G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-28A_Historic_Resources_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

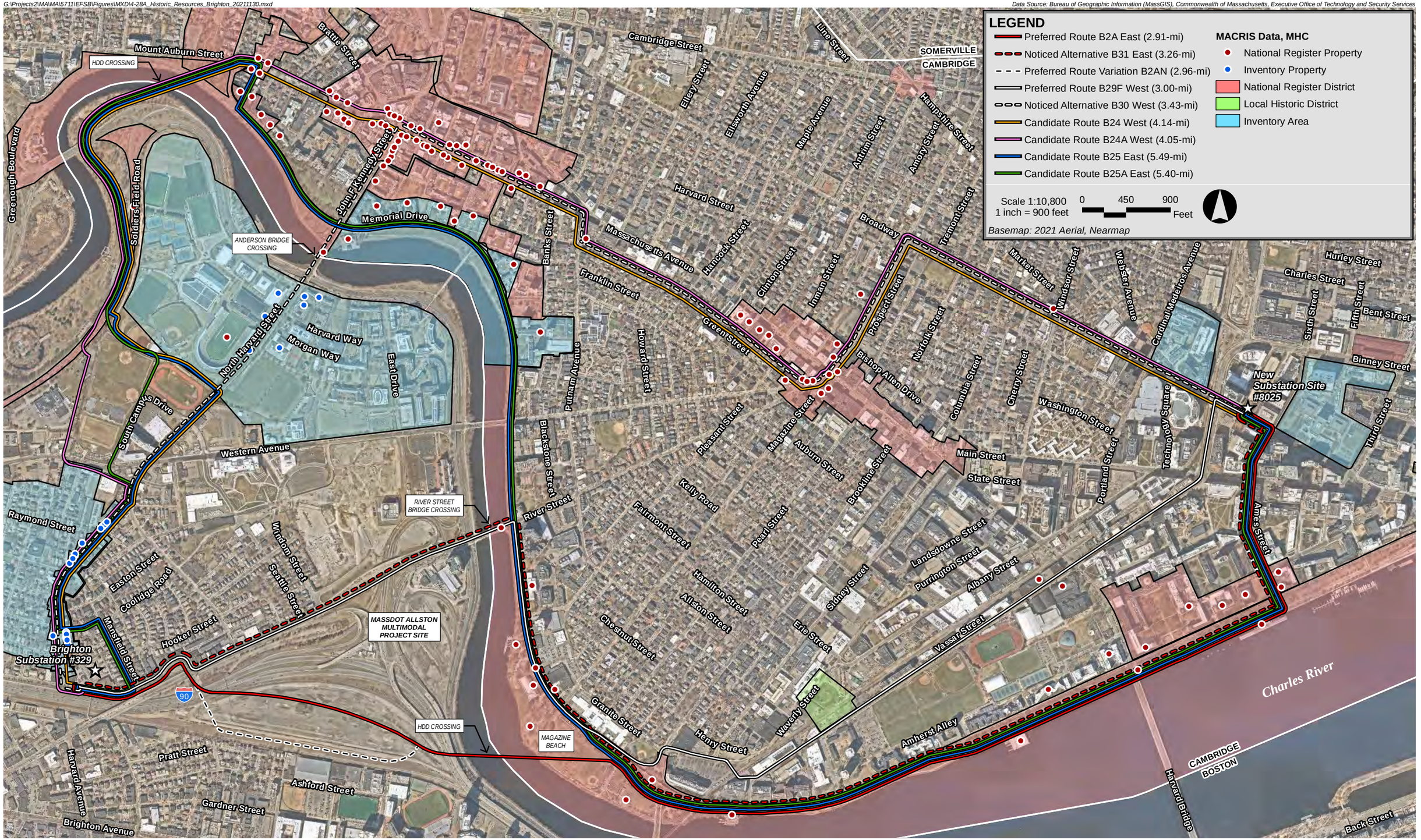

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Figure 4-28A

Historic Resources: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-28B_Historic_Resources_Putnam_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route P13 (0.49-mi)
- Noticed Alternative Route P11 (0.87-mi)
- Candidate Route P12 (1.44-mi)

MACRIS Data, MHC

- National Register Property
- Inventory Property
- National Register District
- Local Historic District

Scale 1:6,000
1 inch = 500 feet
0 250 500 Feet

Basemap: 2021 Aerial, Nearmap

Greater Cambridge Energy Program

EVERSOURCE

Figure 4-28B

Historic Resources: Putnam Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-28C_Historic_Resources_Kendall_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route K5A (0.59-mi)
- Noticed Alternative Route K11 (0.61-mi)
- Candidate Route K6A (0.67-mi)
- Candidate Route K10 (0.63-mi)
- Candidate Route K12 (0.69-mi)

MACRIS Data, MHC

- National Register Property
- Inventory Property
- National Register District
- Inventory Area

Scale 1:2,400
1 inch = 200 feet
0 100 200 Feet

Basemap: 2021 Aerial, Nearmap

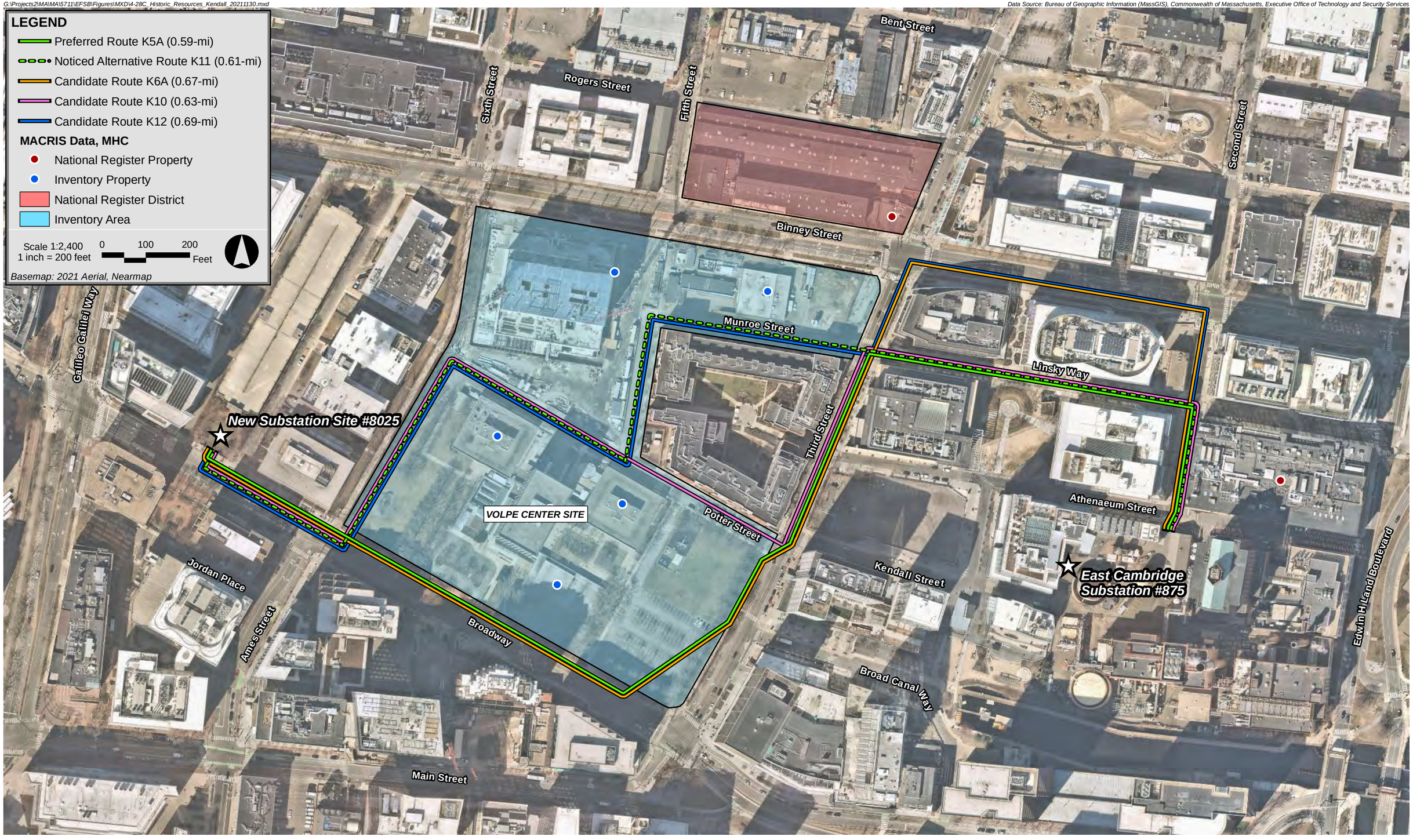

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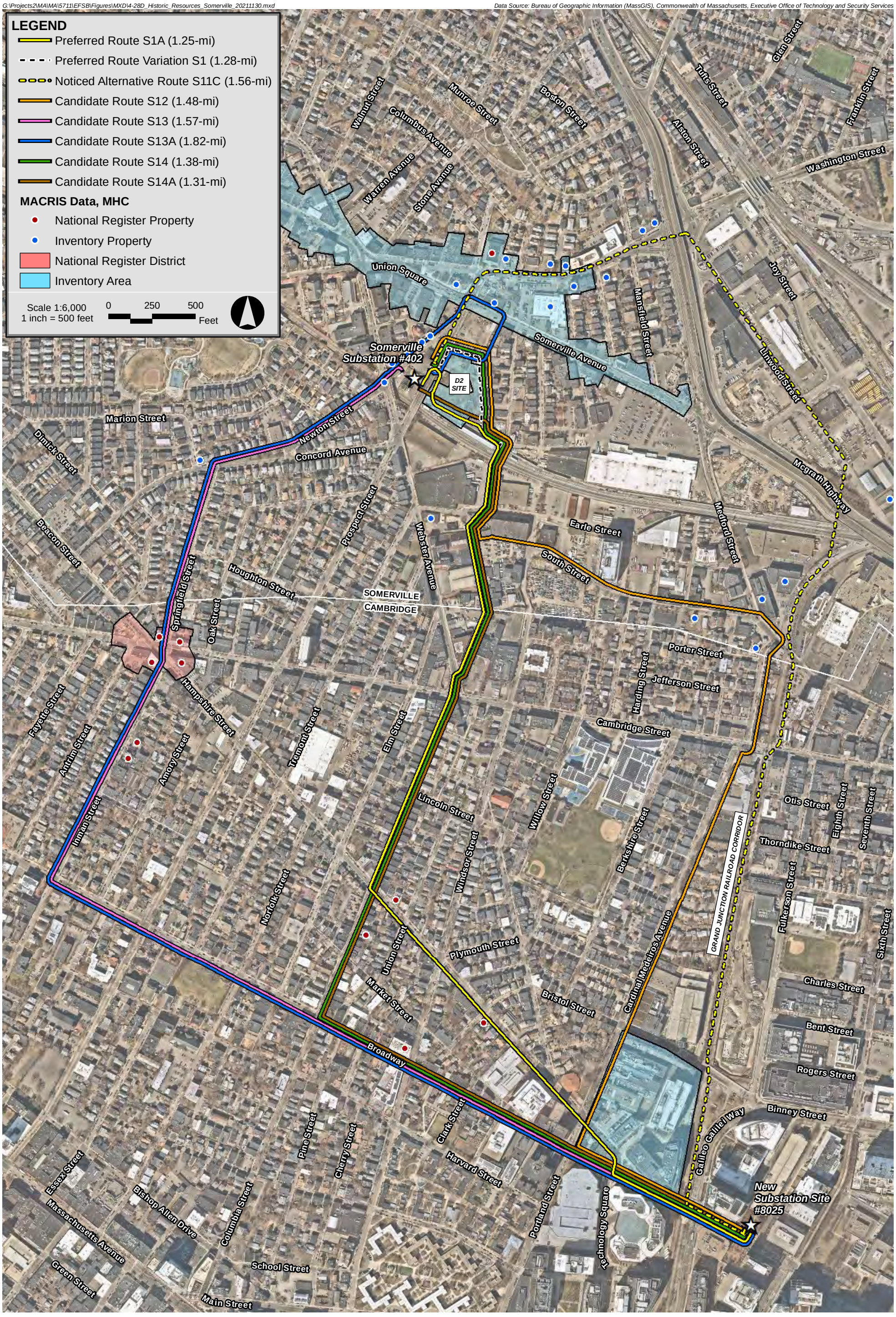
Figure 4-28C

Historic Resources: Kendall Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-28D_Historic_Resources_Somerville_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Greater Cambridge Energy Program

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Figure 4-28D

Historic Resources: Somerville Candidate Routes

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 evaluated in the search include active Tier Classified "Tier I" and "Tier II" sites, including Activity and Use Limitation ("AUL") sites, which are contaminated sites that have been remediated to some extent and are considered " closed" with ongoing maintenance conditions, Utility-related Abatement Measure ("URAM") sites and Class C temporary solution sites. These types of listed sites are further defined 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 data layer 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 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 original source of contamination.

- *Temporary Solution Sites:* These are sites where there has been a temporary cleanup. Although the site does not present a "substantial hazard," as defined in the regulation, it has not reached a level of no significant risk. The site must be evaluated every five years to determine whether a permanent solution is possible.

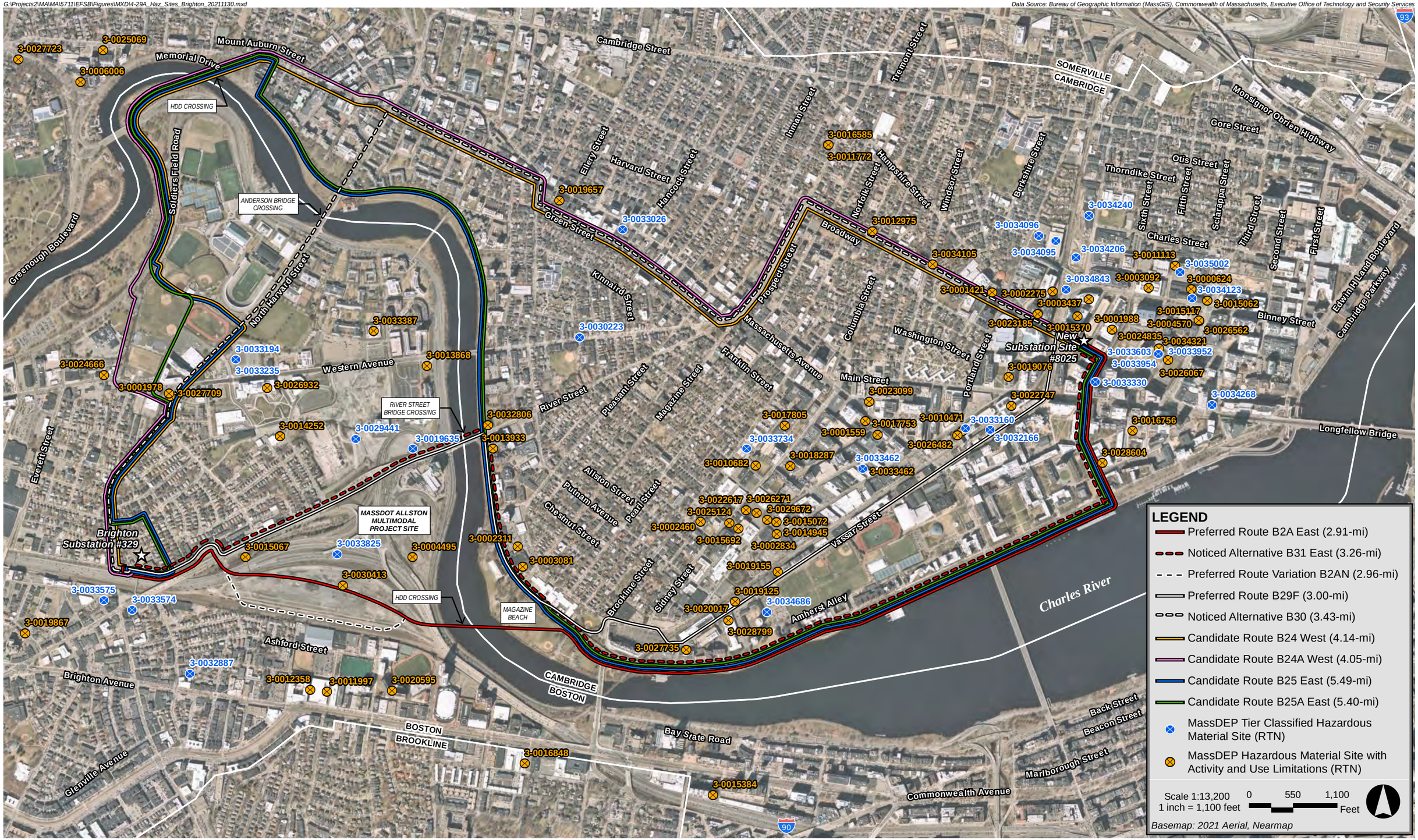
- *URAM*: Sites subject to utility related abatement measures.

As noted above, each Candidate Route was assessed regarding the number of the listed sites located on property parcels within 500-feet of the Candidate Routes. A ratio score was calculated for each Candidate Route based on the total number of listed sites determined for each Candidate Route within each respective Study Area divided by the highest number of listed sites found along all the Candidate Routes within each individual Study Area.

The referenced sites included in the scoring analysis are depicted on Figure 4-29A through D.

G:\Projects2\MA\MA5711\EFSB\Figures\MXD\4-29A_Haz_Sites_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



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EVERSOURCE

Figure 4-29A

MassDEP Tier Classified Oil and/or Hazardous Material Sites, and Sites with Activity and Use Limitations: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-29B_Haz_Sites_Putnam_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route P13 (0.49-mi)
- Noticed Alternative Route P11 (0.87-mi)
- Candidate Route P12 (1.44-mi)
- MassDEP Tier Classified Hazardous Material Site (RTN)
- MassDEP Hazardous Material Site with Activity and Use Limitations (RTN)

Scale 1:9,600
1 inch = 800 feet
0 400 800 Feet

Basemap: 2021 Aerial, Nearmap

New Substation Site #8025

3-0034240, 3-0034096, 3-0034095, 3-0034206, 3-0011113, 3-0035002, 3-0001421, 3-0002275, 3-0034843, 3-0003437, 3-0003092, 3-0000624, 3-0015062, 3-0034123, 3-0015117, 3-0023185, 3-0015370, 3-0001988, 3-0004570, 3-0026562, 3-0024835, 3-0033954, 3-0033952, 3-0033603, 3-0034321, 3-0026067, 3-0019076, 3-0033330, 3-0034268, 3-0023099, 3-0022747, 3-0017805, 3-0001559, 3-0017753, 3-0010471, 3-0033160, 3-0032166, 3-0016756, 3-0033734, 3-0026482, 3-0028604, 3-0010682, 3-0018287, 3-0033462, 3-0033462, 3-0022617, 3-0026271, 3-0029672, 3-0002460, 3-0015072, 3-0014945, 3-0025124, 3-0015692, 3-0002834, 3-0019155, 3-0020017, 3-0019125, 3-0034686, 3-0028799, 3-0027735, 3-0015384

Memorial Drive, River Street, Putnam Avenue, Fairmont Street, Pleasant Street, Cottage Street, Auburn Street, Magazine Street, Brookline Street, Pearl Street, Erie Street, Hamilton Street, Chestnut Street, Granite Street, Alston Street, Sidney Street, Waverly Street, Albany Street, Vassar Street, Amherst Alley, Dummer Street, Commonwealth Avenue, BOSTON, BROOKLINE, Bay State Road, CAMBRIDGE, BOSTON, Harvard Bridge, Charles River, Longfellow Bridge, Charlesbank Road, First Street, Ames Street, Main Street, Washington Street, Western Avenue, Bishop Allen Drive, Essex Street, Columbia Street, Pine Street, Cherry Street, Windsor Street, Harvard Street, Portland Street, Norfolk Street, Prospect Street, Inman Street, Broadway, Market Street, Hampshire Street, Plymouth Street, Bristol Street, Hancock Street, Massachusetts Avenue, Green Street, Franklin Street, Hurley Street, Charles Street, Bent Street, Rogers Street, Fifth Street, Third Street, Second Street, Binney Street, Linsky Way, Edwin H Land Boulevard, Cambridge Parkway, David G Mugar Way, Brimmer Street, Back Street, Beacon Street, Marlborough Street, Fairfield Street, Gloucester Street, Exeter Street, Dartmouth Street, Boylston Street, Clarendon Street, Berkeley Street, Stuart Street, Newbury Street

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Figure 4-29B

MassDEP Tier Classified Oil and/or Hazardous Material Sites, and Sites with Activity and Use Limitations: Putnam Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-29C_Haz_Sites_Kendall_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

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EVERSOURCE

Figure 4-29C

MassDEP Tier Classified Oil and/or Hazardous Material Sites, and Sites with Activity and Use Limitations: Kendall Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-29D_Haz _Sites_Somerville_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route S1A (1.25-mi)
- Preferred Route Variation S1 (1.28-mi)
- Noticed Alternative Route S11C (1.56-mi)
- Candidate Route S12 (1.48-mi)
- Candidate Route S13 (1.57-mi)
- Candidate Route S13A (1.82-mi)
- Candidate Route S14 (1.38-mi)
- Candidate Route S14A (1.31-mi)
- MassDEP Tier Classified Hazardous Material Site (RTN)
- MassDEP Hazardous Material Site with Activity and Use Limitations (RTN)

Scale 1:6,000
1 inch = 500 feet
0 250 500 Feet

D2 SITE

Somerville Substation #402

New Substation Site #8025

3-0027087
3-0034864
3-0032294
3-0031291
3-0018323
3-0021316
3-0032134
3-0032133
3-0031763
3-0031025
3-0030510
3-0028512
3-0031024
3-0032129
3-0029452
3-0032131
3-0022153
3-0030848
3-0030850
3-0032130
3-0032211
3-0013197
3-0002312
3-0016632
3-0020989
3-0020926
3-0000434
3-0020456
3-0034728
3-0010897
3-0034727
3-0019742
3-0025215
3-0014074
3-0035313
3-0034240
3-0034096
3-0034095
3-0034206
3-0012975
3-0034105
3-0001421
3-0002275
3-0034843
3-0003437
3-0023185
3-0015370
3-0001988
3-0033330

Walnut Street
Munroe Street
Boston Street
Alson Street
Tufts Street
Washington Street
New Washington Street
Warren Avenue
Stone Avenue
Columbus Avenue
Union Square
Joy Street
Mansfield Street
Somerville Avenue
Marion Street
Newton Street
Dimick Street
Concord Avenue
Linwood Street
Mcgrath Highway
Chestnut Street
Medford Street
Beacon Street
Dickinson Street
Springfield Street
Houghton Street
Prospect Street
South Street
SOMERVILLE
CAMBRIDGE
Oak Street
Hunting Street
Harding Street
Porter Street
Jefferson Street
Cambridge Street
Antrim Street
Inman Street
Hampshire Street
Amory Street
Tremont Street
Elm Street
Lincoln Street
Willow Street
Berkshire Street
Otis Street
Eighth Street
Thorndike Street
Seventh Street
Spring Street
Fulkerson Street
Union Street
Windsor Street
Norfolk Street
Plymouth Street
Cardinal Medeiros Avenue
GRAND JUNCTION RAILROAD CORRIDOR
Broadway
Market Street
Bristol Street
Charles Street
Bent Street
Sixth Street
Rogers Street
Binney Street
Galileo Galilei Way
Technology Square
Portland Street
Essex Street
Bishop Allen Drive
Columbia Street
Pine Street
Cherry Street
Harvard Street
School Street
Massachusetts Avenue
Brookline Street
Green Street
Main Street
State Street
2A
28

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Figure 4-29D

MassDEP Tier Classified Oil and/or Hazardous Material Sites, and Sites with Activity and Use Limitations: Somerville Candidate Routes

4.6.1.2 Natural Environment Criteria

Natural environment criteria compare existing conditions of, and potential impacts to, the natural environment. The natural environment criteria included in the scoring analysis are:

- Wetland Resource Areas, Buffer Zones and Tidelands,
- Article 97 Authorization, and
- Public Shade Trees.

Rare species habitat was not included as a natural environment routing criterion because no portion of the Project Area is in mapped Estimated Habitat or Priority Habitat for state-listed species.[84]

Wetland Resource Areas, Buffer Zones and Tidelands

The evaluation of wetland resources identified in the Study Area includes those primarily associated with the Charles River including Riverfront Area, Inland Bank, Bordering Vegetated Wetlands, Bordering Land Subject to Flooding (100-year floodplain), 100-foot Buffer Zone and jurisdictional tidelands regulated under Chapter 91.

The jurisdictional resource areas were identified using a combination of field delineation, MassGIS data layers and ArcGIS. The ratio score was calculated by dividing the total combined length of jurisdictional areas crossed by each Candidate Route within each respective Study Area by the longest total combined length among all the Candidate Routes within each individual Study Area.

Wetland resource areas, buffer zones and tideland areas included in the scoring analysis are depicted on Figure 4-30A through D.

Article 97 Authorization

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 requiring Article 97 approval to construct and operate the transmission line along each Candidate Route within each individual Study Area by the greatest total length among all the Candidate Routes within each individual Study Area.

Article 97 parcels included in the scoring analysis are identified on Figure 4-31A through D.

[84] See https://www.mass.gov/service-details/regulatory-maps-priority-estimated-habitats.

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30A_Water_Resources_Brighton_20211201.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route B2A East (2.91-mi)
- Noticed Alternative B31 East (3.26-mi)
- Preferred Route Variation B2AN (2.96-mi)
- Preferred Route B29F West (3.00-mi)
- Noticed Alternative B30 West (3.43-mi)
- Candidate Route B24 West (4.14-mi)
- Candidate Route B24A West (4.05-mi)
- Candidate Route B25 East (5.49-mi)
- Candidate Route B25A East (5.40-mi)
- Land Under Water
- Bordering Vegetated Wetland
- 25-ft Riverfront Area
- 100-ft Wetland Buffer Zone
- Chapter 91 Jurisdiction
- Bordering Land Subject to Flooding

Scale 1:11,400
1 inch = 950 feet

0 475 950 Feet

Basemap: 2021 Aerial, Nearmap

SEE FIGURE 4-31A.1
SEE FIGURE 4-31A.2
SEE FIGURE 4-31A.3
SEE FIGURE 4-31A.4
SEE FIGURE 4-31A.5

HDD CROSSING
ANDERSON BRIDGE CROSSING
RIVER STREET BRIDGE CROSSING
MASSDOT ALLSTON MULTIMODAL PROJECT SITE
HDD CROSSING
MAGAZINE BEACH

New Substation Site #8025
Brighton Substation #329

Mount Auburn Street
Brattle Street
Cambridge Street
Eliot Street
Ellsworth Avenue
Maple Avenue
Antrim Street
Amory Street
Hampshire Street
Line Street
SOMERVILLE
CAMBRIDGE
Greenough Boulevard
Soldiers Field Road
John F Kennedy Street
Memorial Drive
Harvard Street
Banks Street
Massachusetts Avenue
Franklin Street
Hancock Street
Clinton Street
Inman Street
Broadway
Tremont Street
Market Street
Windsor Street
Webster Avenue
Cardinal Medeiros Avenue
Hurley Street
Charles Street
Sixth Street
Fifth Street
Bent Street
Binney Street
Third Street
North Harvard Street
Harvard Way
Morgan Way
East Drive
South Campus Drive
Western Avenue
Putnam Avenue
Howard Street
Green Street
Prospect Street
Norfolk Street
Columbia Street
Cherry Street
Bishop Allen Drive
Washington Street
Technology Square
Pleasant Street
Magazine Street
Auburn Street
Brookline Street
Main Street
State Street
Portland Street
Ames Street
Blackstone Street
Kelly Road
River Street
Fairmont Street
Pearl Street
Raymond Street
Windom Street
Seattle Street
Easton Street
Coolidge Road
Mansfield Street
Hooker Street
Chestnut Street
Hamilton Street
Alston Street
Sidney Street
Erie Street
Waverly Street
Granite Street
Henry Street
Landsdowne Street
Purrington Street
Albany Street
Vassar Street
Amherst Alley
Charles River
CAMBRIDGE
BOSTON
Harvard Bridge
Back Street
Pratt Street
Ashford Street
Gardner Street
Harvard Avenue
Brighton Avenue
90

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Figure 4-30A

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30A.1_Water_Resources_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

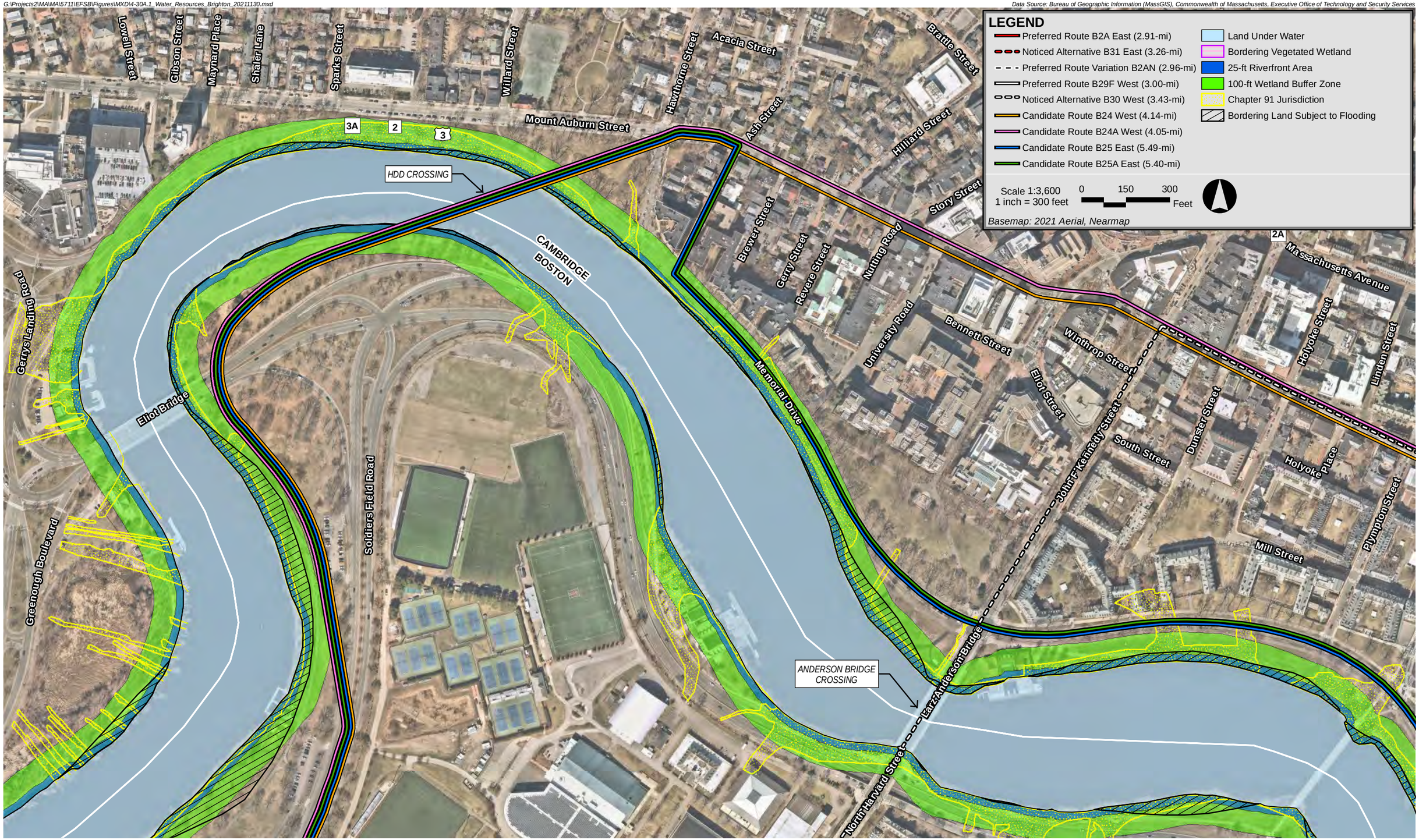

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Figure 4-30A.1

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30A.2_Water_Resources_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

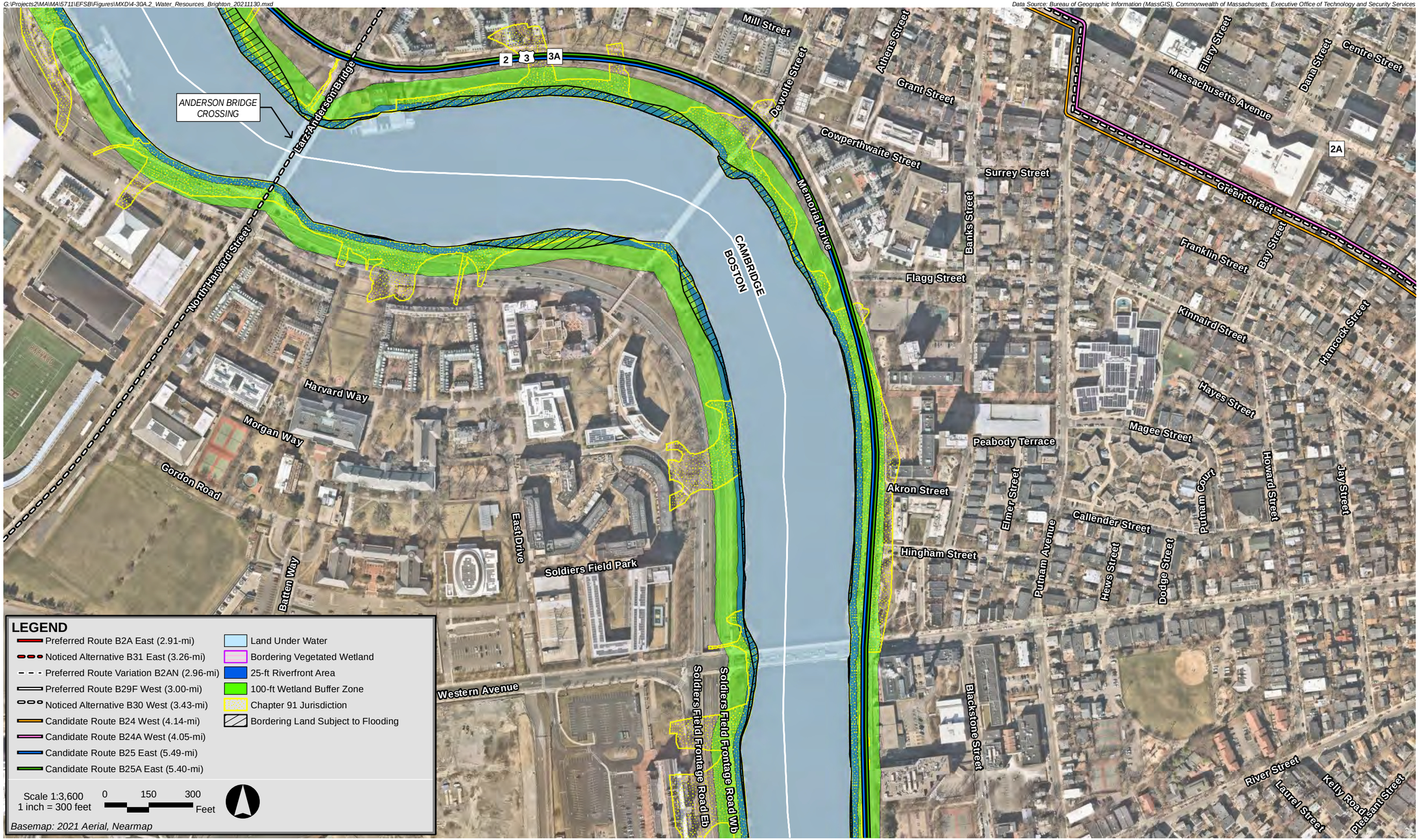

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Figure 4-30A.2

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30A.3_Water_Resources_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route B2A East (2.91-mi)
- Noticed Alternative B31 East (3.26-mi)
- Preferred Route Variation B2AN (2.96-mi)
- Preferred Route B29F West (3.00-mi)
- Noticed Alternative B30 West (3.43-mi)
- Candidate Route B24 West (4.14-mi)
- Candidate Route B24A West (4.05-mi)
- Candidate Route B25 East (5.49-mi)
- Candidate Route B25A East (5.40-mi)

- Land Under Water
- Bordering Vegetated Wetland
- 25-ft Riverfront Area
- 100-ft Wetland Buffer Zone
- Chapter 91 Jurisdiction
- Bordering Land Subject to Flooding

Scale 1:3,600
1 inch = 300 feet

0 150 300 Feet

Basemap: 2021 Aerial, Nearmap

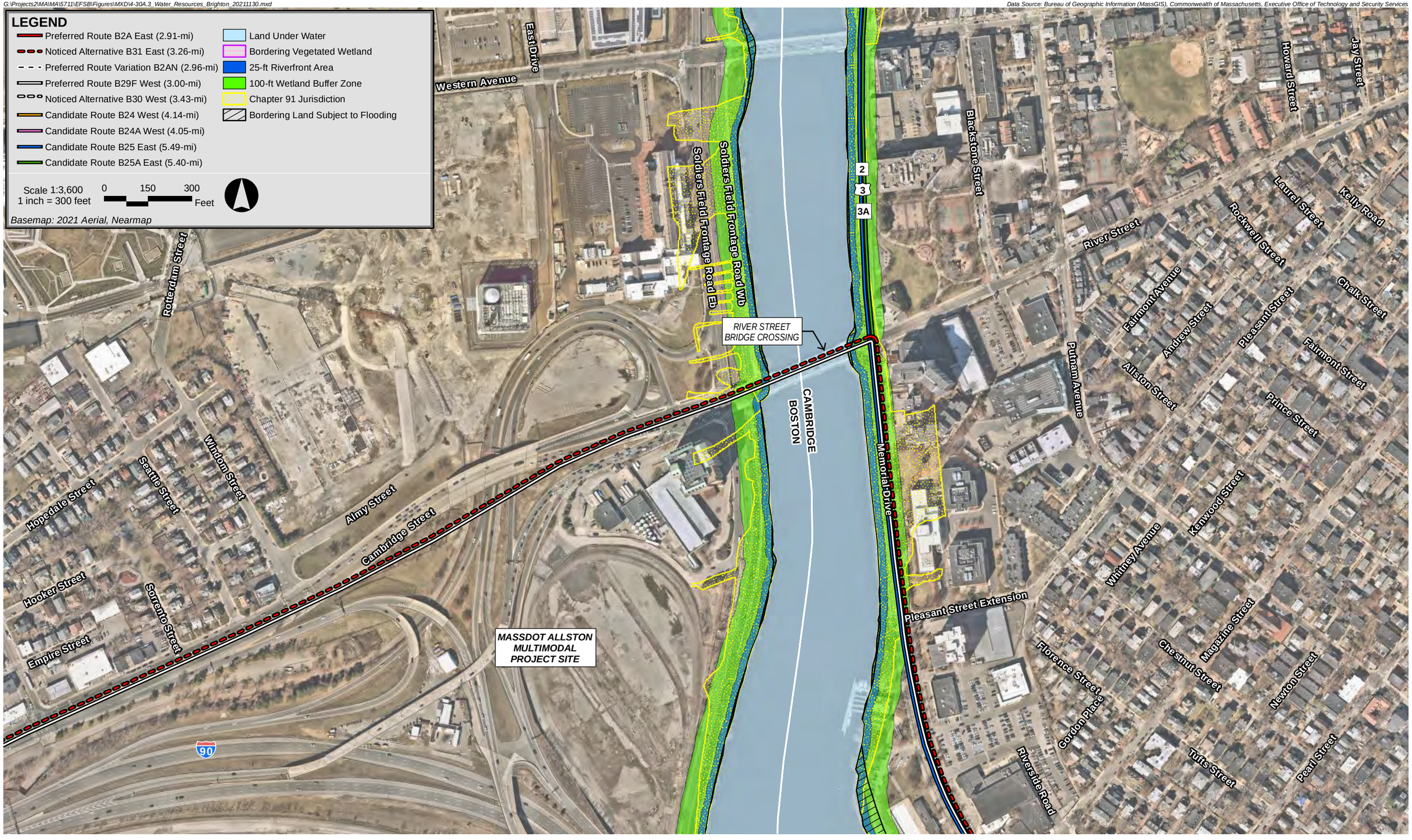

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Figure 4-30A.3

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30A.4_Water_Resources_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

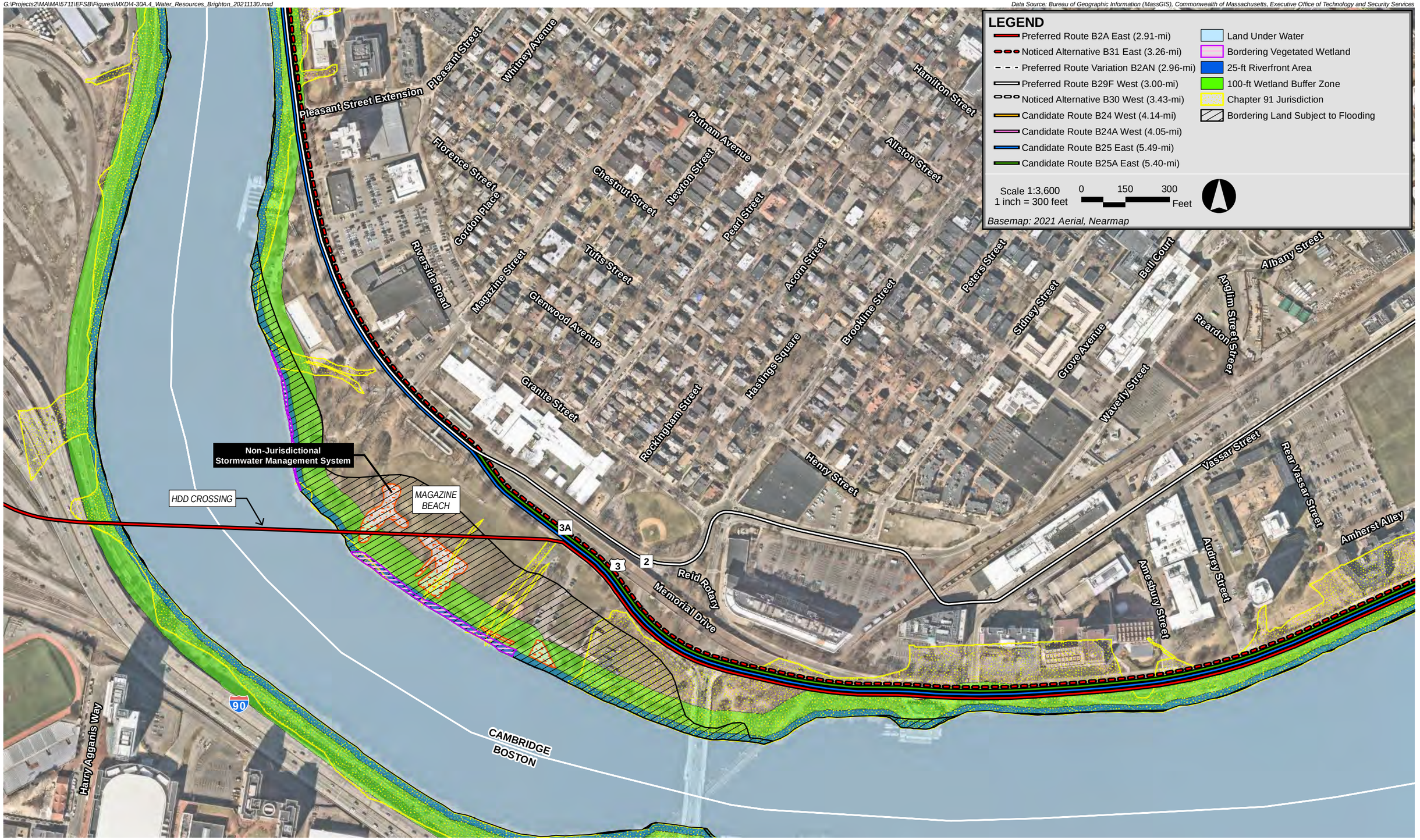

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Figure 4-30A.4

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30A.5_Water_Resources_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

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Figure 4-30A.5

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30B_Water_Resources_Putnam_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route P13 (0.49-mi)
- Noticed Alternative Route P11 (0.87-mi)
- Candidate Route P12 (1.44-mi)
- Land Under Water
- 25-ft Riverfront Area
- 100-ft Wetland Buffer Zone
- Chapter 91 Jurisdiction
- Bordering Land Subject to Flooding

Scale 1:6,000
1 inch = 500 feet
0 250 500 Feet

Basemap: 2021 Aerial, Nearmap

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Figure 4-30B

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Putnam Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30C_Water_Resources_Kendall_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route K5A (0.59-mi)
- Noticed Alternative Route K11 (0.61-mi)
- Candidate Route K6A (0.67-mi)
- Candidate Route K10 (0.63-mi)
- Candidate Route K12 (0.69-mi)
- Land Under Water
- 25-ft Riverfront Area
- 100-ft Wetland Buffer Zone
- Chapter 91 Jurisdiction
- Bordering Land Subject to Flooding

Scale 1:2,400
1 inch = 200 feet
0 100 200 Feet

Basemap: 2021 Aerial, Nearmap

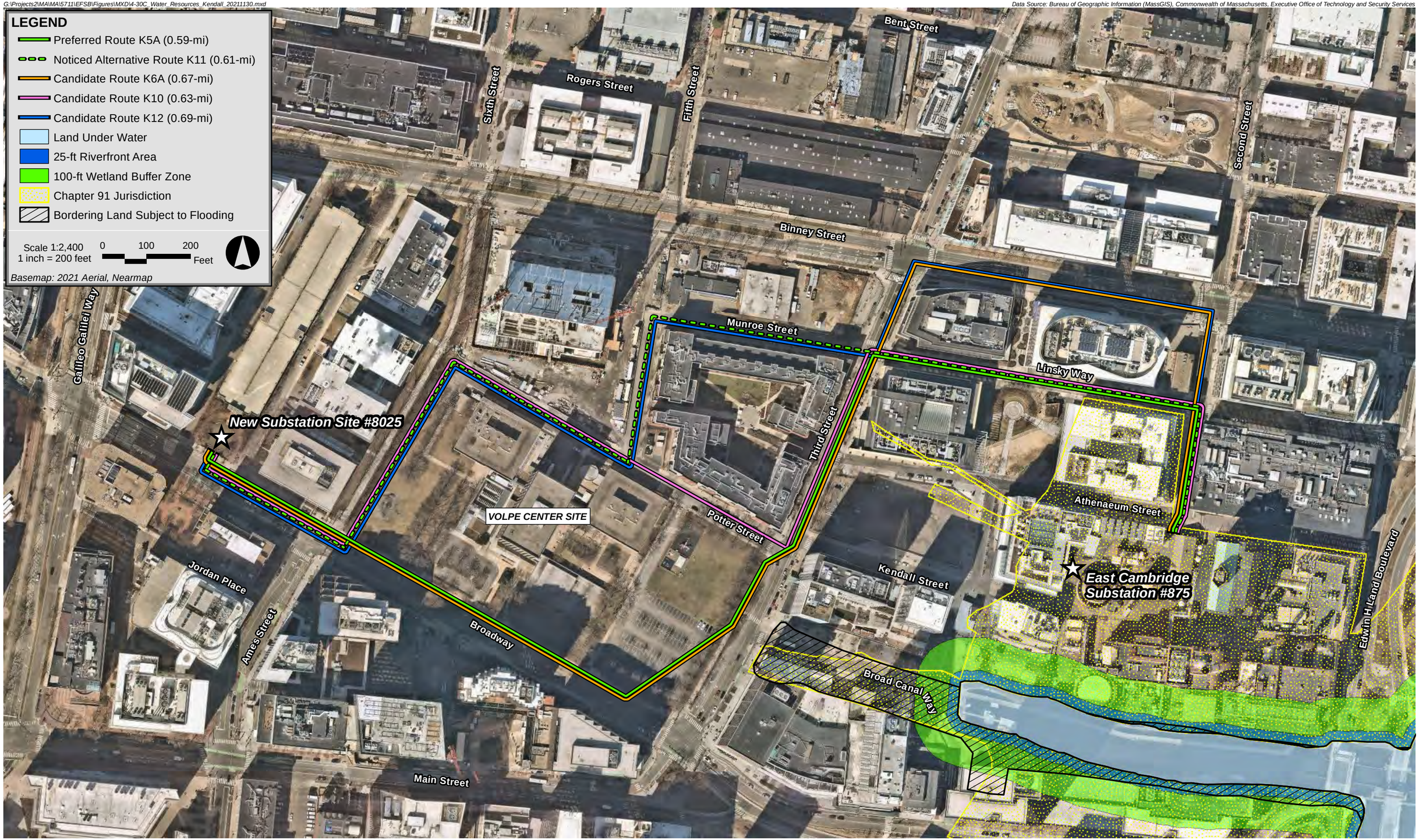

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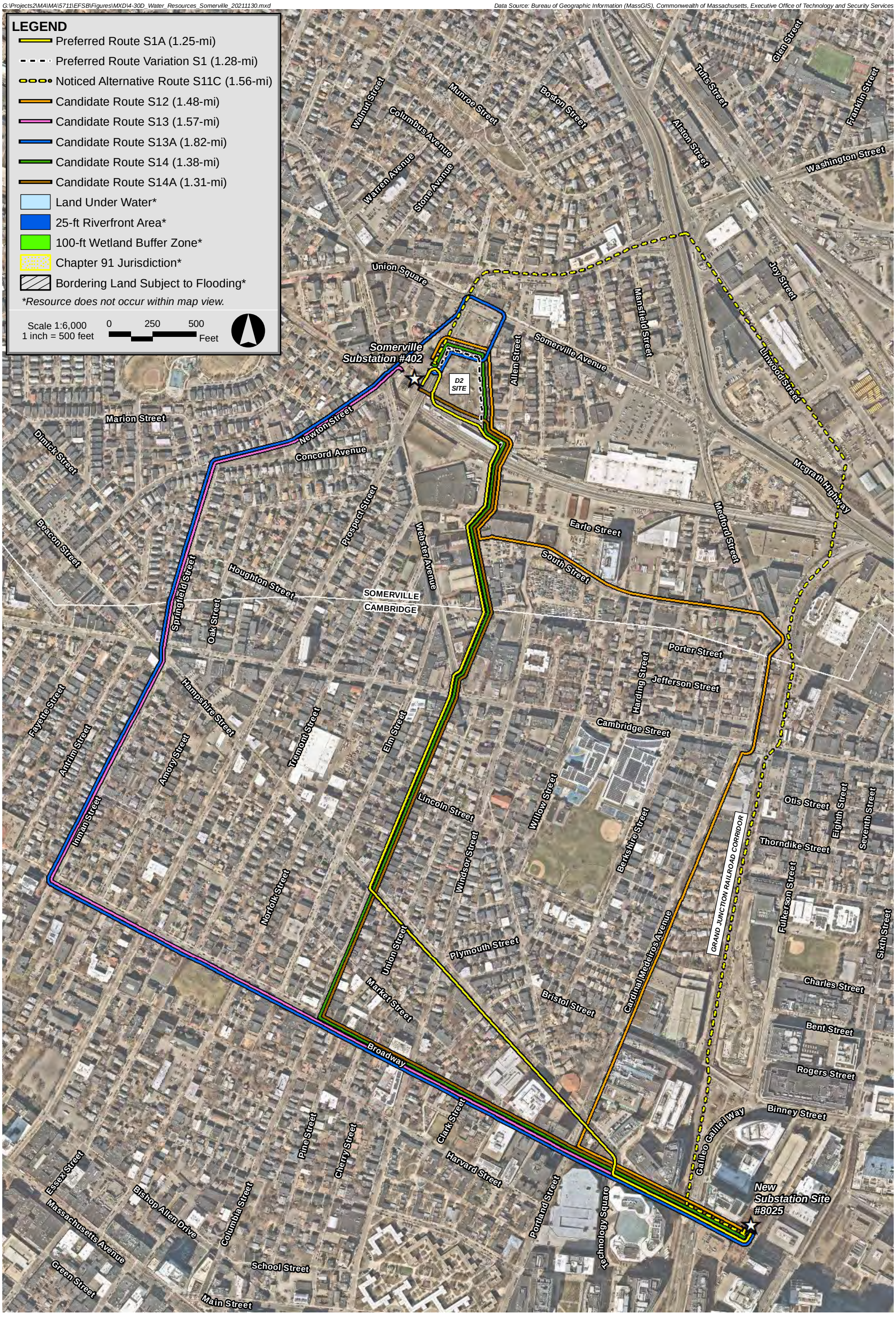
Figure 4-30C

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Kendall Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-30D_Water_Resources_Somerville_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Greater Cambridge Energy Program

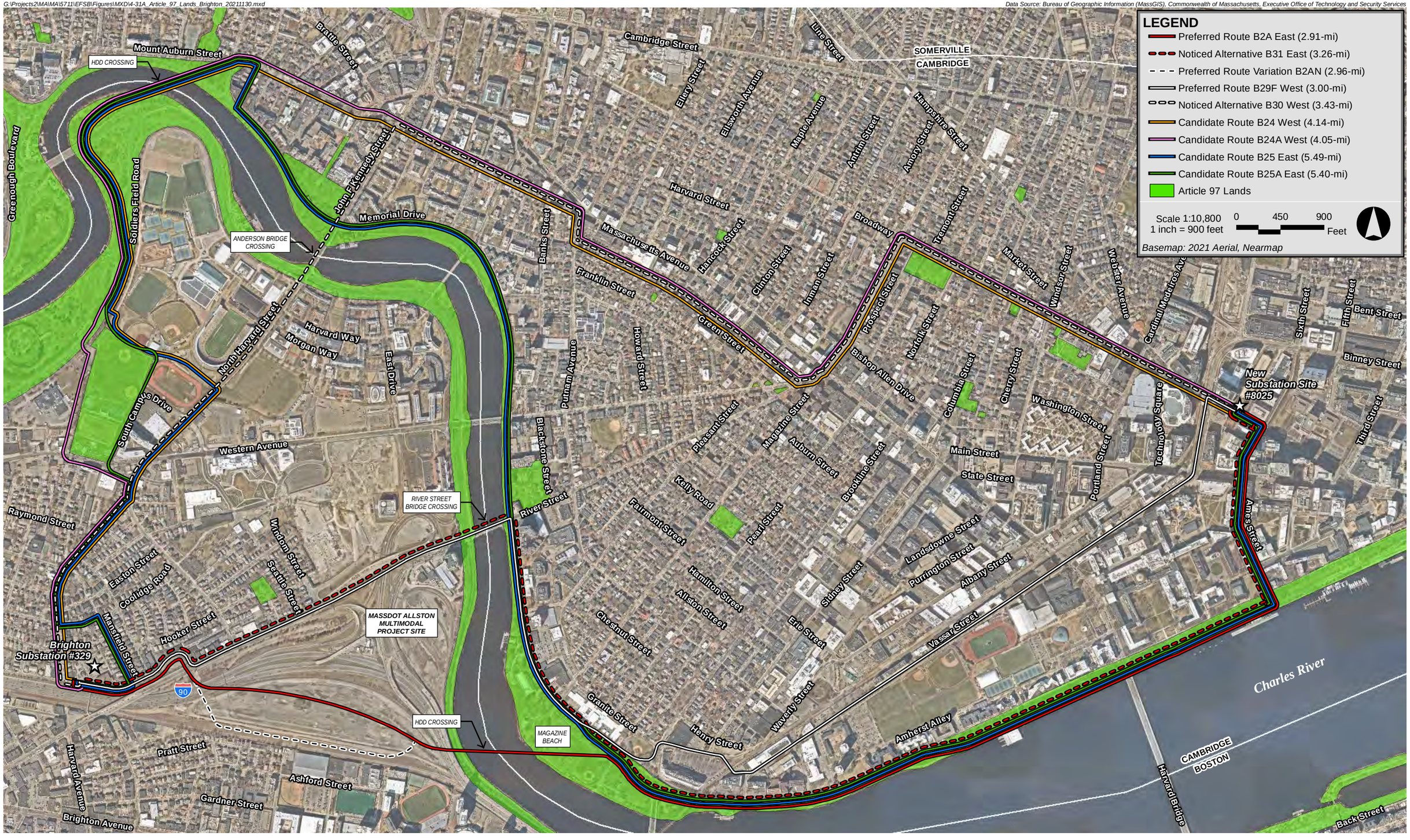
EVERSOURCE

Figure 4-30D

Wetland Resource Areas, Buffer Zones, and Chapter 91 Tidelands: Somerville Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-31A_Article_97_Lands_Brighton_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



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EVERSOURCE

Figure 4-31A

Article 97 Lands: Brighton Candidate Routes

G:\Projects2\MA\MA5711\EFSB\Figures\MXD\4-31B_Article_97_Lands_Putnam_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

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Figure 4-31B

Article 97 Lands: Putnam Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-31C_Article_97_Lands_Kendall_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- Preferred Route K5A (0.59-mi)
- Noticed Alternative Route K11 (0.61-mi)
- Candidate Route K6A (0.67-mi)
- Candidate Route K10 (0.63-mi)
- Candidate Route K12 (0.69-mi)
- Article 97 Lands

Scale 1:2,400
1 inch = 200 feet
0 100 200 Feet

Basemap: 2021 Aerial, Nearmap

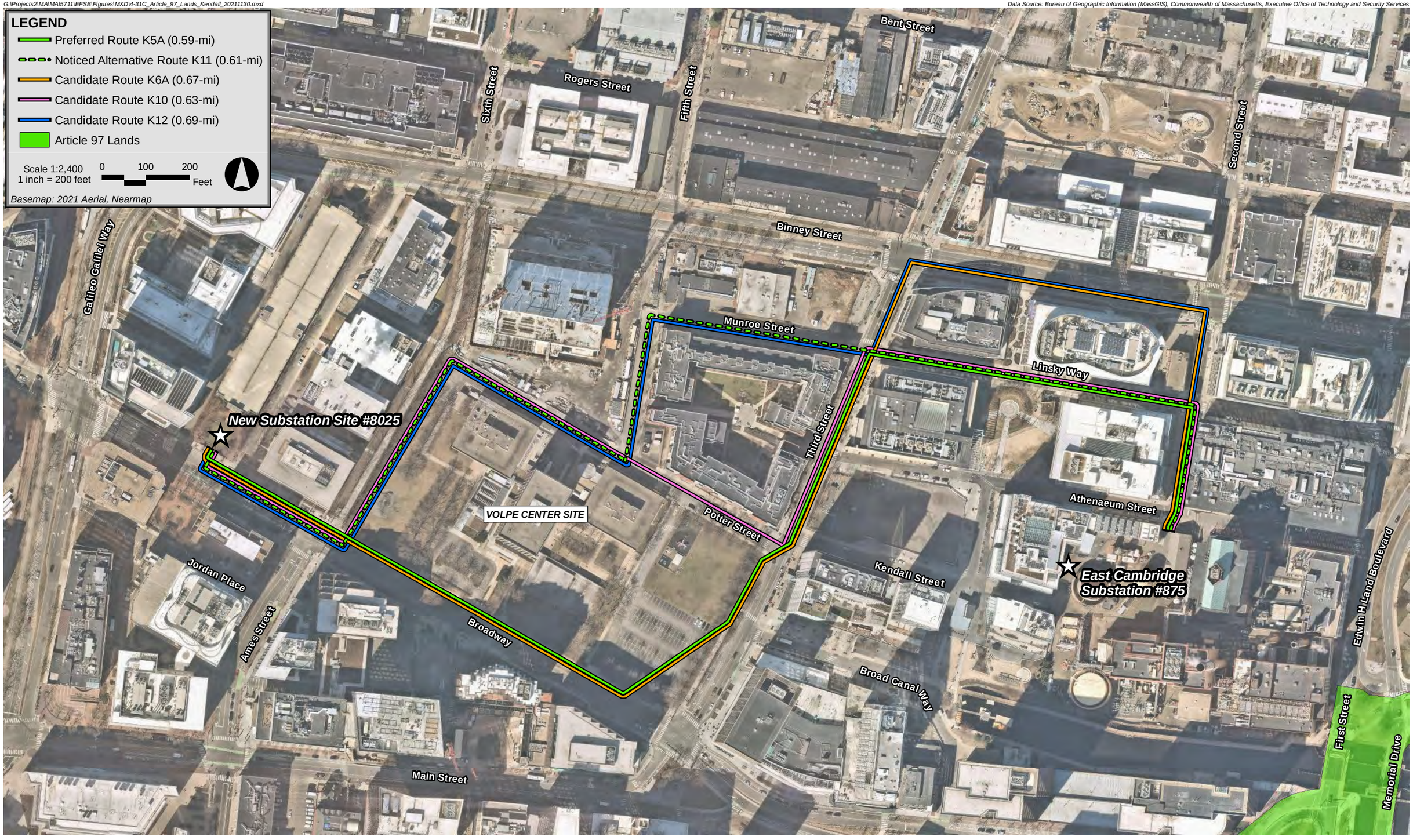

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Figure 4-31C

Article 97 Lands: Kendall Candidate Routes

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

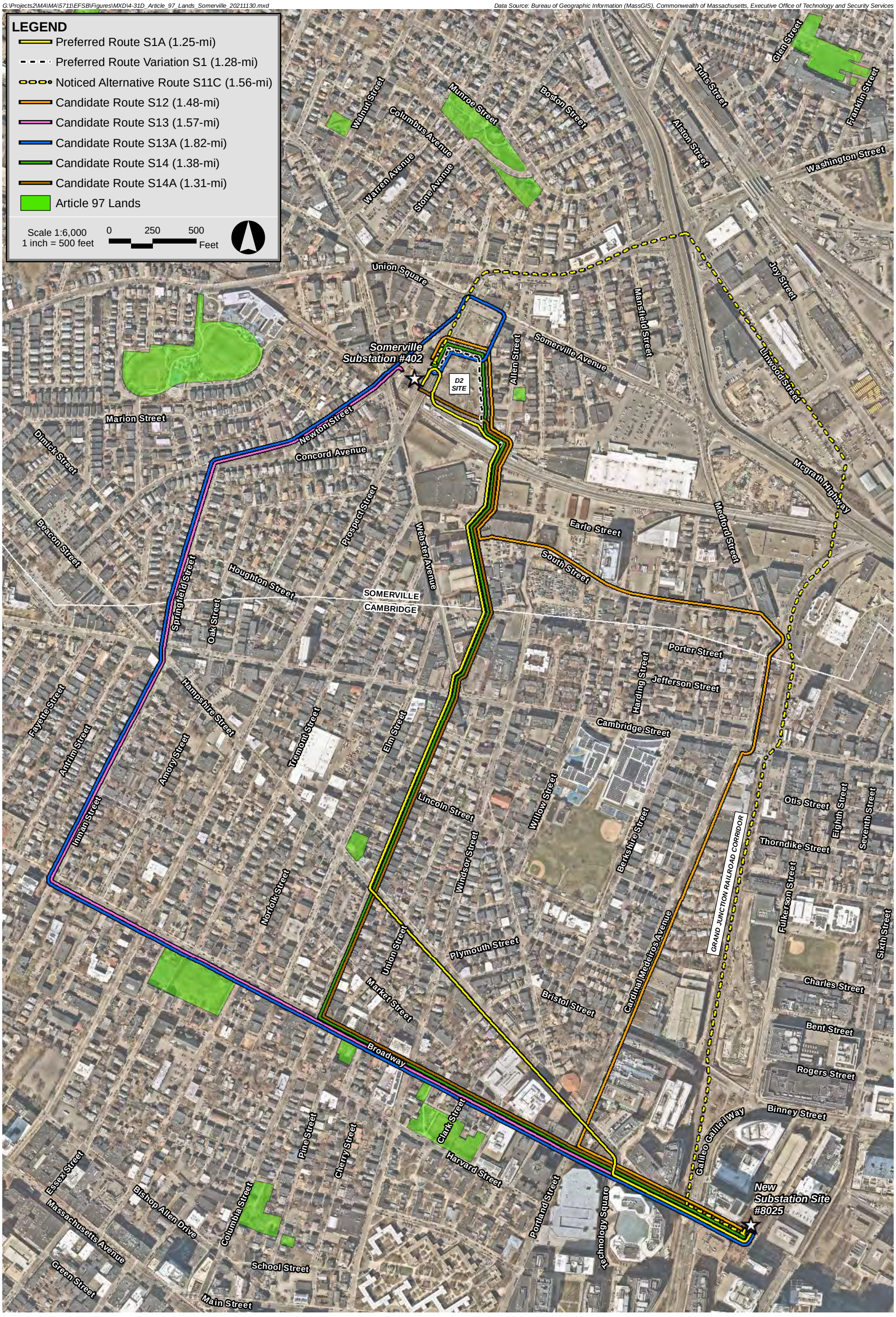

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Figure 4-31D

Article 97 Lands: Somerville Candidate Routes

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 M.G.L. Chapter 87, were counted along the Candidate Routes. A desktop analysis and field reconnaissance were conducted to count trees within the public way along the route (including off-road segments through public open spaces like Magazine Beach and Herter Park), regardless of diameter at breast height or distance from the proposed route centerlines. 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.

4.6.1.3 Technical/Constructability Criteria

Technical and constructability criteria compared route location and design factors that add complexity, schedule delays, reliability concerns or cost to the Project. Technical and constructability factors can also affect the magnitude and duration of impacts. The constructability criteria used in the scoring analysis for this Project, are:

- Existing Utility Density, and
- Complex Crossings.

These constructability factors are important construction considerations or impacts that allow the Company to identify measurable factors that differentiate between the duration and magnitude of impact to natural and built environmental considerations along each Candidate Route, as well as cost considerations.

Refer to the following sections for additional detail regarding constructability criteria analyzed by the Company.

Existing Utility Density

The number of identified 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 survey data. The survey data were compiled from available records as provided by utility companies, municipal and institutional engineering departments. The score for Existing Utility Density was calculated based on the following three factors:

- Estimated Maximum Useable Corridor Width: the maximum available underground space that is potentially available to install the transmission line, measured horizontally between existing utilities in 100-foot-long stations/increments along each Candidate Route, as determined by Project Engineers. From this data, an "Average Useable Corridor Width Rating" was generated for each Candidate Route as a means of representing the average overall underground space that is potentially available to install the transmission line, based on ratings between 1 and 5. For example, Estimated Maximum Useable Corridor Widths greater than 15-feet were assigned a rating of 1 (most favorable because there is presumably more space along the route to install the line relative to other utilities); widths between 10 and 15-feet were assigned a rating of 2; widths between 6 and 9-feet were assigned a rating of 3; widths between 4 and 5 were assigned a rating of 4; and widths less than 3-feet were assigned a rating of 5 (least favorable because there is presumably minimal space to install the line relative to other utilities). These ratings were then averaged for each Candidate Route to generate an overall rating for each Candidate Route.

- Number of Utility Crossings: identified existing utilities (including heat generating sources, as discussed below) that are intersected by the approximate centerline of each Candidate Route, regardless of type, size, or depth.

- Number of Heat Generating Source(s): includes existing electric transmission and distribution lines and steam lines intersected by the approximate centerline of each Candidate Route, regardless of size or depth.

A ratio score was then generated for each of these three factors following the same methodology that was used for other scoring criteria, within each individual Study Area. The ratio scores for these factors were then added up for each Candidate Route to develop a single "Combined Existing Utility Density" score for each Candidate Route. Please refer to Appendix 4-4 for additional detail.

Complex Crossings

Complex Crossings are types of crossings requiring extended construction duration and greater potential for extended and severe construction impacts and expanded staging and laydown areas. In addition, depending on the crossing methodology, such crossings could cause a disruption to the public associated with construction noise, dust generation and the use of road shoulders to support construction.

For scoring purposes, Complex Crossings include crossings of the Charles River (trenchless crossings or bridge crossings), MBTA commuter rail tracks, Grand Junction Railroad tracks, I-90 ramps, and MBTA Red Line subway tunnel crossings.

The number of complex crossings was identified for each Candidate Route within each respective Study Area and a ratio score was calculated by dividing the number of complex crossings on the route by the greatest number of such crossings required for any individual Candidate Route within each individual Study Area. The complex crossings included in the scoring analysis are depicted on Figure 4-32A through D on the following pages.

4.7 Transmission Line Routing Criteria Evaluation Methods

Within each Study Area, the Company scored each Candidate Route based on the evaluating criteria presented in Section 4.6 above. After gathering data for each of the criteria, the Company identified the Candidate Route that had the largest data (number) for each criterion. All other routes/designs were then compared against this number to arrive at an unweighted "raw 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 unweighted raw ratio scores would be calculated as shown in the following table.

Candidate Route	Number of Trees	Unweighted Raw 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 ratio scores for each criterion were then added to arrive at total raw ratio scores. The lowest total raw ratio score would equate to the lowest potential for impact at this stage of the analysis. This means that lower total raw scores are better in this analysis. Use of unweighted raw data to compare the Candidate Routes provides a meaningful comparison but does not consider the degree of importance of each criterion to the Project routing.

Accordingly, the Company then conducted a separate scoring analysis that applied weights to the evaluation criteria that were deemed to be of higher significance than other criteria. As was previously discussed, use of a 1-to-5 scale for weighting was considered appropriate to reflect the degree of importance of each criterion specific to this project, with 1 being the lowest weight and lesser importance and 5 being the highest weight and greater importance. Lower total weighted ratio scores are better in this analysis. The applied weight for each criterion is compiled on Table 4-11 on page 4-108.

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

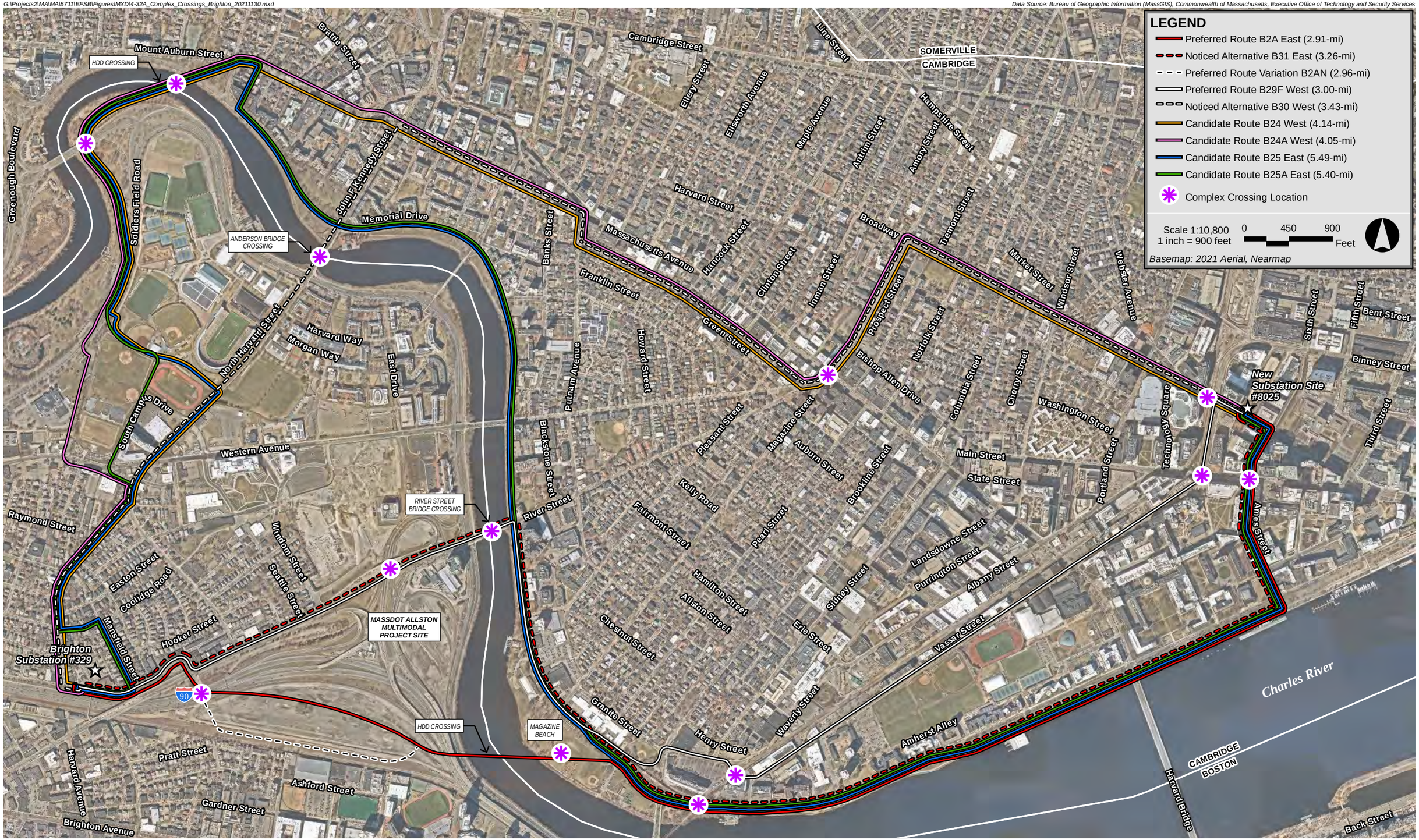

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Figure 4-32A

Complex Crossings: Brighton Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-32B_Complex_Crossings_Putnam_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

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Figure 4-32B

Complex Crossings: Putnam Candidate Routes

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

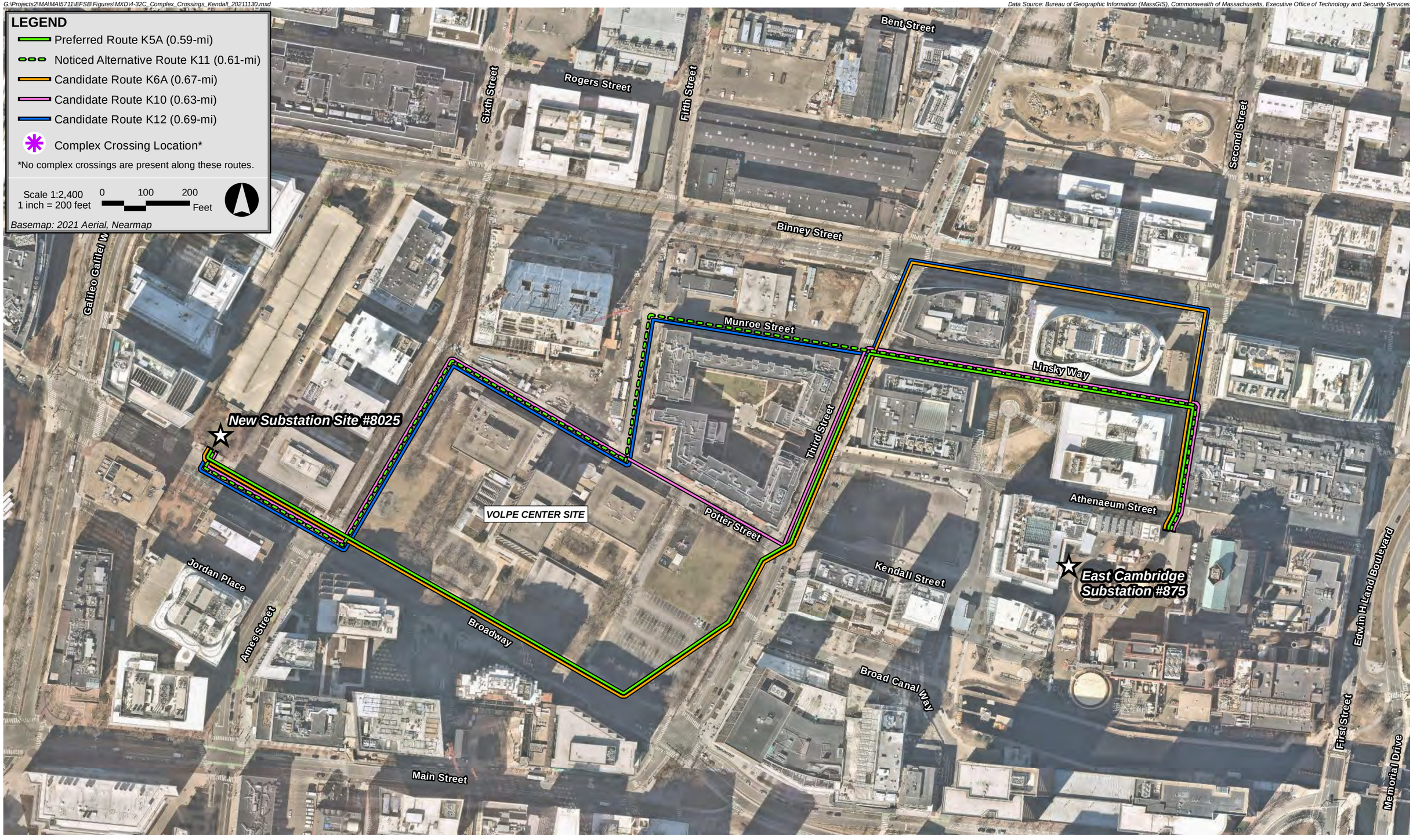

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Figure 4-32C

Complex Crossings: Kendall Candidate Routes

G:\Projects2\MA\MA\5711\EFSB\Figures\MXD\4-32D_Complex_Crossings_Somerville_20211130.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

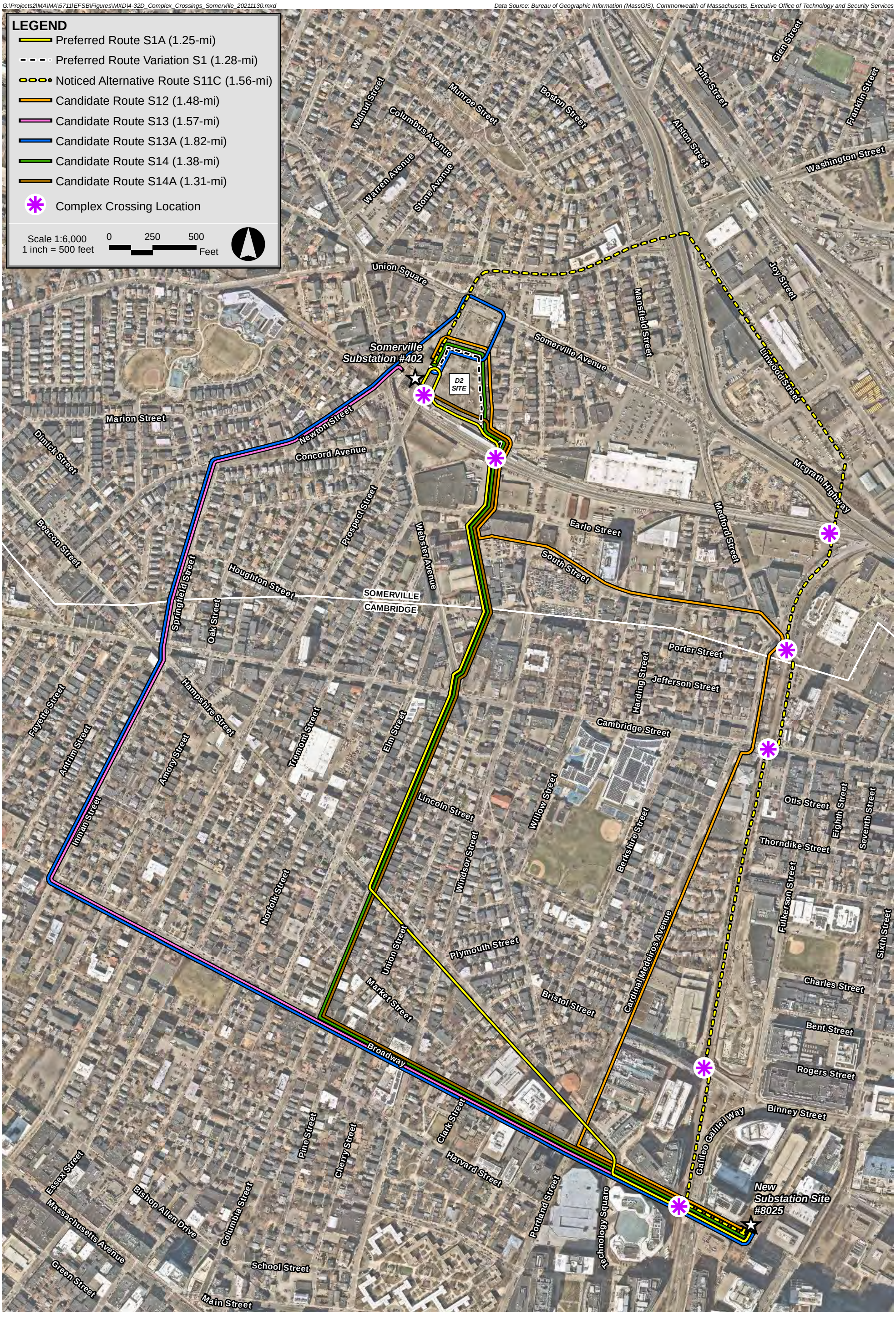

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Figure 4-32D

Complex Crossings: Somerville Candidate Routes

Table 4-11 Applied Weights for Scoring Criteria

	Scoring Criteria	Applied Weight
DEVELOPED ENVIRONMENT CRITERIA	Residential Land Use	5
	Sensitive Receptors	4
	Commercial / Industrial Land Use	1
	Transportation Impacts	5
	Historic and Archaeological Resources	2
	Potential to Encounter Subsurface Contamination	4
NATURAL ENVIRONMENT CRITERIA	Wetland Resource Areas, Buffer Zones and Tidelands	2
	Article 97 Authorization	5
	Public Shade Trees	3
TECHNICAL / CONSTRUCTABILITY CRITERIA	Existing Utility Density	5
	Complex Crossings	3

4.8 Transmission Line Routing Environmental Impact Analysis Results

Tables 4-12A and 4-12E on the following pages provides an overview of all raw data, total ratio scores and total weighted scores for each Candidate Route within each individual Study Area. The Candidate Route that has the lowest and highest potential for impact is highlighted in **GREEN** (lowest) and **RED** (highest), respectively.

Table 4-12A Brighton West Candidate Routes Scores

CANDIDATE ROUTES		HUMAN ENVIRONMENT CRITERIA					NATURAL ENVIRONMENT CRITERIA				CONSTRUCTABILITY & TECHNICAL CRITERIA		TOTAL SCORE	RANK
		Residential Land Uses	Commercial and Industrial Land Uses	Sensitive Receptors	Historic & Archaeological Resources	Transportation Impacts	Wetland Resource Area and Buffer Zone Crossings	Potential to Encounter Subsurface Contamination	Article 97 Lands	Public Shade Trees	Utility Density	Complex Crossings		
	Weight	5	1	4	2	5	2	4	5	3	5	3		
Candidate Route B-24 WEST	Raw Ratio Score	0.90	0.99	1.00	0.99	0.69	0.56	0.63	1.00	0.96	0.91	1.00	9.63	
	Weighted Ratio Score	**4.50**	**0.99**	**4.00**	**1.98**	**3.44**	**1.12**	**2.50**	**5.00**	**2.88**	**4.57**	**3.00**	**33.99**	3
Candidate Route B-24A WEST	Raw Ratio Score	0.90	1.00	1.00	0.98	0.68	0.56	0.58	1.00	1.00	1.00	1.00	9.71	
	Weighted Ratio Score	**4.51**	**1.00**	**4.00**	**1.96**	**3.42**	**1.12**	**2.33**	**5.00**	**3.00**	**5.00**	**3.00**	**34.35**	4
Candidate Route B-29F WEST	Raw Ratio Score	0.19	0.15	0.24	0.11	1.00	1.00	1.00	0.00	0.63	0.78	0.75	5.85	
	Weighted Ratio Score	**0.97**	**0.15**	**0.95**	**0.22**	**5.00**	**2.00**	**4.00**	**0.00**	**1.89**	**3.91**	**2.25**	**21.33**	1
Candidate Route B-30 WEST	Raw Ratio Score	1.00	0.77	1.00	1.00	0.95	0.28	0.63	0.00	0.80	1.00	0.75	8.17	
	Weighted Ratio Score	**5.00**	**0.77**	**4.00**	**2.00**	**4.73**	**0.57**	**2.50**	**0.00**	**2.41**	**5.00**	**2.25**	**29.22**	2

Table 4-12B Brighton East Candidate Routes Scores

CANDIDATE ROUTE		HUMAN ENVIRONMENT CRITERIA					NATURAL ENVIRONMENT CRITERIA				CONSTRUCTABILITY & TECHNICAL CRITERIA			
		Residential Land Uses	Commercial and Industrial Land Uses	Sensitive Receptors	Historic & Archaeological Resources	Transportation Impacts	Wetland Resource Area and Buffer Zone Crossings	Potential to Encounter Subsurface Contamination	Article 97 Lands	Public Shade Trees	Utility Density	Complex Crossings	TOTAL SCORE	RANK
Weight		**5**	**1**	**4**	**2**	**5**	**2**	**4**	**5**	**3**	**5**	**3**		
Candidate Route B-2A EAST	Raw Ratio Score	0.22	0.54	0.40	0.32	0.77	0.66	0.69	0.37	0.54	0.52	1.00	6.02	
	Weighted Ratio Score	**1.08**	**0.54**	**1.60**	**0.65**	**3.84**	**1.32**	**2.75**	**1.85**	**1.62**	**2.58**	**3.00**	**20.82**	1
Candidate Route B-25 EAST	Raw Ratio Score	1.00	1.00	1.00	1.00	0.90	1.00	1.00	1.00	1.00	1.00	1.00	10.90	
	Weighted Ratio Score	**5.00**	**1.00**	**4.00**	**2.00**	**4.51**	**2.00**	**4.00**	**5.00**	**3.00**	**5.00**	**3.00**	**38.51**	4
Candidate Route B-25A EAST	Raw Ratio Score	1.00	1.00	1.00	0.97	0.87	1.00	0.88	1.00	0.98	0.97	1.00	10.67	
	Weighted Ratio Score	**5.00**	**1.00**	**4.00**	**1.94**	**4.37**	**2.00**	**3.50**	**5.00**	**2.95**	**4.87**	**3.00**	**37.62**	3
Candidate Route B-31 EAST	Raw Ratio Score	0.47	0.81	0.60	0.40	1.00	0.68	0.88	0.00	0.62	0.76	1.00	7.22	
	Weighted Ratio Score	**2.34**	**0.81**	**2.40**	**0.81**	**5.00**	**1.36**	**3.50**	**0.00**	**1.87**	**3.82**	**3.00**	**24.90**	2

Table 4-12C Somerville Candidate Route Scores

CANDIDATE ROUTE		HUMAN ENVIRONMENT CRITERIA					NATURAL ENVIRONMENT CRITERIA				CONSTRUCTABILITY & TECHNICAL CRITERIA			
		Residential Land Uses	Commercial and Industrial Land Uses	Sensitive Receptors	Historic & Archaeological Resources	Transportation Impacts	Wetland Resource Areas, Buffer Zone and Tidelands	Potential to Encounter Subsurface Contamination	Article 97 Lands	Public Shade Trees	Existing Utility Density	Complex Crossings	TOTAL SCORE	RANK
	Weight	5	1	4	2	5	2	4	5	3	5	3		
Candidate Route S-1A	Raw Ratio Score	0.61	0.87	0.43	0.20	0.76	0.00	0.86	0.00	0.64	0.51	0.50	5.38	
	Weighted Ratio Score	**3.07**	**0.87**	**1.71**	**0.40**	**3.80**	**0.00**	**3.44**	**0.00**	**1.92**	**2.53**	**1.50**	**19.25**	1
Candidate Route S-11C	Raw Ratio Score	0.41	0.80	0.43	0.80	0.36	0.00	1.00	0.00	0.31	0.74	1.00	5.85	
	Weighted Ratio Score	**2.03**	**0.80**	**1.71**	**1.60**	**1.79**	**0.00**	**4.00**	**0.00**	**0.93**	**3.71**	**3.00**	**19.58**	2
Candidate Route S-12	Raw Ratio Score	0.37	0.85	0.71	0.30	0.62	0.00	1.00	0.00	0.84	0.95	0.50	6.13	
	Weighted Ratio Score	**1.84**	**0.85**	**2.86**	**0.60**	**3.08**	**0.00**	**4.00**	**0.00**	**2.51**	**4.73**	**1.50**	**21.96**	3
Candidate Route S-13	Raw Ratio Score	1.00	0.85	1.00	0.65	1.00	0.00	0.53	0.00	0.98	0.83	0.25	7.08	
	Weighted Ratio Score	**4.98**	**0.85**	**4.00**	**1.30**	**5.00**	**0.00**	**2.11**	**0.00**	**2.93**	**4.16**	**0.75**	**26.09**	5
Candidate Route S-13A	Raw Ratio Score	1.00	0.86	1.00	1.00	0.94	0.00	0.72	0.00	1.00	1.00	0.25	7.78	
	Weighted Ratio Score	**5.00**	**0.86**	**4.00**	**2.00**	**4.70**	**0.00**	**2.89**	**0.00**	**3.00**	**5.00**	**0.75**	**28.21**	6
Candidate Route S-14	Raw Ratio Score	0.79	1.00	0.71	0.15	0.70	0.00	0.89	0.00	0.79	0.67	0.50	6.20	
	Weighted Ratio Score	**3.94**	**1.00**	**2.86**	**0.30**	**3.52**	**0.00**	**3.56**	**0.00**	**2.37**	**3.35**	**1.50**	**22.39**	4

Table 4-12D Putnam Candidate Routes Scores

CANDIDATE ROUTE		HUMAN ENVIRONMENT CRITERIA					NATURAL ENVIRONMENT CRITERIA				CONSTRUCTABILITY & TECHNICAL CRITERIA			
		Residential Land Uses	Commercial and Industrial Land Uses	Sensitive Receptors	Historic & Archaeological Resources	Transportation Impacts	Wetland Resource Areas, Buffer Zone and Tidelands	Potential to Encounter Subsurface Contamination	Article 97 Lands	Public Shade Trees	Existing Utility Density	Complex Crossings	TOTAL SCORE	Rank
	Weight	5	1	4	2	5	2	4	5	3	5	3		
Candidate Route P-11	Raw Ratio Score	0.98	0.62	1.00	1.00	1.00	0.88	0.56	0.00	0.82	0.68	1.00	8.54	
	Weighted Ratio Score	**4.88**	**0.62**	**4.00**	**2.00**	**5.00**	**1.77**	**2.25**	**0.00**	**2.46**	**3.40**	**3.00**	**29.38**	2
Candidate Route P-12	Raw Ratio Score	1.00	1.00	1.00	0.50	0.97	1.00	1.00	0.00	1.00	1.00	1.00	9.47	
	Weighted Ratio Score	**5.00**	**1.00**	**4.00**	**1.00**	**4.85**	**2.00**	**4.00**	**0.00**	**3.00**	**5.00**	**3.00**	**32.85**	3
Candidate Route P-13	Raw Ratio Score	0.98	0.50	1.00	0.50	0.58	0.86	0.25	0.00	0.38	0.47	1.00	6.52	
	Weighted Ratio Score	**4.90**	**0.50**	**4.00**	**1.00**	**2.89**	**1.71**	**1.00**	**0.00**	**1.14**	**2.35**	**3.00**	**22.50**	1

Table 4-12E Kendall Candidate Routes Scores

CANDIDATE ROUTE		HUMAN ENVIRONMENT CRITERIA					NATURAL ENVIRONMENT CRITERIA				CONSTRUCTABILITY & TECHNICAL CRITERIA			
		Residential Land Uses	Commercial and Industrial Land Uses	Sensitive Receptors	Historic & Archaeological Resources	Transportation Impacts	Wetland Resource Areas, Buffer Zone and Tidelands	Potential to Encounter Subsurface Contamination	Article 97 Lands	Public Shade Trees	Existing Utility Density	Complex Crossings	TOTAL SCORE	Rank
	Weight	5	1	4	2	5	2	4	5	3	5	3		
Candidate Route K-5A	Raw Ratio Score	0.91	0.88	0.80	0.60	1.00	1.00	0.86	0.00	0.91	0.87	0.00	7.82	
	Weighted Ratio Score	**4.56**	**0.88**	**3.20**	**1.20**	**5.00**	**2.00**	**3.43**	**0.00**	**2.72**	**4.35**	**0.00**	**27.33**	3
Candidate Route K-6A	Raw Ratio Score	1.00	1.00	1.00	0.90	1.00	1.00	1.00	0.00	1.00	1.00	0.00	8.90	
	Weighted Ratio Score	**5.00**	**1.00**	**4.00**	**1.80**	**5.00**	**2.00**	**4.00**	**0.00**	**3.00**	**5.00**	**0.00**	**30.80**	5
Candidate Route K-10	Raw Ratio Score	0.91	0.58	0.80	0.70	0.81	1.00	0.81	0.00	0.71	0.83	0.00	7.16	
	Weighted Ratio Score	**4.56**	**0.58**	**3.20**	**1.40**	**4.04**	**2.00**	**3.24**	**0.00**	**2.14**	**4.17**	**0.00**	**25.32**	2
Candidate Route K-11	Raw Ratio Score	0.63	0.53	0.80	0.80	0.69	1.00	0.86	0.00	0.69	0.83	0.00	6.83	
	Weighted Ratio Score	**3.14**	**0.53**	**3.20**	**1.60**	**3.47**	**2.00**	**3.43**	**0.00**	**2.08**	**4.15**	**0.00**	**23.60**	1
Candidate Route K-12	Raw Ratio Score	0.72	0.65	1.00	1.00	0.75	1.00	1.00	0.00	0.92	0.95	0.00	7.99	
	Weighted Ratio Score	**3.58**	**0.65**	**4.00**	**2.00**	**3.76**	**2.00**	**4.00**	**0.00**	**2.76**	**4.75**	**0.00**	**27.50**	4

Tables 4-13 through 4-17 below presents a summary of the Candidate Routes ranked by a total weighted environmental score. The lowest score equates to the lowest potential for impact based on the criteria used in this analysis. As previously noted, the Candidate Route that has the lowest and highest potential for impact is highlighted in **GREEN** (lowest) and **RED** (highest), respectively.

Table 4-13 Environmental Rank by Total Weighted Scores (Brighton Study Area East)

Candidate Route	Route Length (miles)	Total Weighted Score	Rank
B2A East (Magazine Beach HDD)	2.91[85]	20.82	1
B25 East (Herter Park HDD and Memorial Drive)	5.49	38.51	4
B25A East (Herter Park HDD and Harvard Athletic Complex)	5.40	37.62	3
B31 East (River Street Bridge)	3.26	24.90	2

As shown in Table 4-13, Candidate Route B2A has the lowest weighted environmental score and would result in the lowest potential for impact of the four Candidate Routes evaluated within the Brighton East Study Area. It is also the shortest Candidate Route to construct within the Study Area. Candidate Route B31 East had the second lowest weighted environmental score and would result in fewer potential impacts relative to the remaining three Candidate Routes. This route is also a geographically distinct routing alternative to Candidate Route B2A. Candidate Route B25 East had the highest weighted environmental score and would result in the greatest potential for impacts of all the Candidate Routes. It is also the longest of these Candidate Routes.

Table 4-14 Environmental Rank by Total Weighted Scores (Brighton Study Area West)

Candidate Route	Route Length (miles)	Total Weighted Score	Rank
B24 West (Herter Park HDD and Mt. Auburn Street)	4.14	33.99	3
B24A West (Herter Park HDD and WBZ Site)	4.05	34.35	4
B29F West (River Street Bridge)	3.00	21.33	1
B30 West (Anderson Bridge)	3.43	29.22	2

[85] Route Variation B2AN is nominally longer at approximately 2.96 miles.

As shown in Table 4-14, Candidate Route B29F West has the lowest weighted environmental score and would result in the lowest potential for impact of the four Candidate Routes evaluated within the Brighton West Study Area. It is also the shortest Candidate Route to construct within the Study Area. Candidate Route B30 West had the second lowest weighted environmental score and would result in fewer potential impacts relative to the remaining three Candidate Routes. This route is also a geographically distinct routing alternative to Candidate Route B29F West. Candidate Route B24A West had the highest weighted environmental score and would result in the greatest potential for impacts of all the Candidate Routes. This route is also more than one mile longer than the top Route B29F West and more than ½ mile longer than Route B30 West.

Table 4-15 Environmental Rank by Total Weighted Scores (Putnam Study Area)

Candidate Route	Route Length (miles)	Total Weighted Score	Rank
P11 (Massachusetts Avenue)	0.87	29.38	2
P12 (Vassar Street)	1.44	32.85	3
P13 (Ames Street)	0.49	22.50	1

As shown in Table 4-15, Candidate Route P13 has the lowest weighted environmental score and would result in the lowest potential for impact of the three Candidate Routes evaluated within the Putnam Study Area. It is also the shortest Candidate Route to construct within the Study Area. Candidate Route P11 had the second lowest weighted environmental score and would result in fewer potential impacts relative to the remaining Candidate Route. This route is also a geographically distinct routing alternative to Candidate Route P13. Candidate Route P12 had the highest weighted environmental score and would result in the greatest potential for impacts of all the Candidate Routes. It is also the longest of these Candidate Routes.

Table 4-16 Environmental Rank by Total Weighted Scores (Kendall Study Area)

Candidate Route	Route Length (miles)	Total Weighted Score	Rank
K5A (Linskey Way)	0.59	27.33	3
K6A (Binney Street	0.67	30.80	5
K10 (Potter Street)	0.63	25.32	2
K11 (Fifth Street)	0.61	23.60	1
K12 (Munroe Street)	0.69	27.50	4

As shown in Table 4-16, Candidate Route K11 has the lowest weighted environmental score and would result in the lowest potential for impact of the five Candidate Routes evaluated within the Kendall Study Area. Candidate Route K10 had the second lowest weighted environmental score and would result in fewer potential impacts relative to the remaining four Candidate Routes. However, when compared to the top scoring Candidate Route K11, it only provides modest geographic diversity with the primary difference being about two city blocks before converging again with Candidate Route K11 on Linskey Way. Greater geographic diversity from Candidate

Route K11 is provided by Candidate Routes K5A and 6A, which follow Broadway and Third Street, across the Volpe Center Site's eastern corner, and to a lesser degree Candidate Route K12, which follows Binney Street in lieu of Linskey Way. Candidate Route K6A had the highest weighted environmental score and would result in the greatest potential for impacts of all the Candidate Routes. All these routes contain generally comparable lengths, with Candidate Route K5A being the shortest most direct route and Candidate Route K12 being the longest route.

Table 4-17 Environmental Rank by Total Weighted Scores (Somerville Study Area)

Candidate Route	Route Length (miles)	Total Weighted Score	Rank
S1A (Hampshire Street and D2 Site)	1.25[86]	19.25	1
S11C (Grand Junction RR Multi-Use Pathway)	1.56	19.58	2
S12 (Cardinal Medeiros Avenue)	1.48	21.96	3
S13 (Broadway)	1.57	26.09	5
S13A (D2 Site and Somerville Avenue)	1.82	28.21	6
S14 (Columbia Street)	1.38	22.39	4

As shown in Table 4-17, Candidate Route S1A has the lowest weighted environmental score and would result in the lowest potential for impact of the six Candidate Routes evaluated within the Somerville Study Area. It is also one of the shorter Candidate Route to construct within this Study Area. Candidate Route S11C had the second lowest weighted environmental score and of the remaining six routes, it would result in fewer potential impacts. This route is also a geographically distinct routing alternative to Candidate Route S1A. Candidate Route S13A had the highest weighted environmental score and would result in the greatest potential for impacts of all the Candidate Routes. It is also the longest of these Candidate Routes.

The following sections provide more detailed comparisons and observations of the environmental analysis results.

4.8.1 Environmental Scoring Criteria Overview Tables

The series of tables provided on the following pages provide an overview of how each Candidate Route scores with respect to the three distinct subcategories of the environmental criteria: Developed Environment, Natural Environment, and Technical and Constructability. The Candidate Route that has the lowest and highest potential for impact is highlighted in **GREEN** (lowest) and **RED** (highest), respectively.

[86] Route Variation S1 is nominally longer in length at approximately 1.28 miles.

4.8.1.1 Developed Environment

Table 4-18 Overview of Developed Environment Scores (Brighton Study Area East)

Candidate Route	Developed Environment	
	Weighted Score	Rank
B2A East (Magazine Beach HDD)	7.71	1
B25 East (Herter Park HDD and Memorial Drive)	16.51	4
B25A East (Herter Park HDD and Harvard Athletic Complex)	16.31	3
B31 East (River Street Bridge)	11.36	2

Table 4-19 Overview of Developed Environment Scores (Brighton Study Area West)

Candidate Route	Developed Environment	
	Weighted Score	Rank
B24 West (Herter Park HDD and Mt. Auburn Street)	14.91	3
B24A West (Herter Park HDD and WBZ Site)	14.89	2
B29F West (River Street Bridge)	7.29	1
B30 West (Anderson Bridge)	16.50	4

Table 4-20 Overview of Developed Environment Scores (Putnam Study Area)

Candidate Route	Developed Environment	
	Weighted Score	Rank
P11 (Massachusetts Avenue)	16.50	3
P12 (Vassar Street)	15.85	2
P13 (Ames Street)	13.29	1

Table 4-21 Overview of Developed Environment Scores (Kendall Study Area)

Candidate Route	Developed Environment	
	Weighted Score	Rank
K5A (Linskey Way)	14.83	4
K6A (Binney Street)	16.80	5
K10 (Potter Street)	13.78	2
K11 (Fifth Street)	11.94	1
K12 (Munroe Street)	13.99	3

Table 4-22 Overview of Developed Environment Scores (Somerville Study Area)

Candidate Route	Developed Environment	
	Weighted Score	Rank
S1A (Hampshire Street and D2 Site)	9.86	3
S11C (Grand Junction RR Multi-Use Pathway)	7.94	1
S12 (Cardinal Medeiros Avenue)	9.22	2
S13 (Broadway)	16.13	5
S13A (D2 Site and Somerville Avenue)	16.57	6
S14 (Columbia Street)	11.62	4

4.8.1.2 Natural Environment

Table 4-23 Overview of Natural Environment Scores (Brighton Study Area East)

Candidate Route	Natural Environment	
	Weighted Score	Rank
B2A East (Magazine Beach HDD)	7.54	2
B25 East (Herter Park HDD and Memorial Drive)	14.00	4
B25A East (Herter Park HDD and Harvard Athletic Complex)	13.45	3
B31 East (River Street Bridge)	6.73	1

Table 4-24 Overview of Natural Environment Scores (Brighton Study Area West)

Candidate Route	Natural Environment	
	Weighted Score	Rank
B24 West (Herter Park HDD and Mt. Auburn Street)	11.50	4
B24A West (Herter Park HDD and WBZ Site)	11.46	3
B29F West (River Street Bridge)	7.89	2
B30 West (Anderson Bridge)	5.47	1

Table 4-25 Overview of Natural Environment Scores (Putnam Study Area)

Candidate Route	Natural Environment	
	Weighted Score	Rank
P11 (Massachusetts Avenue)	6.47	2
P12 (Vassar Street)	9.00	3
P13 (Ames Street)	3.85	1

Table 4-26 Overview of Natural Environment Scores (Kendall Study Area)

Candidate Route	Natural Environment	
	Weighted Score	Rank
K5A (Linskey Way)	8.15	3
K6A (Binney Street)	9.00	5
K10 (Potter Street)	7.38	1
K11 (Fifth Street)	7.51	2
K12 (Munroe Street)	8.76	4

Table 4-27 Overview of Natural Environment Scores (Somerville Study Area)

Candidate Route	Natural Environment	
	Weighted Score	Rank
S1A (Hampshire Street and D2 Site)	5.37	3
S11C (Grand Junction RR Multi-Use Pathway)	4.93	1
S12 (Cardinal Medeiros Avenue)	6.51	6
S13 (Broadway)	5.04	2
S13A (D2 Site and Somerville Avenue)	5.89	4
S14 (Columbia Street)	5.92	5

4.8.1.3 Technical and Constructability

Table 4-28 Overview of Technical and Constructability Scores (Brighton Study Area East)

Candidate Route	Technical and Constructability	
	Weighted Score	Rank
B2A East (Magazine Beach HDD)	5.58	1
B25 East (Herter Park HDD and Memorial Drive)	8.00	4
B25A East (Herter Park HDD and Harvard Athletic Complex)	7.87	3
B31 East (River Street Bridge)	6.82	2

Table 4-29 Overview of Technical and Constructability Scores (Brighton Study Area West)

Candidate Route	Technical and Constructability	
	Weighted Score	Rank
B24 West (Herter Park HDD and Mt. Auburn Street)	7.57	3
B24A West (Herter Park HDD and WBZ Site)	8.00	4
B29F West (River Street Bridge)	6.16	1
B30 West (Anderson Bridge)	7.25	2

Table 4-30 Overview of Technical and Constructability Scores (Putnam Study Area)

Candidate Route	Technical and Constructability	
	Weighted Score	Rank
P11 (Massachusetts Avenue)	6.40	2
P12 (Vassar Street)	8.00	3
P13 (Ames Street)	5.35	1

Table 4-31 Overview of Technical and Constructability Scores (Kendall Study Area)

Candidate Route	Technical and Constructability	
	Weighted Score	Rank
K5A (Linskey Way)	4.35	3
K6A (Binney Street)	5.00	5
K10 (Potter Street)	4.17	2
K11 (Fifth Street)	4.15	1
K12 (Munroe Street)	4.75	4

Table 4-32 Overview of Technical and Constructability Scores (Somerville Study Area)

Candidate Route	Technical and Constructability	
	Weighted Score	Rank
S1A (Hampshire Street and D2 Site)	4.03	1
S11C (Grand Junction RR Multi-Use Pathway)	6.71	6
S12 (Cardinal Medeiros Avenue)	6.23	5
S13 (Broadway)	4.91	3
S13A (D2 Site and Somerville Avenue)	5.75	4
S14 (Columbia Street)	4.85	2

4.9 Cost Analysis

The Company evaluated cost estimates for each Candidate Route. Many factors can affect the cost of a transmission line project, including cost and availability of materials and equipment, labor, presence of contaminated soils and potential for work hour restrictions or time-of-year restrictions imposed by project permits, the local community, or other entities. Subsurface conditions such as the type and depth of soil and rock that must be excavated to place the duct bank could also significantly affect project cost. In addition, the cost is influenced by the proximity of existing distribution and transmission lines and the density of underground utilities. Waterbodies, like the Charles River, or other features that may need to be traversed by trenchless or other more complex crossing options, could also significantly affect project cost.

A summary of the cost estimates for the Candidate Routes is provided below in Tables 4-33 through 4-37. The cost estimates include transmission line design, substation connections, survey, environmental compliance, environmental mitigation, siting and permitting, construction management, public outreach, risk contingency, and other potential associated costs. The Candidate Route that has the lowest and highest cost is highlighted in **GREEN** (lowest) and **RED** (highest), respectively.

Table 4-33 Candidate Route Cost Estimates (Brighton Study Area East)

Candidate Route	Cost ($ millions)[87]	Cost Ranking within Study Area	Percent More than Lowest Cost Estimate within Study Area
B2A East (Magazine Beach HDD)	$194.0	1	0%
B25 East (Herter Park HDD and Memorial Drive)	$290.8	4	49.9%
B25A East (Herter Park HDD and Harvard Athletic Complex)	$288.4	3	48.6%
B31 East (River Street Bridge)	$199.6	2	2.9%

Table 4-34 Candidate Route Cost Estimates (Brighton Study Area West)

Candidate Route	Cost ($ millions)[88]	Cost Ranking within Study Area	Percent More than Lowest Cost Estimate within Study Area
B24 West (Herter Park HDD and Mt. Auburn Street)	$229.8	4	18.5%
B24A West (Herter Park HDD and WBZ Site)	$228.7	3	17.9%
B29F West (River Street Bridge)	$194.0	1	0%
B30 West (Anderson Bridge)	$215.4	2	11%

[87] Planning grade cost estimates (-25%/+25%) were developed for Routes B2A East and B31 East based on preliminary engineering drawings. Order of magnitude cost estimates (-50%/+200%) were developed for Routes B25 East and B25A East based on initial engineering drawings.

[88] Planning grade cost estimates (-25%/+25%) were developed for Routes B29F West and B30 West based on preliminary engineering drawings. Order of magnitude cost estimates (-50%/+200%) were developed for Routes B24 West and B24A West based on initial engineering drawings.

Table 4-35 Candidate Route Cost Estimates (Putnam Study Area)

Candidate Route	Cost ($ millions)[89]	Cost Ranking within Study Area	Percent More than Lowest Cost Estimate within Study Area
P11 (Massachusetts Avenue)	$56.7	2	50.8%
P12 (Vassar Street)	$80.5	3	114%
P13 (Ames Street)	$37.6	1	0%

Table 4-36 Candidate Route Cost Estimates (Kendall Study Area)

Candidate Route	Cost ($ millions)[90]	Cost Ranking within Study Area	Percent More than Lowest Cost Estimate within Study Area
K5A (Linskey Way)	$48.6	1	0%
K6A (Binney Street)	$59.2	2	21.8%
K10 (Potter Street)	$66.3	3	36.4%
K11 (Fifth Street)	$72.1	4	48.4%
K12 (Munroe Street	$80.0	5	64.6%

[89] Planning grade cost estimates (-25%/+25%) were developed for Routes P11 and P13 based on preliminary engineering drawings. An order of magnitude cost estimate (-50%/+200%) was developed for Route P12 based on initial engineering drawings.

[90] Planning grade cost estimates (-25%/+25%) were developed for Routes K5A and K11 based on preliminary engineering drawings. Conceptual cost estimates (-25%/+50%) were developed for Routes K6A, K10 and K12 based on conceptual engineering drawings.

Table 4-37 Candidate Route Cost Estimates (Somerville Study Area)

Candidate Route	Cost ($ millions)[91]	Cost Ranking within Study Area	Percent More than Lowest Cost Estimate within Study Area
S1A (Hampshire Street and D2 Site)	$98.6	1	0%
S11C (Grand Junction RR Multi-Use Pathway)	$130.0	6	31.8%
S12 (Cardinal Medeiros Avenue)	$111.0	4	12.6%
S13 (Broadway)	$99.4	3	0.8%
S13A (D2 Site and Somerville Avenue)	$113.8	5	15.4%
S14 (Columbia Street)	$99.3	2	0.7%

4.10 Reliability Analysis

The Company considered whether there was a difference in the Candidate Routes regarding the reliability of the proposed New Line. All Candidate Routes are underground and have relatively small differences in design that do not result in any substantial difference in the level of reliability risk. A new 115-kV transmission line constructed along any of the Candidate Routes would address the Project Need identified in Section 2 of this Analysis.

4.11 Selection of Top Two Routes within Each Study Area

Tables 4-38 through 4-41 provide a comprehensive summary of the Candidate Routes and their relative rankings with respect to the natural environment, developed environment, constructability, overall environmental score, reliability, and cost.

[91] Planning grade cost estimates (-25%/+25%) were developed for Routes S1A and S11C based on preliminary engineering drawings. Conceptual cost estimates (-25%/+50%) were developed for Routes S12, S13, S13A, and S14 based on conceptual engineering drawings.

Table 4-38 Ranking Summary of Transmission Line Candidate Routes/Designs (Brighton Study Area East)

Candidate Route	Developed Environment	Natural Environment	Technical & Constructability	Total Environmental	Estimated Cost	Route Ranking
B2A East (Magazine Beach HDD)	1	2	1	1	1	Preferred
B25 East (Herter Park HDD and Memorial Drive)	4	4	4	4	4	
B25A (Herter Park HDD and Harvard Athletic Complex)	3	3	3	3	3	
B31 East (River Street Bridge)	2	1	2	2	2	Noticed Alternative

Table 4-39 Ranking Summary of Transmission Line Candidate Routes/Designs (Brighton Study Area West)

Candidate Route	Developed Environment	Natural Environment	Technical & Constructability	Total Environmental	Estimated Cost	Route Ranking
B24 West (Herter Park HDD and Mt. Auburn Street)	3	4	3	3	4	
B24A West (Herter Park HDD and WBZ Site)	2	3	4	4	3	
B29F West (River Street Bridge)	1	2	1	1	1	Preferred
B30 West (Anderson Bridge)	4	1	2	2	2	Noticed Alternative

Table 4-40 Ranking Summary of Transmission Line Candidate Routes/Designs (Putnam Study Area)

Candidate Route	Developed Environment	Natural Environment	Technical & Constructability	Total Environmental	Estimated Cost	Route Ranking
P11 (Massachusetts Avenue)	3	2	2	2	2	Noticed Alternative
P12 (Vassar Street)	2	3	3	3	3	
P13 (Ames Street)	1	1	1	1	1	Preferred

Table 4-41 Ranking Summary of Transmission Line Candidate Routes/Designs (Kendall Study Area)

Candidate Route	Developed Environment	Natural Environment	Constructability	Total Environmental	Estimated Cost	Route Ranking
K5A (Linskey Way)	4	3	3	3	1	Preferred
K6A (Binney Street)	5	5	5	5	2	
K10 (Potter Street)	2	1	2	2	3	
K11 (Fifth Street)	1	2	1	1	4	Noticed Alternative
K12 (Munroe Street)	3	4	4	4	5	

Table 4-42 Ranking Summary of Transmission Line Candidate Routes/Designs (Somerville Study Area)

Candidate Route	Developed Environment	Natural Environment	Technical & Constructability	Total Environmental	Estimated Cost	Ranking
S1A (Hampshire Street and D2 Site)	3	3	1	1	1	Preferred
S11C (Grand Junction RR Multi-Use Pathway)	1	1	6	2	6	Noticed Alternative
S12 (Cardinal Medeiros Avenue)	2	6	5	3	4	
S13 (Broadway)	5	2	3	5	3	
S13A (D2 Site and Somerville Avenue)	6	4	4	6	5	
S14 (Columbia Street)	4	5	2	4	2	

In consideration of the above, the Company identified the top two routes within the Putnam, Kendall, and Somerville Study Areas and the top four routes within the Brighton Study Areas that best balance environmental impacts, costs, and reliability, provide some measure of geographic diversity, and enable the Company to meet the identified need. The top routes are summarized in further detail below.

As illustrated on Table 4-43 below, Candidate Routes P13 and P11 emerged as the top two routes in the Putnam Study Area. Candidate Route P13 is the best scoring, most direct, and lowest cost alternative in this Study Area. Similarly, Candidate Route P11 ranked second on overall scoring and cost estimates. Accordingly, given its overall superiority in the route selection process, Candidate Route P13 was identified as the Preferred Route and Candidate Route P11 was identified as the Noticed Alternative Route in the Putnam Study Area.

Table 4-43 Top Two Routes in the Putnam Study Area

Route Name	Length of Route (miles)	Communities Crossed by Routes
P13 (Ames Street)	0.49	Cambridge
P11 (Massachusetts Avenue)	0.87	Cambridge

For the Kendall Study Area, as illustrated on Table 4-44 below, Candidate Routes K5A and K11 emerged as the top two routes in the Kendall Study Area. Candidate Route K5A is the lowest cost route but ranks third overall from a scoring perspective. The final alignment of K5A was identified in close consultation and with the support of the owner of the development rights (MITIMCO) and the City of Cambridge to avoid and minimize potential impacts to future development plans on the Volpe Center Site, minimization of impacts to public shade trees, and in consideration of significant utility congestion and planned utility upgrades in Broadway and Third Street. Candidate Route K11 ranks first overall from a scoring perspective but is one of the more expensive routes to construct within the Kendall Study Area primarily because of the anticipated easement costs associated with obtaining rights to install and operate the transmission line in three private roads (Potter Street, Fifth Street, Munroe Street). While the Kendall Study Area is very compact, Candidate Route K11 does provide some measure of geographic diversity relative to Candidate Route K5A. In consideration of these factors, Candidate Routes K5A and K11 were identified as the top routes in the Kendall Study Area. More specifically, Candidate Route K5A was selected as the Preferred Route and Candidate Route K11 was selected as the Noticed Alternative Route in the Kendall Study Area.

Table 4-44 Top Two Routes in the Kendall Study Area

Route Name	Length of Route (miles)	Communities Crossed by Routes
K5A (Linskey Way)	0.59	Cambridge
K11 (Fifth Street)	0.61	Cambridge

For the Somerville Study Area, as illustrated on Table 4-45 below, Candidate Routes S1A and S11C emerged as the top two routes in the Somerville Study Area. Candidate Route S1A received the best overall score and is the second least expensive. Candidate Route S11C received the second-best overall score (within ½ point to Candidate Route S1A); however, it is the most expensive of all the routes considered. Candidate Route S11C was retained as one of the top two routes in this Study Area for its geographic diversity and utilization of off-road segments along the Grand Junction Railroad corridor including potentially collocating with a future municipal multiuse pathway project. For the foregoing reasons, considering its overall superiority in the route selection process, Candidate Route S1A is the Preferred Route (along with Route Variation S1) and Candidate Route S11C is the Noticed Alternative Route in the Somerville Study Area.

Table 4-45 Top Two Routes in the Somerville Study Area

Route Name	Length of Route (miles)	Communities Crossed by Routes
S1A (Hampshire Street and D2 Site)	1.25	Cambridge, Somerville
S11C (Grand Junction RR Multi-Use Pathway)	1.56	Cambridge, Somerville

In the Brighton Study Area, with respect to the eastern routes evaluated, as illustrated on Table 4-46 below, Candidate Routes B2A and B31 emerged as the top two routes. Candidate Route B2A received the best overall score, is the most direct, and is the least expensive option in the Study Area. Candidate Route B31 received the second-best overall score, is the second least expensive option in the Study Area and utilizes existing roadway corridors. Accordingly, given its overall superiority in the route selection process, Candidate Route B2A is the Preferred Route (along with Route Variation B2AN) and Candidate Route B31 is the Noticed Alternative Route in the eastern portion of the Brighton Study Area.

Table 4-46 Top Two Routes in the Brighton East Study Area

Route Name	Length of Route (miles)	Communities Crossed by Routes
B2A East (Magazine Beach HDD)	2.91	Cambridge, Somerville, Boston
B31 East (River Street Bridge)	3.26	Cambridge Somerville, Boston

For the western routes in the Brighton Study Area, as illustrated on Table 4-47 below, Candidate Routes B29F and B30 emerged as the top two routes. Candidate Route B29F received the best overall score and is the least expensive route option. Candidate Route B30 received the second-best overall score and is ranked second with respect to cost. Thus, based on its overall superiority in the route selection process, Candidate Route B29F is the Preferred Route and Candidate Route B30 is the Noticed Alternative Route in the western portion of the Brighton Study Area.

Table 4-47 Top Two Routes in the Brighton West Study Area

Route Name	Length of Route (miles)	Communities Crossed by Routes
B29F West (River Street Bridge)	3.00	Cambridge, Somerville, Boston
B30 West (Anderson Bridge)	3.43	Cambridge, Somerville, Boston

4.12 Conclusion

In accordance with the Siting Board's standard of review, the Company has objectively and comprehensively assessed a wide array of potential routes and route variations within the bounds of the Project Study Area and with extensive stakeholder input. At the conclusion of this process, the Company identified the top two routes within the Putnam, Kendall, and Somerville Study Areas and the top four routes within the Brighton Study Area that best balance environmental impacts, costs and reliability and enable the Company to meet the identified need. A more detailed examination and comparison of these top routes is presented in Section 5.

Section 5.0

Route Comparison

5.0 ROUTE COMPARISON

5.1 Introduction and Overview

As presented in Section 4, the Company objectively and comprehensively assessed a wide array of potential transmission line routes and route variations within the bounds of four separate Study Areas referred to as the Brighton, Putnam, Kendall, and Somerville Study Areas. At the conclusion of this process, the Company identified the top two transmission line routes within these Study Areas and the top four transmission line routes within the Brighton Study Area[92] that best balance environmental impacts, costs and reliability and enable the Company to meet the identified need. A more detailed examination and comparison of these top routes is presented in the balance of this section. The Preferred Routes within each respective Study Area are summarized on Table 5-1 below. Collectively, these Preferred Routes along with related substation work comprise the "Project".

Table 5-1 Preferred Project Routes

Study Area	Preferred Route Name	Communities Crossed by Routes
Putnam	P13 (Ames Street)	Cambridge
Kendall	K5A (Linskey Way)	Cambridge
Somerville	S1A (Hampshire Street/D2 Site)	Cambridge, Somerville
Brighton (East)	B2A (Magazine Beach HDD)	Cambridge, Boston
Brighton (West)	B29F (River Street Bridge)	Cambridge, Boston

[92] As was described in Section 4, the Brighton Study Area involves construction of two new transmission line duct banks, necessitating a separate evaluation of potential routes that head east or west from the New Substation onto Broadway to ensure geographic diversity as required by the Siting Board while being mindful of space and constructability constraints to install and operate the new transmission lines.

In addition to the Preferred Routes noted above, the Company also analyzed minor route variations to Preferred Routes S1A and B2A. As described in further detail in Section 5.2, Route Variation S1 provides an alternate route across the D-2 Block-Union Square Project development site ("D2 Site") in Somerville as it approaches the Somerville Substation.

Route Variation B2AN is a variation of route B2A to address the current options for the MassDOT Allston Multimodal Project Site (the "N" stands for "no-build"). Route Variation B2AN was designed with input from the present landowner (Harvard) to accommodate future development of the property.

Geographically distinct routing alternatives were also selected from each Study Area. Collectively these routes comprise the "Noticed Alternative." The Noticed Alternative routes include:

Table 5-2 Noticed Alternative Routes

Study Area	Noticed Alternative Route Name	Communities Crossed by Routes
Putnam	P11 (Massachusetts Avenue)	Cambridge
Kendall	K11 (Fifth Street)	Cambridge
Somerville	S11C (Grand Junction RR Multi-Use Pathway)	Cambridge, Somerville
Brighton (East)	B31 (River Street Bridge)	Cambridge, Boston
Brighton (West)	B30 (Anderson Bridge)	Cambridge, Boston

The balance of this Section provides an overview of the construction methodology and construction sequence for the overall Project and a detailed comparison of the potential environmental impacts and mitigation, cost and reliability associated with the construction and operation of the Project and the Noticed Alternative. This Section includes complete descriptions of the Project components; maps, construction methods and representative photographs of each of the transmission line routes; a description of the modifications needed at the Company's existing substation facilities where the New Lines will be interconnected; and impacts associated with construction of the New Substation. The construction methods and associated impacts described in this Section are based on preliminary engineering designs. More detailed engineering designs will be developed as part of the final design phase and will reflect continued input from stakeholders, such as input from the staff at the cities of Cambridge, Somerville, and Boston, as well as state and federal agencies. This Section also contains a description of the community engagement actions taken by the Company in its analysis of facility locations and development of the overall Project.

As described in further detail below, based on this detailed comparison, the Company determined that, while the Project and Noticed Alternative would offer comparable reliability, the Project, on balance, is superior to the Noticed Alternative with respect to environmental impacts and cost.

5.2 Route Descriptions

The Preferred Routes for the Project, Noticed Alternative and proposed route variations (collectively the "Routes") are depicted on the following pages in Figures 5-1 and 5-2. Representative photographs of existing locations along the Routes are provided in the Photographic Log, Appendix 5-1.

5.2.1 Preferred Project Routes

The Project includes a total of 8.3 miles of new underground electric transmission line duct banks to be located predominantly in public roadways. A detailed map set of the Preferred Routes is provided in Appendix 5-2. The five Preferred Routes of the Project were described in detail in Section 4. For ease of review and context, these routes are summarized again below.

Putnam Study Area: Preferred Route P13 (Ames Street)

The Preferred Route P13 is approximately 0.49-miles long, located entirely within Cambridge. This route heads east from the proposed New Substation facility in East Cambridge onto Broadway and south on Ames Street. The route follows Ames Street through the Main Street intersection, and the MBTA Red Line subway tunnel beneath it, to the intersection with Memorial Drive. At Memorial Drive, the route ends in a "T" configuration with the line being spliced into existing Eversource transmission line(s) to the east and west on Memorial Drive.

Kendall Study Area: Preferred Route K5A (Linskey Way)

The Preferred Route K5A is approximately 0.59-miles long, located entirely within Cambridge. This route heads east from the New Substation onto Broadway, then turns northeast the abutting U.S. Department of Transportation John A. Volpe National Transportation Systems Center ("Volpe Center Site") property and transitions onto Third Street near its intersection with Potter Street. The route crosses the Volpe Center Site to avoid utility congestion in parts of Third Street and specifically the Third Street/Broadway intersection. The route then turns east onto Linskey Way and south onto Second Street, where it connects into the East Cambridge Substation.

Somerville Study Area: Preferred Route S1A (Hampshire Street/D2 Site)

The Preferred Route S1A is approximately 1.25-miles long, located within Cambridge and Somerville. This route heads west from the New Substation Site onto Broadway for about one block before turning northwest onto Hampshire Street. From Hampshire Street, the route heads north on Columbia Street. The route follows Columbia Street into Somerville to its intersection with Windsor Place. The route crosses Windsor Place and heads north across a private commercial

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- New Substation Site #8025
- Existing Substation
- Town/City Boundary
- Brighton Preferred Route B2A East (2.91-mi)
- Brighton Preferred Route B29F West (3.00-mi)
- Kendall Preferred Route K5A (0.59-mi)
- Putnam Preferred Route P13 (0.49-mi)
- Somerville Preferred Route S1A (1.25-mi)

Scale 1:19,200
1 inch = 1,600 feet

0 800 1,600 Feet

Basemap: 2021 Aerial, Nearmap

North Cambridge Substation #509
Somerville Substation #402
Route Variation S1
D2 SITE
Brighton Substation #329
Putnam Substation #831
New Substation Site #8025
VOLPE CENTER SITE
East Cambridge Substation #875
RIVER STREET BRIDGE CROSSING
MASSDOT ALLSTON MULTIMODAL PROJECT SITE
MAGAZINE BEACH
HDD CROSSING
Route Variation B2AN
Fresh Pond Parkway
Concord Avenue
Massachusetts Avenue
Elm Street
Highland Avenue
Summer Street
Medford Street
McGrath Highway
Somerville Avenue
Beacon Street
Washington Street
Craigie Street
Brattle Street
Garden Street
Kirkland Street
Quincy Street
Mount Auburn Street
Belmont Street
CAMBRIDGE
BELMONT
Cambridge Street
Prospect Street
Webster Avenue
Hampshire Street
Broadway
Inman Street
Cardinal Medeiros Avenue
Columbia Street
Portland Street
Third Street
Binney Street
Cambridge Parkway
Monsignor Obrien Highway
New Rutherford Avenue
SOMERVILLE
CAMBRIDGE
BOSTON
SOMERVILLE
Nashua Street
Charles Street
Charlesbank Road
Longfellow Bridge
First Street
Main Street
Albany Street
Vassar Street
Wavercly Street
Erie Street
Sidney Street
Brookline Street
Putnam Avenue
Memorial Drive
River Street
Western Avenue
Soldiers Field Road
Arsenal Street
WATERTOWN
BOSTON
North Harvard Street
WATERTOWN
CAMBRIDGE
North Beacon Street
Market Street
Brighton Avenue
Harvard Avenue
CAMBRIDGE
BOSTON
Commonwealth Avenue
Boylston Street
28
2
3
3
1
93
90
20

Greater Cambridge Energy Program

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Figure 5-1
Project with Route Variations

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Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- New Substation Site #8025
- Existing Substation
- Town/City Boundary
- Brighton Noticed Alternative Route B31 East (3.26-mi)
- Brighton Noticed Alternative Route B30 West (3.43-mi)
- Kendall Noticed Alternative Route K11 (0.61-mi)
- Putnam Noticed Alternative Route P11 (0.87-mi)
- Somerville Noticed Alternative Route S11C (1.56-mi)

Scale 1:19,200
1 inch = 1,600 feet

0 800 1,600 Feet

Basemap: 2021 Aerial, Nearmap

North Cambridge Substation #509
Somerville Substation #402
D2 SITE
New Substation Site #8025
VOLPE CENTER SITE
East Cambridge Substation #875
Putnam Substation #831
Brighton Substation #329
ANDERSON BRIDGE CROSSING
RIVER STREET BRIDGE CROSSING
MASSDOT ALLSTON MULTIMODAL PROJECT SITE
MAGAZINE BEACH
GRAND JUNCTION RAILROAD CORRIDOR

Fresh Pond Parkway, Concord Avenue, Massachusetts Avenue, Elm Street, Highland Avenue, Summer Street, Somerville Avenue, Medford Street, Mcgrath Highway, Beacon Street, Washington Street, Craigie Street, Brattle Street, Garden Street, Kirkland Street, Belmont Street, Mount Auburn Street, Quincy Street, Prospect Street, Cambridge Street, Broadway, Inman Street, Hampshire Street, Cardinal Medeiros Avenue, Monsignor Obrien Highway, Atlantic Street, New Rutherford Avenue, Nashua Street, Cambridge Parkway, Charlesbank Road, Charles Street, Longfellow Bridge, First Street, Main Street, Portland Street, Columbia Street, River Street, Western Avenue, North Harvard Street, Soldiers Field Road, Arsenal Street, North Beacon Street, Market Street, Brighton Avenue, Harvard Avenue, Memorial Drive, Putnam Avenue, Brookline Street, Sidney Street, Albany Street, Vassar Street, Erie Street, Waverly Street, Commonwealth Avenue, Boylston Street

CAMBRIDGE, BELMONT, WATERTOWN, BOSTON, SOMERVILLE

1, 2, 3, 20, 28, 90, 93

Greater Cambridge Energy Program

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Figure 5-2
Noticed Alternative

parking lot towards the MBTA commuter rail tracks (Fitchburg Route Main Line). The railroad tracks would be crossed using a trenchless construction technique. After crossing the tracks, the route travels in a westerly direction across the D2 Site, parallel to the MBTA railroad tracks and the MBTA new Green Line train station platform, turning north running parallel to Prospect Street (and around the approximate limits of a building that is presently under construction on the D2 Site), and then west across Prospect Street where it enters the Somerville Substation property.

Route Variation S1 follows the same alignment described above for the Preferred Route S1A except that it travels in a northwesterly direction around the eastern edge of the site of the MBTA's new Union Square train station platform, across the D2 Site, generally following the approximate alignment of two future roadways associated with the development, identified as Milk Alley and Bennett Court. The route then crosses over Prospect Street and accesses the Somerville Substation from the east.

Brighton Study Area (East): Preferred Route B2A East (Magazine Beach HDD)

The Preferred Route B2A East is approximately 2.91-miles long, located in Cambridge and Boston. This route heads east from the New Substation Site in Cambridge onto Broadway before turning south onto Ames Street. The route follows Ames Street through the Main Street intersection, and the MBTA Red Line subway tunnel beneath it, to the intersection with Memorial Drive. At Memorial Drive, the route turns to the west following the east bound lanes to the MassDCR Magazine Beach property. Like Magazine Beach, the Memorial Drive segment is located within the Charles River Reservation and is under the care and custody of MassDCR. At the Magazine Beach property, the route crosses beneath the Charles River into Boston via HDD. After crossing beneath the Charles River, the route follows the general alignment of the anticipated new street, referred to as the Lincoln Street Connector, that is proposed to be constructed as part of MassDOT's Allston Multimodal Project. From there, the route goes onto Cambridge Street, following Cambridge Street to Empire Street and Lincoln Street where it terminates at the Brighton Substation.

The Company evaluated a route variation to Route B2A East associated with the orientation of the HDD path across the MassDOT Allston Multimodal Project Site. The Preferred Route B2A East generally follows the future alignment of the Lincoln Street Connector through the multimodal site and Route Variation B2AN East generally runs parallel with the southerly property line near the existing MBTA rail tracks. Route Variation B2AN provides routing flexibility if MassDOT's Allston Multimodal Project does not advance into construction as currently proposed, while also minimizing potential future development constraints by locating the transmission line and manhole infrastructure in areas of the site that will not negatively affect the present landowner's (Harvard) ability to develop the property in the future. This route variation does not add any appreciable length (approximately 0.05 miles) or costs relative to the Preferred Route B2A.

Brighton Study Area (West): Preferred Route B29F West (River Street Bridge)

The Preferred Route heading west from the New Substation in the Brighton Study Area is Route B29F West (River Street Bridge). This route is approximately 3.0-miles long, located in Cambridge and Boston. This route heads west from the New Substation Site in Cambridge onto Broadway before turning south onto Galileo Galilei Way to Vassar Street. The route follows Vassar Street before crossing northwest through a parking lot, a portion of which is owned by MIT and the MBTA. From the parking lot, the route crosses the Grand Junction Railroad using a pipe jacking or other similar trenchless crossing technique to reach a parking lot on a second parcel of land owned by MIT (referred to as #634 Memorial Drive). The route then follows Waverly Street to Brookline Street through the Reid Rotary at the B.U. Bridge, continuing west on Memorial Drive to the River Street Bridge. At this location, the route turns to the west across the River Street Bridge, over the Charles River, and onto Cambridge Street in Boston. The bridge crossing would be accomplished by installing the transmission cable in the bridge deck/roadway pavement.[93] On the Boston side of the Charles River, the route would cross over the I-90 ramps following the approximate location of Cambridge Street if it is reconstructed at-grade as part of MassDOT's Allston Multimodal Project (the route cannot be constructed along the existing elevated section of Cambridge Street that spans the I-90 ramps). After passing through a short stretch of wooded, undeveloped land (~500-feet) adjacent to the roadway shoulder(s) (where the future Cambridge Street will be constructed), the route transitions back onto existing Cambridge Street until it reaches Lincoln Street. The route follows Lincoln Street to the Brighton Substation.

5.2.2 Noticed Alternative

The Noticed Alternative design consists of a total of 9.7 miles of new underground electric transmission line located primarily in public roadways. A detailed map set of the Noticed Alternative is provided in Appendix 5-3. The five routes comprising the Noticed Alternative are summarized below.

Putnam Study Area: Noticed Alternative Route P11 (Massachusetts Avenue)

The Noticed Alternative Route P11 is approximately 0.87-miles long, located entirely within Cambridge. This route heads east from the New Substation Site onto Broadway and then south onto Ames Street to the intersection with Main Street. The route heads west on Main Street parallel to the MBTA Red Line subway tunnel before crossing over the tunnel onto Vassar Street. The route heads south on Vassar Street to Massachusetts Avenue, where it then turns towards

[93] MassDOT indicated to Eversource that it is moving forward with certain repairs and upgrades to the River Street bridge and confirmed there is sufficient space within the roadway deck to accommodate a new transmission line.

the southeast on Massachusetts Avenue to Memorial Drive. At Memorial Drive, the route ends in a "T" configuration with the line being spliced into existing Eversource transmission line(s) to the east and west on Memorial Drive.

Kendall Study Area: Noticed Alternative Route K11 (Fifth Street)

The Noticed Alternative Route K11 is approximately 0.61-miles long, located entirely within Cambridge. This route heads east from the New Substation Site onto Broadway before turning north across the abutting Volpe Center Site to Potter Street. The route alignment across the Volpe Center Site was identified in consultation with the owner of the development rights (MITIMCO) and Cambridge officials so as not to restrict future development activities at the site from the placement of the electrical infrastructure and to avoid impacts to mature public shade trees bordering the Loughrey Walkway and Bike Path west of the site. From Potter Street, the route heads north onto 5th Street and west onto Munroe Street before crossing over Third Street onto Linskey Way. Potter Street, 5th Street, and Munroe Street are private roads. The route follows Linskey Way in an easterly direction before turning south onto Second Street to its interconnection point within the East Cambridge Substation.

Somerville Study Area: Noticed Alternative Route S11C (Grand Junction RR Multi-Use Pathway)

The Noticed Alternative Route S11C is approximately 1.56-miles long, located in Cambridge and Somerville. This route heads west from the New Substation Site onto Broadway for about one block before turning north onto a parcel of land owned by the City of Cambridge abutting the east side of the MBTA Grand Junction Railroad corridor. The route continues north on the City of Cambridge owned properties parallel to the east side of the MBTA Grand Junction Railroad corridor. From Broadway to Medford Street in Somerville, the route collocates with the potential future alignment of Cambridge's Grand Junction Multi-Use Path, which requires crossing from City of Cambridge-owned land on the east side of the existing railroad corridor to City of Cambridge-owned land on the west side of the railroad corridor. These crossovers would occur at the following at-grade street crossings: Binney Street, Cambridge Street and Medford Street. The Cambridge/Somerville municipal boundary is located just south of Medford Street. After crossing Medford Street, Route S11C continues north along the western edge of the MBTA ROW up to the intersection of the Grand Junction railroad tracks and the MBTA commuter rail tracks (Fitchburg Route Main Line). The route would then cross beneath the MBTA commuter rail tracks and McGrath Highway (Route 28) using a trenchless construction technique, to reach an Eversource-owned parcel of land on Linwood Street. The transmission line would then transition back to conventional open-trench construction as it turns northwest onto Linwood Street, Washington Street and Prospect Street where it connects with the Somerville Substation.

Brighton Study Area (East): Noticed Alternative Route B31 East (River Street Bridge)

The Noticed Alternative Route B31 East is approximately 3.26-miles long, located in Cambridge and Boston. This route heads east from the New Substation Site onto Broadway before turning south onto Ames Street. The route follows Ames Street to the intersection with Memorial Drive.

At Memorial Drive, the route turns to the west (following the east bound lanes of Memorial Drive) to the Reid Rotary at the B.U. Bridge, continuing west on Memorial Drive to the River Street Bridge. At this location, the route turns to the west across the River Street Bridge, over the Charles River, and onto Cambridge Street in Boston. The bridge crossing would be accomplished by installing the cable in the bridge deck/roadway pavement.[94] On the Boston side of the Charles River, the route would cross over the I-90 ramps following the approximate location of Cambridge Street if it is reconstructed at-grade as part of MassDOT's Allston Multimodal Project (the route cannot be constructed along the existing elevated section of Cambridge Street that spans the I-90 ramps). After passing through a short stretch of wooded, undeveloped land (~500-feet) adjacent to the roadway shoulder(s), the route transitions back onto Cambridge Street until it reaches Lincoln Street. The route follows Lincoln Street to the Brighton Substation.

Brighton Study Area (West): Noticed Alternative Route B30 West (Anderson Street Bridge)

The Noticed Alternative Route heading west from the New Substation in the Brighton Study Area is Route B30 West (Anderson Street Bridge). This route is approximately 3.43-miles long, located in Cambridge and Boston. This route heads west from the New Substation Site onto Broadway before turning south onto Prospect Street and then west onto Green Street. The route follows Green Street to Putnam Avenue where it turns north and then west onto Mt. Auburn Street. The route follows Mt. Auburn Street to John F. Kennedy Street. The route then heads south along John F. Kennedy Street to the Anderson Memorial Bridge over the Charles River. The bridge crossing would be accomplished by installing the cable in the bridge deck/roadway pavement. On the Boston side of the Charles River, the route follows North Harvard Street to Franklin Street and Lincoln Street before terminating at the Brighton Substation.

5.3 General Construction Sequence and Best Management Practices for Underground Transmission Lines

The construction sequence for the underground transmission lines includes the following general steps, each of which is described in further detail below:

- Installation of erosion and sediment controls,
- Installation of manholes/splice vaults,
- Trenching and duct bank installation,
- Cable pulling, splicing, and testing, and
- Restoration.

[94] As was noted for Preferred Route B29F West, MassDOT indicated to Eversource that it is moving forward with certain repairs and upgrades to the River Street bridge and confirmed there is sufficient space within the roadway deck to accommodate a new transmission line.

5.3.1 Installation of Erosion and Sediment Controls

To minimize the potential for erosion and sediment migration during construction, temporary erosion and sediment control measures will be installed prior to the initiation of soil disturbing activities and will be inspected regularly and maintained during construction. Erosion and sediment controls such as straw bales, silt fence, compost filter tubes and/or straw wattles, and catch basin inlet protection will be installed in accordance with Eversource's Best Management Practices Manual for Massachusetts and Connecticut ("BMP manual") (see Appendix 5-7) and any applicable environmental permit requirements. These controls will be installed between the work areas and environmentally sensitive areas, including wetlands and waterbodies associated with the Charles River. Additionally, inlet protection will be installed in stormwater catch basins along the Project routes in the immediate vicinity of active trenching, excavation or other construction activities involving sediment disturbance.

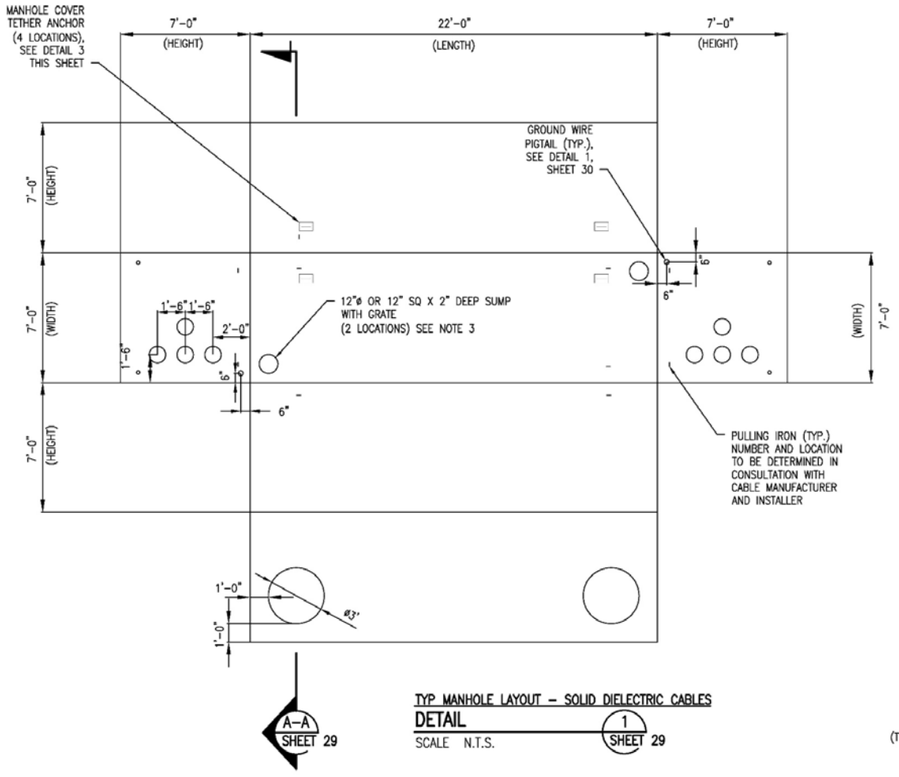
5.3.2 Installation of Manholes /Splice Vaults

Pre-cast or cast-in-place concrete splice vaults (also referred to as manholes), will be installed prior to or in parallel with trenching and installation of the duct bank. Splice vaults facilitate cable installation and splicing and provide access for future maintenance. Each splice vault is approximately 9-feet wide by 9-feet high by 24-feet long (outside diameter dimensions). The depth of the splice vault would vary by location and be located entirely underground with only the manhole cover and frame visible at ground level. A precast communication handhole measuring 5-feet by 5-feet by 5-feet (outside diameter dimensions) will typically be located at each splice vault. A typical manhole detail is provided on Figure 5-3.

Splice vaults are spaced approximately 1,500 to 1,800 feet apart, but sometimes could be closer, depending upon the physical aspects of the route and location of the duct bank. The factors contributing to final placement of the splice vaults include the maximum length of a cable that can be transported on the reel; allowable pulling tensions for the specific location; sidewall pressure on the cables as they are pulled around a bend; and accessibility. On average, each splice vault takes approximately seven to ten days to install.

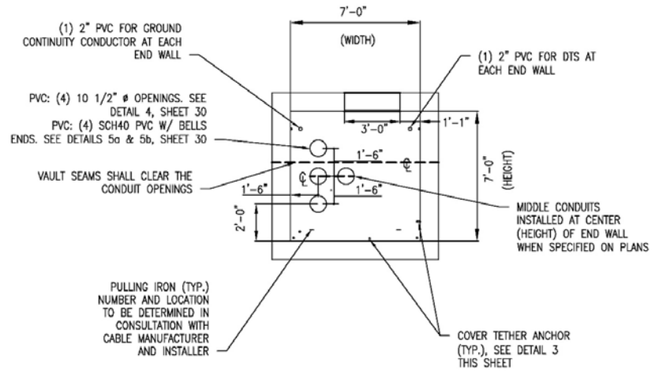
Existing utilities may need to be relocated to create space for the new splice vaults (this would be determined during detailed design). The Company would work with the local municipal officials and utility owners regarding these relocations on a case-by-case basis.

In the event contaminated soils, contaminated groundwater or other regulated materials are encountered during excavation of the splice vaults, soils/materials would be managed pursuant to the Utility-Related Abatement Measure ("URAM") provisions of the Massachusetts Contingency Plan ("MCP"). The Company would also 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 C.M.R. 40.0460 et seq.



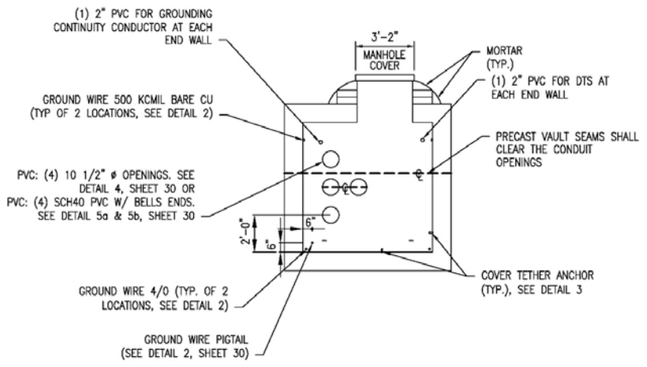
TYP MANHOLE LAYOUT – SOLID DIELECTRIC CABLES
DETAIL 1
SCALE N.T.S. SHEET 29

NOTES:
1. MANHOLE DIMENSIONS SHOWN ARE INSIDE DIMENSIONS.
2. ALL PULLING EYES SHALL BE DESIGNED FOR MULTIDIRECTIONAL CABLE PULLS.
3. TOP OF GRATE SHALL BE FLUSH WITH SURROUNDING FINISHED SURFACE.



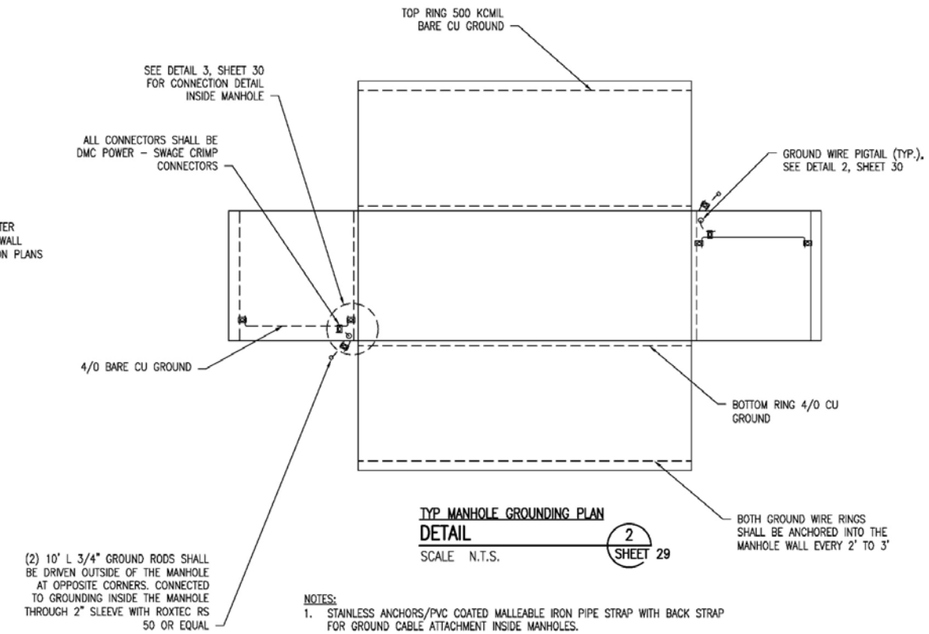
TYP MANHOLE END VIEW– SOLID DIELECTRIC CABLES
SECTION A-Aa
SCALE: N.T.S. SHEET 29

NOTES:
1. MANHOLE DIMENSIONS SHOWN ARE INSIDE DIMENSIONS.
2. ALL PULLING EYES SHALL BE DESIGNED FOR MULTIDIRECTIONAL CABLE PULLS.
3. ALL PIPE SIZES ARE NOMINAL.



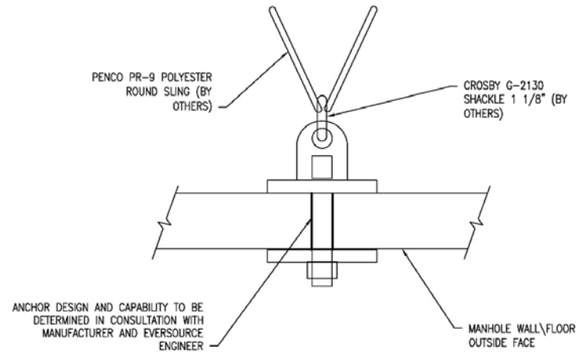
TYP MANHOLE END VIEW – SOLID DIELECTRIC CABLES
SECTION A-Ab
SCALE: N.T.S. SHEET 29

NOTES:
1. ALL PIPE SIZES ARE NOMINAL.
2. TOP OF MANHOLE FRAME/GATE SHALL BE FLUSH WITH SURROUNDING FINISHED SURFACE.



TYP MANHOLE GROUNDING PLAN
DETAIL 2
SCALE N.T.S. SHEET 29

NOTES:
1. STAINLESS ANCHORS/PVC COATED MALLEABLE IRON PIPE STRAP WITH BACK STRAP FOR GROUND CABLE ATTACHMENT INSIDE MANHOLES.



TYP MANHOLE COVER TETHER ANCHOR
DETAIL 3
SCALE N.T.S. SHEET 29

NOTES:
1. REQUIRED ONE ON THE FLOOR & ONE ON THE WALL PER MANHOLE COVER.

5.3.3 Trenching and Duct Bank Installation

Following or in parallel with installation of the splice vaults, the underground duct bank construction will begin. The underground line segment will consist of six (6) cross-linked polyethylene ("XLPE") insulated cables. The duct bank will contain a total of fourteen (14) conduits: six (6) polyvinyl chloride ("PVC") 8-inch-diameter conduits for the insulated XLPE cables, four (4) 2-inch-diameter PVC conduits for relay and communication cables and four 2-inch-diameter PVC conduits (two for ground continuity conductors (one per circuit) and two for possible future temperature-monitoring of each circuit). A common thermal concrete envelope encases the conduits to form the "duct bank." See Figure 5-4 for a depiction of the general arrangement in the duct bank.

The primary method for underground duct bank construction in roadways is open cut trenching. The trench will be approximately four feet wide and generally five and a half to eight feet deep, though on occasion it may need to be wider and/or deeper to avoid utilities or other obstacles, depending on the final design profile of the duct bank. For installation of the transmission line within roadways, the width of the trench would be marked on the street, Dig-Safe would be contacted, the location of existing utilities would be marked, and the pavement would be saw-cut. Saw cutting provides a clean break in the pavement and defines the parameters of the trench for asphalt removal and trench excavation.

Following saw cutting, the pavement would be removed with a backhoe/excavator and loaded into a dump truck and removed from the site. Pavement material would be handled separately from excavated soil and would be recycled at an asphalt batching plant. Subsequently, a backhoe/excavator would excavate the trench to the required depth. In some areas, excavation may be done by hand or vacuum excavation to avoid disturbing existing utility lines and/or service connections. Soil removal would likely be a "clean trench" or "live loading" method in which soil would be loaded directly into a dump truck and transported to an off-site facility for recycling, reuse, or disposal. Soil would not typically be stockpiled along the edge of the roadway, thus reducing the size of the required work area and the potential for sedimentation or the creation of nuisance dust. Any rock encountered during excavation would be removed by mechanical means and brought to an off-site facility for recycling, reuse, or disposal.

As with the splice vault excavation described above, if contaminated soils, contaminated groundwater, or other regulated materials are encountered during trenching for the duct banks, the contaminated soils/groundwater/materials would be managed pursuant to the URAM provisions of the MCP. The Company would also contract with a LSP as necessitated by conditions, consistent with the requirements of the MCP at 310 C.M.R. 40.0460 et seq.