/or Massachusetts Water Resources Authority ("MWRA"). As Weymouth is part of the MWRA sewer service area, MWRA authorization would be required as well.

5.5 Land Use, Environmental and Cultural Resources Impacts Analysis

As construction will be underground in electric facility Right-of-way and municipal streets, there will be no permanent impacts to land use, environmental or cultural resources and the minor temporary impacts will be largely mitigated. Nevertheless, HMLP has performed a comparative analysis of adjacent land uses and environmental and cultural resources along the Preferred Route and the Noticed Alternative Route as presented below.

Categories of potential impacts considered include adjacent land use, traffic and transportation, wetlands and water resources, public shade trees, subsurface contamination, visual, electric and magnetic fields and noise. Potential cultural resource analysis considered both historic resources (i.e., above-ground buildings, structures, districts and objects) and archaeological resources (i.e., pre-contact and historic archaeological sites and areas).

5.5.1 Environmental Justice Considerations

As a municipal light plant, HMLP strives to be a thoughtful community partner. While HMLP's focus is on providing reliable electric services to the Town of Hingham, the Project requires infrastructure in both Weymouth and Hingham. The Project is proposed to cross EJ communities within Weymouth, therefore, HMLP considered project effects on EJ populations and provided meaningful opportunities for Weymouth residents, including members of EJ communities, to participate in the project siting process. As a project partner, Eversource has also focused outreach to provide meaningful opportunities for EJ populations to provide input on the Tap Station site.[26]

5.5.1.1 Background

In Massachusetts, "An Act Creating a Next Generation Roadmap for Massachusetts Climate Police" (c. 8 of the Acts of 2021) (the "Roadmap Act") brought new focus to environmental justice by defining environmental justice populations and environmental burden, and by charging agencies of the Commonwealth to meaningfully involve all people in decisions and policies and to consider the equitable distribution of environmental benefits and burdens. These EJ principles support protection from environmental pollution and the ability to live in and enjoy a clean and healthy environment, regardless of race, color, income, class, handicap, gender identity, sexual orientation, national origin, ethnicity or ancestry, religious belief or English language proficiency.

The EOEEA Environmental Justice Policy (updated June 24, 2021) charged EOEEA agencies to develop strategies for considering environmental justice in decisions and policies. HMLP and Eversource engaged in enhanced public outreach with intent to engage environmental justice populations and evaluate environmental burdens.

Figure 5-12 depicts the Preferred and Noticed Alternative Routes relative to environmental justice populations as defined by minority status, income status, English isolation, and/or combinations of these attributes, as defined by the Roadmap Act.

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[26] Notably, the Project does not trigger review under the Massachusetts Environmental Policy Act ("MEPA").

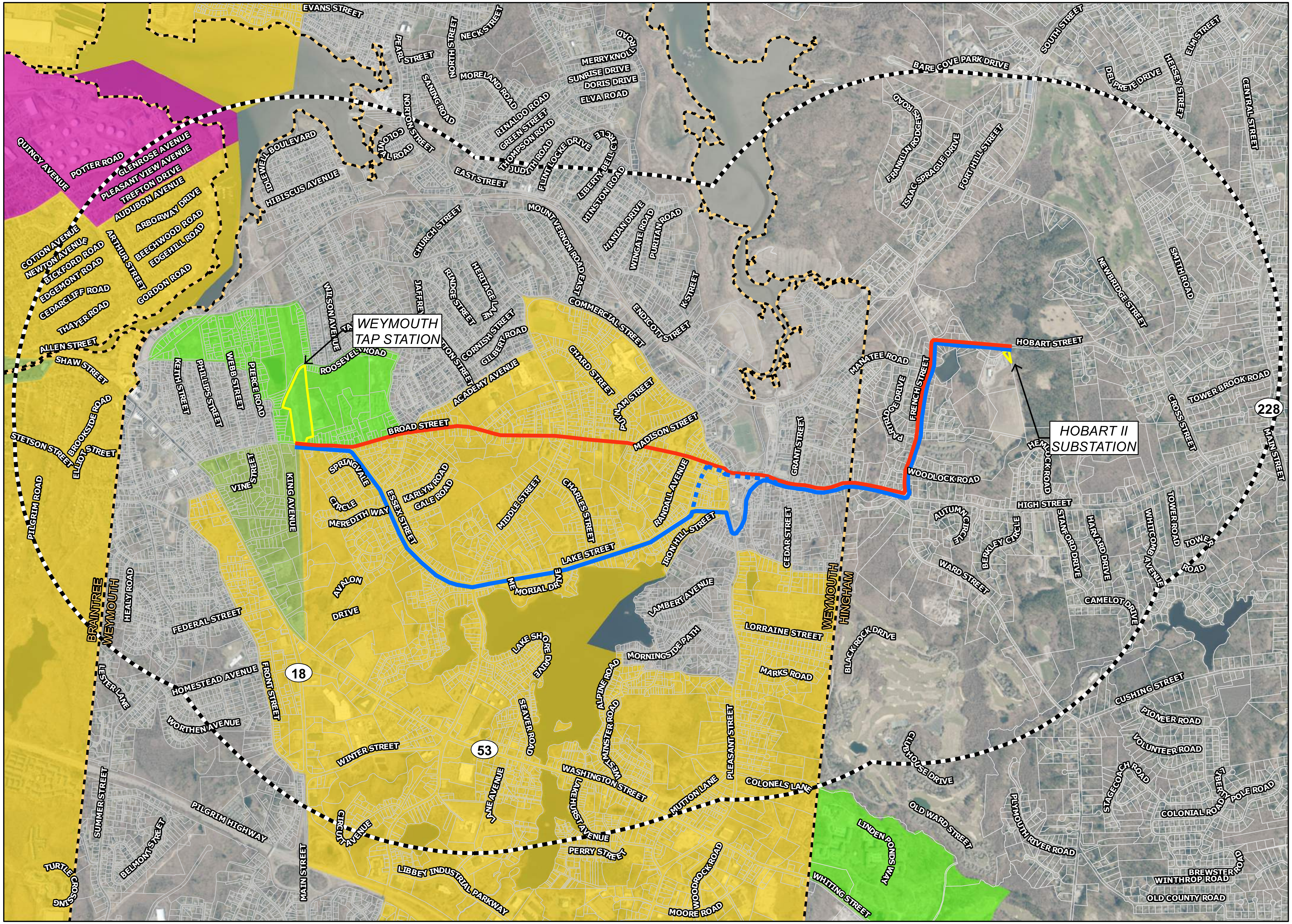


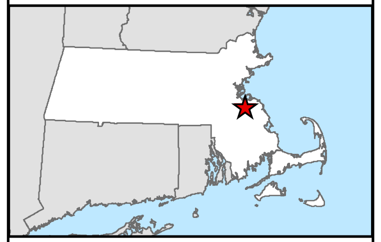
FIGURE 5-12
PREFERRED & NOTICED ALTERNATIVE ROUTES ENVIRONMENTAL JUSTICE

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
November 2024

LEGEND

- Broad Street (Preferred)
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- 1-Mile Radius
- Minority
- Income
- Minority and Income
- Minority and English isolation
- Tap/Substation Sites
- Parcel Boundary
- Town Boundary

LOCUS MAP



N

0 875 1,750
Feet
1:21,000

NOTES

1. Based on MassGIS Color Orthophotography (2023)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate,
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.
4. Environmental Justice data Provided by the Commonwealth of Massachusetts, MassGIS

Tighe&Bond

5.5.1.2 Public Participation

As discussed in Sections 1.7 and 4.1.5, HMLP held multiple open houses within Weymouth to provide opportunities to learn about the Project and to provide comments on the Project. Two open houses, on August 25, 2022 from 6PM to 8PM and September 13, 2022 from 5:00 PM to 7:00 PM, were held at the Tufts Library on Broad Street in Weymouth. The library is an accessible public space located in the vicinity of the Project. The August 25, 2022 open house was set up with stations where attendees could learn about different aspects of the project and talk with subject matter experts. Based on feedback from this session, the September 13, 2022 session included a presentation in addition to the information stations. Each open house was attended by 20 to 30 people. In addition, an open house was held in Hingham on September 28, 2022 from 6:00 PM to 8:00 PM, in which people from both Hingham and Weymouth were in attendance. A Zoom meeting was also held on October 13, 2022 at 7:00 PM to reach people in both Towns who were unable to attend in person.

In addition, Eversource hosted meetings in Weymouth at Union Towers I on January 25, 2024 from 12:00 PM to 1:00 PM and at Union Towers II on January 26, 2024 from 10:00 AM to 11:00 AM. These meetings were targeted to the Union Towers population. Union Towers was chosen as it provides affordable housing for the elderly and disabled. Approximately 25 people attended this event. Review of the Massachusetts EJ mapper – languages spoken map – indicates that there are no census tracts within one mile of the project where at least 5% of the population are speakers who report they do not speak English "very well". Eversource researched languages spoken within the Union Towers population, and provided a Cantonese interpreter on site that was utilized by seven residents. Materials were distributed in English and Traditional Chinese and were also made available in Spanish. The focus of these meetings was on the Tap Station, and HMLP representatives were in attendance to address questions and comments on the transmission line.

Eversource hosted an additional meeting on March 19, 2024 from 6:00 PM to 8:00 PM at the Crossroads Worship Center, which is located across Broad Street from the Tap Station site. Although Spanish and Portuguese interpreters were present, there were no interpretation needs identified in advance, and materials were available in English, Portuguese, Traditional Chinese and Spanish. The focus of this Open House was on the Tap Station, and HMLP representatives were in attendance to address questions and comments on the transmission line.

HMLP also contacted the EOEEA Office of Environmental Justice & Equity for a list of CBOs in the project area. A letter informing the CBOs of the project and offering to meet with representatives of the CBOs was mailed to each CBO in March 2023. No response was received.

Information on the project is also available on the HEIRP website (www.HEIRP.com). Project updates are posted on this site, and there is link on the website that people can use to provide feedback to HMLP. HMLP will continue to communicate status updates on the project, offering opportunities for public input throughout the siting, permitting and construction phases.

5.5.1.3 Assessment of Potential Impacts on Environmental Justice Communities

The proposed project involves the construction of a new tap station in Weymouth, a new substation in Hingham, and a 115kV transmission line linking the two stations. The Project does not generate energy, nor does it result in any industrial discharges. Again, it should be noted that the Project does not trigger review under MEPA. HMLP looked at several alternatives to the Project, as summarized in Section 3, and as there are no existing transmission lines for HMLP to tap into within Hingham, impacts to the neighboring Town of Weymouth are unavoidable. HMLP analyzed several sites for both the Weymouth Tap Station and Hobart II Substation, and chose locations that were adjacent to existing infrastructure and away from residences to minimize the environmental burden. The Weymouth Tap Station site is located in an area mapped as Environmental Justice for the income criteria. As noted previously, the site is adjacent to existing electrical transmission infrastructure and the Tap Station has been sited away from residences.

The new transmission line will be underground, and the primary impact of the project will be related to construction, similar to other underground infrastructure projects (e.g., water, sewer, stormwater). Underground infrastructure is prevalent throughout Massachusetts and within the project area. The purpose of the proposed project is to provide a reliable energy source to HMLP's customers. Due to the limitations of the existing electric grid locations, the transmission portion of the Project needs to cross Weymouth to reach Hingham. The Preferred and Noticed Alternative Routes both traverse areas mapped as Environmental Justice for minority populations in Weymouth. HMLP will minimize impacts and incorporate mitigation measures as noted above in Section 5.4 to address construction period impacts, including noise, air emissions, and traffic management.

In summary, the Project will not result in disparate impact to EJ populations. Potential impacts associated with the project are primarily related to temporary impacts associated with construction of the transmission line. These impacts will be the same for both EJ and non-EJ populations. HMLP has identified minimization and mitigation measures to address the anticipated unavoidable construction-phase impacts of the project. The Project will not have a disproportionately adverse human health or environmental impact to EJ populations in the Project Area.

5.5.2 Adjacent Land Use

Land use along the Preferred Route and Noticed Alternative Route was assessed using MassGIS 2016 Land Use data as well as MassGIS parcel data. Land use was tabulated in acres within approximately 100 feet of the edge of the existing roadway edge along each segment. Results are listed in Table 5-2 (Land Use within 100 feet Preferred Route and Noticed Alternative Route). MassGIS land-use data are also shown on Figures 5-3 and 5-6 for the Preferred Route and Noticed Alternative Route, respectively.

TABLE 5-2
Land Use within 100 Feet of Preferred and Noticed Alternative Routes

Land Use Type	Preferred Route (acres)	Noticed Alternative Route (acres)	Noticed Alternative Route – Variation (acres)
Commercial	6.64	4.01	3.96
Single-family Residential	28.04	36.03	35.54
Multi-family Residential	7.71	8.21	8.59
Open Land	7.34	7.04	7.55
Water	0.05	0.22	0.13
Right-of-Way	25.37	28.58	28.33
Tax-Exempt	2.55	4.71	3.75

Preferred Route

The dominant land use proximate to the Preferred Route is residential along the local streets, with approximately 35.75 acres of residential use within 100 feet of the route. There are approximately 604 residential units adjacent to the Preferred Route. The Preferred Route has approximately 63 adjacent commercial and/or industrial land uses. Additional land uses along Broad Street include forests and open land. The routing analysis in Section 4 considered proximity to sensitive receptors, defined as hospitals, police/fire stations, elder care facilities/nursing homes, schools, daycare facilities, places of worship, parkland, protected open space and funeral homes. There are 18 sensitive receptors located along the Preferred Route:

- Crossroads Worship Center
- Crossroads Enrichment Center
- Connel Rink and Pool
- Academy Avenue School Playground
- Clapp Memorial Park
- Weymouth Afterschool Stars
- Currie Daycare
- Weymouth Preschool Stars
- Weymouth Fire Department
- Immaculate Conception (Church)
- Weymouth United Methodist Church
- East Weymouth Congregational Church/South Shore Stars Weymouth Preschool
- Herring Run Park
- Herring Run Pool Park
- Lovell Field/Playground
- Zsigalov Daycare
- More-Brewer Park
- Brewer Reservation

Noticed Alternative Route

The dominant land use proximate to the Noticed Alternative Route is residential, with approximately 44.24 acres residential use within 100 feet of the route. There are approximately 878 residential units adjacent to the Noticed Alternative Route and 813 adjacent to the Noticed Alternative Route Variation. Additional land uses along Lake Street include forests and open land and commercial. The Noticed Alternative Route has approximately 22 adjacent commercial and/or industrial land uses. The Noticed Alternative Route Variation has approximately 38 adjacent commercial and/or industrial land uses.

There are ten sensitive receptors located along the Noticed Alternative Route:

- Crossroads Worship Center
- Crossroads Enrichment Center
- Humphrey Field
- Town of Weymouth Recreation
- Weymouth Youth and Family Services
- Herring Run Park
- Herring Run Pool Park
- More-Brewer Park
- Zsigalov Daycare
- Brewer Reservation

There are eleven sensitive receptors along the Noticed Alternative Route Variation:

- Crossroads Worship Center
- Crossroads Enrichment Center
- Currie Daycare
- Weymouth Preschool Stars
- Humphrey Field
- East Weymouth Congregational Church/ South Shore Stars Weymouth Preschool
- More-Brewer Park
- Herring Run Park
- Herring Run Pool Park
- Zsigalov Daycare
- Brewer Reservation

Comparison

The Preferred Route is shorter and is adjacent to more commercial and industrial uses than the Noticed Alternative Route. The Noticed Alternative Route (and variation) is adjacent to more residential uses, including affordable housing developments. The Preferred Route has fewer residences and, as the route length is shorter, the duration and extent of transmission line construction near sensitive receptors and residences will be less, the Preferred Route is superior to the Noticed Alternative for this criterion.

Impact Mitigation

The potential for the Preferred Route or Notice Alternative Route (and variation) to affect adjacent land use is limited. There are no permanent changes to land use associated with construction of the transmission line along either route. Temporary impacts to residences, businesses and sensitive receptors may include traffic disruption, including roadway lane closures and construction noise and air quality impacts. Construction hours will be limited in the vicinity of schools and proper construction best management practices ("BMPs") will be in place to reduce traffic, noise and air quality impacts.

5.5.3 Traffic and Transportation Impacts

This section evaluates the potential for impacts to traffic, parking and public transportation along the Preferred Route and Noticed Alternative Route. Traffic impacts associated with the underground work in public roads will be temporary in nature and confined to the period necessary to construct the Project. A variety of mitigation measures will be used to minimize traffic disruption during construction. Implementation of a well-designed Traffic Management Plan ("TMP") will reduce the potential for inconvenience to drivers and those using public transportation, as well as any potential secondary effects on local businesses. Access to local businesses and residences will be maintained throughout Project construction.

To compare potential traffic impacts of the Preferred Route and Noticed Alternative Route, HMLP reviewed existing traffic and parking conditions, roadway widths, travel lanes, and the presence of public bus service along each route, as well as the options for traffic mitigation along each route.

Preferred Route

The total length of the Preferred Route is approximately 3.2 miles, the majority of which is located within public roads. The majority of the roads comprising the Preferred Route can generally be described as medium volume roads with a mix of functional classifications of minor arterials and major collectors and are all classified as two-way vehicular flow. The roads are all two-way roads and would require a combination of lane shifts and road closures/detours. High Street and Broad Street are functionally classified as Minor Arterial Roads, and French Street and Hobart Street are functionally classified as Major Collector Roads.

MBTA Bus Route 222 (East Weymouth – Quincy Center Station) coincides with the Preferred Route along Broad Street and High Street; there are eighteen bus stops along the Preferred Route portion of Broad Street.

Work within areas of traffic congestion or near certain sensitive receptors will be managed to minimize construction related impacts. A TMP will be prepared and will include active and passive traffic management measures, including the use of police details. Night work typically is implemented in areas that have the following characteristics: (1) the segment experiences high traffic volumes and congestion during the day; (2) the adjacent land uses are primarily commercial and/or industrial; and/or (3) the municipality has required HMLP to construct at night. The primary advantage of night work is that it can minimize traffic congestion by avoiding hours of peak traffic volumes and avoiding potential business interruptions. The Towns may request night work to alleviate traffic impacts. Any such work outside of typical construction hours will be closely coordinated with local officials and any necessary local authorizations will be sought by HMLP.

TABLE 5-3
Preferred Route Road Segments

Segment	Approximate Average Road Width (feet)	Existing Traffic and Parking	Public Transportation Route	Daily Traffic Volume*
Broad Street	40	• Sidewalks on both sides • On street parking on both sides	Yes	9,031
High Street	25	• Sidewalk on one side • No on street parking	Yes	7,946
French Street	25	• Sidewalk on one side • No on street parking	No	5,000
Hobart Street	25	• Sidewalk on one side • No on street parking	No	5,000

* Daily Traffic Volume obtained from publicly available resources. In the absence of available data, local streets, major collectors, and minor arterials were assigned 2,000, 5,000, and 7,500 vehicles per day, respectively.

Noticed Alternative Route

The total length of the Noticed Alternative Route is 3.7 miles, all of which is located in public roads. The majority of the roads comprising the Noticed Alternative Route can generally be described as low to medium volume local roads. As with the Preferred Route, the roads are all two-way roads and would require a combination of lane shifts and road closures/detours. Essex Street, French Street, Hobart Street and Spring Street are functionally classified as Major Collector Roads, Broad Street and High Street are functionally classified as Minor Arterial Roads and Lake Street and Shawmut Street are functionally classified as Local Roads. MBTA Bus Route 222 (East Weymouth – Quincy Center Station) includes eleven stops along the Noticed Alternative Route.

Work within areas of traffic congestion or near certain sensitive receptors would be managed to minimize impacts to traffic and disturbances affecting nearby residences and businesses. A TMP would be prepared and would include active and passive traffic management measures, including the use of police details.

TABLE 5-4
Noticed Alternative Route Road Segments

Segment	Approximate Average Road Width (feet)	Existing Traffic and Parking	Public Transportation Route	Daily Traffic Volume*
Broad Street	40	• Sidewalks on both sides • On street parking on both sides	Yes	9,031
Spring Street	25	• Sidewalks on both sides • No on street parking	No	4,601
Essex Street	30	• Sidewalk on one side • No on street parking	No	4,601
Lake Street	30	• Sidewalk on one side • No on street parking	No	4,601
Shawmut Street	20	• Sidewalks on both sides • One side with on street parking	No	4,601
Pleasant Street	35	• Sidewalks on both sides • No on street parking	No	13,458
Water Street	30	• Sidewalks on both sides • No on street parking	No	4,830
High Street	25	• Sidewalk on one side • No on street parking	Yes	7,946
French Street	25	• Sidewalk on one side • No on street parking	No	5,000
Hobart Street	25	• Sidewalk on one side • No on street parking	No	5,000

* Daily Traffic Volume obtained from publicly available resources. In the absence of available data, local streets, major collectors, and minor arterials were assigned 2,000, 5,000, and 7,500 vehicles per day, respectively.

Comparison

In order to compare traffic impacts along the Preferred Route and Noticed Alternative Route, HMLP assessed a number of indicators of potential traffic congestion as described above. Based on the route evaluation and scoring analysis provided in Section 4 of the Analysis (see Table 4-5), the Noticed Alternative Route scored more favorably for transportation impacts than the Preferred Route, primarily due to the higher volume of traffic on Broad Street and the number of bus stops on Broad Street.

Each route would require implementation of TMPs and close coordination with the Towns of Hingham and Weymouth to ensure that traffic delays are minimized. Traffic management measures, including use of police details and implementation of detours and lane closures, would be required regardless of the route selected. While the Noticed Alternative Route scored more favorably in the transportation impact criteria than the Preferred Route for the routing analysis, the Broad Street route would provide greater flexibility for transportation management options than the Lake Street route due to the greater width of Broad Street.

HMLP is committed to mitigating traffic impacts to the fullest extent possible along either route.

Impact Mitigation

Upon completion of the detailed design work and prior to the start of construction, HMLP will work closely with the Towns of Weymouth and Hingham to develop a TMP. Topics to be addressed in the TMP will include:

- Width and lane location of the work zone to minimize impacts to vehicular traffic;
- Work schedule and duration of lane closures, road closures, or detours (where applicable);
- The use of traffic-control devices such as barricades, reflective barriers, advance warning signs, traffic regulation signs, traffic-control drums, flashers, detour signs, and other protective devices to be placed as shown on plans and as approved by the Towns of Hingham and Weymouth;
- Locations where temporary provisions may be made to maintain access to homes and businesses;
- Routing and protection of pedestrian and bicycle traffic;
- Maintenance of MBTA service and school bus service;
- Communication with adjacent businesses, so critical product deliveries are not interrupted by construction;
- Notification to municipal officials, local businesses, and the public of the timing and duration of closed curbside parking spaces and travel way restrictions; and
- Coordination between HMLP and police and fire departments to ensure that emergency access through the route be provided at all times. In most cases, travel past the work zone will be open to one-way alternating travel under police control. In this circumstance, the police officer(s) will stop all traffic, thereby providing passage of the emergency vehicle. In the rare instance that a roadway is closed temporarily to traffic, emergency vehicles would still be permitted to pass through the work zone as all construction activity would cease temporarily and a section of roadway would be cleared of all contractor vehicles and equipment.

The scope of the TMP will include analysis of the roads affected by the transmission line construction. The TMP will be submitted for review and approval by appropriate municipal authorities prior to construction. Traffic-control plans will be developed consistent with the FHWA Manual of Uniform Traffic Control Devices for Streets and Highways and the MassDOT publication, "Work Zone Safety". HMLP will also closely coordinate with local officials and abutting property owners.

5.5.4 Wetlands and Water Resources

Wetland and water resources include river crossings, wetland crossings, riverfront area and Chapter 91 jurisdiction limits. As described in Section 4 of the Analysis, the evaluation of the wetland resource areas criterion involved reviewing MassGIS databases and conducting field reconnaissance to determine the number of resource areas the routes would cross. The evaluation of wetland crossings involved reviewing MassGIS data and conducting field reconnaissance to determine the number of local- and state-regulated resource areas, as defined in the Massachusetts Wetlands Protection Act (MWPA) regulations (310 CMR 10.00 et seq.), including BVW and Bank and their associated 100-foot buffers, Bordering Land Subject to Flooding (BLSF, 100-year floodplain) and 200-foot Riverfront Area, that the proposed routes would cross. The evaluation of Chapter 91 jurisdictional areas involved reviewing MassGIS data layers developed under Chapter 91, using a combination of contemporary high water, historic high water and landlocked tidelands to form the landward and seaward boundaries of landlocked tidelands. No Chapter 91 jurisdictional areas are within the Preferred Route or Noticed Alternative Route.

Preferred Route

Table 5-5 summarizes the wetland resource areas and stream crossings associated with the Preferred Route.

TABLE 5-5
Wetland Resource Areas Crossed by the Preferred Route

Wetland Resource Area	Preferred Route
Linear Feet ("lf") within 100-foot Buffer Zone	~2,700 lf
Waterbody Crossing	Herring Run Brook 3 unnamed stream/culvert crossings
Square Feet within Riverfront Area (assumes ~8-foot-wide trench)	6,400 sf*
Square Feet within 100 Year Floodplain/BLSF (assumes ~8-foot-wide trench)	800 sf

* Note that minor activities in Buffer Zone and Riverfront Area are exempt from filing under the Wetlands Protection Act and include, per 310 CMR 10.02(2)(b)(2)i., Installation of underground utilities (e.g., electric, gas, water) within existing paved or unpaved roadways and private roadways/driveways, provided that all work is conducted within the roadway or driveway and that all trenches are closed at the completion of each workday.

Anticipated wetlands-related permitting includes an Order of Conditions from the Hingham and Weymouth Conservation Commission. HMLP is proposing to cross the Herring Run Brook through HDD technology to minimize impacts to this resource.

Given that the underground cable construction associated with the Preferred Route is anticipated to occur within existing paved roadways and disturbed rights of way, no permanent impacts to wetlands or streams are anticipated.

Noticed Alternative Route

Table 5-6 summarizes the wetland resource areas and stream crossings associated with the Noticed Alternative Route.

TABLE 5-6
Wetland Resource Areas Crossed by the Noticed Alternative Route

Wetland Resource Area	Preferred Route
Linear Feet ("lf") within 100-foot Buffer Zone	~2,850 lf
Square Feet within 100 Year Floodplain/BLSF (assumes ~8-foot-wide trench)	800 sf
Waterbody Crossing	Herring Run Brook 2 unnamed stream/culvert crossings
Square Feet within Riverfront Area (assumes ~8-foot-wide trench)	17,600 sf *
Linear Feet within the watershed to an ORW	6,700 lf

* Note that minor activities in Buffer Zone and Riverfront Area are exempt from filing under the Wetlands Protection Act and include, per 310 CMR 10.02(2)(b)(2)i., Installation of underground utilities (e.g., electric, gas, water) within existing paved or unpaved roadways and private roadways/driveways, provided that all work is conducted within the roadway or driveway and that all trenches are closed at the completion of each workday.

Anticipated wetlands-related permitting includes an Order of Conditions from the Hingham and Weymouth Conservation Commission. As noted above, HMLP is proposing to cross the Herring Run Brook through HDD technology to minimize impacts to this resource.

Given that the underground cable construction associated with the Noticed Alternative Route is anticipated to occur within existing paved roadways and disturbed rights of way, no permanent impacts to wetlands or streams are anticipated.

Comparison

Both the Preferred Route and Noticed Alternative Route will include crossings of work within jurisdictional wetland and water resources, the temporary impacts are minor and there will be no permanent impacts. The Noticed Alternative Route is within the vicinity of Whitman Pond, which is an Emergency Surface Water Supply for the Town of Weymouth. The wetland resource areas along the Preferred Route and Noticed Alternative Route consist of roadway rights-of-way and existing culverts, and therefore, the Preferred Route and Noticed Alternative Route will not alter the values of the resource areas. Moreover, all of the activities proposed in wetland and water resource areas and buffer zones can be designed to conform to applicable local, state and Federal wetlands regulatory programs. The Preferred Route is superior to the Noticed Alternative Route for this criterion due to less impacts within Riverfront Area.

Impact Mitigation

The potential impacts are limited, as noted above, and are within the footprint of previously disturbed areas. Neither underground route in public roads requires any filling or clearing within wetlands. The project proposes to avoid and minimize impacts to the Herring Run Brook and its associated 100-foot floodplain (BLSF) by using HDD construction to install the new transmission line beneath the Herring Run Brook. Given that the vast majority of underground cable construction is anticipated to occur within existing paved roadways, no permanent impacts to wetlands or streams are anticipated. To address the potential for erosion and sedimentation within wetland resource areas, a

SWPPP will be prepared for the Project that will specify erosion control measures to be implemented.

5.5.5 Public Shade Trees

M.G.L. Chapter 87 defines public shade trees as all trees within a public way or within the boundaries thereof. A field reconnaissance was conducted to count all trees within the public way along the route regardless of diameter at breast height or distance from the proposed cable trench, as described in Section 4 of the Analysis. As is typical for this mostly residential environment, the canopies of certain trees on the Preferred Route and the Noticed Alternative Route extend out over the road. Construction proposed in paved roadways is not anticipated to require the removal of any trees along either the Preferred Route or the Noticed Alternative Route. No permanent impacts to public shade trees are proposed, however potential temporary impacts include trimming of branches and exposure or cutting of roots.

Preferred Route

There are 27 public shade trees within the public way associated with the Preferred Route. No permanent impacts to public shade trees are anticipated to be required as part of the installation of the underground transmission line within the Preferred Route.

Noticed Alternative Route

There are 33 public shade trees within the public way associated with the Noticed Alternative Route and 34 public shade trees associated with the variation. No permanent impacts to public shade trees are anticipated to be required as part of the installation of the underground transmission line within the Noticed Alternative Route.

Comparison

As noted below, HMLP anticipates coordination with Weymouth and Hingham Tree Wardens regarding public shade tree protection and replacement where required. Due to both the Preferred Route and the Noticed Alternative Route and variation having a similar number of public shade trees, HMLP determined the routes were comparable for this criterion.

Impact Mitigation

Typical mitigation measures to protect public shade trees along the underground route segments include:

- Prior to construction, HMLP will meet with the local Tree Wardens to confirm the location and condition of public shade trees and other trees along the route relative to construction work areas. HMLP will review BMPs and finalize a monitoring and mitigation plan for the protection of public shade trees and applicable regulated trees during construction.

- Where trees are encountered within 15 feet of trench edges, they will be protected from bark and limb damage by surrounding them with wire-bound 2x4 lumber to an appropriate height depending on the particular tree. Alternative tree protection may be used if accepted in advance by the property owner(s). Where tree roots are encountered during excavation, mechanical excavation will cease, roots will be exposed by hand (to the least extent possible, see discussion below), and will be kept moist and covered with wet burlap or plastic throughout the exposure period. Thermal backfill will be placed in the trench in a manner to avoid impacting tree roots.

- Erect and maintain a temporary fence around the perimeter of individual tree pits (typically the area between the curb and sidewalk where the tree resides). The temporary fence will remain in place for the duration of construction and will serve to: prohibit the storage of construction materials, debris, or excavated material within tree pit area or on any sidewalks; and prohibit vehicles, equipment or foot traffic within tree pit area. Although unlikely, if excavation is required within the tree pit area and/or sidewalk, the Tree Wardens will be contacted before any work begins. The Tree Wardens will determine whether the contractor on site may commence with the work, or if a qualified arborist must be hired to conduct root pruning. If permission is granted to the contractor to commence with root pruning, the following practices will be implemented: (1) narrow-tine spading forks or compressed air will be used to comb soil to expose roots; (2) roots will be cut cleanly after excavation with clean, sharp tools, to promote callus formation and wound closure; (3) tree rooting will be dressed with a hormone compound; and (4) the excavation will be backfilled as soon as possible and the soil around the roots will be watered to avoid leaving air pockets. If backfilling immediately is not possible, the exposed roots will be covered with wet burlap and watered regularly to prevent roots from drying out, and backfilling with soil will occur as soon as possible.

- Trees and vegetation will be replaced in a manner approved by the Tree Wardens.

5.5.6 Subsurface Contamination

Subsurface excavation associated with the Project has the potential to encounter contaminated soils from historical releases and/or urban fill in the vicinity of both the Preferred Route and Noticed Alternative Route. A review of the MassDEP waste site list on-line database was performed to determine the potential to encounter subsurface contamination along each route at listed sites. The online database was used to collect and review information on MassDEP-listed sites (sites issued an RTN) directly abutting the routes.

Preferred Route

There are four (4) Tier classified sites, including one (1) site with an AUL within 500 feet of the Preferred Route, as described in Table 5-7.

TABLE 5-7
MassDEP-Listed Sites within 500 Feet of the Preferred Route

RTN	Location	Description/Status
4-0029718	890 Broad Street, Weymouth	Tier 2
4-3004101/4-3020961	565 Broad Street, Weymouth	Tier 1D/AUL
4-3001301	406 Broad Street, Weymouth	Tier 1D
4-0297219/4-0029719	1409 Commercial Street, Weymouth	Tier 1D/2

Noticed Alternative Route

There are two (2) Tier classified sites and two (2) sites with AULs within 500 feet of the Noticed Alternative Route, as described in Table 5-8.

TABLE 5-8
MassDEP-Listed Sites within 500 Feet of the Noticed Alternative Route

RTN	Location	Description/Status
4-3001301	406 Broad Street, Weymouth	Tier 1D
4-0297219/4-0029719	1409 Commercial Street, Weymouth	Tier 1D/2
4-0020187	PARCEL 22-200-38, Randall Avenue, Weymouth	RAO A3/AUL
4-3002295	Gasoline Station, 1305 Pleasant Street, Weymouth	RAO B2/AUL

The variation also is within proximity to RTN 4-0029718, 890 Broad Street, which is a Tier 2 site

Comparison

The Preferred Route and Noticed Alternative Route are within 500 feet of four sites that could impact subsurface contamination. The routes are equivalent for this criterion.

Impact Mitigation

If contaminated soils are encountered, they will be managed pursuant to URAM provisions of the MCP. HMLP will prepare a soil and groundwater management plan, and will contract with an LSP as necessitated by conditions encountered along the Project alignment, consistent with the requirements of the MCP at 310 CMR 40.0460 et seq. All excess soil will be managed in accordance with local, State and Federal regulations.

5.5.7 Visual Assessment

Because the transmission line portion of the Project is underground, the only potential permanent visual impacts associated with the transmission line are those associated with vegetation clearing. As noted below, minimal impact to vegetation is proposed.

Preferred Route

Visual impacts associated with the Preferred Route are anticipated to be minimal, as no public shade trees are anticipated to be directly impacted by the installation of the underground transmission line within the existing paved roadways of the Preferred Route.

Noticed Alternative Route

Visual impacts associated with the Noticed Alternative Route are anticipated to be minimal, as no public shade trees are anticipated to be directly impacted by the installation of the underground transmission line within the existing paved roadways of the Noticed Alternative Route.

Comparison

Because the potential for visual impact on both routes relative to underground line construction is similar, HMLP determined the routes were comparable for this criterion.

Impact Mitigation

As described in Section 5.4.4, HMLP anticipates coordination with the local Tree Wardens regarding public shade tree protection and replacement where required.

5.5.8 Electric and Magnetic Fields

As noted above, the term EMF is used to describe fields created by electric voltage (electric fields) and electric current (magnetic fields). An electric field is present whenever voltage exists on an object and is not dependent on current. Similarly, a magnetic field is present whenever current flows in a conductor and is not dependent on voltage. When an object has voltage and carries current, it produces both an electric and magnetic field.

HMLP, like all North American electric utilities, supplies electricity at 60 Hz (60 cycles per second). Therefore, the electric utility system, and the equipment connected to it, produce 60-Hz (power-frequency) EMF.

Preferred Route

HMLP modeled EMF levels associated with the proposed transmission facilities at sections representative of the post-Project circuit configurations under average annual loading conditions and anticipated system peak loading conditions. The FIELDS computer program, designed by Southern California Edison, was utilized to calculate MF strengths from the Project's underground 115kV transmission line. This program operates using Maxwell's equations, which accurately apply the laws of physics as related to electricity and magnetism (EPRI, 1982, 1993). Modeled fields using this program are both precise and accurate for the input data utilized. Results of the model have been checked extensively against each other and against other software (e.g., CORONA, from the Bonneville Power Administration, US Department of Energy) to ensure that the implementation of the laws of physics are consistent. In these validation tests, program results for MF levels were found to be in very good agreement with each other (Mamishev and Russell, 1995). These methods have been shown to accurately predict EMF levels measured near transmission lines. The EMF levels were calculated at one meter (3.28 feet) above ground, in accordance with standard protocol. The EMF Report is included as Appendix 5-3.

MF modeling was performed by Gradient for four representative Project underground line cross sections.

The HDD bore installation case is to be used for installing the Project cables beneath Herring Run Brook in Weymouth. This installation case was found to have the lowest peak aboveground MF levels directly above the circuit centerline due to the greater burial depth (minimum of four feet beneath the ground surface). Some concerns have been raised regarding potential impacts of magnetic fields from the Project underground cables on river herring (alewife and blueback herring) during their annual migration to upstream spawning grounds via Herring Run Brook. However, it is not established that river herring are either magnetosensitve or rely at all on the earth's geomagnetic field to navigate to their spawning grounds. For example, the Naisbett-Jones and Lohmann (2022) review paper on magnetoreception and magnetic navigation in fish included no references to river herring as being among the fish species for which there is evidence of magnetoreception. For example, peer-reviewed journal articles and governmental reports focused on river herring and their migration (*e.g*., Yako *et al*., 2002; Greene *et al*., 2009; Legett *et al*., 2021) make no reference to magnetic fields, such as the earth's geomagnetic field, as being among the potential environmental cues involved in the mechanism of migration. Greene *et al*. (2009) specifically pointed to olfaction as the "primary means for homing behavior" for the alewife herring species. NOAA (2007) referred to changing water temperatures as an initiator of seasonal migrations for alewife herring.

Regardless, even if river herring are in fact magnetosensitive and use the earth's geomagnetic field for navigation/migration purposes, the Project 60-Hz AC cables will generate time-varying AC magnetic fields that differ from the earth's static (*i.e*., steady, 0 Hz) geomagnetic field. It is not established that magnetosensitive marine species, such as salmon, eels, and sharks, which are believed to utilize the earth's steady geomagnetic field for navigation and orientation purposes, can detect and respond to 60-Hz AC magnetic fields (CSA Ocean Sciences Inc. and Exponent, 2019). Notwithstanding the difference between 60-Hz AC magnetic fields and steady (0 Hz) magnetic fields, there is also an absence of scientific evidence that magnetic field fluctuations could serve as major barriers to migration. For example, for Chinook salmon smolts and adult green sturgeon that have been reported to orient to magnetic fields and that thus may use them as a guide for migration, Klimley *et al*. (2017) reported that the large anomalies in steady magnetic fields produced by bridges were not found to present major barriers to the migration of these fish species in the San Francisco Estuary.

The calculated magnetic fields are found in Tables 5-9 and 5-10.

Table 5-9
Modeled Magnetic Fields at 1 Meter Aboveground for Representative Project Underground Line Cross Sections: Annual Average Load Levels

Cross Section	Predicted Resultant Magnetic Field (mG)			
	Maximum Directly Above Circuit Centerline	**±10 ft from Circuit Centerline**	**±25 ft from Circuit Centerline**	**±50 ft from Circuit Centerline**
Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches	14.3	5.1	1.1	0.3
Horizontal Conductor Configuration for Flat Trenches	23.6	7.5	1.6	0.4
Vertical Conductor Configuration for Manhole Approaches	31.9	14.1	3.7	1.0
HDD Bore Conductor Configuration	13.2	5.4	1.3	0.4

Notes:
ft = Feet; HDD = horizontal directional drilling; mG = Milligauss.

Table 5-10
Modeled Magnetic Fields at 1 Meter Aboveground for Representative Project Underground Line Cross Sections: System Peak Load Levels

Cross Section	Predicted Resultant Magnetic Field (mG)			
	Maximum Directly Above Circuit Centerline	**±10 ft from Circuit Centerline**	**±25 ft from Circuit Centerline**	**±50 ft from Circuit Centerline**
Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches	35.5	12.5	2.8	0.8
Horizontal Conductor Configuration for Flat Trenches	58.5	18.6	4.0	1.1
Vertical Conductor Configuration for Manhole Approaches	78.9	34.8	9.1	2.5
HDD Bore Conductor Configuration	32.6	13.4	3.3	0.9

Notes:
ft = Feet; HDD = horizontal directional drilling; mG = Milligauss.

The reference levels for whole body exposure by the general public to 60-Hz fields is summarized in the following table:

TABLE 5-11
60-Hz AC EMF Guidelines Established by International Health and Safety Organizations

Organization	Electric Field	Magnetic Field
American Conference of Governmental and Industrial Hygienists (ACGIH) (occupational)	25 kV/m(1)	10,000 mG(1) 1,000 mG(2)
International Commission on Non-Ionizing Radiation Protection (ICNIRP) (general public)	4.2 kV/m(3)	2,000 mG(3)
International Commission on Non-Ionizing Radiation Protection (ICNIRP) (occupational)	8.3 kV/m(3)	10,000 mG(3)
Institute of Electrical and Electronics Engineers (IEEE) Standard C95.1™-2019 (general public)	5.0 kV/m(4)	9,040 mG(4)
Institute of Electrical and Electronics Engineers (IEEE) Standard C95.1™-2019 (occupational)	20.0 kV/m(4)	27,100 mG(4)

Notes:
AC = Alternating Current; EMF = Electric and Magnetic Field; Hz = Hertz; kV/m = Kilovolts per Meter; mG = Milligauss.
(1) The ACGIH guidelines for the general worker (ACGIH, 2023).
(2) The ACGIH guideline for workers with cardiac pacemakers (ACGIH, 2023).
(3) ICNIRP (2010).
(4) IEEE (2019); developed by the IEEE International Committee on Electromagnetic Safety (ICES).

The MF modeling analysis showed that all modeled post-Project MF values for each representative cross section at both annual average and system peak load levels, including directly above the circuit centerlines, are well below the ICNIRP health-based guideline of 2,000 mG for allowable public exposure to 60-Hz AC magnetic fields (ICNIRP, 2010). This is the case despite a conservative modeling approach that did not consider the small reductions in magnetic fields from the induced GCC currents. In all cases, aboveground MF values dropped off rapidly with increasing lateral distance from the circuit centerlines (*e.g.*, 88-93% reductions at lateral distances of ±25 ft from circuit centerlines), such that aboveground MF levels decreased to negligible levels at short distances beyond the trenches.

In addition, MFs for the HDD bore installation case where the Project 115kV underground circuit will cross beneath Herring Run Brook in Weymouth are not expected to impact the annual migration of river herring to their upstream spawning grounds.

Noticed Alternative Route and Variation

The EMF levels for the Noticed Alternative and Variation would be the same as the Preferred Route.

Comparison

The anticipated EMF levels for both routes are equivalent.

5.5.9 Noise Impacts

Noise impacts associated with the proposed transmission line are limited to temporary construction noise. As discussed in Section 5.3.1, there are four principal phases of construction for underground cable projects within the streets conducted in sequence at each location. Work for the transmission line will take place over an approximately 24-month period.

Several phases of construction will likely be ongoing simultaneously along various sections of the route, such as: manhole placement, roadway cutting, excavation of fill, conduit placement, and backfilling and temporary paving. During later portions of the Project, cable pulling and splicing (electrical) phases may overlap with ongoing civil construction activities.

The potential for noise impacts from Project construction is a function of the specific receptors along the route as well as the equipment used and proposed hours of operation. Construction is anticipated to occur during typical work hours, though in specific instances, at some locations, or at the request of the Towns, HMLP may seek municipal approval to work at night.

Transmission line construction will generate noise levels that are periodically audible along the Project route, at conductor pulling sites, and at staging areas. The construction equipment to be used will be similar to that used during typical public works projects (e.g., road resurfacing, storm sewer installation, water line installation). In general, the sound levels from construction activity will be dominated by the loudest piece of equipment operating at the time. Therefore, at any given Project location, the loudest piece of equipment will be the most representative of the expected sound levels in the area.

Maximum sound levels from typical equipment that will be used during construction of the underground cable are listed in Table 5-12 at a reference distance of 50 feet.[27] The sound levels provided are the calculated contribution from the construction equipment/activities based on approximations of sound propagation.

Construction equipment proximity to noise-sensitive land uses will vary along the transmission line routes. Because sound levels from a point source drop off due to geometric divergence (hemispherical spreading) at a rate of 6 dB per doubling of distance, the reference sound levels at 50 feet will decrease by 6 decibels ("dBA") for locations 100 feet back from the edge of construction. For example, maximum excavator sound levels at 100 feet would be expected to be approximately 75 dBA. In a more urbanized area, setbacks may be only 25 feet from construction activity, thus increasing the sound levels from each piece of equipment by 6 dBA. For example, an excavator at 25 feet would be expected to produce a maximum sound level of 87 dBA.

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[27] A typical sound level distance of 50-feet from residences, businesses and sensitive receptors is provided herein for discussion purposes as HMLP has not yet identified the locations of the proposed duct bank, manholes and splicing locations within the public road alignments. The locations of these activities and structures relative to residences and sensitive receptors will be determined during the detailed design process.

TABLE 5-12
Reference Sound Levels of Construction Equipment at 50 feet

Activity	Type of Equipment	Typical Sound Levels dBA at 50 feet[1, 2]	Familiar Sounds with Similar Noise Levels[3]
Trench Excavation, Pile Install and Pavement Patching	Pavement Saw	90	Firecrackers: 100 Lawn Mower: 90 Hair Dryer: 80 Freeway Traffic: 70 Air Conditioning: 60
	Pneumatic Hammer	85	
	Mounted Impact Hammer (hoe ram)	89	
	Excavator	81	
	Dump Truck	76	
	Pipe Crane	81	
	Welding Machine/Generator	81	
	Concrete Batch Truck	79	
Manhole Installation	Pavement Saw	90	
	Excavator	81	
	Manhole Crane	81	
	Dump Truck	76	
	Asphalt Paver	77	
Cable Pulling, Splicing and Testing	Generator	81	
	Splicing Van	75	
Final Pavement Restoration	Asphalt Paver	77	

Source:
https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook00.cfm
Washington State DOT Biological Assessment Preparation Manual:
https://wsdot.wa.gov/sites/default/files/2021-10/Env-FW-BA_ManualCH07.pdf

Construction equipment is generally not operated continuously, with significant variation in power and usage. Sound levels would fluctuate, depending on the construction activity, equipment type and separation distances between source and receiver. Other factors, such as vegetation, terrain and noise attenuating features, such as buildings, will act to further reduce construction noise levels. Construction activities, including cable installation and testing, are described in detail in Section 5.3.

Noise impacts are regulated by the Town of Hingham Noise Control By-law as well as by MassDEP. Under the local regulations, construction is limited to the hours 7:00 AM to 7:00 PM, Monday through Friday and 8:00 AM to 7:00 PM on Saturday and Sunday, unless a permit is obtained from the Enforcement Official, which includes the Chief of Police or any Town board, department, or official having regulatory authority over Construction activity. Should off-hours construction be required, HMLP will seek a permit. Daytime and nighttime noise impacts from the proposed Project and anticipated equipment installations are predicted to fully comply with the applicable Town of Hingham Noise Control By-law and MassDEP Air Pollution Control (310 CMR 7.00) and noise policy when compared to measured background sound levels at the closest sensitive receptor locations.

Preferred Route

Sensitive receptors along the Preferred Route include park/recreation facilities, medical facilities, a school, and places of worship. In general, the area along the Preferred Route has a greater number of sensitive receptors, but a lower density of residences than the Noticed Alternative Route. Daytime and nighttime noise impacts from the proposed Project and anticipated equipment installations are predicted to comply with the applicable Town of Hingham Noise Control By-law, MassDEP Air Pollution Control (310 CMR 7.00) and MassDEP noise policy when compared to measured background sound levels at the closest sensitive receptor locations. Should off-hours construction be required, HMLP will seek required permits. Town of Weymouth officials will also be consulted about construction practices and noise reduction strategies.

Noticed Alternative Route

The Noticed Alternative Route generally has a higher density of residential uses than the Preferred Route, however the Noticed Alternative Route does have slightly fewer sensitive receptors than the Preferred Route. As with the Preferred Route, noise impacts are predicted to comply with the applicable Town of Hingham Noise Control By-law, MassDEP Air Pollution Control (310 CMR 7.00) and MassDEP noise policy when compared to measured background sound levels at the closest sensitive receptor locations. Should off-hours construction be required, HMLP will seek required permits. Town of Weymouth officials will also be consulted about construction practices and noise reduction strategies. However, the degree of construction-related noise generated by the Project is anticipated to be similar for both the Noticed Alternative Route and the Preferred Route, and potential impacts from noise are anticipated to be temporary in nature.

Comparison

The level of construction-related noise associated with underground line construction would be similar along most of the Preferred Route and the Noticed Alternative Route. HMLP determined that the Preferred Route is superior to the Noticed Alternative Route from a construction noise perspective because it will be incrementally less impactful and because the Preferred Route is adjacent to more commercial, industrial and institutional land uses, while the Noticed Alternative is located adjacent to more dense residential neighborhoods.

Impact Mitigation

Noise from cable splicing operations would be minimized through use of specialized low-sound equipment such as low-noise generators, and by reducing or eliminating the use of motorized equipment during evening and overnight work. Other potential mitigation measures include use of a low-noise/muffled generator, portable sound walls (temporary noise barriers) as needed, blocking the path of generators, and working with the Towns to coordinate work.

5.5.10 Cultural Resources

HMLP undertook a cultural resource investigation to identify historic and archaeological resources adjacent to the underground segments of the Preferred Route and the Noticed Alternative Route. To be considered significant and eligible for listing on the State or National Registers of Historic Places, a cultural resource must exhibit physical integrity and contribute to American history, architecture, archaeology, technology, or culture.

The Project is subject to review by the MHC in compliance with G.L. c. 9, §§ 26-27C as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00). HMLP undertook a cultural resources investigation to identify previously recorded historic and archaeological resources adjacent to the Preferred Route and Noticed Alternative Route. This assessment included review of MHC files and MACRIS.

TABLE 5-13
Historical and Cultural Resources Near the Preferred Route and Noticed Alternative Route

Historic and Archaeological Resources	Preferred Route	Noticed Alternative Route
Inventory Points Adjacent to Route	116	69
Inventory Areas intersected by the route	2	1
Archaeological Sites within 0.25 miles of the route	7	7
Archaeological Sites intersected by the route	2	3

Preferred Route

There are 116 historic sites and 2 historic districts along the Preferred Route inventoried within MHC's MACRIS database. The two historic districts are:

- Central Square Historic District (NRDIS)
- Jackson Square (Not National Register District)

There is one inventoried point, the Washington School Professional Building located at 8 School Street in Weymouth, which is included in the National Register of Historic Places (NRHP). This property is adjacent to both the Preferred Route and Noticed Alternative Route.

Noticed Alternative Route

There are 69 historic sites and 1 historic district along the Noticed Alternative Route inventoried within MHC's MACRIS database. The historic district is:

- Jackson Square (Not National Register District)

As previously described, the Washington School Professional Building is included in the NRHP and is adjacent to the Noticed Alternative Route. No other NRHP-listed properties are adjacent to the Noticed Alternative Route. The variation is adjacent to 94 historic sites.

Comparison

The Preferred Route traverses near more inventoried sites and intersects more inventoried historic areas than the Noticed Alternative Route. However, as the Project involves the underground installation of a transmission line within the existing paved limits of roadways, neither route is anticipated to result in impacts to historic resources.

Impact Mitigation

The proposed transmission line is not anticipated to result in impacts to cultural resources and therefore mitigation for cultural resource impacts is not proposed. A Project Notification Form was submitted to MHC, and the Petitioners are coordinating with the MHC to conduct field investigations on previously undeveloped portions of the Weymouth Tap Station and Hobart Substation II sites and will continue to coordinate with MHC on the results of this investigation. Potential effects and associated mitigation, if any, to historic and archaeological resources will be addressed with the MHC through Section 106 of the National Historic Preservation Act and the State Review processes.

5.5.11 Land Use, Environmental and Cultural Resources Impacts Analysis Conclusion

Table 5-14 provides a comparison of the route alternatives based on the evaluation of land use, environmental and cultural resources criteria. The Preferred Route and Noticed Alternative Route were determined to be comparable on a number of criteria. The Preferred Route is adjacent to fewer residential properties than the Noticed Alternative Route. Due to these attributes of the Preferred Route, the Preferred Route is superior with regard to the Land Use, Wetlands and Water Resources, and Noise criteria. The Noticed Alternative is superior with regard to the Potential for Traffic Congestion criterion. Both routes are comparable with regard to the Potential for Subsurface Contamination, Public Shade Trees, Cultural Resources, Visual and EMF criteria. The impacts associated with Wetlands and Water Resources along the Preferred Route and Noticed Alternative Route will be mitigated by limiting work within previously disturbed areas and through the coordination with other proposed construction projects, to the extent practicable, along the route. Therefore, based on this impact assessment, the Preferred Route is superior.

TABLE 5-14
Land Use, Environmental and Cultural Resources Impact Comparison of the Preferred Route and Noticed Alternative Route

Evaluation Criteria	Preferred Route	Noticed Alternative Route
Land Use	+	-
Potential for Traffic Congestion	-	+
Wetlands and Water Resources	+	-
Public Shade Trees	=	=
Potential for Subsurface Contamination	=	=
Visual	=	=
EMF	=	=
Noise	+	-
Cultural Resources	=	=

Notes:
+ Indicates less potential for impact, which means superior for use
- Indicates more potential for impact, which means inferior for use
= Indicates comparable impacts

5.6 Cost Comparison

The Proposed Route and Noticed Alternative Route both have similar designs. Both routes have the same New Tap Station design and New Substation design. The cable and duct system are similar in design specifications. Therefore, the only cost element that changes between the two routes is the length of the cables and duct bank. Information outlined in Table 4-8 shows the total costs for each of the Candidate Routes. As further described within that table, the transmission only cost for the Preferred Route is $47.7M, whereas the Notice Alternative transmission only cost is $49.2M, a difference in cost of $1.5M.

5.7 Reliability Comparison

The Proposed Route and Noticed Alternative Route both have similar designs. Both routes have the same New Tap Station design and New Substation. For both routes, the cable and duct system are similar in design specifications, duct bank configuration, as well as the system protection elements to remove the underground cable from service in the event of a fault. The system design is consistent with Good Utility Practice as it relates design and construction for electrical systems at this voltage class. They are both considered "Short Transmission lines" in transmission line terminology, and therefore, there is no significant difference in reliability between the Proposed Route and Notice Alternative Route.

5.8 Overall Comparison of Preferred Route and Noticed Alternative Route

All work proposed at the Weymouth Tap Station and Hobart II Substation creates minimal impacts for both the Preferred Route and the Noticed Alternative Route. Therefore, this was not a factor in HMLP's route selection. The Preferred Route and the Noticed Alternative Route have similar and relatively minimal environmental effects, and the majority of those effects will be temporary and can be minimized using mitigation measures.

The Preferred Route was determined to be roughly similar to the Noticed Alternative Route on the basis of cost, environmental impacts and reliability. HMLP had extensive consultations with Town of Weymouth and Town of Hingham officials and held multiple open houses during the routing analysis. Town of Weymouth officials indicated that the timing of the projects is important, as there are plans to construct street improvements along Lake Street prior to the construction of the proposed Transmission Line. In addition, there are more residences along Lake Street, including Environmental Justice housing units directly adjacent to the Lake Street Routes. Regarding the Broad Street route, there is proposed redevelopment within Jackson Square. Input received from open houses indicates a concern along the Broad Street Route for impacts to traffic along Broad Street during construction. While the Broad Street Route is the Preferred Route, HMLP is prepared to move forward with either the Broad Street Route or the Lake Street Route.

HMLP will work closely with the Towns and area neighborhoods to ensure that temporary construction impacts are minimized and that the New Line is installed in the least impactful way possible.

SECTION 6

Section 6
Consistency with the Current Health, Environmental Protection, and Resource Use and Development Policies of the Commonwealth

6.1 Introduction and Standards of Review

Among other things, G.L. c. 164, § 69J states that the Siting Board shall approve a petition to construct a facility if it determines that "plans for expansion and construction of the applicant's new facilities are consistent with current health, environmental protection, and resource use and development policies as adopted by the Commonwealth." As set forth in this Section, the proposed Project satisfies this provision of Section 69J and also is fully consistent with other important state energy policies as articulated in the Electric Utility Restructuring Act of 1997 (the "Restructuring Act"), the Green Communities Act (c. 169 of the Acts of 2008), the Global Warming Solutions Act (c. 298 of the Acts of 2008), the Energy Diversity Act (c. 188 of the Acts of 2016), the Clean Energy Act (c. 227 of the Acts of 2018), and An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy (c. 8 of the Acts of 2021).

6.2 Health Policies

The Restructuring Act provides that reliable electric service is of "utmost importance to the safety, health and welfare of the Commonwealth's citizens and economy…" See Restructuring Act § 1(h). The Legislature has expressly determined that an adequate and reliable supply of energy is critical to the state's citizens and economy. The Siting Board has determined that projects that increase reliability in electric service to the community also can play a role to contribute to the health of the Commonwealth's citizens. *Eversource Mid-Cape* at 89-90; *Sudbury-Hudson* at 188.

The Project will be fully consistent with these policies and Siting Board precedent. As discussed in Section 2 of this Petition, the Project is needed for reliability purposes because the entire Town of Hingham presently is susceptible to an extended outage in the event of N-1 and N-1-1 contingencies. Unlike large investor-owned utilities, which typically have multiple substations within an area and can backstop their customer circuits via distribution tie circuits from other substations, HMLP is limited to one substation. There are no other backstop transmission or distribution options available to HMLP, and one N-1 event would interrupt power to the Town for an extended period of time due to the lack of switching alternatives. Similarly, an outage event or maintenance requirement that takes one of the two circuits supplying HMLP out of service for an extended duration could result in loss of service to the entire town if the second remaining transmission line were to experience an outage event (*i.e.*, an N-1-1 contingency). No backstop transmission or distribution options are available to HMLP which would prevent N-1-1 events from interrupting power to the Town for an extended period of time. As such, the Project is critical to ensuring an adequate and reliable supply of electricity to the citizens and businesses of Hingham and of utmost importance to public safety, health and welfare.

Moreover, HMLP and Eversource will design, construct, and maintain the facilities comprising this Project in a manner to ensure that the health and safety of the public are protected. HMLP and Eversource will comply with all applicable federal, state, and local regulations, and industry standards and guidelines established for protection of the public. As discussed in Section 5 of the Analysis, all design, construction, and operation activities will be in accordance with applicable governmental and industry standards.

6.3 Environmental Protection Policies

HMLP and Eversource will obtain all environmental approvals and permits required by federal, state, and local agencies and will construct and operate the Project in full compliance with applicable federal, state, and municipal statutes, regulations, and environmental policies. As such, the Project will contribute to a reliable, low cost, diverse energy supply for the Commonwealth while avoiding, minimizing, and mitigating environmental impacts to the maximum extent practicable. Table 6-1 identifies the anticipated permits, reviews, and approvals required for the Project (not including the Siting Board's review). By virtue of satisfying the requirements for obtaining each of these federal, state, and local permits and approvals, the Project will comply with applicable state and local environmental policies.

TABLE 6-1

Anticipated Permits, Reviews and Approvals

Agency	Permit, Review, or Approval	Status
Federal		
USEPA	National Pollutant Discharge Elimination System ("NPDES") Construction General Permit	To be filed
USEPA	NPDES Dewatering and Remediation General Permit ("DRGP") and Best Management Practices Plan ("BMPP")	To be filed
State		
MassDEP Bureau of Waste Site Cleanup	Utility Related Abatement Measure ("URAM") under Massachusetts Contingency Plan ("MCP")	To be filed; Presumptive approval 7 days after submission
MassDEP Bureau of Water Resources	WM15 Surface Water Discharge Notice of Intent for EPA NPDES CGP discharges to impaired waters	Approval upon EPA issuance of CGP discharge authorization
MassDEP Bureau of Water Resources	WM15 Surface Water Discharge Notice of Intent for EPA NPDES DRGP	Approval upon EPA issuance of DRGP discharge authorization
Massachusetts Historical Commission ("MHC"),	Determination of No Adverse Effect	A Project Notification Form ("PNF") was submitted on

TABLE 6-1

Anticipated Permits, Reviews and Approvals

Agency	Permit, Review, or Approval	Status
Massachusetts Board of Underwater Archaeological Resources ("MA BUAR") and Tribal SHPOs (G.L. c. 9 Sect. 26-27C as amended by St. 1988 Ch. 254 and Section 106)		April 2024. HMLP is coordinating with the MHC to conduct field investigations on previously undeveloped portions of land at the Tap Station and Substation sites and will continue to coordinate with MHC on the results of this investigation.
Local		
Hingham Conservation Commission	Wetlands Order of Conditions per the MWPA and Hingham Wetlands Protection Bylaw (Article 22)	To be filed
Weymouth Conservation Commission	Wetlands Order of Conditions per the MWPA and Weymouth Wetlands Protection Ordinance (Section 7-300)	To be filed
Weymouth DPW	Stormwater Management Permit	To be filed
Town of Hingham	Road opening permit	Contractor to file
Town of Weymouth	Road opening permit	Contractor to file

6.3.1 The Restructuring Act

The Restructuring Act requires HMLP to demonstrate that the Project minimizes environmental impacts consistent with the minimization of costs associated with avoidance, minimization, and mitigation of the environmental impacts of the Project. Accordingly, an assessment of all impacts of a proposed project is necessary to determine whether an appropriate balance is achieved both among conflicting environmental concerns as well as among environmental impacts, cost, and reliability. A project that achieves the appropriate balance meets the requirement in G.L. c. 164, § 69J to minimize environmental impacts at the lowest possible cost.

To determine if a petitioner has achieved the proper balance among environmental impacts, cost and reliability, the Siting Board first determines if the petitioner has provided sufficient information regarding environmental impacts and potential mitigation measures. The Siting Board then determines whether environmental impacts are avoided, minimized, and mitigated to the maximum extent possible. Similarly, the Siting Board evaluates whether the petitioner has demonstrated that the project is needed and has provided sufficient cost information in order to determine if the appropriate balance among environmental impacts, cost, and reliability has been achieved. In Sections 3, 4, and 5 of this Analysis, HMLP has demonstrated that it compared a range of alternative projects, potential substation and tap station site and transmission line route options, and proposed specific plans to avoid, minimize and mitigate environmental impacts associated with the construction, operation, and maintenance of the proposed New Line, New Substation and New Tap Station, consistent with cost minimization. Accordingly, the proposed Project is consistent with the environmental policies of the Commonwealth as set forth in the Restructuring Act.

6.3.2 State and Local Environmental Policies

As noted in Table 6-1 above, HMLP and Eversource will obtain all environmental approvals and permits required by federal, state, and local agencies and will construct and operate the Project to comply fully with applicable federal, state, and municipal regulations and environmental policies. Thus, the Project will enhance the reliability of the HMLP electric system while avoiding, minimizing, and mitigating environmental impacts to the maximum extent practicable. By meeting the requirements for acquiring each of these federal, state, and local permits, the Project will comply with applicable federal, state and local environmental policies.

6.3.3 The Green Communities Act

The Green Communities Act encourages energy and building efficiency, promotes renewable energy, creates green communities, implements elements of the Regional Greenhouse Gas Initiative, and provides market incentives and funding for various types of energy generation. The Green Communities Act (as amended and supplemented by St. 2012, c. 209, An Act Relative to Competitively Priced Electricity) has resulted in greater renewable supplies and substantial new conservation initiatives since enactment and continuing in future years.

The proposed Project will address a significant existing reliability issue in the Town of Hingham and ensure reliability of the Town's electricity supply for years to come. While the proposed Project is needed to meet reliability standards, given the climate change goals of both the Town of Hingham and the Commonwealth, HMLP determined that it was reasonable and prudent to select a substation site and lay out its proposed substation to accommodate a new transformer and switchgear when load warrants these additions. HMLP has estimated the technical potential for system peak winter load with full electrification and that winter peak exceeds the current system capability. Thus, while not needed for capacity purposes in the near-term, the proposed Project offers the distinct benefit of addressing peak winter load over the long term in the high electrification case.

Moreover, the proposed Project will enable HMLP to continue to integrate clean energy generated by renewable sources, support electrification projects in Town, and accommodate increased usage of electric vehicles and the associated installation of electric charging stations, consistent with the Green Communities Act.

Accordingly, the proposed Project will meet the identified need in a reliable, cost-effective, and environmentally benign manner and therefore, is consistent with the Green Communities Act.

6.3.4 The Global Warming Solutions Act

The Global Warming Solutions Act ("GWSA") establishes aggressive greenhouse gas ("GHG") emissions reduction targets of 25 percent from 1990 levels by 2020 and 80 percent from 1990 levels by 2050. Pursuant to the GWSA, the Secretary of the EOEEA issued the Clean Energy & Climate Plan for 2020 in December 2010 and updated the plan in December 2015. Among other provisions, the GWSA obligates administrative agencies such as the Siting Board, in considering and issuing permits, to consider reasonably foreseeable climate change impacts (e.g., additional GHG emissions) and related effects (e.g., sea level rise). In April 2020, the EOEEA Secretary established a 2050 statewide emissions limit of net zero greenhouse gas emissions (and in no event greater than 85% below 1990 levels). Then, in December 2020, the Secretary issued the Massachusetts 2050 Decarbonization Roadmap that calls for increased electrification (e.g., electric vehicles, electric home heating, new heat pump technologies), new local renewable resources (e.g., wind, solar and battery storage), and the delivery of power from remote clean energy resources, such as offshore wind.

Additionally, the GWSA amended MEPA to require that agencies, departments, boards, commissions, and authorities, in considering and issuing permits, licenses, and other administrative approvals and decisions, consider reasonably foreseeable climate change impacts, including additional GHG emissions, and effects, such as predicted sea level rise. In response, in 2010, MEPA issued the Massachusetts Environmental Policy Act GHG Emissions Policy and Protocol ("GHG Policy"), which requires that projects undergoing review under MEPA quantify the project's GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. The GHG Policy also requires proponents to quantify the impact of proposed mitigation in terms of emissions and energy savings.

On March 26, 2021, former Governor Baker signed the Roadmap Act into law. The Roadmap Act codified the Administration's commitment to net-zero emissions by 2050 and advances and extends the goals of the GWSA by establishing new interim goals for emissions reductions and authorizing a voluntary energy efficient building code for municipalities.

HMLP's proposed Project is fully consistent with the policies established by the GWSA and Roadmap Act. GHG emissions associated with the Project will be de minimis during the construction phase, and short-term localized air quality effects will be minimal. The proposed Project will have no adverse climate change impacts or adverse effects on sea levels. Rather, the proposed Project is needed to maintain reliability of service for the Town of Hingham and enable HMLP to meet regional reliability standards. Additionally, while not needed for capacity purposes in the near-term, the proposed Project offers the distinct benefit of addressing peak winter load over the long term in the high electrification case. As such, the proposed Project will enable HMLP to continue to integrate clean energy generated by renewables sources, support electrification projects in Town, and accommodate increased usage of electric vehicles and the associated installation of electric charging stations.

The Project as designed is consistent with both the Commonwealth's requirements for siting of electric facilities as well as future state and local planning initiatives. Consequently, the Project is consistent with the GWSA and the Roadmap Act.

6.3.5 Energy Diversity Act and Clean Energy Act

On August 8, 2016, former Governor Baker signed into law the Energy Diversity Act, which facilitates the procurement and integration of renewable energy generation resources, including new offshore wind energy generation, firm service hydroelectric generation, and a new class of renewable energy facilities that meet eligibility criteria.

On August 9, 2018, former Governor Baker signed into law the Clean Energy Act, which amends the Energy Diversity Act to further encourage energy storage efforts and requires the Department of Energy Resources to investigate the potential for additional clean energy solicitations.

The Project will improve the reliability of HMLP's transmission system, and also will allow HMLP to continue to integrate clean energy resources, such as solar, wind and battery storage, support electrification projects in Town, and accommodate increased usage of electric vehicles and the associated installation of electric charging stations. Accordingly, the Project is consistent with the Energy Diversity Act as amended by the Clean Energy Act.

6.4 Environmental Justice Policies

The Roadmap Act brought new focus to environmental justice by defining environmental justice populations and environmental burden, and by charging agencies of the Commonwealth to meaningfully involve all people in decisions and policies and to consider the equitable distribution of environmental benefits and burdens. These EJ principles support protection from environmental pollution and the ability to live in and enjoy a clean and healthy environment, regardless of race, color, income, class, handicap, gender identity, sexual orientation, national origin, ethnicity or ancestry, religious belief or English language proficiency.

The EOEEA Environmental Justice Policy (updated June 24, 2021) charged EOEEA agencies to develop strategies for considering environmental justice in decisions and policies. HMLP and Eversource engaged in enhanced public outreach with intent to engage environmental justice populations and evaluate environmental burdens.

The Preferred and Noticed Alternative Routes cross through areas within Weymouth mapped as environmental justice populations as defined by minority status and income status, as defined by the Roadmap Act. Review of the Massachusetts EJ mapper – languages spoken map – indicates that there are no census tracts within one mile of the project where at least 5% of the population are speakers who report they do not speak English "very well".

HMLP and Eversource conducted numerous in-person and Zoom meetings to provide opportunities to EJ populations and others potentially impacted by the Project to learn more about the Project and provide their comments and input. Open houses were held at different times of the day in accessible locations and were generally well attended. A Zoom Open House was also held to reach people who were unable to attend in person.

Eversource researched languages spoken within the Union Towers population, and provided a Cantonese interpreter on site that was utilized by seven residents. Materials were distributed in English and Traditional Chinese and were also made available in Spanish. The focus of these meetings was on the Tap Station, and HMLP representatives were in attendance to address questions and comments on the transmission line.

Eversource hosted an additional meeting at the Crossroads Worship Center, which is located across Broad Street from the Tap Station site. Although Spanish and Portuguese interpreters were present, there were no interpretation needs identified in advance, and materials were available in English, Portuguese, Traditional Chinese and Spanish. The focus of this Open House was on the Tap Station, and HMLP representatives were in attendance to address questions and comments on the transmission line.

Information on the project is also available on the HEIRP website (www.HEIRP.com). Projects updates are posted on this site, and there is link on the website that people can use to provide feedback to HMLP. HMLP will continue to communicate status updates on the project, offering opportunities for public input throughout the siting, permitting and construction phases.

The proposed project involves the construction of a new tap station in Weymouth, a substation in Hingham, and a 115kV transmission line linking the two stations.[28] The Project does not generate energy, nor does it result in any industrial discharges. HMLP looked at several alternatives to the Project, as summarized in Section 3, and as there are no existing transmission lines for HMLP to tap into within Hingham, impacts to the neighboring Town of Weymouth are unavoidable. HMLP analyzed several sites for both the Weymouth Tap Station and Hobart II Substation, and chose locations that were adjacent to existing infrastructure and away from residences to minimize the environmental burden. The Weymouth Tap Station site is located in an area mapped as Environmental Justice for the income criteria. As noted previously, the site is adjacent to existing electrical transmission infrastructure and the Tap Station has been sited away from residences.

The new transmission line will be underground, and the primary impact of the project will be related to construction, similar to other underground infrastructure projects (e.g., water, sewer, stormwater). Underground infrastructure is prevalent throughout Massachusetts and within the project area. The purpose of the proposed project is to provide a reliable energy source to HMLP’s customers. Due to the limitations of the existing electric grid locations, the Project needs to cross Weymouth to reach Hingham.

HMLP has designed the Project to minimize the Project’s impacts to all populations, including EJ populations. HMLP has undertaken, and will continue to undertake, ongoing community outreach in EJ communities in or adjacent to the Project area to facilitate the meaningful opportunity to participate by all. The continued outreach to EJ communities will be consistent with the Roadmap Act and the rules and protocols promulgated thereunder. As such, the Project is consistent with the Commonwealth’s EJ policies as codified in the Roadmap Act.

[28] As set out in Section 5.5.1.3, the Project does not trigger review under MEPA.

6.5 Resource Use and Development Policies

The Project, which will ensure the reliability of HMLP's transmission system, will be constructed and operated in compliance with Massachusetts's policies regarding resource use and development. For example, in 2007, the EOEEA's Smart Growth/Smart Energy policy established the Commonwealth's Sustainable Development Principles, including: (1) supporting the revitalization of city centers and neighborhoods by promoting development that is compact, conserves land, protects historic resources and integrates uses; (2) encouraging remediation and reuse of existing sites, structures and infrastructure rather than new construction in undeveloped areas; and (3) protecting environmentally sensitive lands, natural resources, critical habitats, wetlands and water resources and cultural and historic landscapes.

As described more fully in Section 5 of this Analysis, the Project will support these principles because, among other reasons, the New Substation, New Tap Station and New Line will be located within previously disturbed parcels of land and public ways respectively. In addition, as set forth in Section 4, in selecting a route for the New Line and a location for the New Substation, HMLP employed a site and route selection process which highly disfavored Open Space and Article 97 land. Accordingly, the Project is in compliance with, and furthers, the Commonwealth's policies regarding resource use and development and does not result in the loss of Article 97 lands.

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APPENDIX 1

TOWN OF HINGHAM
Community Planning

MEMORANDUM

TO: Tom Mayo, Town Administrator

CC: Tom Morahan, General Manager

FROM: Emily Wentworth, Community Planning Director, Michael Silveira, Senior Planner, and Jennifer Oram, Zoning Administrator/Senior Planner

DATE: June 25, 2024

RE: Board Recommendations for Proposed Substation at 0 Old Hobart Street

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The Planning Board and Zoning Board of Appeals recently reviewed proposed plans to locate a public utility building enclosing an electric substation and related site work on a portion of the Hingham Transfer Station property at 0 Old Hobart Street (Assessors Map 106, Lot 4) during a joint meeting held on June 4, 2024. Though the review was informal in nature, the meeting was advertised in a local public publication and abutters were noticed.

Article 26 of the 2022 Annual Town Meeting authorized the Select Board to transfer to the Hingham Municipal Lighting Plant (HMLP) the care, custody, management, and control of the northeast corner of the property for the construction and operation of the new electrical substation. Article 26 also authorized the Select Board to include terms and conditions deemed in the best interest of the Town in any agreements or documents necessary to transfer the parcel.

Section III-A, 3.10 of the Hingham Zoning By-Law allows public utility buildings and structures in the Official and Open Space District by a special permit administered by the Zoning Board. Based on the proposed level of disturbance associated with the project, Site Plan Review under Section I-I would also typically be required by the Planning Board. However, MGL c. 40A, s. 3 provides an exemption for certain public utilities that reads in part:

> *Lands or structures used, or to be used by a public service corporation may be exempted in particular respects from the operation of a zoning ordinance or by-law if, upon petition of the corporation… the department of public utilities shall, after notice given pursuant to section eleven and public hearing in the town or city, determine the exemptions required and find that the present or proposed use of the land or structure is reasonably necessary for the convenience or welfare of the public; provided however, that if lands or structures used or to be used by a public service corporation are located in more than one municipality such lands or structures may be exempted in particular respects from the operation of any zoning ordinance or by-law if, upon petition of the corporation… the department of public utilities shall after notice to all affected communities and public hearing in one of said municipalities, determine the exemptions required and find that the present or proposed use of the land or structure is reasonably necessary for the convenience or welfare of the public.*

While HMLP is pursuing a utility project zoning exemption through the Department of Public Utilities (DPU) from certain local zoning requirements, the informal review provided both Boards, as well as members of the public, to discuss the project and offer feedback regarding the plan. The Boards voted unanimously to recommend that the Select Board consider imposition of the following conditions when transferring custody of the parcel to HMLP:

1. Pre-Construction Meeting. A preconstruction review meeting with inspection of the erosion control installation and marked limits of clearing shall be required before issuance of a building permit.

2. Limits of Work. During clearing and/or construction activities, the marked limit of work shall be maintained until all construction work is completed and the site is cleaned up. All vegetation beyond the limit of work shall be retained in an undisturbed state and no stockpiling of topsoil or storage of fill, materials, or equipment may occur within the protected area.

3. Stormwater Pollution Prevention Plan (SWPPP). Since the overall project will disturb more than one acre, the Applicant shall submit a Stormwater Pollution Prevention Plan to the Community Planning Department a minimum of three weeks prior to the start of any work. The Select Board may require, at the applicant's expense, the establishment of a consultant fee account to fund the cost of the SWPPP review.

4. Construction Schedule. At least three weeks prior to the start of any work, the Applicant shall provide a construction schedule and traffic management plan to the Community Planning Department and Department of Public Works. Said construction schedule and traffic management plan shall incorporate assurance that major deliveries and site work will minimize disruption to the transfer station operations.

5. Construction Vehicles. All construction vehicles shall be parked onsite. No construction vehicles shall enter the premises before 7 AM on any given construction day.

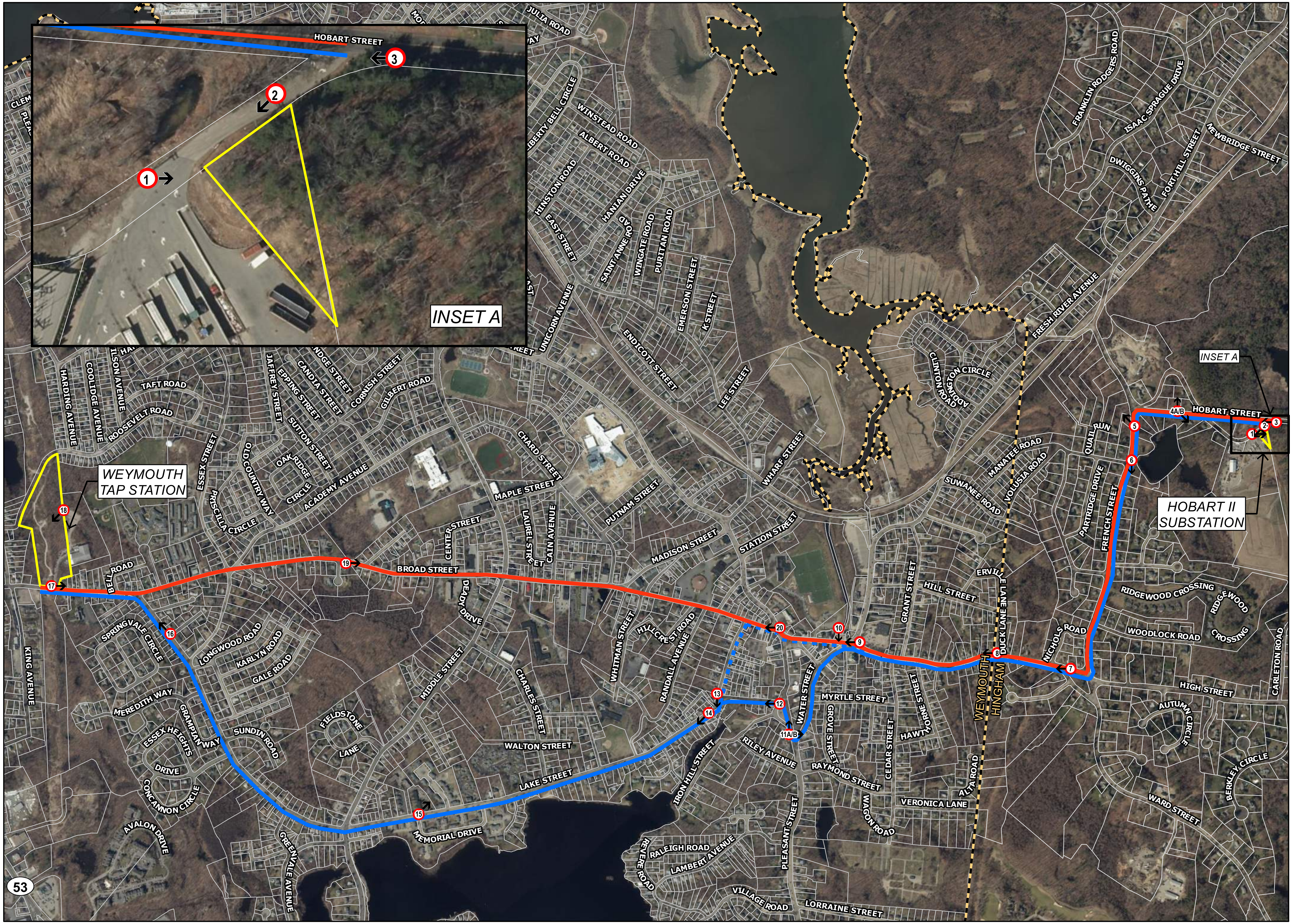
6. Inspections. Inspections shall be required during construction, and prior to issuance of a certificate of occupancy, of all elements of the project related to or affecting erosion control, limits of work, and the approved drainage and stormwater system installed for the project. The Select Board may require, at the applicant's expense, the establishment of a consultant fee account to fund the cost of such inspections.

7. As-Built Plan Requirement. Upon project completion an as-built plan must be submitted to the Building Commissioner prior to the issuance of a certificate of occupancy. In addition to such other requirements as are imposed by the Building Commissioner, the as-built plan must demonstrate substantial conformance with the stormwater system design and performance standards of the approved project plans.

Tighe&Bond

APPENDIX 5

Appendix 5-1
Photographs: Preferred and Noticed Alternative Routes



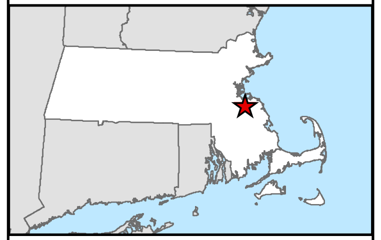
APPENDIX 5-1
PREFERRED ROUTE & NOTICED ALTERNATE ROUTE PHOTO LOCATION

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
November 2024

LEGEND

- Photo Location
- Broad Street (Preferred)
- Lake Street (Noticed Alternate)
- Lake Street Variation (Noticed Alternative)
- Tap/Substation Sites
- Town Boundary
- Parcel Boundary

LOCUS MAP



N

0 500 1,000
Feet
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NOTES

1. Based on MassGIS Color Orthophotography (2021)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.

Tighe&Bond

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H-5059

Photographic Log

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 1	**Date:** 8/08/2024	**Direction Taken:** East
Description: View from access road facing proposed Hobart II substation site. The area abuts the transfer station and is primarily upland woods dominated by oak and pine.		

Photograph No.: 2	**Date:** 8/08/2024	**Direction Taken:** Southwest
Description: Alternate view of the proposed Hobart II substation site. Existing Hobart Substation is visible in the background.		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 3	**Date:** 8/08/2024	**Direction Taken:** West
Description: View of Hobart Street at the exit from the Hingham Transfer Station. Forested, protected open space abuts Hobart Street.		

Photograph No.: 4a	**Date:** 8/08/2024	**Direction Taken:** Southeast
Description: Western Hobart Street abuts low density residential land use. This portion is common to the Preferred Route and Noticed Alternative Route.		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 4b	**Date:** 8/08/2024	**Direction Taken:** North
Description: View facing North from Hobart Street of culvert stream crossing.		

Photograph No.: 5	**Date:** 8/08/2024	**Direction Taken:** Northwest
Description: View facing towards French Street showing culvert stream crossing. This portion is common to the Preferred Route and Noticed Alternative Route.		

Photographic Log

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 6	**Date:** 8/08/2024	**Direction Taken:** South
Description: View facing south at the intersection of French Street (center) and Manatee Road (right). This portion is common to the Preferred Route and Noticed Alternative Route.		

Photograph No.: 7	**Date:** 8/08/2024	**Direction Taken:** West
Description: High Street is primarily low density residential development along the Preferred Route and Noticed Alternative Route.		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 8	**Date:** 8/08/2024	**Direction Taken:** West
Description: View along High Street of Hingham and Weymouth Town Line. This portion is common to the Preferred Route and Noticed Alternative Route.		

Photograph No.: 9	**Date:** 8/08/2024	**Direction Taken:** West
Description: View of the complex intersection at High Street/Broad Street and Commercial Street intersection. The Preferred Route and Noticed Alternative Route cross this intersection.		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 10	**Date:** 8/08/2024	**Direction Taken:** South
Description: View of Broad Street bridge crossing facing upstream. This portion is common to the Broad Street Route (Preferred) and the Lake Street Variation (Noticed Alternative Variation).		

Photograph No.: 11a	**Date:** 8/08/2024	**Direction Taken:** East
Description: View of culvert crossing Pleasant Street along the Lake Street Route (Noticed Alternative).		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 11b	**Date:** 8/08/2024	**Direction Taken:** North
Description: View from Pleasant Street of intersection Pleasant Street and Water Street. The Lake Street Route (Noticed Alternate) crosses this intersection.		

Photograph No.: 12	**Date:** 8/08/2024	**Direction Taken:** West
Description: Shawmut Street, along the Lake Street Route (Noticed Alternate and Noticed Alternative Variation), is primarily abutted by residential properties.		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 13	**Date:** 8/08/2024	**Direction Taken:** Southwest
Description: View of Lake Street and Shawmut Street intersection, where the Lake Street (Noticed Alternate) and Lake Street Variation (Noticed Alternate Variation) reconverge.		

Photograph No.: 14	**Date:** 8/08/2024	**Direction Taken:** Northeast
Description: Lake Street (Noticed Alternative) abuts primarily residential properties.		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 15	Date: 8/08/2024	Direction Taken: East
Description: View of Lake Street. This portion is common to the Lake Street route (Noticed Alternate) and the Lake Street Variation (Noticed Alternate Variation).		

Photograph No.: 16	Date: 8/08/2024	Direction Taken: Northwest
Description: View of Spring Street approaching the intersection with Broad Street; common to Lake Street (Noticed Alternate) and the Lake Street Variation (Noticed Alternate Variation).		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 17	**Date:** 8/08/2024	**Direction Taken:** East
Description: View of Broad Street near the proposed Weymouth Tap Station. This portion is common to the Preferred Route and Noticed Alternative Route.		

Photograph No.: 18	**Date:** 8/08/2024	**Direction Taken:** Southwest
Description: View the proposed Weymouth Tap Station site, which is upland woods dominated by oak species.		

Client: Hingham Municipal Lighting Plant **Job Number:** H-5059-001

Site: HMLP Electrical Infrastructure Reliability Project (Weymouth, Hingham, Massachusetts)

Photograph No.: 19	**Date:** 8/08/2024	**Direction Taken:** East
Description: Representative view along Broad Street, primarily with residential properties. The Broad Street (Preferred) Route follows this segment of Broad Street.		

Photograph No.: 20	**Date:** 8/08/2024	**Direction Taken:** West
Description: View of commercial developments on Broad Street. This portion is common to the Broad Street (Preferred) Route and the Lake Street (Noticed Alternative) Route.		

Appendix 5-2
Town of Hingham Noise Control By-law

Town of Hingham

GENERAL BY-LAWS

TOWN OF HINGHAM
GENERAL BY-LAWS

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ARTICLE 42

NOISE CONTROL

SECTION 1 - Short Title
This By-law may be cited as the Hingham Noise Control By-law.

SECTION 2 - Declarations of Findings and Policy
Whereas excessive sound poses a serious hazard to the public health, welfare, safety and quality of life, and whereas the residents of the Town of Hingham have a right to, and should be ensured, an environment free of excessive Sound that may jeopardize their health, welfare or safety, or degrade their quality of life; now therefore, it is the policy of the Town of Hingham to prevent excessive Sound which may jeopardize the health, welfare or safety of its residents, or adversely impact their quality of life. This By-law shall apply to the control of all Sound originating within the geographical limits of the Town of Hingham.

SECTION 3 - Definitions
(a) All terminology used in this By-law, but not defined below, shall be used with the meanings ascribed to such terms in the applicable standards of the American National Standards Institute ("ANSI") or its successor bodies.

(b) "Construction" means any site preparation, assembly, erection, substantial repair, alteration or similar action, but excluding Demolition for, or of, public or private rights-of-way, structures, utilities, or similar property.

(c) "Demolition" means any dismantling, intentional destruction of, or removal of, structures, utilities, public or private rights-of-way surfaces or similar property.

(d) "Emergency Work" means any work performed for the purpose of preventing or alleviating the physical harm to Persons or property, which requires immediate action.

(e) "Enforcement Official" means a Town official having authority to enforce this By-law as provided in Section 4 below.

(f) "Legal Holiday" means any day designated as a legal holiday under federal or Massachusetts state law.

(g) "Noise Disturbance" means any sound which: (a) may disturb or annoy reasonable Persons of normal sensitivities; (b) causes, or tends to cause, an adverse effect on the public health and welfare; (c) endangers or injures Persons; or (d) endangers or injures real or personal property.

(h) "Person" means any individual, association, partnership, joint venture, corporation or other form of legal entity.

(i) "Plainly Audible Sound" means any sound as to which the information content is unambiguously communicated to the listener including, without limitation, understandable speech, comprehension of whether a voice is raised or normal, repetitive bass Sounds, or comprehension of musical rhythms, without the aid of any listening device.

(j) "Power Tool" means any device powered mechanically, by electricity, by gasoline, by diesel or any other fuel, which is intended to be used, or is actually used, for functions including, without limitation, cutting, nailing, stapling, sawing, vacuuming or drilling.

(k) "Public Right-of-Way" means any highway, boulevard, street, avenue, lane, sidewalk, alley or similar place, which is owned or controlled by a government entity.

(l) "Public Property" means any real property, including structures thereon, which are owned or controlled by a government entity.

(m) "Residential District" means any area designated as a Residential District in the Town of Hingham Zoning By-law.

(n) "Sound" means a temporal and spatial oscillation in pressure, or other physical quantity, in a medium resulting in compression and rarefaction of that medium, and which propagates at finite speed to distant locations.

(o) "Weekday" means any day from Monday through Friday that is not a Legal Holiday.

SECTION 4 - Enforcement of Ordinance
(a) Enforcement Officials. This By-law shall be enforced by the Chief of Police, the Executive Health Officer, the Building Commissioner and their authorized designees. For all purposes other than the granting of permits under this By-law, designees of the Chief of Police shall include any Hingham Police Officer.

(b) Penalties for Violation. Violations of this By-law shall be punishable by fine in accordance with the following schedule:

Offense	Fine
First	$100
Second	$200
Third and Subsequent	$300

Violations resulting from sound emanating from a particular parcel of property will be assessed against the person controlling said property at the time of the violation, regardless of said person's legal status as owner, lessor, tenant-at-will, licensee, or otherwise. Nothing contained in this subjection shall prohibit an Enforcement Official from giving a warning in lieu of a fine if, in the Official's discretion, a warning is appropriate under the circumstances.

(c) Non-Criminal Disposition. In assessing fines for violations of this By-law the Enforcement Official shall follow the procedure set forth in M.G.L. Chapter 40, Section 21D.

SECTION 5 - Duties and Responsibilities of Town Boards and Officials
(a) Town Programs and Activities. All town departments, boards and officials shall carry out their programs and activities in a manner reasonably consistent with this By-law.

(b) Cooperation of Town Boards and Officials. All town departments, boards, and officials shall cooperate with the Enforcement Officials in enforcing the provisions of this By-law.

(c) Project Review and Approval. All town departments, boards, and officials having responsibility for the review and approval of new projects or activities, or changes to existing projects that result, or may result, in the production of sound shall, to the extent reasonably feasible under the circumstances, require compliance with the provisions of this By-law as a condition of approval. This By-law is not intended to require any town department, board or official to apply a more restrictive standard for the approval of any project or activity, or change to any existing projects, than has been applied prior to the By-law's adoption.

SECTION 6 - Noise Disturbance Prohibited

(a) No Person shall make, continue, or cause to be made or continued, any noise disturbance. Unamplified, non-commercial public speaking and public assembly activities conducted at conversational voice levels on any public property or public right-of-way shall be exempt from the operation of this Section if such sound is not plainly audible beyond one hundred (100) feet or does not infringe the legitimate rights of others.

(b) The facts required to establish a Noise Disturbance shall be identical to those required to establish a disturbance of peace under the common law (and punishable under M.G.L. Chapter 272, Section 53). Violations of this By-law need only be proven by a preponderance of the evidence.

SECTION 7 - Specific Activities

(a) Specific Activities Prohibited. Notwithstanding any other provision of this By-law, a person engaging in any of the activities specified in subsections (b) through (d) of this Section 7 at any time other than that permitted for such activity in the applicable subsection shall be in violation of this By-law.

(b) Construction, Demolition and Commercial Landscaping Activity. No Person shall operate or permit the operation of any tools or equipment used in construction, demolition or commercial landscaping work in a Residential District between the hours of 7:00 p.m. and 6:59 a.m. the following day on weekdays or between the hours of 7:00 p.m. and 7:59 a.m. the following day on any other day.

(c) Domestic Power Tools. No person shall operate, or permit the operation of, any power tool or any garden tool, leaf blower or similar device powered mechanically, by electricity, by gasoline, by diesel or other fuel, outdoors in a Residential District between the hours of 8:00 p.m. and 6:59 a.m. the following day.

(d) Dumpsters and Trash Receptacles. No person shall empty dumpsters or similar trash receptacles between the hours of 8:00 p.m. and 6:59 a.m. the following day on Weekdays or between the hours of 8:00 p.m. and 7:59 a.m. the following day on any other day.

(e) Engine Braking Devices. No person shall operate any motor vehicle with an engine braking device engaged within the Town limits unless required for safety. This provision shall not apply to motor vehicles traveling on Route 3.

SECTION 8 - Exemptions and Permits

(a) Exemptions. The following uses and activities shall be exempt from the provisions of this By-law:

(1) Any law enforcement motor vehicle in the performance of law enforcement duties.

(2) Any fire apparatus, ambulance, rescue, public works or emergency response vehicle creating sound in the performance of public safety responsibilities.
(3) Any vehicle in the performance of emergency work.

(4) Public address systems used at public events in a manner approved by any Town board, department or official having authority over said use.

(5) Safety signals, warning devices, emergency pressure relief valves and similar devices during and in relation to public emergencies.

(6) Any activity (i) for which a permit under subsection (b) of this section exempting said activity from the provisions of this By-law has been granted by an Enforcement Official, (ii) which is the subject of a decision of any Town board having authority over said activity including, without limitation, decisions of the Planning Board permitting certain activity at the Hingham Shipyard development and the Derby Street Shoppes or (iii) that is allowed by a Town board, department, or official having authority over said activity including, without limitation, activity permitted subject to noise and/or use restrictions.

(7) Parades, music festivals, public gatherings, and events for which the Chief of Police has granted a permit.

(8) Bells, chimes or carillons, or their amplified, recorded, or other electronic substitution while being used in conjunction with religious services or to denote time intervals between the hours of 7:00 a.m. and 9:00 p.m.

(9) Snow removal from public or private parking lots, roads, driveways, sidewalks and other surfaces traveled by vehicles or pedestrians.

(10) Activities of temporary duration during a time of emergency conducted by a public utility company to repair or maintain public utility infrastructure.

(11) Construction activity under a valid permit issued by the Chief of Police under Section 7 or 15 of Chapter 136 of the Massachusetts General Laws, or by any Town board, department, or official having regulatory authority over Construction activity.

(12) Any vehicle utilizing an amplified communications system operated by a highway maintenance, water department, or public utilities worker acting in the performance of his or her responsibilities.

(13) The operation of modes of public transportation including, without limitation, buses, trains and commuter boats.

(14) Any activity to the extent the regulation thereof has been preempted by state or federal laws or regulations.

(b) Permits. Any Enforcement Official, for good cause shown, and with appropriate conditions so as to reasonably minimize the any adverse impact on the public, may grant a permit allowing activity that would otherwise violate this By-law.

SECTION 9 - Appeal
Appeal of any citation for a violation of this By-law shall be made to the District Court or other court of competent jurisdiction in accordance with the provisions of M.G.L. Chapter 40, Section 21D.

SECTION 10 - Severability
If any of the provisions of this By-law are held to be invalid by any court of competent jurisdiction, the remaining provisions shall remain in full force and effect.

Appendix 5-3
EMF Report

Magnetic Field Modeling Analysis for the Hingham Electrical Infrastructure Reliability Project (HEIRP)

Prepared for

Tighe & Bond
52 Southampton Road
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and

Hingham Municipal Lighting Plant
31 Bare Cove Park Drive
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November 4, 2024

GRADIENT

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Abbreviations

A	Ampere
AC	Alternating Current
DC	Direct Current
DCT	Double-Circuit Tower
DTS	Distributed Temperature Sensing
EF	Electric Field
EMF	Electric and Magnetic Field
ft	Feet
G	Gauss
GCC	Ground Continuity Conductor
GIS	Gas-Insulated Switchgear
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
HEIRP	Hingham Electrical Infrastructure Reliability Project
HMLP	Hingham Municipal Lighting Plant
Hz	Hertz
ICNIRP	International Commission on Non-Ionizing Radiation Protection
in	Inch
kV	Kilovolt
kV/m	Kilovolt per Meter
m	Meter
MA EFSB	Massachusetts Energy Facilities Siting Board
MF	Magnetic Field
mG	Milligauss
MRI	Magnetic Resonance Imaging
MVA	Megavolt-Amperes
MW	Megawatt
PVC	Polyvinyl Chloride
RMS	Root Mean Square
ROW	Right-of-Way
US	United States
V	Volt
V/m	Volt per Meter
WHO	World Health Organization
XLPE	Cross-Linked Polyethylene

1 Introduction and Summary

Hingham Municipal Lighting Plant (HMLP), a municipally owned electric utility, proposes to construct and operate a new underground 115-kilovolt (kV) transmission line and substation in the Town of Hingham, Massachusetts (Hingham Electrical Infrastructure Reliability Project (HEIRP)). Currently, HMLP, which provides electricity to all customers in the Town of Hingham, is served by a single bulk power substation known as "Hobart Substation", located at 190 Old Hobart Street in Hingham, adjacent to the Town landfill and recycling center. HMLP's current substation and distribution system is designed to allow for loss of a single 115/13.8 kV transformer while still retaining the capability to serve the highest load demand of the Town. Hobart Substation currently is fed via two overhead 115-kV transmission lines covering a distance of approximately 3.3 miles, which are supported by both wood and metal structures, including 22 double-circuit towers (DCTs), where the two transmission lines share the same single pole. This configuration is susceptible to contingency events that can result in simultaneous loss of service from both transmission lines. If even a single DCT pole supporting the two lines falls or is otherwise disabled, service to Hobart Substation would be interrupted and all customers within the town of Hingham would be subjected to an extended outage. An extended outage could also occur if one transmission line is out of service for maintenance and there is an outage event on the remaining transmission line. Unlike larger distribution systems, there are no alternative supply options available to restore customers from another substation. Consequently, loss of service to Hobart Substation results in loss of electrical service to the entire town.

Based on the conditions noted above, HMLP has concluded that, due to the reliability of service concerns identified, there is an existing need to mitigate the potential for loss of service in Hingham and has proposed the HEIRP. The total length of the HEIRP Preferred Route, referred to as the Broad Street Route, is approximately 17,000 linear feet (about 3.2 miles). This route exits the proposed Hobart II Substation in Hingham and runs west on Hobart Street, turns south on French Street, then turns west on High Street and continues west into Weymouth on High Street which becomes Broad Street. Broad Street is followed for approximately 8,500 feet and includes a crossing of Herring Run Brook, until ending at the proposed Eversource tap station site at the Eversource Right-of-Way (ROW) in Weymouth. Existing road widths range from 25 feet (French and Hobart Street) to 40 feet (Broad Street), and the predominant adjacent land use is residential, with some commercial and industrial. There is also a Noticed Alternative Route, referred to as the Lake Street Route, that also follows a combination of main and side streets for a slightly longer total length of approximately 19,600 linear feet (3.7 miles).

Tighe & Bond requested that Gradient perform an independent electric and magnetic field (EMF) assessment for the proposed underground 115-kV circuit to be constructed and operated as part of the HEIRP. This EMF assessment is focused on aboveground 60-Hertz (Hz) alternating current (AC) magnetic fields (MFs) that will be generated by the underground 115-kV circuit because there are no aboveground electric fields for underground transmissions lines due to their shielding by the metallic shield covering the conductor insulation, the duct banks, and the intervening earth. The MF modeling analysis is focused on representative cross sections for the new underground 115-kV circuit and not any equipment (*e.g.*, busbars, transformers, switchgear) within the fencelines of either the new substation to be located on the Hingham transfer station site or the new Eversource tap station to be located off of Broad Street at the Eversource ROW in Weymouth. The proposed Hobart II Substation in Hingham will have gas-insulated switchgear (GIS), which will allow the conductors within the proposed substation to be placed closer together than for air-insulated switchgear (AIS), enhancing the rapid drop-off of MF levels with distance away from the equipment. It is thus expected that MFs outside the fenceline of the new substation will be dominated by MFs associated with the Project underground 115-kV transmission line and other transmission or distribution lines entering/exiting the station rather than equipment within the substation fenceline. While AIS is to be used at the new Weymouth tap station, MFs will also diminish rapidly with distance from the tap station equipment, and the tap station will not abut any residential properties (note that the closest residential properties on Broad Street are in closer proximity to the Project underground 115-kV transmission line than the tap station, and the Project underground line would thus be expected to be a larger potential source of MFs at these properties than the more distant tap station; while the closest residences on Roosevelt Road are on the other side of the Eversource ROW from the tap station, so that the tap station would be expected to be a negligible source of MFs at these properties). In addition, engineering design diagrams indicate that the closest tap station switchgear to the paved parking lot at the Connell Rink and Pool is to be located more than 50 feet from the parking lot edge, such that MFs from the tap station equipment will have diminished to minimal levels.

MF modeling was conducted at a height of 1 meter (3.28 feet) above the ground surface for four representative underground line cross sections, including (1) the triangular conductor configuration for the typical underground duct bank trenches, (2) the horizontal conductor configuration for flat trenches, (3) the vertical conductor configuration for manhole (*e.g.*, splice vault) approaches, and (4) the horizontal directional drilling (HDD) bore conductor configuration for the crossing beneath Herring Run Brook in Weymouth. MF modeling was conducted for both annual average and system peak load levels for each cross section. The MF modeling did not consider the weaker currents that will be induced on the ground continuity conductor (GCC) to be installed in the underground duct banks in proximity to the phase conductors. Because this induced current on the GCC will generally have small canceling effects on the aboveground MFs from the phase conductors, the neglect of the induced currents on the GCC will contribute towards a conservative overestimation of the model-predicted MFs.

As discussed in more detail in Section 2 of this report, a number of national and international health and safety organizations have developed EMF exposure guidelines or limits designed to protect humans against any adverse health effects. The limit values should not be viewed as demarcation lines between "safe" and "dangerous" levels of EMFs, but rather, levels that assure safety with adequate margins to allow for uncertainties in the science. For magnetic fields, these health-based guidelines range from about 1,000 to 10,000 milligauss (mG). The International Commission on Non-Ionizing Radiation Protection (ICNIRP) guideline for allowable public exposure to 60-Hz AC MFs is 2,000 mG (ICNIRP, 2010). Section 2 also describes EMF guidelines that have been adopted by various states in the United States (US), including by the Massachusetts Energy Facilities Siting Board (MA EFSB). These state guidelines are not health-effect based and have typically been adopted to maintain the *status quo* for EMF levels on and near overhead transmission line ROWs.

As described in this report and summarized in Tables 1.1 and 1.2 below, our MF modeling analysis showed that all modeled post-Project MF values for each representative cross section at both annual average and system peak load levels, including directly above the circuit centerlines, are well below the ICNIRP health-based guideline of 2,000 mG for allowable public exposure to magnetic fields (ICNIRP, 2010). This is the case despite a conservative modeling approach that did not consider the small reductions in magnetic fields from the induced GCC currents. In all cases, aboveground MF values dropped off rapidly with increasing lateral distance from the circuit centerlines (*e.g.*, 88-93% reductions at lateral distances of ±25 ft from circuit centerlines), such that aboveground MF levels decreased to negligible levels at short lateral distances beyond the trenches.

Table 1.1 Modeled Magnetic Fields at 1 Meter Aboveground for Representative Project Underground Line Cross Sections: Annual Average Load Levels

Cross Section	Predicted Resultant Magnetic Field (mG)			
	Maximum Directly Above Circuit Centerline	±10 ft from Circuit Centerline	±25 ft from Circuit Centerline	±50 ft from Circuit Centerline
Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches	14.3	5.1	1.1	0.3
Horizontal Conductor Configuration for Flat Trenches	23.6	7.5	1.6	0.4
Vertical Conductor Configuration for Manhole Approaches	31.9	14.1	3.7	1.0
HDD Bore Conductor Configuration	13.2	5.4	1.3	0.4

Notes:
ft = Feet; HDD = Horizontal Directional Drilling; mG = Milligauss.

Table 1.2 Modeled Magnetic Fields at 1 Meter Aboveground for Representative Project Underground Line Cross Sections: System Peak Load Levels

Cross Section	Predicted Resultant Magnetic Field (mG)			
	Maximum Directly Above Circuit Centerline	±10 ft from Circuit Centerline	±25 ft from Circuit Centerline	±50 ft from Circuit Centerline
Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches	35.5	12.5	2.8	0.8
Horizontal Conductor Configuration for Flat Trenches	58.5	18.6	4.0	1.1
Vertical Conductor Configuration for Manhole Approaches	78.9	34.8	9.1	2.5
HDD Bore Conductor Configuration	32.6	13.4	3.3	0.9

Notes:
ft = Feet; HDD = Horizontal Directional Drilling; mG = Milligauss.

In addition, as discussed in Section 3, MFs for the HDD bore installation case where the Project 115-kV underground circuit will cross beneath Herring Run Brook in Weymouth are not expected to impact the annual migration of river herring to their upstream spawning grounds.

Section 2 of this report describes the nature of EMFs, provides values for EMF levels from common sources, and reports on EMF exposure guidelines. Section 3 describes the EMF modeling procedures for calculating EMF levels as a function of lateral distance from an electric transmission line (or distribution line) and provides tabular results and charts for the modeled cross sections. Section 4 summarizes the conclusions, and the reference list provides the references for published literature and exposure guidelines cited in this report.

2 Nature of Electric and Magnetic Fields

All matter contains electrically charged particles. Most objects are electrically neutral because positive and negative charges are present in equal numbers. When the balance of electric charges is altered, we experience electrical effects. Common examples are the static electricity attraction between a comb and our hair or a static electricity spark after walking on a synthetic rug in the wintertime. Electrical effects occur both in nature and through our society's use of electric power (generation, transmission, and consumption).

2.1 Units for EMFs Are Kilovolts Per Meter (kV/m) and Milligauss (mG)

The electrical tension on utility power lines is expressed in volts or kilovolts (1 kV = 1,000 V). Voltage is the "pressure" of the electricity and can be envisioned as analogous to the pressure of water in a plumbing system. The existence of a voltage difference between power lines and ground results in an electric field (EF), usually expressed in units of kilovolts per meter (kV/m). The size of the EF depends on the line voltage, the separation distance between lines and ground, and other factors. There are no aboveground electric fields for underground transmissions lines due to their shielding by the metallic shield covering the conductor insulation, the duct banks, and the intervening earth.

Power lines also carry an electric current that creates a MF. The units for electric current are amperes (A), which is a measure of the "flow" of electricity. Electric current is analogous to the flow of water in a plumbing system. The MF produced by an electric current is usually expressed in units of gauss (G) or milligauss (mG) (1 G = 1,000 mG).[1] The size of the MF can be accurately calculated for any location and depends on the electric current, the distance to the current-carrying conductor, and other factors.

2.2 There Are Many Natural and Man-made Sources of EMFs

Everyone experiences a variety of natural and man-made EMFs. EMF levels can be steady or slowly varying (often called direct current [DC] fields), or EMF levels can vary in time (often called alternating current [AC] fields). When the time variation corresponds to that of standard North American power line currents (*i.e.*, 60 cycles per second), the fields are called 60-Hz EMFs, or power-frequency EMFs.

Man-made MFs are common in everyday life. For example, many childhood toys contain magnets. Such permanent magnets generate strong, steady (DC) MFs. Typical toy magnets (*e.g.*, refrigerator door magnets) have fields of 100,000-500,000 mG. On a larger scale, Earth's core also creates a steady DC MF that can be easily demonstrated with a compass needle. The size of the Earth's MF in the northern US is about 550 mG (less than 1% of the levels generated by typical refrigerator door magnets).

2.3 Power-frequency EMFs Are Found Near Electric Lines and Appliances

In North America, electric power transmission lines, distribution lines, and electrical wiring in buildings and homes carry AC currents and voltages that change size and direction at a frequency of 60 Hz. These 60-Hz currents and voltages create 60-Hz EMFs nearby. The size of the MF is proportional to the line

[1] Another unit for magnetic field (MF) levels is the microtesla (μT) (1 μT = 10 mG).

current, while the size of the EF is proportional to the line voltage. The EMFs associated with electrical wires and electrical equipment decrease rapidly with increasing distance away from the electrical wires. Specifically, EMFs from three-phased, balanced conductors decrease in proportion to the square of the distance from the conductors (*i.e.*, $1/d^2$) (IEEE, 2014).

When EMF derives from different wires or conductors that are in close proximity, or adjacent to one another, the level of the net EMF produced will be somewhere in the range between the sum of EMF from the individual sources and the difference of the EMF from the individual sources. EMF may partially add, or partially cancel but, because adjacent wires are often carrying current in opposite directions, the EMF produced in such a case tends generally to cancel.

EMFs in the home arise from electric appliances, indoor wiring, grounding currents on pipes and ground wires, and outdoor distribution or transmission circuits. Inside residences, typical baseline 60-Hz MF levels (away from appliances) range from 0.5-5.0 mG.

Higher 60-Hz MF levels are found near operating appliances. For example, can openers, mixers, blenders, refrigerators, fluorescent lamps, electric ranges, clothes washers, toasters, portable heaters, vacuum cleaners, electric tools, and many other appliances generate MF levels as high as several hundred mG at distances of 1 foot (NIEHS, 2002). MF levels from small appliances held within half a foot (*e.g.*, shavers, hair dryers, vacuum cleaners) can be as high as 600-700 mG (NIEHS, 2002). At school and in the workplace, lights, motors, copy machines, vending machines, video-display terminals, motor-driven pencil sharpeners, electric tools, electric heaters, and building wiring are all sources of 60-Hz MFs.

Recognizing that magnetic resonance imaging (MRI) is primarily a source of DC fields rather than 60-Hz fields, MRIs are a diagnostic procedure that puts humans in much larger, but steady, MF (*e.g.*, levels of 20,000,000 mG). The scanning MF superimposed on the large, steady static field (which is the source of the characteristic audio noise of MRI scans) exposes the body to time-varying MF similar to time-varying power-frequency MF.

2.4 State, National, and International Guidelines for Power-Frequency EMFs

Table 2.1 shows guidelines for 60-Hz AC EMFs from national and world health and safety organizations that are designed to be protective against any adverse health effects. The limit values should not be viewed as demarcation lines between safe and dangerous levels of EMFs, but rather, levels that assure safety with an adequate margin to allow for uncertainties in the science. As part of its International EMF Project, the World Health Organization (WHO) has conducted comprehensive reviews of EMF health-effects research and existing standards and guidelines. The WHO website for the International EMF Project (WHO, 2023) notes: "[T]he main conclusion from the WHO reviews is that EMF exposures below the limits recommended in the ICNIRP international guidelines do not appear to have any known consequence on health."

The US has no federal standards limiting either residential or occupational exposure to 60-Hz EMFs. Table 2.2 lists 60-Hz AC EMF guidelines that have been adopted by various states in the US, including by the MA EFSB. State guidelines, including those of the MA EFSB, are not health-effect based and have typically been adopted to maintain the *status quo* for MFs on and near an overhead transmission line ROW. The MA EFSB accepted an edge-of-ROW guideline level of 85 mG for MF in the mid-1980s (MA EFSB, 2009), along with a corresponding edge-of-ROW electric field guideline level of 1.8 kilovolts per meter (kV/m). While there are references to these guidelines in some older EFSB analyses and decisions on transmission line projects, the MA EFSB has put more emphasis on mitigation of magnetic field impacts rather than on a specific MF guidance level in more recent EFSB analyses and decisions on transmission line projects.

Table 2.1 60-Hz AC EMF Guidelines Established by International Health and Safety Organizations

Organization	Electric Field	Magnetic Field
American Conference of Governmental and Industrial Hygienists (ACGIH) (occupational)	25 kV/m[(1)]	10,000 mG[(1)] 1,000 mG[(2)]
International Commission on Non-Ionizing Radiation Protection (ICNIRP) (general public)	4.2 kV/m[(3)]	2,000 mG[(3)]
International Commission on Non-Ionizing Radiation Protection (ICNIRP) (occupational)	8.3 kV/m[(3)]	10,000 mG[(3)]
Institute of Electrical and Electronics Engineers (IEEE) Standard C95.1™-2019 (general public)	5.0 kV/m[(4)]	9,040 mG[(4)]
Institute of Electrical and Electronics Engineers (IEEE) Standard C95.1™-2019 (occupational)	20.0 kV/m[(4)]	27,100 mG[(4)]

Notes:
AC = Alternating Current; EMF = Electric and Magnetic Field; Hz = Hertz; kV/m = Kilovolts per Meter; mG = Milligauss.
(1) The ACGIH guidelines for the general worker (ACGIH, 2023).
(2) The ACGIH guideline for workers with cardiac pacemakers (ACGIH, 2023).
(3) ICNIRP (2010).
(4) IEEE (2019); developed by the IEEE International Committee on Electromagnetic Safety (ICES).

Table 2.2 State 60-Hz AC EMF Standards and Guidelines for Transmission Lines

State	Line Voltage (kV)	Electric Field (kV/m)		Magnetic Field (mG)	
		On ROW	Edge of ROW	On ROW	Edge of ROW
Florida[(1)]	69-230 >230-500 >500	8.0 10.0 15.0	2.0[(2)] 2.0[(2)] 5.5[(2)]		150[(2)] 200[(2)] 250[(2,3)]
Massachusetts			1.8		85
Minnesota		8.0			
Montana		7.0[(4)]	1.0[(5)]		
New Jersey			3.0		
New York[(1)]		11.8 11.0[(6)] 7.0[(4)]	1.6		200
Oregon		9.0			

Notes:
AC = Alternating Current; Blank = Not Applicable/Not Available; EMF = Electric and Magnetic Field; Hz = Hertz; kV = Kilovolt; kV/m = Kilovolts per Meter; mG = Milligauss; ROW = Right-of-Way.
Sources: NIEHS (2002); FLDEP (2008); MA EFSB (2009).
(1) Magnetic fields for winter-normal (*i.e.*, at maximum current-carrying capability of the conductors).
(2) Includes the property boundary of a substation.
(3) Also applies to 500-kV double-circuit lines built on existing ROWs.
(4) Maximum for highway crossings.
(5) May be waived by the landowner.
(6) Maximum for private road crossings.

3 MF Modeling for Project Underground 115-kV Transmission Line

3.1 MF Modeling Software Program

The FIELDS computer program, designed by Southern California Edison, was utilized to calculate MF levels from the Project underground 115-kV transmission line. This program operates using Maxwell's equations, which accurately apply the laws of physics as related to electricity and magnetism (EPRI, 1982, 1993). Modeled fields using this program are both precise and accurate for the input data utilized. Results of the model have been checked extensively against each other and against other software (*e.g.*, CORONA, from the Bonneville Power Administration, US Department of Energy) to ensure that the implementation of the laws of physics are consistent. In these validation tests, program results for MF levels were found to be in very good agreement with each other (Mamishev and Russell, 1995).

Modeled 60-Hz AC magnetic field levels from FIELDS are reported as root mean square (RMS) values of the resultant fields, generally referred to as $B_{Resultant}$ or B_{Res}, and sometimes as $B_{Product}$ or B_{Prod}. We have reported B_{Res} values to be consistent with the magnetic field levels that will be reported by instruments relying on three fixed orthogonal coils (*e.g.*, fixed-coil instruments like the EMDEX II), where the electronics calculate the sum of the squares of magnetic fields detected by each orthogonal coil separately. However, it is important to note that B_{Res} will always be larger than the real "maximum" rotating magnetic field (*i.e.*, the RMS value of the semi-major axis magnitude of the field ellipse; known as $B_{Maximum}$ or B_{Max}) when modeling (or measuring) elliptically or circularly polarized fields. In other words, B_{Res} is a conservative overestimate of magnetic field values, in particular for elliptically or circularly polarized magnetic fields typical of phase conductors in a triangular or "delta" configuration (IEEE, 2021).

3.2 Power-line Loads

MFs produced by the Project three-phase underground circuit were modeled using both annual average and system peak line loadings. The current per phase satisfies the relationship:

(Eq. 3.1) $$S = \sqrt{3} \times V \times I_{phase}$$

where:

S	=	The power in kilovolt-amperes (kVA)
V	=	The line voltage in kilovolts (kV)
I_{phase}	=	The current per phase in amperes (A)

Thus, the current per phase conductor is:

(Eq. 3.2) $$I_{phase} = \frac{S}{\sqrt{3} \times V}$$

Real power is typically expressed in megawatts (MW) (P), and apparent power in megavolt-amperes (MVA) (S).[2,3] To convert between power quoted in MW to MVA, one must divide MW by the power factor.

Electric current and voltage values, which were either provided by HMLP or calculated from data provided by HMLP, are summarized by load scenario (annual average and system peak loadings) in Table 3.1 for use in the post-Project MF modeling analysis. As indicated by Table 3.1, balanced conductor loadings of either 115.5 amps or 286.2 amps were used for the post-Project annual average and system peak load scenarios, respectively.

Table 3.1 Electric Currents (A) and Voltages (kV) by Load Scenario Used for the Post-Project Magnetic Field Modeling

Load Scenario	Electric Voltage (kV)	Electric Current (A)[1]
Annual Average	115	115.5
System Peak	115	286.2

Notes:
A = Amperes; kV = Kilovolt.
(1) Calculated from real power values of 23 and 57 MW provided by HMLP for post-Project annual average and system peak loading conditions using Equation 3.2 and assuming MVA was equal to MW (*i.e.*, power factor = 1.0).

3.3 Project Cable Specifications and Representative Underground Line Cross Sections

Table 3.2 provides a summary of key technical specifications for the 115-kV transmission cables to be installed in underground duct banks along the Project route. The 115-kV single-core cables will consist of a 750 kcmil copper conductor covered by cross-linked polyethylene (XLPE) solid insulation and by a metallic shield, with an overall cable diameter of 2.9 inches. The 115-kV circuit will consist of three cables, one per phase, each to be installed within 6-inch conduits in the underground duct banks. A GCC, which will consist of a 350 kcmil copper conductor, will also be installed within a 2-inch conduit in close proximity to the Project phase conductors. There will also be smaller conduits for distributed temperature sensing (DTS) and communications cables.

MF modeling was performed by Gradient for four representative Project underground line cross sections. Figure 3.1 shows the triangular conductor configuration that will be used for the underground duct banks to be installed in the typical duct bank trenches. As indicated in this diagram, the typical duct bank will be approximately 26-inches tall by 31-inches wide, and phase conductors will be installed in two lower 6-inch conduits and a single upper conduit. The duct bank will be encased in a thermal concrete envelope. Figures 3.2 through 3.4 show the other three representative cross sections for the underground circuit, including the horizontal conductor configuration to be used as needed depending on subsurface conditions for a flat trench installation case (Figure 3.2), the vertical conductor configuration to be used for manhole (*e.g.*, splice vault) approaches (Figure 3.3), and the HDD bore conductor configuration to be used for crossing beneath Herring Run Brook in Weymouth (Figure 3.4). These figures also show the conduits to be used for the GCC, DTS cables, and communications cables.

[2] MVA is apparent power and is the vector sum of real (active) and imaginary (reactive) power.
[3] 1 MVA = 1,000 kVA

For each representative underground line cross section shown in Figures 3.1 through 3.4, aboveground MF levels were modeled as a function of horizontal distance, perpendicular to the direction of current flow. MF levels were calculated out to 50 feet on either side of the conductor centerline. Per standard industry practices (IEEE Power Engineering Society, 1995a,b), MF levels were modeled at a height of 1 meter above the ground surface to represent the exposure of an upright person. Each phase conductor was assumed to lie in the bottom of the 6-inch polyvinyl chloride (PVC) conduits (for all but the HDD bore installation case) or 8-inch high-density polyethylene (HDPE) conduits (for only the HDD bore installation case), and horizontal and vertical coordinates were calculated based on dimensions shown in the cross section diagrams and conductor specifications provided by Electrical Consulting Engineers, P.C. (Table 3.2). The current on the Project phase conductors will induce a smaller current on the GCC to be installed in the underground duct banks. However, because the FIELDS model does not calculate either the magnitude or phase angle of induced currents, the MF modeling was conducted with the phase conductors' main currents only (*i.e.*, it was assumed that the currents on the GCC are zero). This is a conservatism in the MF modeling (*i.e.*, a factor contributing to the overestimation of MFs) because the weak current induced by the MFs from the phase conductors' main currents on the GCC is expected to produce an MF that will tend to oppose (partially cancel) the MF causing the induced current, similar to the induced current on passive loops used as a mitigation measure for underground transmission lines (Istenic *et al.*, 2001).

The MF modeling analysis is focused on representative cross sections for the new underground 115-kV circuit and not any equipment (*e.g.*, busbars, transformers) within the fencelines of either the new substation to be located on the Hingham transfer station site or the new Eversource tap station to be located off of Broad Street adjacent to the Eversource ROW in Weymouth. The proposed Hobart II Substation in Hingham will have gas-insulated switchgear (GIS), which will allow the conductors within the proposed substation to be placed closer together than for air-insulated switchgear (AIS), thus enhancing the rapid drop-off of MF levels with distance away from the equipment. While AIS is to be used at the new Eversource tap station, MFs will also diminish rapidly with distance from the tap station equipment and the tap station will not abut any residential properties (note that the closest residential properties on Broad Street are in closer proximity to the Project underground 115-kV transmission line than the tap station, and the Project underground line would thus be expected to be a larger potential source of MFs at these properties than the more distant tap station; while the closest residences on Roosevelt Road are on the other side of the Eversource ROW from the tap station, so that the tap station would be expected to be a negligible source of MFs at these properties). In addition, engineering design diagrams indicate that the closest switchgear to the paved parking lot at the Connell Rink and Pool is to be located more than 50 feet from the parking lot edge, such that MFs from the tap station equipment will have diminished to minimal levels. It is well-established that, for the types of electrical equipment present in the proposed substation and tap station (*e.g.*, aboveground buswork, transformers, switchgear), where conductors are arranged in close proximity to each other, that EMF levels decrease rapidly to low levels inside the fenceline; and the strongest fields near the perimeter fence are expected to be associated with the transmission and distribution lines entering/exiting the station (IEEE, 2014). As a result, it is expected that MFs outside the fencelines of the new Project substation in Hingham and the new Eversource tap station in Weymouth will be dominated by MFs associated with the Project underground 115-kV transmission line and other transmission or distribution lines entering/exiting the stations rather than equipment within the fencelines.

Table 3.2 Project 115-kV Transmission Cable Specifications

Parameter	Specification Value
Constructional Data	
Cable Overall Diameter	2.9 inches
Conductor Diameter	0.866 inches
Conductor Type	Copper
Metallic Shield	(38) #12 AWG wires & 6 mil copper foil
Electrical Data	
Current type and frequency	Alternating current 60 Hz
Operating voltage (line-to-line)	115 kV

Notes:
A = Ampere; AWG = American Wire Gauge; Hz = Hertz; kV = Kilovolt; MF = Magnetic Field; mm = Millimeter.

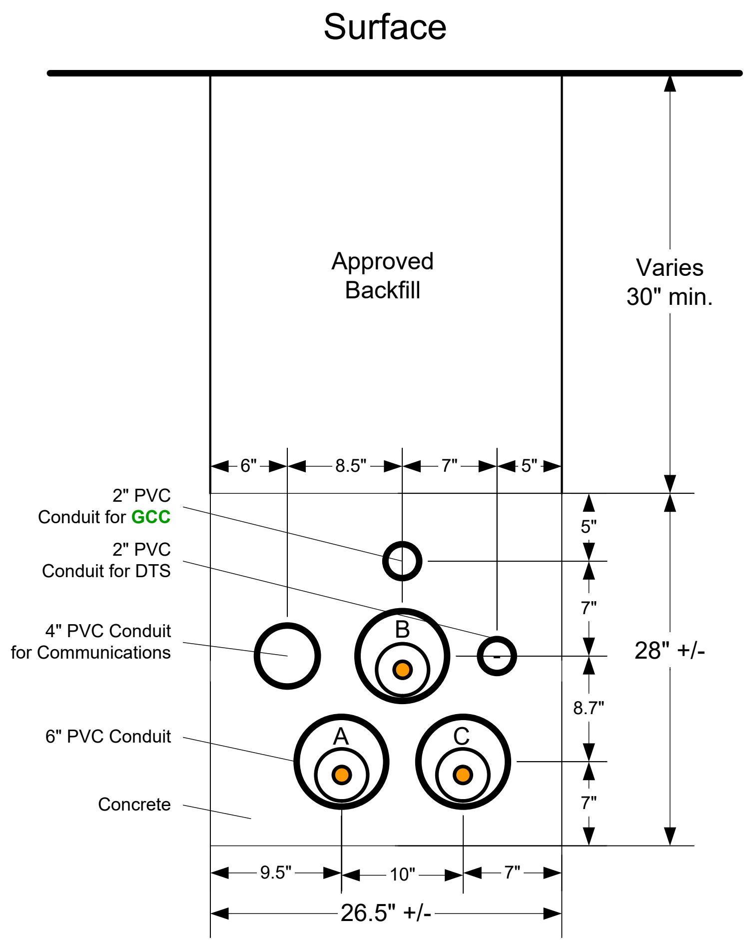

Figure 3.1 Representative Cross Section Drawing of the Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches. As indicated in the figure, the duct bank will have a minimum burial depth of 30 inches, and the uppermost phase conductor will sit within a 6-inch PVC conduit with a midpoint 12 inches beneath the top of the duct bank. The letters A, B, and C indicate the phasing of the phase conductors. The GCC will be installed in a 2-inch conduit at the top of the duct bank.

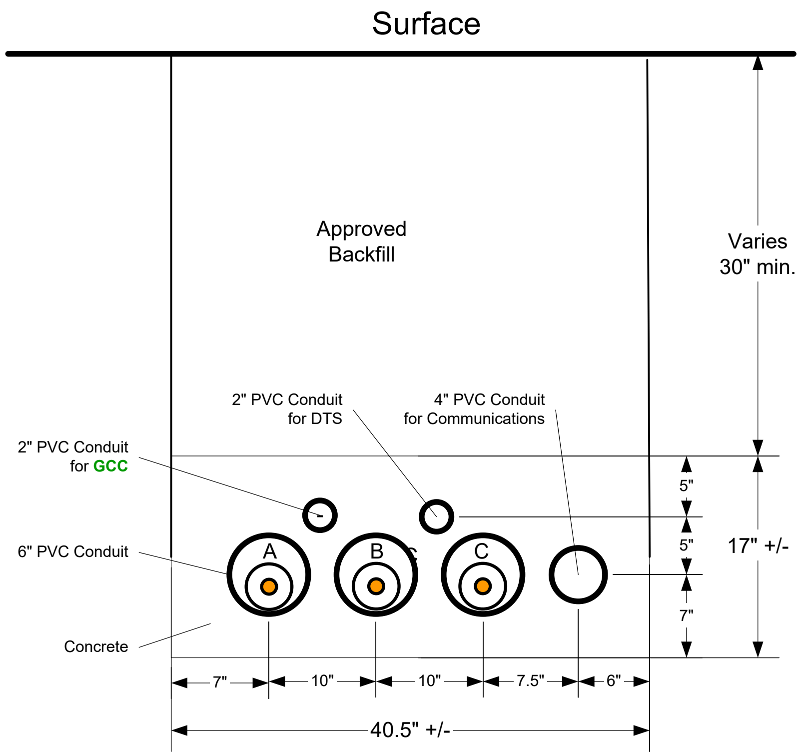

Figure 3.2 Representative Cross Section Drawing of the Horizontal Conductor Configuration for the Flat Trench Installation Case. As indicated in the figure, the duct bank will have a minimum burial depth of 30 inches, and the phase conductors will sit within 6-inch PVC conduits with midpoints 10 inches beneath the top of the duct bank. The letters A, B, and C indicate the phasing of the phase conductors. The GCC will be installed in a 2-inch conduit at the top of the duct bank.

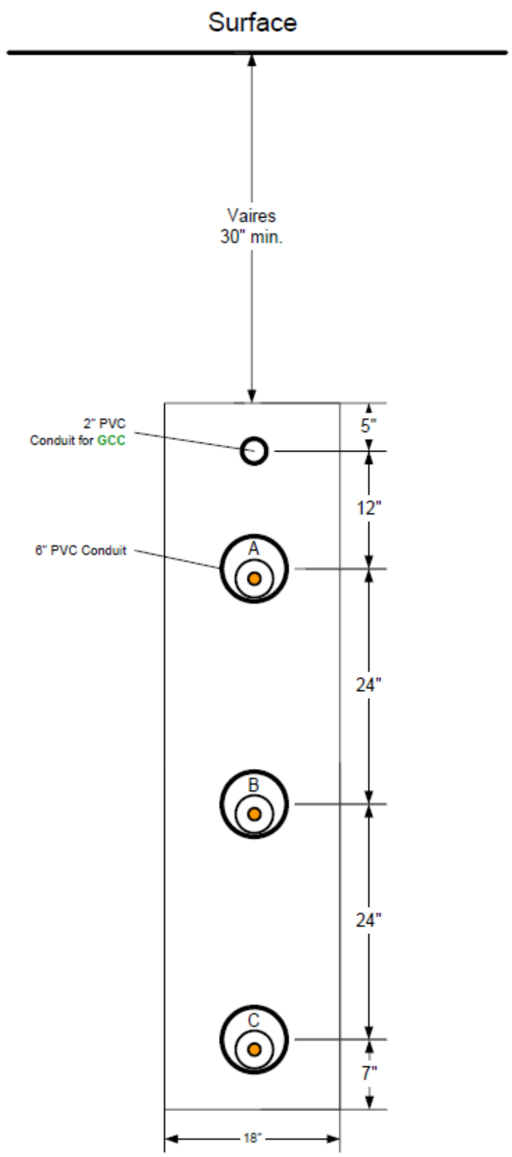

Figure 3.3 Representative Cross Section Drawing of the Vertical Conductor Configuration for Manhole Approaches. As indicated in the figure, the duct bank will have a minimum burial depth of 30 inches, and the uppermost phase conductor will sit within a 6-inch PVC conduit with a midpoint 17 inches beneath the top of the duct bank. The letters A, B, and C indicate the phasing of the phase conductors. The GCC will be installed in a 2-inch conduit at the top of the duct bank.

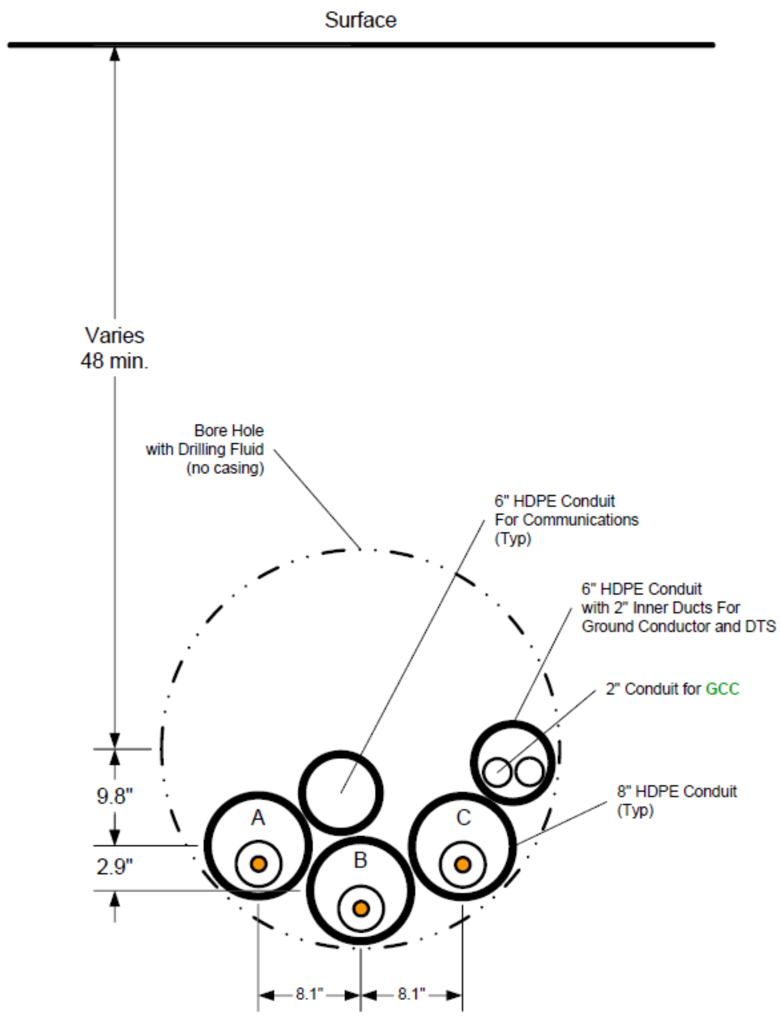

Figure 3.4 Representative Cross Section Drawing of the Horizontal Directional Drilling (HDD) Bore Conductor Configuration. As indicated in the figure, the centerline of the HDD bores will have a minimum burial depth of 48 inches. The letters A, B, and C indicate the phasing of the phase conductors. The GCC will be installed in a 2-inch conduit above and to the side of the 8-inch HDPE conduits with the phase conductors.

3.4 MF Modeling Results

Results of the MF modeling for the representative Project 115-kV underground transmission line cross sections are summarized in Tables 3.4 and 3.5, as well as Figures 3.5 through 3.8. The MF modeling results show that all model-predicted MF values, including those directly above the circuit centerlines, are well below the ICNIRP health-based guideline of 2,000 mG for allowable public exposure to 60-Hz AC MFs (ICNIRP, 2010). For the MF modeling based on annual average load levels, the peak MF level directly above the circuit centerline was 14.3 mG for the triangular conductor configuration in the typical underground duct bank trenches, while peak MF levels for the other representative cross sections directly above the circuit centerline ranged from 13.2 mG to 31.9 mG. Slightly higher MF levels were obtained for the MF modeling based on system peak load levels, with a peak MF level directly above the circuit centerline of 35.5 mG for the triangular conductor configuration in the typical underground duct bank trenches and a range of 32.6 mG to 78.9 mG for the other representative cross sections. In all cases, aboveground MF values dropped off rapidly with increasing lateral distance from the circuit centerlines, such that aboveground MF levels decreased to negligible levels at short distances beyond the trenches. The plots show the significant reductions in aboveground MF levels with increasing lateral distance from the cables including:

- For the triangular conductor configuration for the typical underground duct bank trenches, approximately 92 percent reductions in aboveground MF levels at lateral distances of ±25 ft from the circuit centerline;
- For the horizontal conductor configuration for flat trenches, approximately 93 percent reductions in aboveground MF levels at lateral distances of ±25 ft from the circuit centerline;
- For the vertical conductor configuration for manhole approaches, approximately 88 percent reductions in aboveground MF levels at lateral distances of ±25 ft from the circuit centerline;
- For the HDD bore conductor configuration, approximately 90 percent reductions in aboveground MF levels at lateral distances of ±25 ft from the circuit centerline.

The HDD bore installation case is to be used for installing the Project cables beneath Herring Run Brook in Weymouth, and as indicated in the tables and figures, this installation case was found to have the lowest peak aboveground MF levels directly above the circuit centerline due to the greater burial depth (minimum of four feet beneath the ground surface) for this installation case. It is our understanding that some concerns have been raised regarding potential impacts of magnetic fields from the Project underground cables on river herring (alewife and blueback herring) during their annual migration to upstream spawning grounds *via* Herring Run Brook. However, it is not established that river herring are either magnetosensitive or rely on the earth's geomagnetic field to navigate to their spawning grounds. For example, the Naisbett-Jones and Lohmann (2022) review paper on magnetoreception and magnetic navigation in fish included no references to river herring as being among the fish species for which there is evidence of magnetoreception. Peer-reviewed journal articles and governmental reports focused on river herring and their migration (*e.g.*, Yako *et al.*, 2002; Greene *et al.*, 2009; Legett *et al.*, 2021; NOAA, 2007) make no reference to magnetic fields, such as the earth's geomagnetic field, as being among the potential environmental cues involved in the mechanism of migration. Greene *et al.* (2009) specifically pointed to olfaction as the "primary means for homing behavior" for the alewife herring species. NOAA (2007) referred to changing water temperatures as an initiator of seasonal migrations for alewife herring.

Regardless, even if river herring are in fact magnetosensitive and use the earth's geomagnetic field for navigation/migration purposes, the Project 60-Hz AC cables will generate time-varying AC magnetic fields that differ from the earth's static (*i.e.*, steady, 0 Hz) geomagnetic field. It is not established that magnetosensitive marine species, such as salmon, eels, and sharks, which are believed to utilize the earth's steady geomagnetic field for navigation and orientation purposes, can detect and respond to 60-Hz AC magnetic fields (CSA Ocean Sciences Inc. and Exponent, 2019). Notwithstanding the difference between 60-Hz AC magnetic fields and steady (0 Hz) magnetic fields, there is also an absence of scientific evidence that magnetic field fluctuations could serve as major barriers to migration. For example, for Chinook salmon smolts and adult green sturgeon that have been reported to orient to magnetic fields and that thus may use them as a guide for migration, Klimley *et al.* (2017) reported that the large anomalies in steady magnetic fields produced by bridges were not found to present major barriers to the migration of these fish species in the San Francisco Estuary.

Table 3.3 Modeled Magnetic Fields at 1 Meter Aboveground for Representative Project Underground Line Cross Sections: Annual Average Load Levels

Cross Section	Predicted Resultant Magnetic Field (mG)			
	Maximum Directly Above Circuit Centerline	±10 ft from Circuit Centerline	±25 ft from Circuit Centerline	±50 ft from Circuit Centerline
Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches	14.3	5.1	1.1	0.3
Horizontal Conductor Configuration for Flat Trenches	23.6	7.5	1.6	0.4
Vertical Conductor Configuration for Manhole Approaches	31.9	14.1	3.7	1.0
HDD Bore Conductor Configuration	13.2	5.4	1.3	0.4

Notes:
ft = Feet; HDD = Horizontal Directional Drilling; mG = Milligauss.

Table 3.4 Modeled Magnetic Fields at 1 Meter Aboveground for Representative Project Underground Line Cross Sections: System Peak Load Levels

Cross Section	Predicted Resultant Magnetic Field (mG)			
	Maximum Directly Above Circuit Centerline	±10 ft from Circuit Centerline	±25 ft from Circuit Centerline	±50 ft from Circuit Centerline
Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches	35.5	12.5	2.8	0.8
Horizontal Conductor Configuration for Flat Trenches	58.5	18.6	4.0	1.1
Vertical Conductor Configuration for Manhole Approaches	78.9	34.8	9.1	2.5
HDD Bore Conductor Configuration	32.6	13.4	3.3	0.9

Notes:
ft = Feet; HDD = Horizontal Directional Drilling; mG = Milligauss.

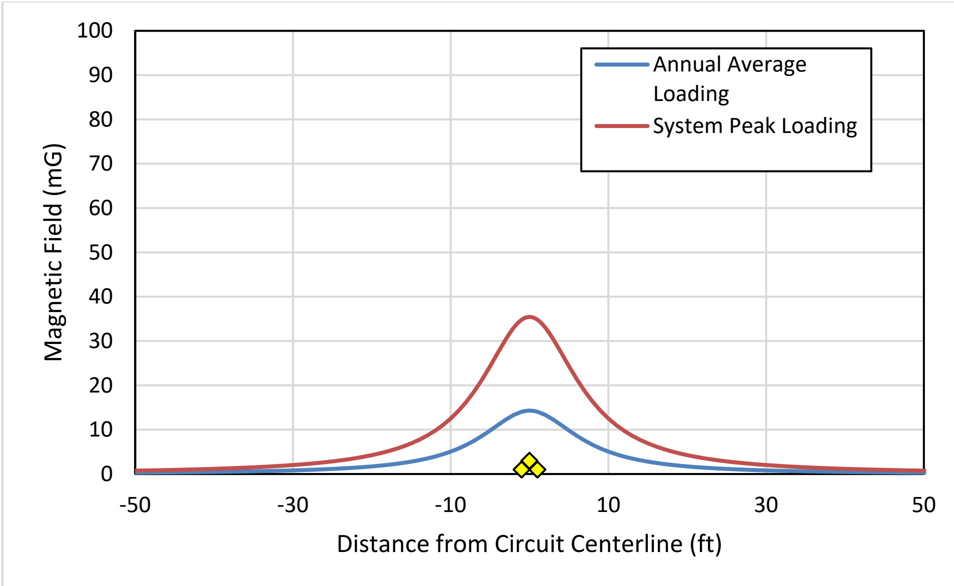

Figure 3.5 Magnetic Field Modeling Results at 1 Meter Aboveground for the Project Underground 115-kV Transmission Line in the Triangular Conductor Configuration for the Typical Underground Duct Bank Trenches. ft= Feet; mG = Milligauss. The conductor locations (yellow diamonds) on the graphs are not to scale and are only provided to show relative locations.

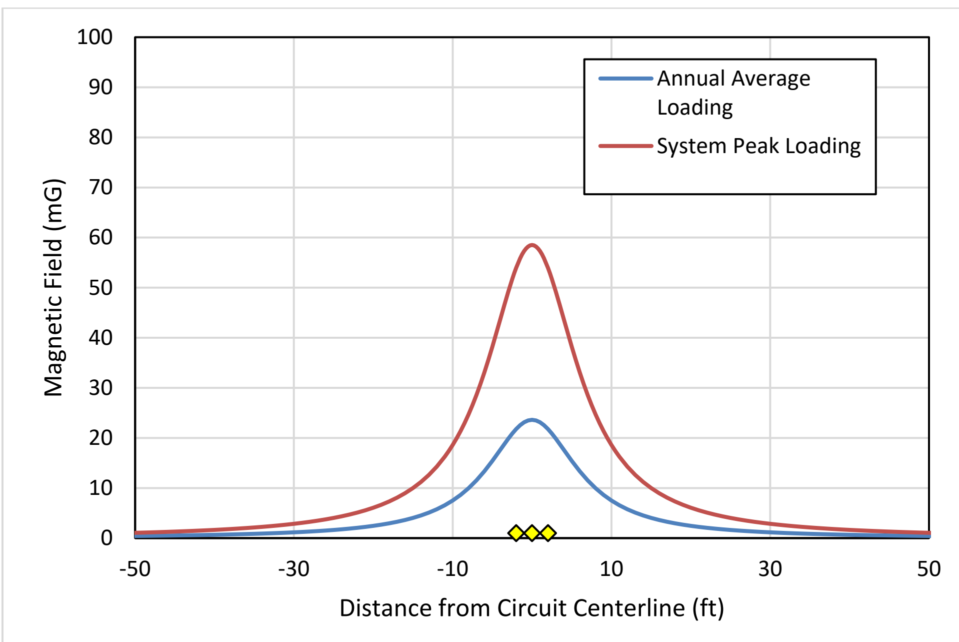

Figure 3.6 Magnetic Field Modeling Results at 1 Meter Aboveground for the Project Underground 115-kV Transmission Line in the Horizontal Conductor Configuration for Flat Trenches. ft= Feet; mG = Milligauss. The conductor locations (yellow diamonds) on the graphs are not to scale and are only provided to show relative locations.

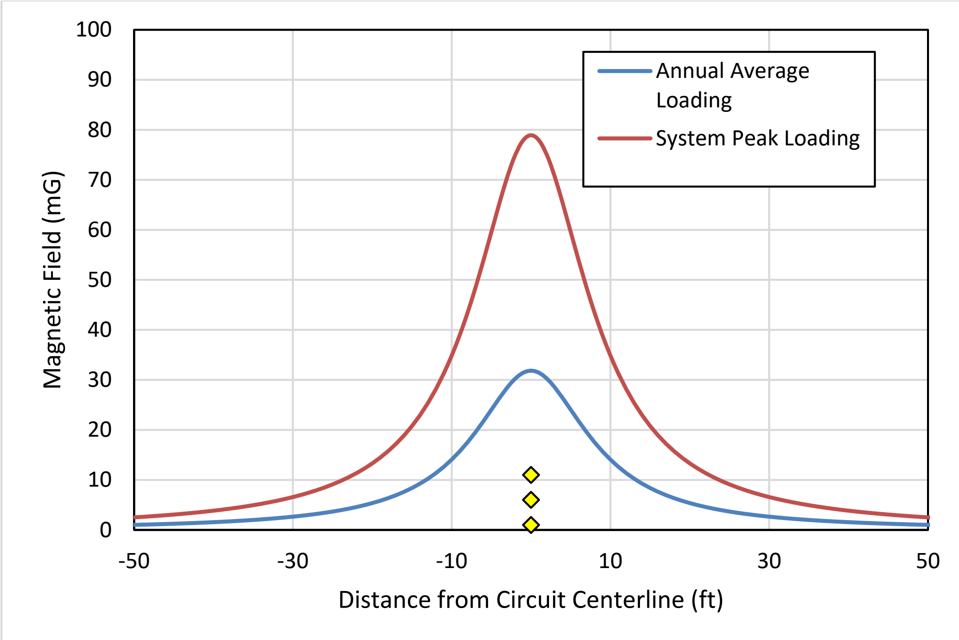

Figure 3.7 Magnetic Field Modeling Results at 1 Meter Aboveground for the Project Underground 115-kV Transmission Line in the Vertical Conductor Configuration for Manhole Approaches. ft= Feet; mG = Milligauss. The conductor locations (yellow diamonds) on the graphs are not to scale and are only provided to show relative locations.

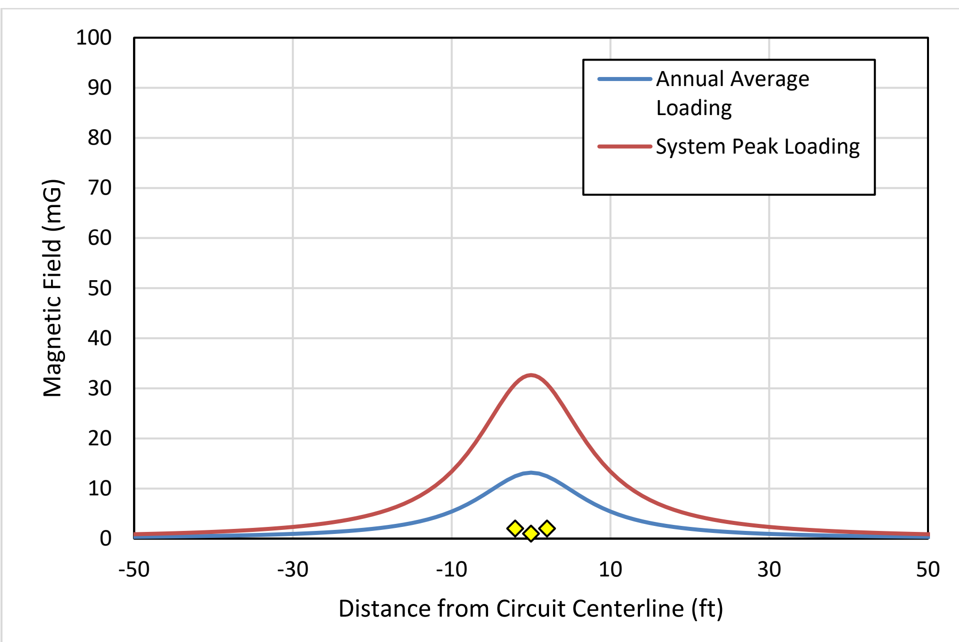

Figure 3.8 Magnetic Field Modeling Results at 1 Meter Aboveground for the Project Underground 115-kV Transmission Line in the Horizontal Directional Drilling (HDD) Bore Conductor Configuration. ft= Feet; mG = Milligauss. The conductor locations (yellow diamonds) on the graphs are not to scale and are only provided to show relative locations.

4 Conclusions

Gradient performed an independent EMF assessment for the proposed underground 115-kV circuit to be constructed and operated as part of the Hingham Electrical Infrastructure Reliability Project (HEIRP). The preferred Project route between the proposed Hobart II Substation in Hingham and the Eversource tap station site at the Eversource ROW in Weymouth is a total of approximately 3.2 miles in length. As discussed in this report, EMF modeling was conducted at a height of 1 meter (3.28 feet) above the ground surface for four representative underground line cross sections, including (1) the triangular conductor configuration for the typical underground duct bank trenches, (2) the horizontal conductor configuration for flat trenches, (3) the vertical conductor configuration for manhole approaches, and (4) the HDD bore conductor configuration for the crossing of Herring Run Brook in Weymouth. For each cross section, EMF modeling was conducted for both annual average and system peak load levels.

Our MF modeling analysis showed that all modeled post-Project MF values for each representative cross section at both annual average and system peak load levels, including directly above the circuit centerlines, are well below the ICNIRP health-based guideline of 2,000 mG for allowable public exposure to 60-Hz AC magnetic fields (ICNIRP, 2010). This is the case despite a conservative modeling approach that did not consider the small reductions in magnetic fields from the induced GCC currents. In all cases, aboveground MF values dropped off rapidly with increasing lateral distance from the circuit centerlines (*e.g.*, 88-93% reductions at lateral distances of ±25 ft from circuit centerlines), such that aboveground MF levels decreased to negligible levels at short distances beyond the trenches. In addition, MFs for the HDD bore installation case where the Project 115-kV underground circuit will cross beneath Herring Run Brook in Weymouth are not expected to impact the annual migration of river herring to their upstream spawning grounds; this conclusion is based on both the lack of scientific evidence that river herring are magnetosensitive or rely on the earth's geomagnetic field to navigate to their spawning grounds, as well as the lack of scientific evidence that magnetic field fluctuations from 60-Hz AC transmission lines can serve as major barriers to migration to magnetosensitive marine species, such as salmon and eels.

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Appendix A

Aerial Overview Map Showing the Hingham Electrical Infrastructure Reliability Project (HEIRP) Route

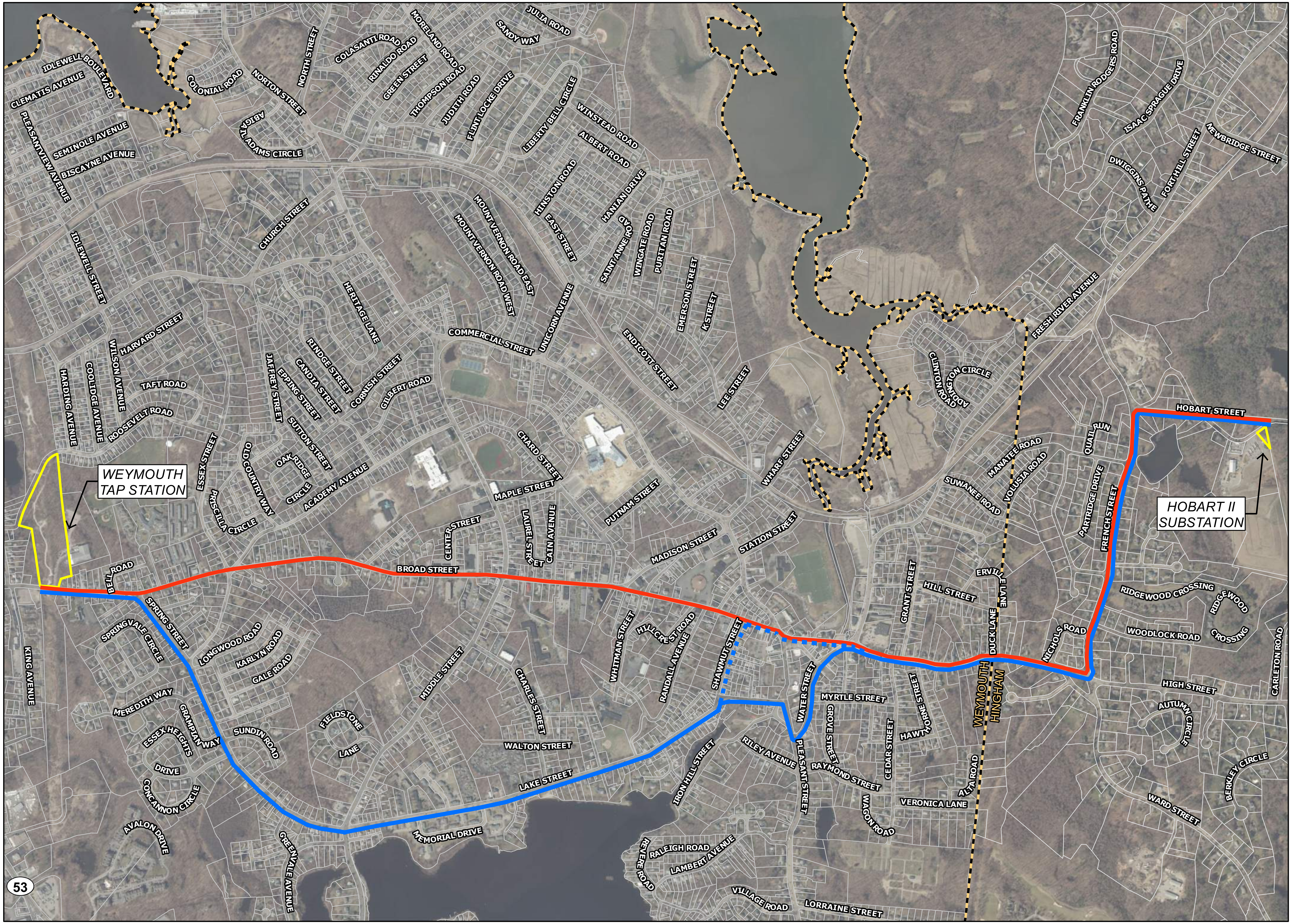


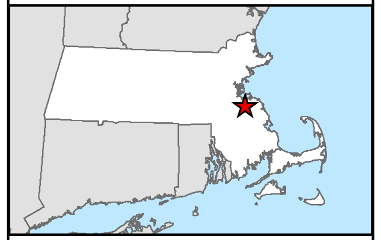
FIGURE 1
PREFERRED ROUTE & NOTICED ALTERNATE ROUTE

Hingham Electrical Infrastructure Reliability Project
Hingham & Weymouth, Massachusetts
October 2024

LEGEND

- Broad Street (Preferred)
- Lake Street (Noticed Alternative)
- Lake Street Variation (Noticed Alternative Variation)
- Tap/Substation Sites
- Town Boundary
- Parcel Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2021)
2. Hingham (2022) and Weymouth (2022) Parcels Downloaded from MassGIS and are Approximate.
3. Routes are exaggerated for display purposes. Routes will remain within ROWs.

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