New England Wind 2 Connector

Analysis to Support Petition Before the Energy Facilities Siting Board

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Volume I: Text and Figures

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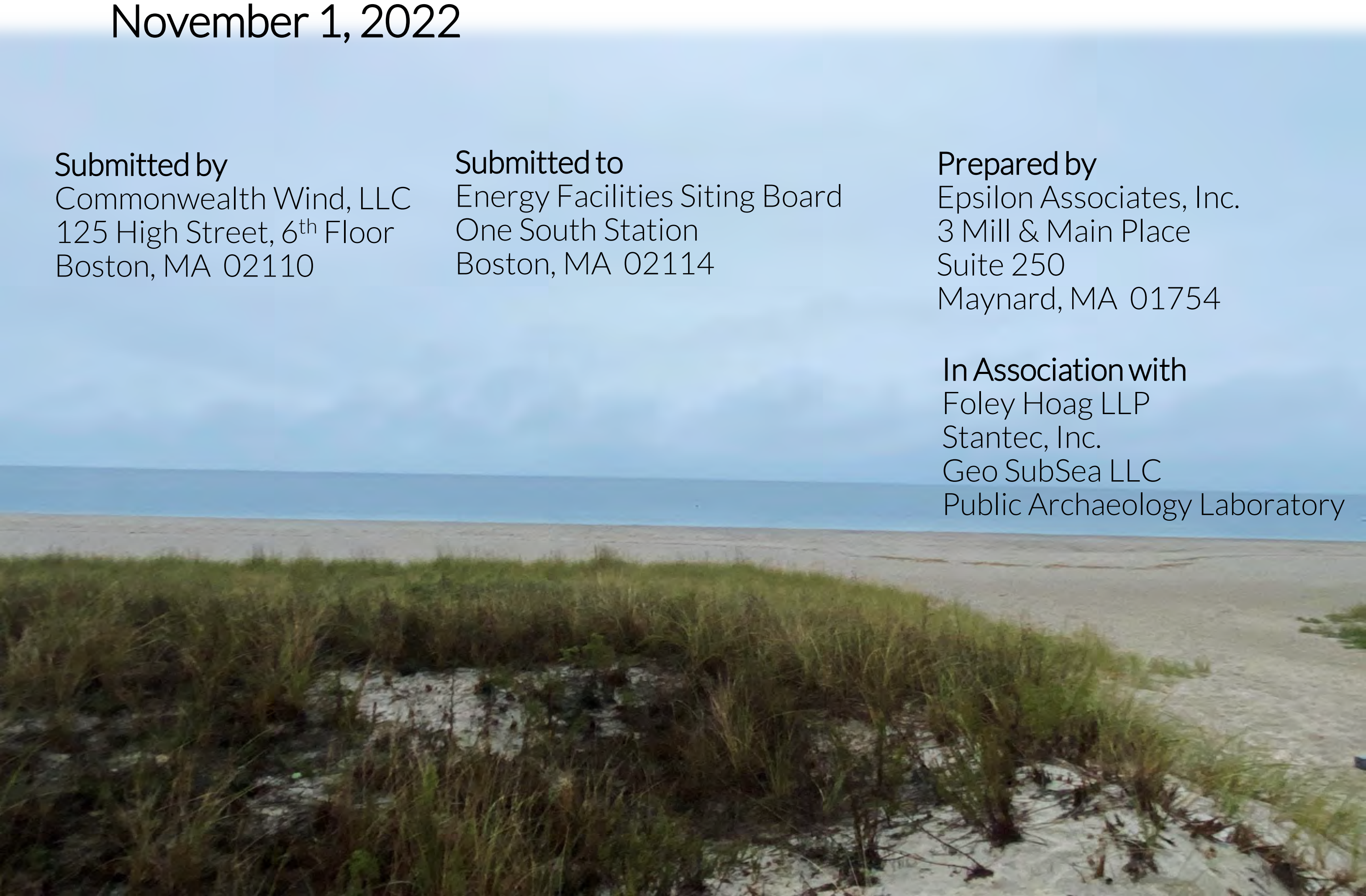

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Volume II – Attachments

List of Acronyms

AC	alternating current
ACEC	Areas of Critical Environmental Concern
AIS	Air Insulated Substation
AUL	Activity and Use Limitation
BACT	Best Available Control Technology
BLSF	Bordering Land Subject to Flooding
BMPs	Best Management Practices
BOEM	Bureau of Ocean Energy Management
BVW	Bordering Vegetated Wetland
BWSC	Bureau of Waste Site Cleanup
CAA	Clean Air Act
CBA	Community Benefit Agreement
CBOs	Community-Based Organizations
CCC	Cape Cod Commission
CFR	Code of Federal Regulations
CFRF	Commercial Fisheries Research Foundation
CGP	Construction General Permit
cm	centimeter
CMP	Construction Management Plan
CMR	Code of Massachusetts Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	Corresponding Onshore Area
COP	Construction and Operations Plan
CPT	Cone Penetration Tests
CRC	University of Rhode Island Coastal Resources Center
CRM	cultural resource management
CWA	Clean Water Act
CWMP	Comprehensive Wastewater Management Plan
CZM	Massachusetts Office of Coastal Zone Management
CZMA	Coastal Zone Management Act
DCR	Massachusetts Department of Conservation and Recreation
DEI	Diversity Equity and Inclusion
DH	deep downhole
DMF	Division of Marine Fisheries
DOER	Massachusetts Department of Energy Resources
DP	Dynamic Positioning
DPU	Massachusetts Department of Public Utilities
DRI	Development of Regional Impact
DPW	Department of Public Works

List of Acronyms (Continued)

EA	Environmental Assessment
EDCs	Massachusetts Electric Distribution Companies
EEA	Massachusetts Executive Office of Energy and Environmental Affairs
EFSB	Energy Facilities Siting Board
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EJ	Environmental Justice
EMF	electric and magnetic field
ENF	Environmental Notification Form
EPA	U.S. Environmental Protection Agency
EPC	Engineering, Procurement and Construction
ESA	Endangered Species Act
ESPs	electrical service platforms
FAA	Federal Aviation Administration
FAB	Rhode Island Fishermen's Advisory Board
FAST	Fixing America's Surface Transportation Act
FCP	Fisheries Communications Plan
FDR	Facilities Design Report
FHWA	Federal Highway Administration
FIR	Fabrication & Installation Report
FONSI	Finding of No Significant Impact
ft^2	square feet
FTA	Federal Transit Administration
FTB	fluidized thermal backfill
FTE	full time equivalent
GIS	Gas Insulated Substation
GWSA	Commonwealth of Massachusetts 2008 Global Warming Solutions Act
HAB	Habitat Advisory Board
HCA	Host Community Agreement
HDD	horizontal directional drilling
HDPE	high-density polyethylene
HPFF	High-Pressure Fluid-Filled
HSE	Health, Safety, and Environmental
HVAC	high voltage alternating current
HVDC	high voltage direct current
IHA	Incidental Harassment Authorization
in	inch
ISO-NE	ISO-New England
IVW	Isolated Vegetated Wetlands
IWPA	Interim Wellhead Protection Area

List of Acronyms (Continued)

km	kilometers
kV	kilovolt
kW	kilowatt
LAER	Lowest Achievable Emission Rate
LID	Low Impact Development
LIPA	Long Island Power Authority
LOA	Letter of Authorization
LSCSF	Land Subject to Coastal Storm Flowage
LSF	Lands Subject to Flooding
LSP	Licensed Site Professional
m	meters
MA WEA	Massachusetts Wind Energy Area
MACRIS	Massachusetts Cultural Resource Information System
MARPOL	International Convention for the Prevention of Pollution from Ships
MassCEC	Massachusetts Clean Energy Center
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MassGIS	Massachusetts Geographical Information System
MBTA	Migratory Bird Treaty Act
MBUAR	Massachusetts Board of Underwater Archaeological Resources
MC-FRM	Massachusetts Coast Flood Risk Model
MCP	Massachusetts Contingency Plan
MEPA	Massachusetts Environmental Policy Act
MESA	Massachusetts Endangered Species Act
MHC	Massachusetts Historical Commission
MHHW	Mean Higher High Water
MHW	Mean High Water
MLPs	Municipal Light Plants
MLW	Mean Low Water
mm	millimeter
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MTBM	micro tunnel boring machine
MVC	Martha’s Vineyard Commission
MW	megawatts
NE Wind 2 Connector	New England Wind 2 Connector
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NHESP	MassWildlife's Natural Heritage & Endangered Species Program
NHPA	National Historic Preservation Act
NJ	New Jersey

List of Acronyms (Continued)

NMFS	National Marine Fisheries Service
nmi	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_x	nitrogen oxides
NPCC	Northeast Power Coordinating Council
NPDES	National Pollutant Discharge Elimination System
NR	National Register
NREL	National Renewable Energy Laboratory
NY	New York
NYSERDA	New York State Energy Research and Development Authority
O&M	operations and maintenance
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OECC	Offshore Export Cable Corridor
OFL	Onboard Fisheries Liaison
OMP	Ocean Management Plan
ORW	Outstanding Resource Waters
OSHA	Occupational Safety and Health Administration
OSRP	Oil Spill Response Plan
OVA	Osterville Village Association
PAL	the Public Archaeology Laboratory
PAM	Passive Acoustic Monitoring
PATON	Private Aids to Navigation
PBD	Public Benefit Determination
PCBs	polychlorinated biphenyls
PJM	Pennsylvania-Jersey-Maryland
PM	Particulate Matter
PMP	Probable Maximum Precipitation
PNF	Project Notification Form
POI	Potential Interconnection Points
PPA	Power Purchase Agreement
ppm	parts per million
PPPP	Piping Plover Protection Plan
PSO	Protected Species Observer
PVC	polyvinyl chloride
QP	queue position
RFA	Riverfront Area
RFI	Request for Interest
RFP	Request for Proposal

List of Acronyms (Continued)

RI	Rhode Island
RMAT	Resilient Massachusetts Action Team
ROD	Record of Decision
ROSA	Responsible Offshore Science Alliance
ROV	Remotely Operated Vehicle
ROW	Right-of-Way
RSD	rippled scour depressions
SAP	Site Assessment Plan
SAV	Submerged Aquatic Vegetation
SEMA	Southeast Massachusetts Area
SMAST	School for Marine Science and Technology
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPCC Plan	Spill Prevention, Control and Countermeasures Plan
SR	State Register
SSU	special, sensitive, and unique
STATCOM	Static Synchronous Compensator
SWDA	Southern Wind Development Area
SWPPP	Stormwater Pollution Prevention Plan
TBF	To be filed
THPO	Tribal Historic Preservation Officers
TMDL	Total Maximum Daily Load
TMP	Traffic Management Plan
TOY	Time of Year
tpy	tons per year
TSHD	Trailing Suction Hopper Dredge
TSS	Total Suspended Solids
ULSD	Ultra-Low Sulfur Diesel
UMass	University of Massachusetts
URAM	Utility-Related Abatement Measure
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFW	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compounds
WHOI	Woods Hole Oceanographic Institute
WPA	Wetland Protection Act
WTG	wind turbine generator
XLPE	cross-linked polyethylene

Section 4.0

Route Selection

4.0 ROUTE SELECTION

As discussed in Section 2.0, the Company is proposing a wind energy generation facility known as Commonwealth Wind in the southern portion of Lease Area OCS-A 0534. This offshore wind energy generation project, which will deliver a minimum of 1,200 MW of energy, requires the construction of export cables through federal and state waters; a suitable landfall location that can accommodate the offshore-to-onshore transition facilities; the construction of onshore export cables from the landfall site to a new onshore substation; and the construction of grid interconnection cables from the new onshore substation to a suitable interconnection point to the electrical grid. The Massachusetts-jurisdictional portion of the offshore export cables, the landfall location, the onshore export cables, the new onshore substation, and the grid interconnection cables are collectively referred to as the New England Wind 2 Connector ("the Project" or "NE Wind 2 Connector").

This Section describes the siting analyses the Company completed to determine the optimal locations for the various components of the Project. The objective of the Company's siting analysis was to identify a technically feasible and cost-effective design capable of delivering a minimum of 1,200 MW from the offshore wind energy generation facility in federal waters to a suitable onshore interconnection point.

For a project of this complexity, there are interrelated aspects of the siting and routing of each component, all of which are important, and all of which must work together collectively to achieve the Project purpose. The offshore export cable route, landfall site, onshore export cable route, new onshore substation site, and grid interconnection location are all critical aspects of the overall siting. Each must be feasible from technical, environmental, legal/permitting, and municipal support perspectives, and each must allow for feasible implementation of the other necessary components. For instance, a landfall location must also serve as one of the endpoints for both the offshore and onshore export cable routing. A flaw in any one of these critical components could be seriously detrimental, or even fatal, to the Project. The ultimate selection of the components requires balancing all of the factors discussed in this Analysis.

4.1 Analysis of Offshore Export Cable Corridor (OECC)

Offshore wind projects are unique infrastructure that utilize rapidly changing technologies deployed in a dynamic marine environment. The high-energy marine environment can cause features like shoals to be in a constant state of change, resulting in corresponding water depth changes. Experience in the offshore wind industry in Europe as well as offshore cable installations in the U.S. has demonstrated that the use of an installation corridor can provide flexibility in the engineering and installation stages to maximize the likelihood of successful cable burial while also avoiding and minimizing environmental impacts.

This Section describes how the OECC was developed and optimized for the Project. Specifically, Section 4.1.1 describes the framework for offshore export cables in state waters, Section 4.1.2 identifies the marine surveys that were completed to identify the OECC, and Section 4.1.3 provides a description of the proposed OECC.

In summary, the Project's proposed offshore export cables connecting the offshore wind turbine generators (WTGs), located within Lease Area OCS-A 0534 in federal waters to the Dowses Beach Landfall Site will be installed within a shared OECC (referred to as the Primary OECC). The Primary OECC will travel from the northwestern corner of Lease Area OCS-A 0534, along the northwestern edge of Lease Area OCS-A 0501, and northward along the eastern side of Muskeget Channel towards the southern shore of Barnstable, Massachusetts. The OECC for the NE Wind 2 Connector is largely the same OECC (approximately 96%) that was proposed for the Vineyard Wind Connector 1 and NE Wind 1 Connector (formerly Vineyard Wind Connector 2). The portion of the OECC associated with the NE Wind 2 Connector not previously reviewed as part of the Vineyard Wind Connector 1 and/or NE Wind 1 Connector projects is located in Centerville Harbor where the corridor diverges from the Primary OECC to make landfall at the Dowses Beach Landfall Site. This small segment of the NE Wind 2 Connector OECC totals approximately 488 acres (see Figure 1-4). Using a substantially shared OECC provides an efficient, consolidated route from the Lease Areas to point of landfall divergence, and minimizes environmental, operational, and commercial impacts relative to longer alternative routes.

4.1.1 Massachusetts Ocean Management Plan

The Massachusetts OMP, initially released in 2009 and subsequently revised in 2015 and again in 2021, creates a framework for managing uses and activities within the state's ocean waters, including offshore wind projects and associated transmission. As described in this section and in Section 6.4.5, the Company considered the OMP carefully in identifying potential offshore corridors. A large part of the planning process for the OMP was devoted to mapping and evaluating natural resources and existing water-dependent uses (e.g., navigation and fishing), and identifying which of these resources and uses may be sensitive to different types of projects, such as transmission cables (export cables). A transmission cable is an allowable use per the OMP, which defines siting and performance standards. More specifically, the OMP identifies special, sensitive, and unique (SSU) resources that particular types of projects must endeavor to avoid. For cable projects, SSU areas are: (1) core habitat of the North Atlantic right whale, fin whale, and humpback whale; (2) hard/complex seafloor; (3) eelgrass; and (4) intertidal flats. For this Project, North Atlantic Right Whale core habitat, hard/complex seafloor, and eelgrass are all mapped within the general Project area. As described in Section 6.4.5, which addresses Project consistency with the OMP, the OECC has been selected to avoid the North Atlantic Right Whale core habitat and to minimize the areas of hard/complex bottom that may be affected. The landfall site has been assessed and selected partially on the basis of avoiding mapped eelgrass habitat.

In addition, the OMP identifies some preliminary corridors for offshore wind transmission cables that are in presumptive compliance with siting standards of the OMP. The Company considered these corridors while assessing offshore routing alternatives, but they were unsuitable for the Project given that water depths within the mapped preliminary corridors are frequently too shallow, a landfall in Barnstable is needed to minimize onshore routing distance (mapped preliminary corridors do not include a landfall site in that town), and the Project is proposed to pass through federal waters in Nantucket Sound to minimize routing distance. As discussed in the balance of Section 4.0, the routing process for the OECC must consider all major elements of the interconnection route: the submarine corridor, landfall, onshore routing, grid interconnection, and Project substation location. The submarine routes cannot be considered in isolation, but rather must be combined with suitable landfalls, onshore routes, a workable grid interconnection point, and substation locations.

The map set in Attachment C shows the proposed OECC along with SSU areas mapped in the OMP as well as modified delineation of SSU areas based on marine survey results. As previously described, the OECC is largely the same corridor proposed for the NE Wind 1 Connector, which is currently under review by the Siting Board, and which is itself largely the same as the corridor approved for the Vineyard Wind Connector 1 (the difference between those corridors being certain width expansions proposed for the NE Wind 1 Connector, distinct landfall points at the northern terminus of the OECC, and a short variant route for a portion of the crossing through the Muskeget channel included only for Vineyard Wind Connector 1 and NE Wind 2 Connector).

4.1.2 Marine Surveys to Identify OECC

An initial analysis of potential offshore export cable routes began in 2017 in the context of investigating route options for the Vineyard Wind 1 project. This initial analysis considered a number of factors, including mapping of SSU areas from the OMP, bathymetric data, the locations of navigation corridors, water currents, and mapped obstacles such as rock outcroppings and shipwrecks.

In 2017, building off results from the initial desktop study, an initial geophysical survey was performed along more than 180 miles (156 nautical miles, or 290 km) of potential offshore route segments to find a suitable route for linking Lease Area OCS-A 0501[1] to the south shore of Cape Cod. Geotechnical surveys and environmental sampling (e.g., benthic grab samples and underwater video) of the potential corridors were also performed in 2017 (at the time focused on Barnstable and Yarmouth). This field program was performed in accordance with a Survey and Sampling Plan that was the product of consultations with the Massachusetts Ocean Team as well as consideration of the 2015 OMP; the Massachusetts Ocean Team consists of representatives from Massachusetts Office of Coastal Zone Management (CZM), MassDEP, Division of Marine Fisheries (DMF), Massachusetts Board of Underwater Archaeological Resources (MBUAR), and the MEPA Office.

[1] BOEM segregated Lease Area OCS-A 0501 into two lease areas – OCS-A 0501 and OCS-A 0534 – in June 2021. At the time of this survey (2017), Lease Area OCS-A 0501 had not yet been segregated into two lease areas.

The initial geophysical survey included the following:

- A single geophysical trackline along each offshore route alternative, consisting of a 164-foot-wide (50-meter-wide) swath of multi-beam sidescan sonar and sub-bottom profiling;
- Additional geophysical tracklines in areas where route alternatives pass in proximity to mapped SSU areas to map the resources' areal extent and determine a path for avoidance; and
- Additional geophysical tracklines in areas where adverse site conditions were identified (e.g., shallow water depths, difficult surficial geology).

Results from the initial geophysical survey were used to identify potential routes for the OECC. Additional data collection as outlined below was then conducted:

- Vibracore sampling at a spacing of approximately 3,280 feet (1,000 m), with additional vibracores added where needed to verify subsurface sediment horizons interpreted from subbottom data (vibracore locations were selected in consultation with the Company's Qualified Marine Archaeologist);
- Benthic grab samples (with still camera photographs), at a spacing of approximately 3,280 feet (1,000 m), with locations alternating with video transects for a combined approximately 1,640-foot (500-meter) spacing; and
- Underwater video transects oriented perpendicular to the OECC at a spacing of approximately 3,280 feet (1,000 m) along the corridors and additional transects as dictated by review of survey data and in the vicinity of mapped SSU areas.

The initial desktop study performed prior to the 2017 geophysical survey showed that the surficial geology within Nantucket Sound consists of Holocene sediments, mostly silt/clay or medium to coarse sand with minor amounts of gravel, and Pleistocene glacial drift deposits, mostly outwash sand and gravel and glacial lake silt and clay.[2] The 2017 survey, which included the acquisition of bathymetry, side-scan sonar, seismic profiling, magnetometer, underwater video, grab sample, and vibracore data, showed mostly loose to medium dense sandy sediments in the surveyed areas, confirming the findings of the desktop study. In addition, areas with significant sand waves and some hard-bottom areas with gravel, cobbles, and boulders were identified. Although the vibracores did not clearly indicate the presence of hard-bottom areas in Muskeget Channel, the geophysical survey showed a higher concentration of boulders and more extensive bottom coverage with coarse material in that area relative to areas outside of Muskeget Channel.

[2] Charles J. O'Hara and Robert N. Oldale. Maps showing geology and shallow structure of eastern Rhode Island Sound and Vineyard Sound, Massachusetts. U.S. Geological Survey, 1980.

Results from the 2017 preliminary survey were used to narrow the focus of the routing analysis and distill the offshore route segments into two OECCs: a Western OECC and an Eastern OECC. The Eastern OECC traveled north between Martha's Vineyard and Nantucket via Muskeget Channel, passing east of the scoured channel itself and continuing northward on the east side of Horseshoe Shoals to landfall sites at New Hampshire Avenue in Lewis Bay and Great Island. The Western OECC also traveled north between Martha's Vineyard and Nantucket via Muskeget Channel and included two possible variations through the channel: the western Muskeget option, which traveled through the channel itself, where water depths are greater but are accompanied by stronger currents, and the eastern Muskeget option, which avoided the scoured channel. The Western OECC then continued northward on the west side of Horseshoe Shoals. As the Western OECC approached the Cape Cod mainland, it initially included options for reaching landfall sites at Covell's Beach, New Hampshire Avenue, or Great Island.

After extensive review and based on the results of additional geophysical and geotechnical surveys of the OECC in the spring of 2018, the Eastern OECC was eliminated from further consideration. The Western OECC was selected as the optimal route because it is technically suitable for cable installation, is more direct, contains a smaller proportion of complex bottom, has a lower frequency of sand waves above 6.6 feet (2 m), and otherwise avoids or minimizes potential environmental impacts. A shorter route allows for less impact area, lower electrical line loses, and lower installation and operational costs.

The 2018 marine survey included data collection along multiple lines (50-foot [15-meter] line spacing in state waters and 100-foot [30-meter] line spacing in federal waters) within the OECC still under consideration. This was a high-resolution, detailed survey covering the entirety of the OECC at the time to document and assess all areas of potential seabed disturbance. After the 2018 survey, Covell's Beach in Barnstable was selected as the landfall site for Vineyard Wind Connector 1, and the site in Yarmouth was eliminated from the project.

Along the OECC, the 2018 survey consisted of a full geophysical equipment spread (i.e., multibeam echosounder, side scan sonar, magnetometer, high- and low-frequency subbottom profilers) used on the majority of lines to provide complete coverage of the survey corridor. Surficial ground-truthing was provided by benthic grab samples, underwater video, and shallow subsurface confirmation of lithologies obtained via vibracores and cone penetration tests (CPTs). The extensive 2018 survey effort in the OECC included more than 2,860 nautical miles (5,300 km) of geophysical trackline data, 147 vibracores, 100 CPTs, 75 benthic grab samples with still photographs, and 44 underwater video transects. The focus of the investigations was the upper 2 to 3 meters of seafloor sediments, where export cable burial is planned.

Results from the 2018 survey enabled the Company to confirm previous findings and to refine the extent of OMP-mapped SSU areas (i.e., hard bottom, complex bottom, and eelgrass). The resulting delineations of hard bottom, complex bottom, and eelgrass were used to develop initial cable alignments for the Vineyard Wind Connector 1 within the OECC that avoided and minimized impacts to these areas to the extent feasible. Additional engineering analyses performed during the refinement of the Vineyard Wind Connector 1 cable alignments resulted in the identification of the eastern Muskeget option as the preferred means of traversing the Muskeget Channel area for that project. The western Muskeget option (Western Muskeget Variant) has been retained for the NE Wind 2 Connector to provide space and flexibility to ensure all three proposed cables can be accommodated. A map set illustrating the physical characteristics of the seafloor within the OECC as well as within the western Muskeget option is provided as Attachment C.

In addition to the breadth of marine survey data already collected within the OECC, marine survey work was conducted in 2019 to widen the nearshore survey area to the west to encompass the Craigville Public Beach Landfall Site (i.e., the landfall site for the NE Wind 1 Connector).

In 2020, the Company conducted additional marine surveys focused on areas of the OECC that were expanded to accommodate NE Wind 1 Connector cables as well as the OECC spur to the Dowses Beach Landfall Site and the Western Muskeget Variant for the NE Wind 2 Connector (otherwise, the Primary OECC for the NE Wind 2 Connector is the same as for the NE Wind 1 Connector). This additional survey work ensured full coverage of the OECC proposed for the NE Wind 2 Connector. While the Company intends to install all NE Wind 2 Connector offshore export cables within the Primary OECC that travels through the eastern side of Muskeget Channel towards the landfall site in the Town of Barnstable, the Company is reserving the fallback option to install one (and up to two) cables along the Western Muskeget Variant.

Extensive survey and engineering analyses of potential OECCs have resulted in a thoroughly vetted and studied route that connects the Lease Area in federal waters to the south shore of Cape Cod. Using a substantial portion of this well-studied OECC provides the most optimal approach for the NE Wind 2 Connector. Project engineers have determined that the OECC can accommodate the additional cables proposed for the NE Wind 2 Connector, with inclusion of the Western Muskeget Variant. The OECC has a typical width of approximately 3,500 feet (1,060 m), and its width ranges from approximately 3,100 to 5,500 feet (950 to 1,700 m).

Results from the marine survey efforts performed from 2017 through 2020 have been compiled in a plan set, provided as Attachment C, which presents information that includes, but is not limited to, bathymetry, select video still images, benthic habitat characterization, and delineation of hard bottom, complex bottom, and eelgrass. Tables 4-1 and 4-2 summarize the marine survey data and results along the OECC and the Western Muskeget Variant, respectively.

Table 4-1 Summary of Marine Survey Data and Results in the OECC

Item	Description
Data	• > 3,407 nautical miles (nmi) (>6,310 km) of geophysical trackline data over a 2,182- to 5,479-foot-wide (665 to 1,670-meter-wide) corridor • Two deep boreholes • Three deep downhole (DH) CPTs • 192 vibracores • 134 seabed CPTs • 163 benthic grab samples with still photos • 119 underwater video transects
Surface conditions	• water depths <6.6 to 148 feet (<2 to 46 m), local slopes up to 25-30° on bedforms • numerous natural slope/topography, <10° gradients • overall fairly homogenous surficial sediments, mainly sand • mobile surface layer with sand waves >6.6 feet (>2 m) height locally • sand with some gravel, cobbles in shallow, higher current areas • localized concentrations of boulders with gravel and sand (Spindle Rock, Gannet Rocks, Collier Ledge) in the northern portion of the OECC • sand with silt in deeper water areas, less tidal current • soft surficial layer offshore in deeper water, immediately seaward of the offshore slope south of Muskeget in depths of 82 to 98 feet (25 to 30 m) • variable benthic habitats due to different substrates • SSUs present locally • Rippled Scour Depressions (RSDs) offshore, bedform fields with isolated, larger sand waves over 16.4 feet (5 m) in Nantucket Sound • coarse deposits with boulders in Muskeget Channel area • overall low concentration of man-made objects with moderate concentration locally • sediments relatively consistent, sand with coarse material particularly in higher current areas and silt in deeper and quiescent locations
Subsurface conditions	• abundant buried channels north of Horseshoe Shoal, no unusual sediments of concern identified • fine grained, organic-rich layers associated with channel bank/terrace deposits adjacent to some paleochannels • often acoustically transparent mobile sand layer • coarse deposits with boulders in Muskeget Channel area
Hazards	• large sand waves in some areas • paleochannels with top sections in the upper 6.6 feet (2 m), all sediments sampled by geotechnical investigations and pose no threat to cable installation • localized subsurface gas in Centerville Harbor, no issue for cable installation • Coarse deposits with boulders in Muskeget Channel area

Table 4-1 Summary of Marine Survey Data and Results in the OECC (Continued)

Item	Description
Assessment	• isolated man-made objects in corridor to be avoided, one debris pile/possible shipwreck in the OECC, approximately 5.9 nmi (11 km) southwest of Craigville Beach, one unidentified buried possible cable is located southeast of Martha's Vineyard • Predominantly sand with gravel in higher current areas and silt-in deeper, low flow locations. • Coarser deposits and associated habitats in Muskeget Channel area, as well as large sand waves and high currents to contend with during installation, no fatal flaws identified. • Export cables can be micro-sited within the OECC to avoid most challenging conditions and SSUs where feasible. • Dredging may be necessary to remove the tops of large sand waves; only short-term disturbance to the habitat.

Table 4-2 Summary of Marine Survey Data and Results in the Western Muskeget Variant

Data/Results	Summary
Data	• 424 nmi (785 km) of geophysical trackline data over 0.4 to 0.5 nmi (800 to 1,000 m) wide corridor • 15 shallow CPTs • 22 vibracores • 11 benthic grab samples with still photos • Six underwater video transects
Surface conditions	• water depths ~10 to 144 feet (~3 to 44 m), local slopes up to 30° on bedforms • numerous natural slopes/topography, <10° gradients • overall homogenous surficial sediments, mainly sand • mobile surface layer with sand waves >26 feet (>8 m) height locally • sand with some gravel, cobbles in shallow, higher current areas • variable benthic habitats due to different substrates; some sensitive habitats possible locally • coarse deposits with boulders in Muskeget Channel area • overall low concentration of man-made objects with moderate concentration locally • sediments relatively consistent, sand with coarse material particularly in higher current areas and silt in deeper and quiescent locations
Subsurface conditions	• fine grained, organic-rich layers associated with channel bank/terrace deposits adjacent to some paleochannels • often acoustically transparent mobile sand layer • coarse deposits with boulders in Muskeget Channel area

Table 4-2 Summary of Marine Survey Data and Results in the Western Muskeget Variant (Continued)

Data/Results	*Summary*
Hazards	• large sand waves in some areas • paleochannels with top sections in the upper 6.6 feet (2 m), all sediments sampled by geotechnical investigations and pose no threat to cable installation • coarse deposits with boulders in Muskeget Channel area • possible sensitive habitats for avoidance, if possible, mainly Muskeget area • potential isolated man-made objects in the corridor, two debris pile/possible shipwrecks in the northern part of the Western Muskeget Variant
Assessment	• Predominantly sand, with small amounts of gravel in higher current areas • Coarser deposits and associated habitats in Muskeget Channel area, as well as large sand waves and high currents to contend with during installation, no fatal flaws identified. • Export cables can be micro-sited in most places within the Western Muskeget Variant to avoid the most challenging conditions and sensitive habitats where feasible. • Dredging may be necessary to remove the tops of large sand waves; only short-term disturbance to the habitat.

The principal technical and environmental considerations and constraints factoring into the geography of the OECC include:

- Feasibility of cable installation;
- Burial risk assessment/work to limit possibilities of cable failure;
- Avoiding and/or minimizing impacts to SSU areas mapped in the OMP;
- Avoiding and/or minimizing anchorage areas and areas with mapped shipwrecks and boulders;
- Environmental and/or permitting constraints and avoidance of impacts;
- Minimizing cable length to reduce transmission losses and cost;
- Adequate capacity delivered to the grid connection point;
- Available landfall locations;
- Maintaining a suitable water depth (typically of at least 20 feet [6 m]), and avoiding shoals;
- Avoiding slopes where the seafloor bathymetry changes dramatically; and
- Crossing large seabed slopes and existing offshore cables in a perpendicular, or nearly perpendicular, orientation.

The OECC is described below.

4.1.3 Description of OECC

The Project's proposed offshore export cables will be installed within a shared OECC (referred to as the Primary OECC). The Primary OECC will travel from the northwestern corner of Lease Area OCS-A 0534, along the northwestern edge of Lease Area OCS-A 0501, and northward along the east side of Muskeget Channel towards the south shore of Barnstable, Massachusetts (see Figures 1-1 and 1-4). The OECC for the NE Wind 2 Connector is almost entirely (i.e., approximately 96%) the same OECC that was proposed for the NE Wind 1 Connector (which was also largely the same as the OECC proposed for the Vineyard Wind Connector 1). The only portion of the OECC proposed for the NE Wind 2 Connector that has not been previously reviewed as part of the Vineyard Wind Connector 1 and/or NE Wind 1 Connector projects is the approximately 488-acre area (approximately 4% of the area of the OECC within state waters) in Centerville Harbor that provides access to the Dowses Beach Landfall Site (see Figure 1-4). Using a substantially shared OECC provides an efficient, consolidated route from the federal lease areas to the point of landfall site divergence, and minimizes environmental, operational, and commercial impacts relative to longer alternative routes.

The OECC will pass through state waters in the offshore areas of Edgartown, Nantucket, Barnstable, and Mashpee before making landfall in Barnstable (see Figure 1-4). All sections of the offshore export cable route within state waters lie within the OMP planning area. The OECC has a typical width of approximately 3,500 feet (1,060 m), and its width ranges from approximately 3,100 to 5,500 feet (950 to 1,700 m). The maximum length of the OECC in state waters is approximately 21.9 miles (35 km), and its total length in both federal and state waters is approximately 47.2 miles (76 km).

In the planning stage for the NE Wind 1 Connector, the OECC was widened from its previous dimensions established for the Vineyard Wind Connector 1 by approximately 984 feet (300 m) to the west along the entire corridor and by approximately 984 feet (300 m) to the east in portions of Muskeget Channel. The Primary OECC is the preferred route for the NE Wind 2 Connector, however, the Company proposes a supplemental route option through the Western Muskeget as a Variant (see Figure 1-4). This Variant would be utilized in the event technical or space constraints necessitate that one or up to two cables need to be placed within the Western Muskeget Variant due to installation and micro-siting of the cables for Vineyard Wind Connector 1 and NE Wind 1 Connector. The three possible scenarios include:

1. Three cables are installed in the Primary OECC;
2. Two cables are installed in the Primary OECC, and one cable is installed in the Western Muskeget Variant; or
3. One cable is installed in the Primary OECC, and two cables are installed in the Western Muskeget Variant.

Table 4-3 defines the maximum cable and corridor length for each respective OECC option associated with the Project. Note that cable length is longer than corridor length because of micro-siting (see footnote 2 in the table).

Table 4-3 Summary of OECC and Offshore Export Cables

Summary Information	*Federal Waters (miles)*	*State Waters (miles)*	*Total (miles)*
OECC			
Maximum Length of Primary OECC[1]	25.3	21.9	47.2
Maximum Length of OECC[1] using the Western Muskeget Variant	25.3	19.6	44.9
Offshore Export Cables			
Maximum length of each cable within the Primary OECC[2]	27.6	23.0	50.6
Maximum length of each cable within the OECC using the Western Muskeget Variant	27.6	20.7	48.3

Notes:

1. The length of the OECC is measured from the offshore edge of the corridor at the Dowses Beach Landfall Site to the northwest corner of Lease Area OCS-A 0534.
2. The offshore export cable length a 5% allowance for micro-siting within the OECC outside the lease areas. An additional length of offshore export cable within the portion of Lease Area OCS-A 0534 that will be utilized for Commonwealth Wind (up to approximately 26 miles [approximately 42 km] per cable, but likely less) will be needed to reach the electrical service platform(s).

Offshore export cables within the OECC will typically be separated by approximately 165-330 feet (50-100 m) to provide appropriate flexibility for routing, installation, and maintenance or repairs. This separation distance could be further adjusted, pending ongoing routing evaluation, to account for local conditions such as deeper waters, micro-siting for sensitive habitat areas, or other environmental or technical reasons.

For each cable, the direct trenching impacts will be limited to an approximately 3.3-foot (1-meter) wide strip of the seabed, with some broader impacts where sand wave dredging may be required to achieve burial within the stable seabed or where cable protection may be required should burial depth be insufficient. The final cable alignments for the NE Wind 2 Connector will be developed to avoid crossing cables installed for the Vineyard Wind Connector 1 or NE Wind 1 Connector.

Prior to cable installation, a pre-lay grapnel run and pre-lay survey will be performed to clear obstructions and inspect the route. Large boulders along the final cable alignments may need to be relocated and some dredging of the upper portions of sand waves may be required prior to cable installation to achieve sufficient burial depth within the stable seabed. Each offshore export cable will be installed at a target depth of 5 to 8 feet (1.5 to 2.5 m). Offshore export cable installation is expected to be performed primarily via simultaneous lay and bury using jetting techniques (e.g., jet plow or jet trenching) or mechanical plow. However, other specialty techniques may be used in certain areas to ensure sufficient burial depth (see Section 5.5.1). To facilitate cable installation, anchored vessels may be used along the entire length of the offshore export cables. While the Company intends to avoid or minimize the need for cable protection to the greatest extent feasible, the following provides the amount of cable protection estimated for each OECC scenario:

- OECC Scenario 1 (three cables in the Primary OECC) – up to 29.4 acres in state waters
- OECC Scenario 2 (two cables in the Primary OECC / one cable in the Western Muskeget Variant) – up to 32.5 acres in state waters
- OECC Scenario 3 (one cable in the Primary OECC / two cables in the Western Muskeget Variant) – up to 35.6 acres in state waters

The Primary OECC provides a relatively direct route for connecting the offshore wind energy generation facility proposed for Commonwealth Wind to the Dowses Beach Landfall Site in Barnstable. A shorter route allows for less impact area, lower electrical line loses, and lower installation and operational costs. The Primary OECC maintains sufficient water depths for installation, avoiding and minimizing passage through shoals and large seabed slopes. The Primary OECC also avoids and minimizes impacts to SSU areas identified in the OMP, completely avoiding core habitat of the North Atlantic Right Whale and eelgrass while minimizing impacts to hard or complex bottom. Results from the marine survey efforts from 2017 through 2020 have been compiled onto the plan set provided as Attachment C, which presents information that includes, but is not limited to, benthic habitat characterization, eelgrass, delineation of hard bottom and complex bottom, and locations of grab samples, vibracores, and video transects.

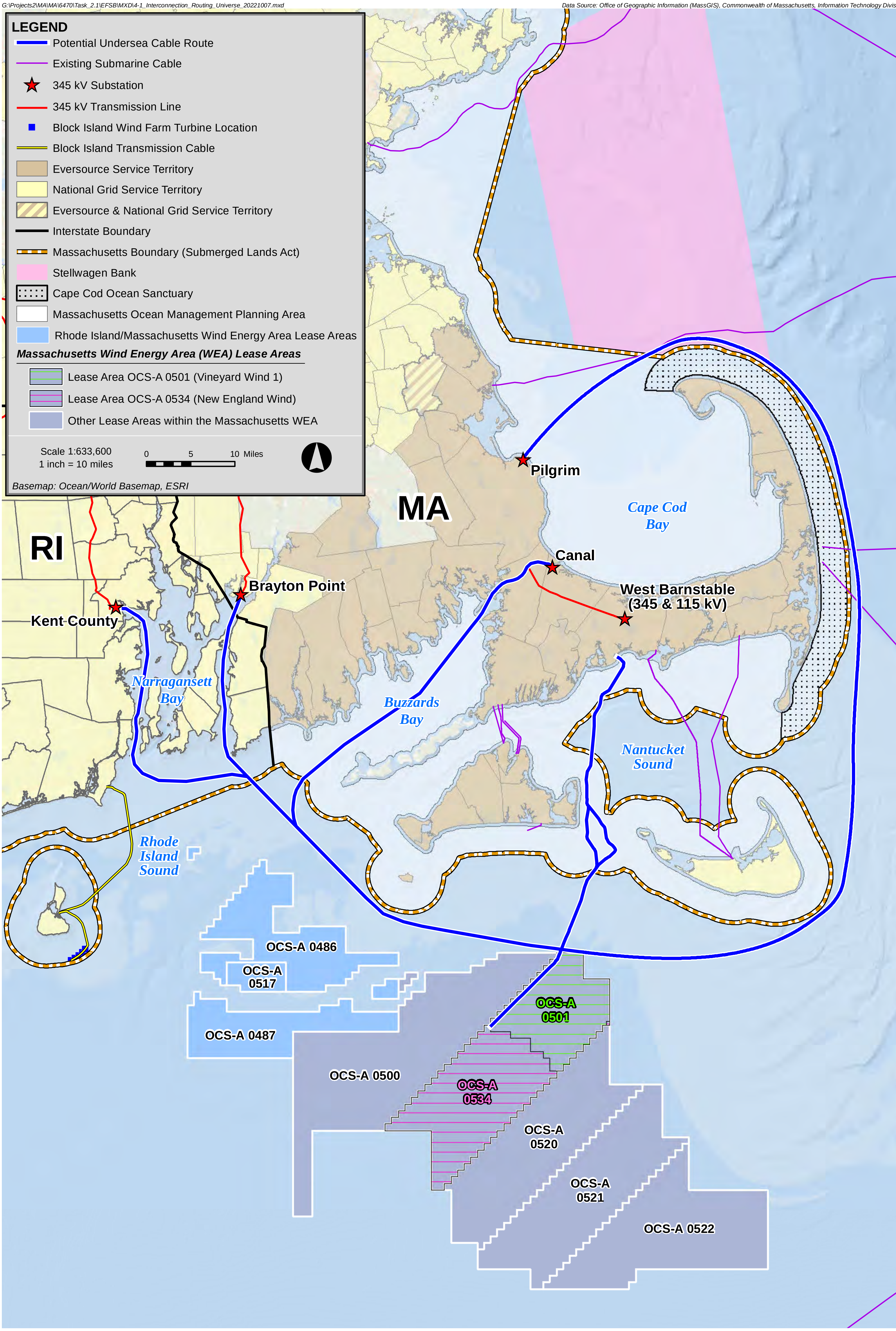
4.2 Point of Interconnection

4.2.1 Study Area and Universe of Options

To ensure that all reasonable options for interconnection were considered, the Company delineated a Study Area that encompassed all of southeastern Massachusetts as well as eastern Rhode Island. Features within the Study Area of particular importance and identified in Figure 4- 1 include:

- Locations of possible interconnection points to the electrical grid with existing transmission infrastructure with capacity for accommodating a minimum of 1,200 MW of energy injection with reasonable upgrades;
- Locations of existing offshore cables; and
- The boundaries of the NE Wind 2 Connector OECC.

Route Selection for the Project was determined by several key factors. As described in Section 3.1.3.2, a dual interconnection alternative was dismissed in an effort to minimize construction impacts and cost. Therefore, the Company sought a grid interconnection point that could accommodate a minimum 1,200 MW injection of power to avoid the need to construct multiple onshore export cable routes and substations. Injecting capacity required for a single



New England Wind 2 Connector Project

Figure 4-1
Point of Interconnection Routing Study Area

interconnection for the Project requires a robust substation with a connection to a transmission system at 345-kV or above. Substations that can accommodate a minimum of 1,200 MW located near the coastline within southeastern Massachusetts and Rhode Island include the following substations which are identified on Figure 4-1:

- Kent County Substation
- Brayton Point
- Canal Substation
- West Barnstable Substation
- Pilgrim Substation

Once the substations were identified, the Company considered the distance of each substation from Lease Area OCS-A 0534 (see Table 4-4 and Figure 4-1).

Table 4-4 Universe of Routing Options (all lengths approximate)

Interconnection Point	*Approximate Export Cable Length within Primary OECC*					
	Offshore[3]		*Onshore*		*Total*	
	miles	km	miles	*km*	*miles*	*km*
Kent County Substation (National Grid), RI	109	175	3	5	112	180
Brayton Point	74	119	<1	<1.6	75	121
Canal Substation, via Cape Cod Canal	88	142	<1	<1.6	89	144
Canal Substation, via onshore route parallel to the Cape Cod Canal	82	132	7	11	89	143
West Barnstable Substation	47	76	7	11	54	87
Pilgrim Substation, via ocean route	140	225	<1	<1.6	141	227

4.2.2 Route Concepts Eliminated for Excessive Length

During the previously completed siting and permitting processes for Lease Area OCS-A 0501 and the northern portion of Lease Area OCS-A 0534 that will be utilized for Park City Wind, it was determined that the proposed OECC allowed for less environmental impacts than any other alternative evaluated due to its direct (i.e., shortest) route to the mainland from the lease areas and siting, which minimizes impacts to sensitive habitats. As described further in Section 4.1.2,

[3] The approximate lengths of offshore export cable reported in Table 4-4 are measured from the northernmost portion of the area of Lease Area OCS-A 0534 to an assumed landfall site on the mainland. An additional length of offshore export cable within the portion of Lease Area OCS-A 0534 that will be utilized for Commonwealth Wind (up to approximately 26 miles [approximately 42 km] per cable, but likely less) will be needed to reach the electrical service platform(s).

extensive survey data has been collected on the OECC. Additionally, the direct route of the OECC results in less electrical line losses (i.e., higher reliability) and lower installation and operational costs than any other alternative. Further, as described in Section 3, the Project is utilizing High Voltage Alternative Current (HVAC) cable technology for several important reasons including maturity of the technology, availability of HVAC cables for the Project schedule, cost and reliability. Therefore, 345-kV interconnection points that allowed the use of the OECC and limited offshore cable lengths were advanced.

Project engineers identified roughly 75 miles (120 km) as the approximate maximum length of a 275-kV Alternating Current (AC) export cable. The actual maximum distance is not a definitive value, as it depends on the precise technology used, such as voltage level and cable design. Project-specific variables such as cable design, cable loading (power and thermal cycling), power costs, technical requirements established by the connecting grid, and others may influence the cable length limitations. Soil resistivity at the end point of the submarine cable also impacts the maximum length. The targeted capacity of the cable is also relevant, as increasing the distance of export cable lowers the capacity of the cable.

Accordingly, the first step in screening initial point of interconnection concepts was to eliminate any option from the initial route concepts that significantly exceeded 75 miles (120 km) in total length; the options eliminated on the basis of excessive length are shaded in light gray in Table 4- 4.

4.2.3 Assessment of Potential Interconnection Points

The Company also assessed the viability of various Potential Interconnection Points (POIs) within the Study Area, as identified in Table 4-5, based on queue capacity and ability to utilize the shared OECC. Results from this assessment, described below, indicate that after consideration of cable length, queue capacity, and the ability to utilize the shared OECC, the West Barnstable Substation is the most viable point of interconnection to the ISO-NE electrical grid for the Project.

4.2.3.1 Kent Substation

Kent County Substation is a 345-kV substation located in Kent County, Rhode Island. This substation is connected to the bulk power grid by two 345-kV lines which run towards northern Rhode Island and to eastern Connecticut. The surrounding system is predominantly composed of 115-kV transmission elements, which would require significant reinforcements to accommodate the minimum 1,200 MW capacity of the NE Wind 2 Connector.

In addition, the offshore export cable route to Kent County Substation is 109 miles (175 km) which would exceed the range of feasible length identified by project engineers resulting in an offshore export cable route that would be more environmentally impactful and costlier than the Preferred Route. It would also stray far outside the shared OECC and undermine the objective of the shared OECC which was to minimize the area in which cables would be laid. Therefore, this potential grid interconnection point was eliminated from further consideration.

4.2.3.2 West Barnstable Substation

Based on an ISO-NE Feasibility Study, the 345-kV West Barnstable Substation has the capacity to accommodate the NE Wind 2 Connector with certain modifications and upgrades, and the Company has the queue rights to connect at this location. In addition, the onshore export cable route to the West Barnstable Substation would be of feasible length. The 345-kV West Barnstable Substation is located on a 12-acre parcel at the confluence of utility Right-of-Way (ROW) #381 and ROW #342. The West Barnstable Substation was originally constructed as part of a series of projects (known as NSTAR's Lower SEMA project) designed to improve reliability on the Cape. The core of the Lower SEMA project was to bring a new 345-kV line across the Cape Cod Canal from the Carver Substation to the West Barnstable Substation. This approximately 13-mile 345-kV line was created by changing the operating voltage on an existing line from 115-kV to 345-kV (the line had been constructed with 345-kV capability), and the West Barnstable Substation serves as the terminus of the 345-kV line (Line 399). The northern part of the same parcel contains the 115-kV Oak Street Substation.

The West Barnstable Substation is also the proposed interconnection point for the NE Wind 1 Connector associated with the Park City Wind project. That Park City Wind project has been assumed to be interconnected in ISO-NE interconnection studies for the NE Wind 2 Connector. The West Barnstable Substation has the available capacity to accommodate interconnection of both projects with reasonable grid upgrades.

The ISO-NE Feasibility Study for the NE Wind 2 Connector's planned 345-kV interconnection at the West Barnstable Substation determined bus work, feeders, a new autotransformer, and breaker bay will be required to accommodate the Project. It is expected that the work at the West Barnstable Substation will be designed and constructed and operated by Eversource.

4.2.3.3 Brayton Point

Brayton Point is the site of a retired multi-unit coal/oil fired, steam cycle base load 1,600 MW power plant located on an approximately 300-acre site in the Town of Somerset on Mount Hope Bay and the Taunton River. The National Grid-owned substation which served Brayton Point is connected to the bulk power grid by two 345-kV lines which run north to Medway as well as a number of 115-kV lines running to the north, east, and west. Mayflower Wind Energy LLC has filed a Petition with the Energy Facilities Siting Board (EFSB 22-04) that includes an interconnection at Brayton Point. In total, there are at least 3,600 MW of active queue generation seeking interconnection at the Brayton Point Substation. Given the projects ahead of the Company in the ISO-NE queue, and the amount of capacity being proposed at Brayton Point, it is unlikely that Brayton Point would have the sufficient transmission capacity to accommodate the NE Wind 2 Connector without significant grid upgrades.

At 75 miles (121 km) long, the route to Brayton Point from the Lease Area is approximately 21 miles (34 km) longer than the route to Barnstable. This distance to Brayton Point assumes that cables are routed on the east side of Aquidneck Island (Sakonnet River) and traverse the narrow

Sakonnet channel between the north end of Aquidneck and the mainland (Tiverton, Rhode Island area). The Sakonnet channel is crossed by both power cables and pipelines as well as a bridge. There are also two marked pipeline crossing areas further south along Aquidneck Island. A route on the west side of Aquidneck Island would add some distance to the 75-mile (121-km) preliminary route. It would also stray far outside the shared OECC and undermine the objective of the shared OECC which was to minimize the area in which cables would be laid.

Aside from considerations of routing length, Brayton Point poses other challenges. The route to Brayton Point traverses a 20-mile stretch of Rhode Island waters, and cable installation in Rhode Island waters would require several, separate Rhode Island reviews and approvals, adding complexity to an already complex undertaking. Mount Hope Bay is traversed by the dredged Taunton River Federal Navigation Channel (serving Brayton Point, Fall River, the former Montaup Station, and the former Shell marine fuels terminal, among others). Cable installation would need to cross the navigation channel at some point, and the installation would need to proceed through some areas of historic contamination and fine-grained sediments. Therefore, this potential grid interconnection point was eliminated from further consideration.

4.2.3.4 Canal Substation

The Canal 345-kV Substation is located in Sandwich, Massachusetts. The Eversource/NSTAR-owned substation that currently serves the Canal Generating Station is connected to the bulk power grid by two 345-kV lines which run north to the Carver and Pilgrim substations, as well as three 115-kV lines running to the south to Bourne.

The substation already has two existing combined cycle generators and one simple cycle generator with a combined capacity of approximately 1,500 MW. There is no available transmission capacity to accommodate large injections of new energy generation without significant rebuild of the existing transmission system. Additionally, it is further northeast from the shared OECC compared to West Barnstable and as such undermines the objective of the shared OECC which was to minimize the area in which cables would be laid.

4.2.3.5 Pilgrim Substation

The Pilgrim 345-kV Substation is located in Plymouth, Massachusetts. The Eversource/NSTAR-owned substation served the 677 MW Pilgrim Nuclear Generating Station until the plant's retirement in 2019. The substation is connected to the bulk power grid by three 345-kV lines, which run north to Holbrook, west to Carver, and south towards Canal in Sandwich.

The substation currently has approximately 1,200 MW of generation in the queue for proposed interconnection. Pilgrim Substation could likely accommodate additional capacity beyond the 1,200 MW, but would require significant transmission system reinforcements to accommodate the minimum 1,200 MW capacity of NE Wind 2 Connector.

Additionally, interconnecting at the Pilgrim Substation would require the longest offshore export cables from the Lease Area (approximately 140 miles [225 km]) and would require laying export cables around outer Cape Cod, requiring passage either through the Cape Cod Ocean Sanctuary or Stellwagen Bank National Marine Sanctuary (see Figure 4-1). It would stray far outside the shared OECC and undermine the objective of the shared OECC, which was to minimize the area in which cables would be laid. Therefore, this potential grid interconnection point was eliminated from further consideration.

4.2.4 Conclusion/Summary (Interconnection Points)

Table 4-5 compares the various potential interconnection points considered for the Project. The West Barnstable Substation was determined to be the most favorable point of interconnection for the Project within the technological boundaries that would not impose significant additional costs and potential environmental impacts.

Table 4-5 Summary comparison of potential interconnection points

	Kent	*Brayton Point*	*West Barnstable*	*Canal*	*Pilgrim*
Capacity to accept at least 1,200 MW?	Yes	Yes	Yes	Yes	Yes
Sufficient Queue Capacity?	Yes	No	Yes	No	Yes
Ability to use the Shared OECC?	No	No	Yes	No	No
Cable route of acceptable length?	No	No	Yes	No	No
Retained for routing analysis?	No	No	Yes	No	No

4.3 Landfall Sites

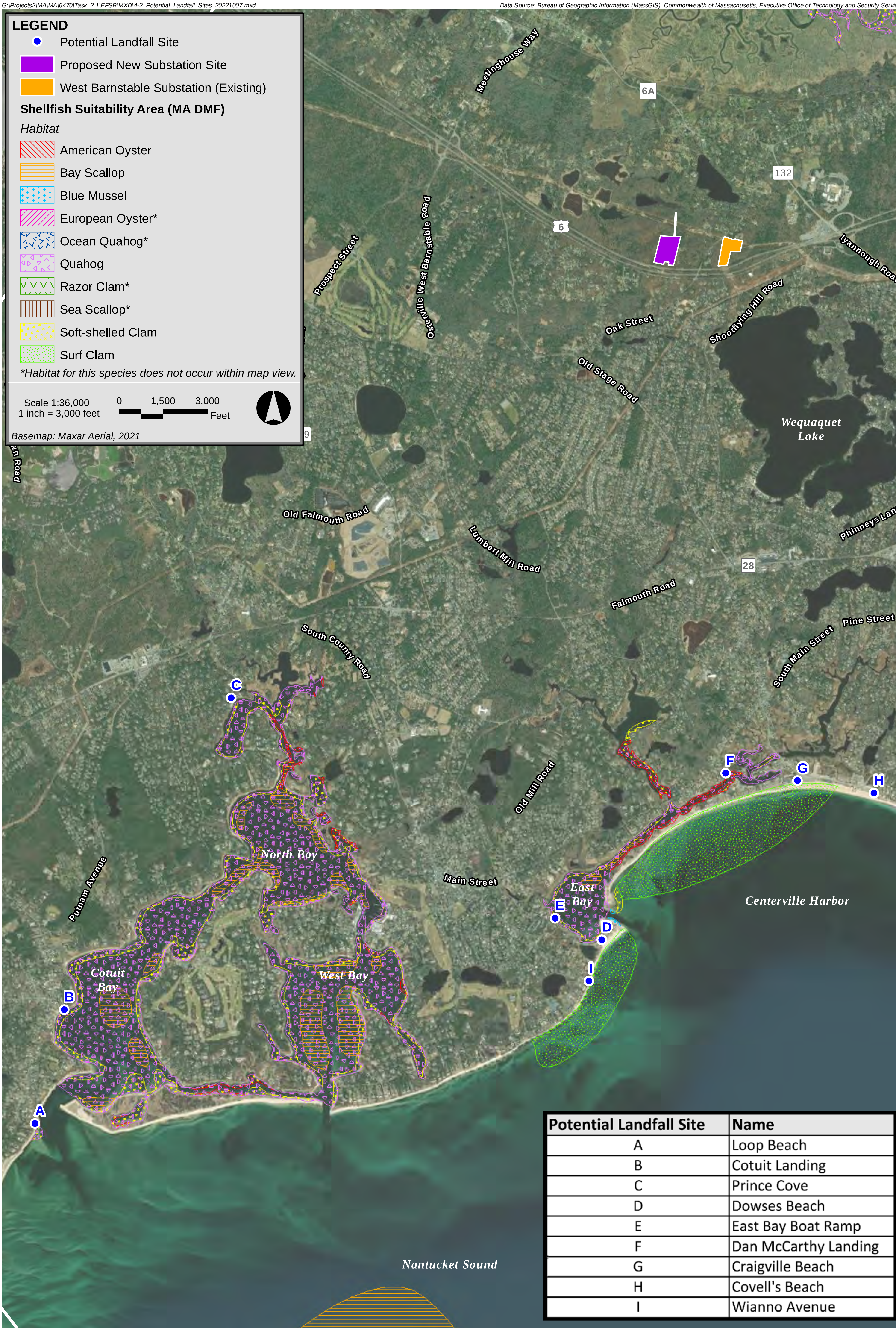
As outlined in detail in Section 4.1, the proposed shared OECC has less environmental impact than any other alternative evaluated and its direct route to the mainland from the Lease Area resulted in less electrical line losses (i.e., was more reliable) and had lower installation and operational costs than any other alternative evaluated.

Next, as outlined in detail in Section 4.2, Eversource's existing West Barnstable Substation, was determined to be the most favorable point of interconnection for the Project. Accordingly, the offshore export cables must bring power from the Lease Area to a landfall site within reasonable proximity to the existing West Barnstable Substation for the NE Wind 2 Connector.

In light of these two factors, the interconnection point and the use of the shared OECC, the Company identified a study area for the potential NE Wind 2 Connector landfall site that extended along the Barnstable coastline from Covell's Beach in Centerville Harbor to Meadow Point in Cotuit Bay and identified potential landfall sites with the following required engineering and environmental characteristics/criteria:

- A beach-front public parking area or similar available land with an appropriate area available to accommodate the offshore-to-onshore transition facilities required for the Project;
- Technically feasible egress onto a public roadway of sufficient width to accommodate the onshore export cable duct bank component of the Project;
- Sufficient water depths (of 10 to 20 feet [3 to 6 m]) within approximately 3,000 feet (914.4 m) offshore to accommodate the required support barges for the HDD transition in the nearshore area to make the transition from the offshore export cables to the onshore export cables;
- Enough space to accommodate the entry pits and drilling equipment associated with HDD;
- Surrounding land uses, if residential, either set back from the landfall location or characterized as seasonal, rather than year-round, to avoid and minimize construction-period impacts to the public;
- Environmental considerations avoided and minimized to the extent practicable such as impacts to wetland resource areas and mapped eelgrass habitat; and
- Minimization of onshore export cable duct bank route length.

The Company identified nine potential landfall sites along the Barnstable coastline for consideration and completed additional engineering, environmental, and constructability evaluations for each. Figure 4-2 provides the location of each of these potential landfall sites and Table 4-6 provides a summary of the result of the Company's evaluation. As presented in the table and in the following paragraphs, the Company concluded that Dowses Beach in Osterville is the most suitable landfall site for the Project and selected it as the Preferred landfall site for the NE Wind 2 Connector.



Potential Landfall Site	Name
A	Loop Beach
B	Cotuit Landing
C	Prince Cove
D	Dowses Beach
E	East Bay Boat Ramp
F	Dan McCarthy Landing
G	Craigville Beach
H	Covell's Beach
I	Wianno Avenue

Table 4-6 Summary of Potential Landfall Sites

Figure ID	Name	Comments
A	Loop Beach	Insufficient space in parking area for offshore-to-onshore transition facilities and shallow offshore water depths insufficient for the HDD transition operations in the nearshore area.
B	Cotuit Landing	Insufficient space in parking area for offshore-to-onshore transition facilities and shallow offshore water depths insufficient for the HDD transition operations in the nearshore area. Would result in conflicts with moorings and boating interests.
C	Prince's Cove	Would result in direct impacts to estuarine habitat and shallow offshore water depths insufficient for the HDD transition operations in the nearshore area. Would result in conflicts with moorings and boating interests.
D	Dowses Beach	Sufficient space for offshore-to-onshore transition facilities, technically feasible egress for onshore export cable duct bank to public roadways with sufficient width and available space to accommodate the onshore export cable duct bank route, the existing parking area is set back from residences allowing for minimization of construction period impacts, has ability to avoid impacts to environmentally sensitive areas, and has a direct route to point of interconnection.
E	East Bay Boat Ramp	Insufficient space for offshore-to-onshore transition facilities. Would result in direct impacts to estuarine habitat and conflicts with boating interests.
F	McCarthy's Landing	Insufficient space for offshore-to-onshore transition facilities. Would result in direct impacts to estuarine habitat and has conflicts with boating interests.
G	Craigville Beach	NE Wind 1 Connector landfall site. Insufficient space in roadway layouts from landfall for the onshore export cable duct bank to the West Barnstable Substation.
H	Covell's Beach	Vineyard Wind Connector 1 landfall site. Transition vaults for that project installed in April 2022. Insufficient space for offshore-to-onshore transition facilities for the Project at this landfall location and insufficient space in roadway layouts for the onshore export cable duct bank to the West Barnstable Substation.
I	Wianno Avenue	Insufficient space for offshore-to-onshore transition facilities.

4.3.1 Loop Beach

Loop Beach is a small public beach owned and managed by the Town of Barnstable off Ocean View Avenue on the west side of Cotuit Bay (see Figure 4-2). Its small parking area of less than 0.25 acres is inadequate for the offshore-to-onshore transition facilities. The site features good egress on public roads but has shallow offshore water depths insufficient for the HDD transition operations in the nearshore area. Due to space constraints, the Loop Beach Landfall Site was eliminated from further consideration.

4.3.2 Cotuit Landing

Cotuit Landing is a public boating facility located at 37 Oyster Place Road on the west side of Cotuit Bay (see Figure 4-2). Its small parking area of approximately 0.33 acres is inadequate for the offshore-to-onshore transition facilities. The site features good egress on public roads but has shallow offshore water depths insufficient for the HDD transition operations in the nearshore area resulting in open cut installation within Cotuit Bay. In addition, review of available mapping revealed that use of this site would also require construction within environmentally sensitive areas within Cotuit Bay, which has been designated by the Massachusetts DMF as potential shellfish habitat for Quahog (*Mercenaria mercenaria)* and Softshell Clam (*Mya arenia*). For these reasons, the Cotuit Landing was eliminated from further consideration.

4.3.3 Prince Cove Marina

Prince Cove Marina is a public marina operated by the Town of Barnstable near the intersection of Cedar Tree Neck Road and Prince Avenue in Marstons Mills (see Figure 4-2). Prince Cove is part of a large estuary that extends inland from North Bay in the village of Cotuit. Landing the cable at this location was considered but was eliminated because its location has shallow water depths in the nearshore area that are insufficient for the HDD offshore-to-onshore transition. This option would require open cut installation of the offshore-to-onshore transition that would result in direct impacts to estuarine habitats and other environmentally sensitive areas located within the Three Bays area of Barnstable. For these reasons, this landfall site was eliminated from further consideration.

4.3.4 East Bay Boat Ramp

This site is located at a boat ramp owned and operated by the Town of Barnstable along the east-facing shore of East Bay (see Figure 4-2). Use of this site would require construction within environmentally sensitive areas within East Bay, which has been designated by the Massachusetts DMF as potential shellfish habitat for Quahog and Softshell Clam. The site lacks sufficient space for the offshore-to-onshore transition facilities and would potentially conflict with boating interests when the ramp would be inaccessible during construction. For these reasons, the East Bay Boat Ramp Landfall Site was eliminated from further consideration.

4.3.5 Wianno Avenue

This site is a small, paved parking area at the end of Wianno Avenue, south of the intersection of Wianno Avenue and Sea View Avenue (see Figure 4-2). The size of the site is inadequate for the offshore-to-onshore transition facilities. Mapped and surveyed eelgrass habitat is located off the coast of the Wianno Avenue Landfall Site. In addition, the Massachusetts DMF has designated an area of shellfish suitability for Surf Clam (*Spisula solidissima*) off the coast of the Wianno Avenue Landfall Site for a distance of approximately 1,150 feet (350 m). These environmentally sensitive areas can be avoided by HDD; however, this location is better suited for an open trench method of transition due to the elevated onshore topography, slope of the parking lot, and shoreline that has been previously altered by the installation of a riprap seawall. Given that this site lacks adequate space to accommodate the offshore-to-onshore transition facilities, it was eliminated from further consideration.

4.3.6 Dowses Beach

Dowses Beach is a residents-only beach that is owned and managed by the Town of Barnstable and has an approximately 2.5-acre paved parking lot. Dowses Beach is situated on a peninsula between East Bay and the Centerville Harbor away from nearby residences. A Massachusetts DMF shellfish suitability area for Surf Clam is located off Dowses Beach (approximately 1,200 feet [366 m]), but this environmentally sensitive area can be avoided by HDD. The Dowses Beach Landfall Site has adequate space for the offshore-to-onshore transition facilities. It also has a technically feasible option to install the onshore export cable duct bank from the parking area to public roadway layouts of sufficient width and with available space to accommodate the onshore export cables. Further, this location provides a relatively direct route of reasonable length to the point of interconnection.

4.3.7 McCarthy's Landing

This site is a small gravel parking area associated with a public boat ramp owned and operated by the Town of Barnstable located on the north side of the Centerville River approximately one mile upstream of East Bay (see Figure 4-2). The size of the site is inadequate for the offshore-to-onshore transition facilities and HDD staging. Use of this site would require construction within environmentally sensitive areas within East Bay and in the Centerville River. Massachusetts DMF has designated this part of the Centerville River as suitable habitat for a variety of commercially important shellfish species including Quahog, American Oyster *(Crassostrea virginica)*, and Softshell Clam. In addition, use of this site would potentially conflict with boating interests since the ramp would be inaccessible during construction. Lastly, the routing of cable within the Centerville River could conflict with navigation since the waterbody requires periodic dredging to maintain adequate depths for vessel passage. For these reasons, McCarthy's Landing was eliminated from further consideration.

4.3.8 Covell's Beach

Covell's Beach is the Vineyard Wind Connector 1 landfall site. The transition vaults for that project were installed in the existing parking lot in April 2022. There is insufficient space in the remainder of the parking lot for the offshore-to-onshore transition facilities required for the NE Wind 2 Connector. In addition, the onshore export cables associated with the Vineyard Wind Connector 1 are being installed within public roadways from this landfall site, and there is insufficient space in these roadway layouts to accommodate the onshore export cables for the NE Wind 2 Connector from this location to the point of interconnection. Due to these significant constructability constraints, this site was eliminated from further consideration.

4.3.9 Craigville Public Beach

The Craigville Public Beach Landfall Site is located within a 3.5-acre paved parking area associated with a public beach that is owned and managed by the Town of Barnstable. The landfall site is located in the central part of the Centerville Harbor bight in an area where the shoreline is relatively stable. This site is the location of the NE Wind 1 Connector landfall. This site has adequate space in the parking lot to also accommodate the NE Wind 2 Connector offshore-to-onshore transition facilities. However, the onshore export cables associated with the NE Wind 1 Connector are being installed almost entirely within public roadway layouts from this landfall site to the point of interconnection, and there is insufficient space in these roadway layouts to accommodate the onshore export cables from the NE Wind 2 Connector. Due to this significant constructability constraint, this site was eliminated from further consideration.

4.3.10 Conclusion on Landfall Sites

Six of the nine potential landfall sites were eliminated from further consideration because they lacked sufficient space for the offshore-to-onshore transition facilities (Loop Beach, Cotuit Landing, East Bay Boat Ramp, McCarthy's Landing, Covell's Beach, and Wianno Avenue). Craigville Beach was eliminated because there is insufficient space in the roadway layouts from this potential landfall site for the onshore export cable duct bank to be constructed to the West Barnstable Substation. Prince Cove was eliminated from further consideration because of the direct impacts to estuarine habitats that would result from using this location as the landfall site.

Dowses Beach was selected as the preferred landfall option because it has an existing paved beach-front public parking area with sufficient space for the offshore-to-onshore transition facilities; it has sufficient offshore water depths (10 to 20 feet [3 to 6 m]) within approximately 3,000 feet (0.9 km) of the shoreline for the HDD operation; it avoids any impacts within sensitive environmental resources in the nearshore and onshore areas; residences are located away from the landfall areas; it is technically feasible to install the onshore export cable duct bank route from the parking area at Dowses Beach to public roadway layouts; and the public roadway layouts have sufficient width and space available and provide relatively direct routes of reasonable length to the West Barnstable Substation, the point of interconnection that has been selected for the Project.

4.4 Project Substation Sites

As described in Section 1.3.4, the Project will require a new onshore substation where the 275-kV voltage in the onshore export cables will step up to 345-kV in preparation for interconnection to the grid at the West Barnstable Substation. The Company completed a thorough search to identify potential locations suitable for the new onshore substation. To facilitate this search, the Company developed a set of considerations to identify and screen potential substation sites as follows:

- Commercially available parcel(s) exceeding 10 acres in size;
- Proximity to the West Barnstable Substation (point of Project interconnection to the regional electrical grid);
- Proximity to Dowses Beach (the preferred landfall site);
- Suitable surrounding land uses;
- Suitable site topography;
- Accessibility from public roadways; and
- Suitable existing environmental site features.

The Company identified four potential substation sites for the new onshore substation, all of which are located in the Town of Barnstable. These potential substation sites are described below and are identified in Figure 4-3.

4.4.1 Clay Hill parcels, west of Oak Street

The Clay Hill parcels consist of three adjacent wooded parcels located west of Oak Street in West Barnstable. All three parcels are in private ownership and have a total combined area of approximately 15.2 acres. The site is comprised primarily of undeveloped wooded uplands. There is an existing access road that provides access to multiple parcels, including the site, a residential parcel developed with one single-family home, and a Fire Tower located on an adjacent parcel that abuts all three parcels. Aside from the single residence, the parcels are not located near other residences or businesses and are surrounded by undeveloped forested land and Route 6. To the west, the parcels are bordered by undeveloped land. To the north, the parcels are bordered by the existing Eversource utility ROW #342 and two protected parcels that are part of the Spruce Pond Conservation Area owned by the Town of Barnstable and managed by the Conservation Commission. To the south is the Route 6 layout managed by MassDOT. The Clay Hill parcels are located approximately 0.25 miles west of the existing West Barnstable Substation.

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

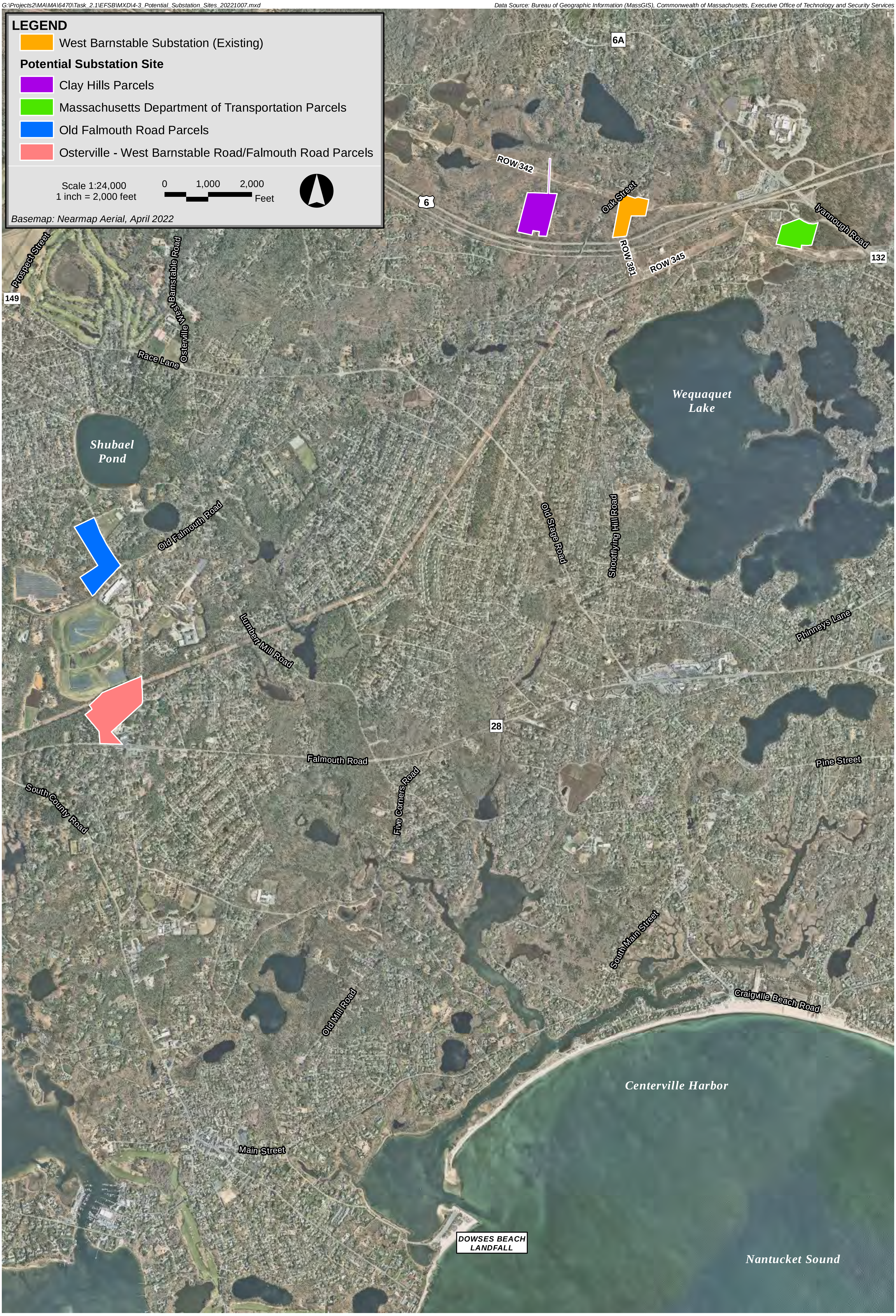


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Figure 4-3
Potential Substation Sites

4.4.2 Massachusetts Department of Transportation parcels, off Shootflying Hill Road

This site consists of two adjacent parcels totaling approximately 9.2 acres owned by MassDOT. The parcels largely consist of undeveloped wooded land with the exception of where Eversource ROW #343 crosses the parcels. Where Eversource ROW #343 crosses the two parcels, the parcels have been cleared and the ROW is developed with existing transmission lines and access roads. The undeveloped wooded portions of these parcels total approximately eight acres. The parcels are located just south of the Route 6/Route 132 interchange and are approximately one mile east of the West Barnstable Substation as measured along the utility ROW. To the west is the existing motel parcel that will be developed for the NE Wind 1 Connector substation.

4.4.3 Old Falmouth Road parcels

The Old Falmouth Road site consists of five parcels of varying size. The five privately owned parcels combined total approximately 18.5 acres. Developed portions of the parcels include several existing structures, internal roadways, and a contractor yard(s). Undeveloped portions of the site are wooded. Residential areas are located to the east, west/northwest, and north of the parcels. South/southeast of the parcels across Old Falmouth Road is an existing commercial building with multiple tenants. Multiple ground-mounted solar developments are located west and south of the parcels. The Old Falmouth Road parcels are located over 2.5 miles from the West Barnstable Substation.

4.4.4 Osterville-West Barnstable Road/Falmouth Road (Route 28) parcels

The Osterville-West Barnstable Road/Falmouth Road parcels consist of two privately owned parcels (separate ownership) totaling approximately 24 acres. The larger approximately 19-acre parcel is zoned Industrial, portions of which are developed as a sand and gravel pit and storage yard. The northern portion of the larger parcel is crossed by Eversource ROW #345 and includes transmission lines and an access road. Wooded areas are located between Eversource ROW #345 and other developed portions of the parcel. The smaller, five-acre parcel is zoned Commercial and is developed with existing buildings. Residential areas are located to the east, west, and south of the parcels. North of the parcels and Eversource ROW #345 are multiple ground-mounted solar developments.

4.4.5 Conclusion on Project Substation Sites

The MassDOT parcels located off Shootflying Hill Road were eliminated from further consideration because they lacked sufficient space (less than 10 acres) for the Project substation. Two of the potential substation sites (Old Falmouth Road parcels and Osterville-West Barnstable/Falmouth Road [Route 28] parcels) were eliminated from further consideration because they were not currently available on the real estate market. The Clay Hill parcels located west of Oak Street in Barnstable are collectively the preferred Project onshore substation site and generally meet the considerations listed above. Additionally, the Company has secured an option to purchase the Clay Hill parcels, and thus has site control. A detailed description of the proposed Project substation is provided in Section 4.4.1.

4.5 Onshore Export Cable Route

The Company used an iterative process to identify and evaluate potential routes for siting the onshore export cables. The routing analysis methodology presented herein uses previously established approaches for evaluating export cable routing options and is a consistent and standard process implemented by previous projects approved by the Siting Board.

In conducting its siting analysis, the Company applied and balanced the general guidelines below:

- Compliance with all applicable statutory requirements, regulations, and state and federal siting agency policies;
- Identify an onshore export cable route that was a reliable, operable, and cost-effective solution;
- Maximize the practical and feasible use of existing linear corridors that have sufficient space to install the onshore cable route (e.g., utility rights-of-way and public roadway layouts);
- Identify direct routing options between the preferred landfall site (i.e., Dowses Beach) and the proposed onshore substation site (west of Oak Street) and avoid circuitous routing options;
- Minimization or avoidance of routes or route segments that require complex or expensive engineering construction techniques; and
- Consideration of other public benefits associated with each route. The consideration of other public benefits for each route is an important distinguishing factor for each Candidate Route. In particular, the Town of Barnstable is implementing a Comprehensive Wastewater Management Plan (CWMP) to protect the Town's coastal waters, ponds and drinking water by managing nutrient pollution from wastewater. The potential public and associated environmental benefit of coordinating with the Project schedule with the implementation of the CWMP would result in years of acceleration of sewering depending on the location and planned CWMP phase.

4.5.1 Routing Analysis Methodology

The onshore export cable routing analysis involved the following steps:

- **Identification of a Study Area.** Focused the routing analysis within the geographic region of the Dowses Beach Landfall Site and the proposed onshore substation site (west of Oak Street).
- **Identification of Universe of Routes.** Identified routing options that would connect the Dowses Beach Landfall Site and the proposed onshore substation site (west of Oak Street) including the evaluation of existing linear corridors (e.g., utility rights-of-way and public roadway layouts) to develop an initial set of potential routes ("Universe of Routes").

- **Identification of Candidate Routes.** From the Universe of Routes, determined the most viable routes (collectively referred to herein as "Candidate Routes") that meet the need parameters for the Project and were consistent with the routing analysis guidelines.
- **Environmental Analysis.** Compared the potential for developed and natural environmental impacts along the Candidate Routes.
- **Cost Analysis.** Compared the estimated costs for the Candidate Routes.
- **Reliability Analysis.** Compared the reliability of the Candidate Routes.
- **Public Benefits Analysis.** Compared the potential for collaboration with The Town of Barnstable's CWMP and resulting acceleration of water quality improvements along each Candidate Route.
- **Selection of Routes.** Evaluated the results of the above analyses and identified the top routes and potential route variations that best balanced reliability, minimization of environmental impacts, and cost.

4.5.2 Identification of Onshore Export Cable Study Area

The Company reviewed the geographic area between the Dowses Beach Landfall Site and the proposed onshore substation site (west of Oak Street) to identify the "Onshore Export Cable Route Study Area," within which to delineate potential onshore export cable routes (see Figure 4-4).

This Study Area is located entirely within the Town of Barnstable and includes the villages of Osterville and Centerville and portions of the villages of West Barnstable and Barnstable. The Study Area generally consists of developed residential areas and commercial areas. Sensitive receptors within the study area include schools, places of worship, and fire stations. The Project Study Area also contains certain state, municipal, and private open space areas. The Project Study Area is bound to the south and southwest by East Bay, Centerville Harbor, and West, North, and Cotuit Bays. Several ponds are located within the Study Area as are Wequaquet and Mystic Lakes. Major rivers include Centerville River, Eel River, and Bumps River. Route 6 (Mid-Cape Highway) and Route 28 (Falmouth Road) traverse the Study Area in generally an east-west direction.

4.5.3 Identification of Onshore Export Cable Universe of Routes

Using the initial screening guidelines listed in the preceding section, the Company reviewed USGS maps, Massachusetts Geographical Information System (MassGIS) data, and aerial photography to identify the universe of routes that could support the onshore export cables. As shown in Figure 4-5, the universe of potential onshore export cable routes was primarily identified using the existing roadway network and utility ROWs. This universe consisted of potential onshore export cable segments, which were then subjected to screening as described below.

G:\Projects2\MA\MA\6470\Task_2.1\EFSB\MXD\4-4_Study_Area_20221007.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

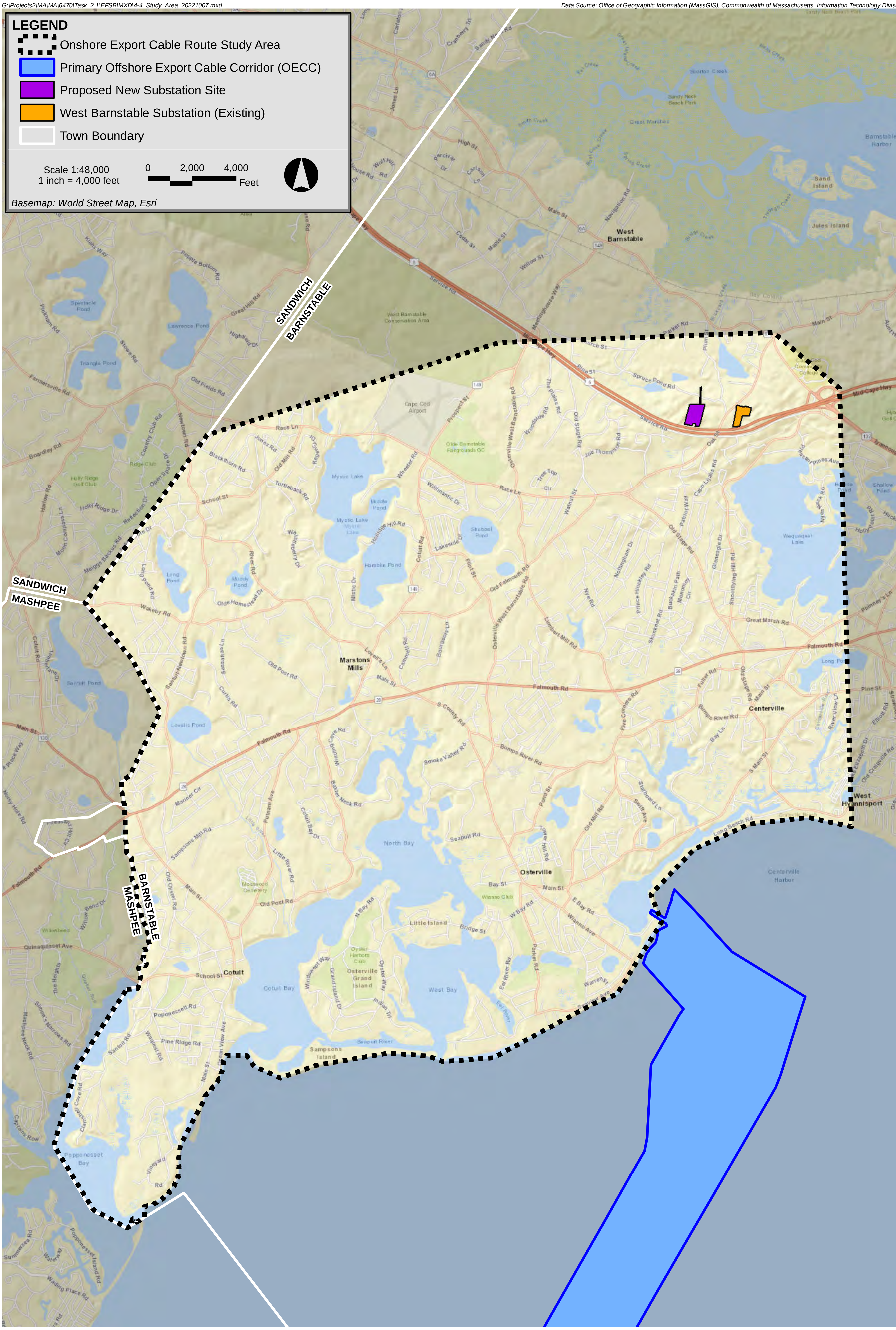

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Figure 4-4

Onshore Export Cable Route Study Area

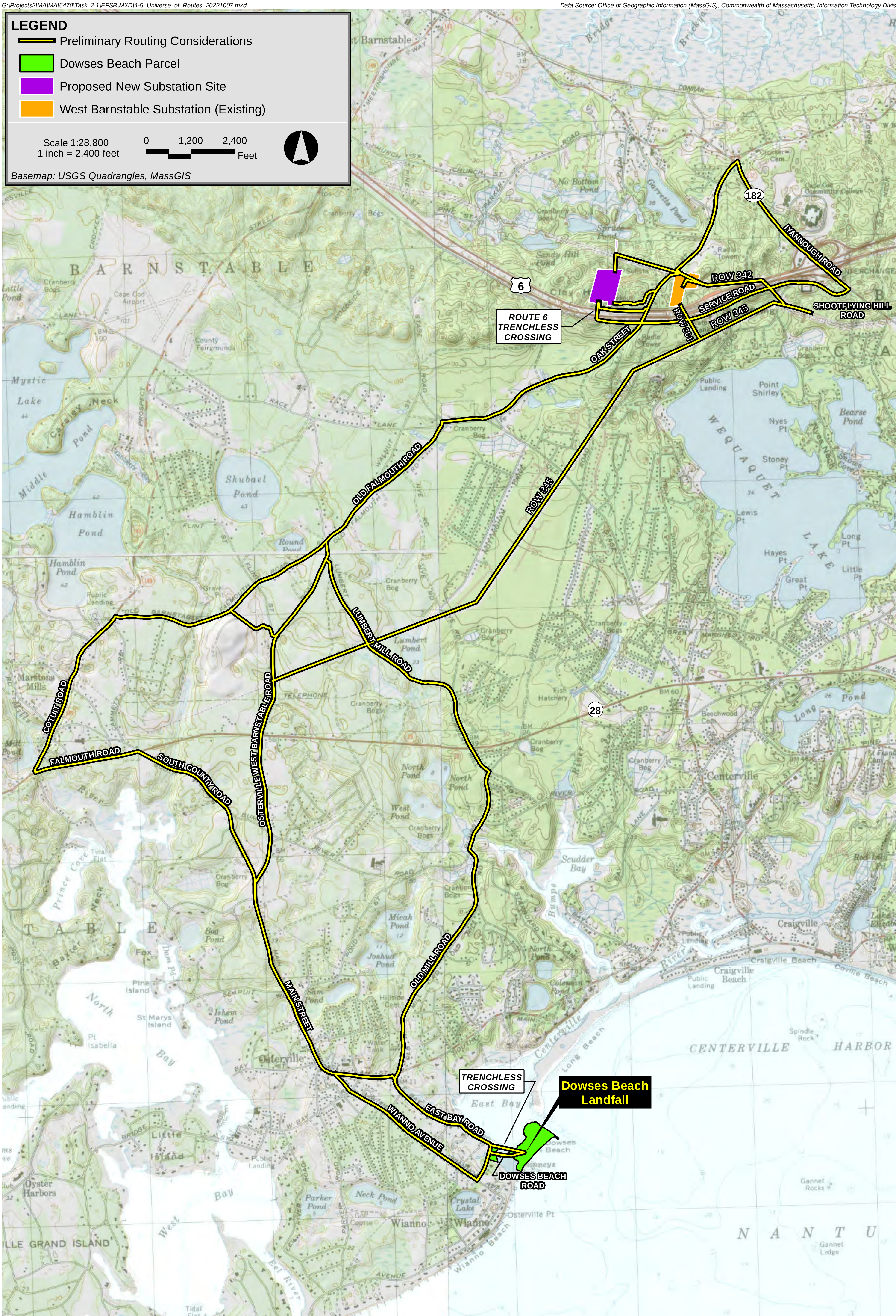

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Figure 4-5

Universe of Routes Considered - Onshore Export Cables

4.5.4 Routes Evaluated and Eliminated

Preliminary screening provided a basis for deferring several segments from further consideration due to the identification of clearly superior alternatives. Export cable routes that would require crossing or co-locating within the same roadway segments as the duct bank for the NE Wind 1 Connector were eliminated through the initial screening process due to construction feasibility and system engineering concerns. Table 4-7 summarizes the rationale for removing route segments from consideration at this stage, and Figure 4-6 highlights the route segments eliminated from further consideration from the universe of routes considered.

Table 4-7 Summary of Onshore Export Cable Segments Eliminated during Initial Screening Process

Route Segment Description	*Rationale for Dismissing Route Segment from Further Analysis*
Service Road, east of Oak Street to Eversource ROWs #342, #381 or #345	This route was eliminated from further analysis because the segment would require crossing and/or co-locating with the NE Wind 1 Connector duct bank. This route was also eliminated from further analysis because it is circuitous and not as direct as other route segments.
Service Road, east of Oak Street to Iyannough Road (Route 132) to Oak Street	This route was eliminated for the same reasons as the Eversource ROWs.
Off-Road Segment through Town of Barnstable Property off of Osterville-West Barnstable Road, south of Flint Street	This off-road segment adds additional length with no benefit.
East Bay Trenchless Crossing	An engineering feasibility assessment indicates that it is feasible to install a duct bank within Dowses Beach Road. Therefore, at this time the Company does not anticipate pursuing trenchless crossings of East Bay.

The Oak Street bridge crossing (Route 6 Crossing) is discussed in Section 5.5.3.4. The onshore export cable routes evaluated and advanced to scoring are described in Section 4.5.5.

4.5.5 Onshore Export Cable Candidate Routes

From the preliminary screening process, the Company identified seven onshore export cable routes, identified as T1 through T7, from the Dowses Beach Landfall Site to the proposed onshore substation site that were advanced as Candidate Routes for more detailed evaluation and scoring. These Candidate Routes advanced into scoring are summarized below; they are also shown in Figure 4-7. The following section provides a basic description of the Candidate Routes. The routes are scored and compared in more detail in Sections 4.5.6.

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Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

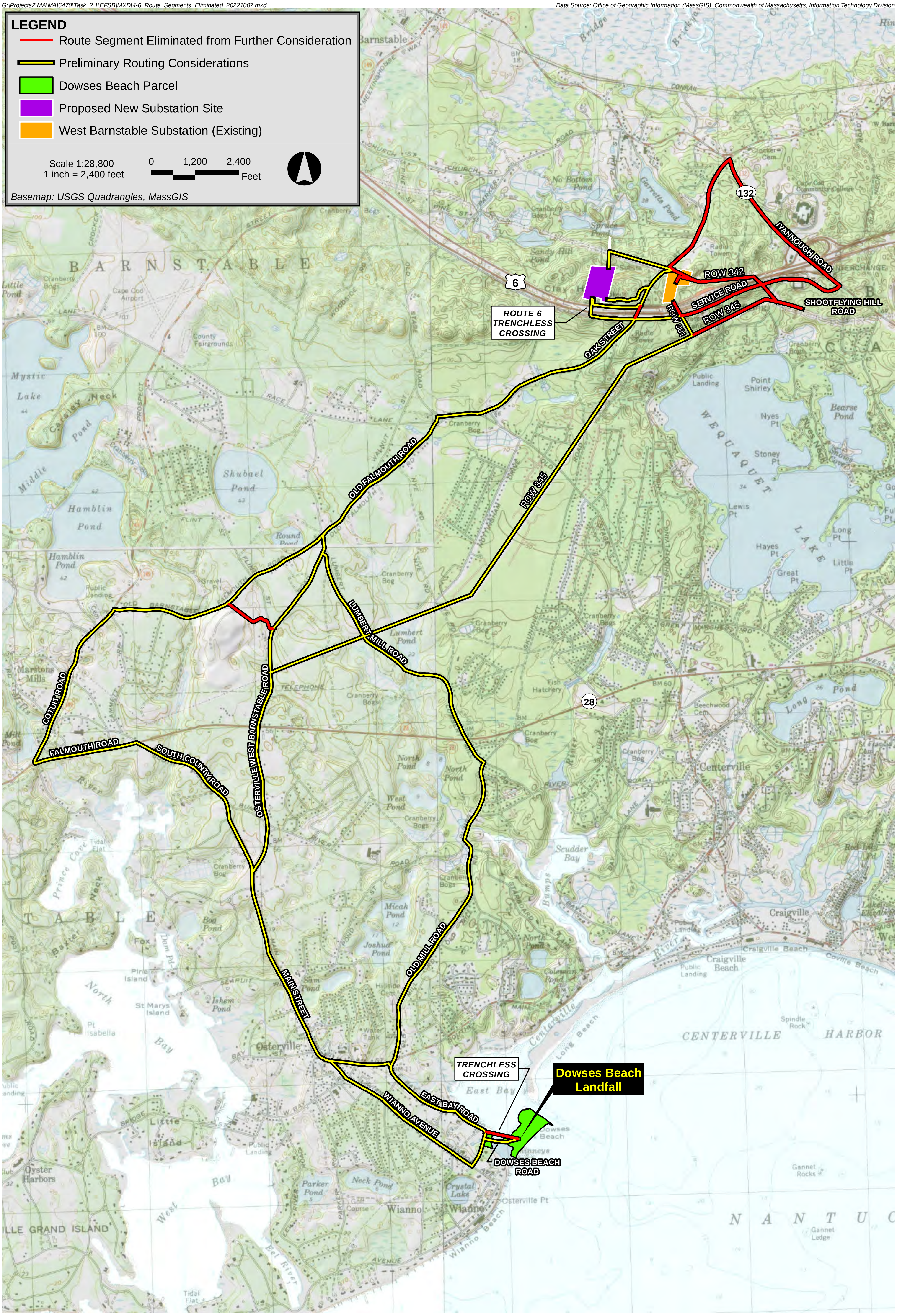

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Figure 4-6

Route Segments Eliminated from Further Consideration - Onshore Export Cables

G:\Projects2\MA\MA\6470\Task_2.1\EFSB\MXD\4-7_Candidate_Routes_20221007.mxd

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

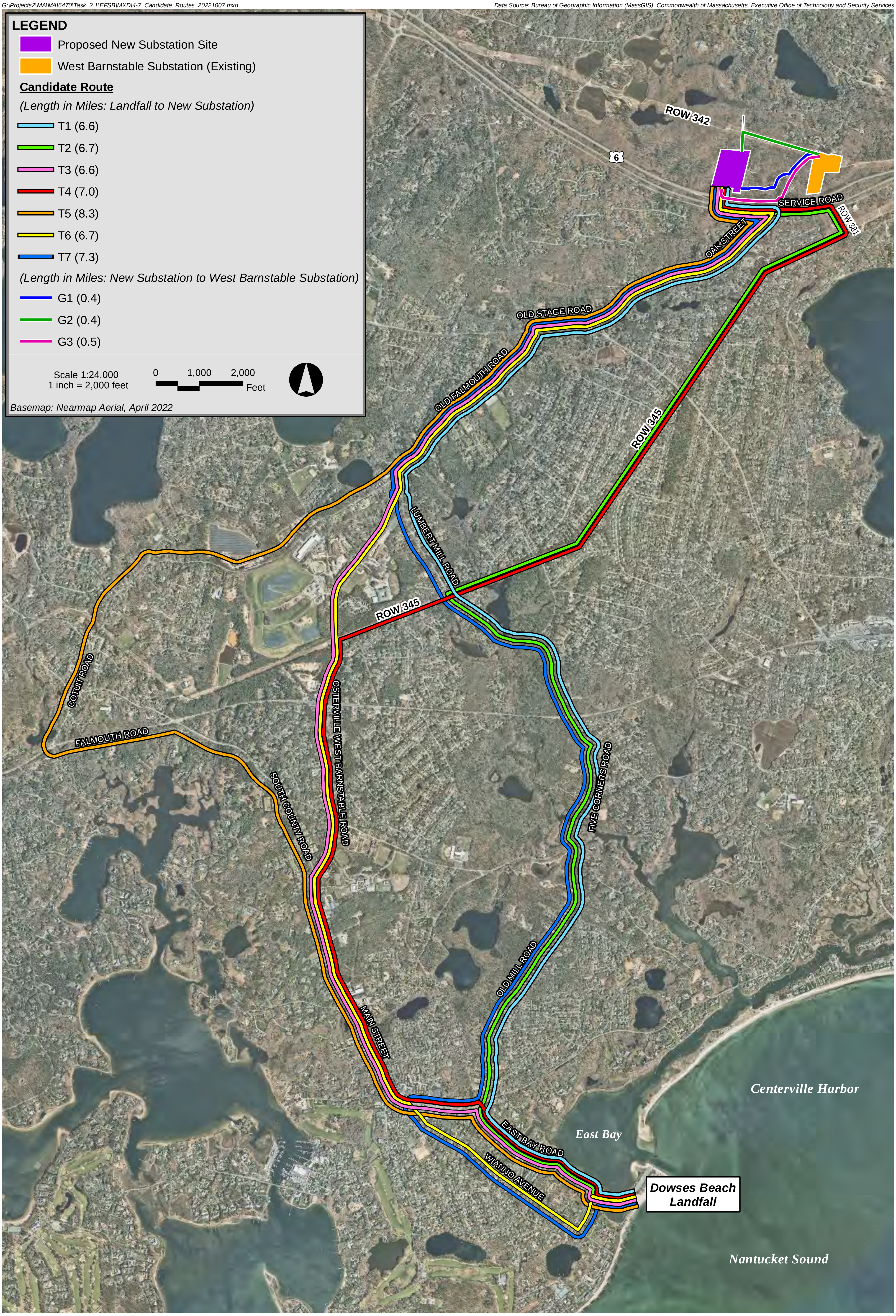

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Figure 4-7

Candidate Routes Evaluated - Onshore Export Cables

As shown on Figure 4-7, there are two route segments common to all Candidate Routes evaluated. The first common segment shared by all Candidate Routes is along Dowses Beach Road for approximately 0.2 miles from the parking lot at the Dowses Beach Landfall Site to the intersection of Dowses Beach Road and East Bay Road. The second common segment shared by all Candidate Routes starts at the intersection of Oak Street and Service Road where this route segment follows Service Road for approximately 0.2 miles to the proposed staging area for the proposed trenchless crossing of Route 6 into the proposed onshore substation site.

4.5.5.1 Candidate Route T1: East Bay Road and Old Mill Road

Candidate Route T1 is approximately 6.6 miles long and is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach. This route begins in the parking lot of the Dowses Beach Landfall Site and proceeds generally northwest on Dowses Beach Road to East Bay Road. From there, the route travels approximately 0.7 miles in a northwesterly direction along East Bay Road. At the north end of East Bay Road, Route T1 crosses Main Street and proceeds in a northeasterly direction for approximately 1.7 miles on Old Mill Road, Bumps River Road, and Five Corners Road. The route then turns to the northwest on Lumbert Mill Road and continues for approximately 1.5 miles to Osterville-West Barnstable Road. Turning again toward the northeast, the route follows Osterville-West Barnstable Road a short distance before merging onto Old Falmouth Road and continuing for approximately 0.9 miles to Old Stage Road. The route follows Old Stage Road for approximately 0.2 miles to Oak Street, then proceeds on that road for approximately 1.0 mile before turning westward on Service Road and continuing another 0.2 miles to a staging area for the proposed trenchless crossing of Route 6 into the proposed onshore substation site.

4.5.5.2 Candidate Route T2: East Bay Road, Old Mill Road, and Eversource ROW #345

Candidate Route T2 is approximately 6.7 miles long. Candidate Route T2 begins in the parking lot of the Dowses Beach Landfall Site and proceeds generally northwest on Dowses Beach Road to East Bay Road. From there, the route travels approximately 0.7 miles in a northwesterly direction along East Bay Road. At the north end of East Bay Road, the route crosses Main Street and proceeds in a northeasterly direction for approximately 1.7 miles on Old Mill Road, Bumps River Road, and Five Corners Road. The route then turns to the northwest on Lumbert Mill Road, which it follows for approximately 1.0 mile to Eversource ROW #345. The route then proceeds along ROW #345 in a northeasterly direction for approximately 2.4 miles to Eversource ROW #381 where it turns north and proceeds along ROW #381 for approximately 0.1 miles to Service Road. Turning west on Service Road, the route follows Service Road for approximately 0.5 miles to the staging area for the proposed trenchless crossing of Route 6 to the proposed onshore substation site. Almost 40% of Candidate Route T2 is located off-road and within existing utility ROWs. The balance of the route is located within public roadway layouts or within the existing parking lot area at Dowses Beach.

4.5.5.3 Candidate Route T3: East Bay Road and Main Street

Candidate Route T3 is approximately 6.6 miles long and is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach. Candidate Route T3 begins in the parking lot of the Dowses Beach Landfall Site and proceeds generally northwest on Dowses Beach Road to East Bay Road. From there, the route proceeds for approximately 0.7 miles in a northwesterly direction along East Bay Road. At the north end of East Bay Road, the route turns to the west and follows Main Street for approximately 1.4 miles to Osterville-West Barnstable Road, which it then follows in a northerly direction for approximately 1.9 miles to Old Falmouth Road. The route follows Old Falmouth Road in a northeasterly direction for approximately 0.9 miles to Old Stage Road. At Old Stage Road, the route turns to the east for approximately 0.2 miles to the Oak Street intersection. Turning north on Oak Street, the route proceeds on Oak Street for approximately 1.0 mile before turning west on Service Road and continuing for another 0.2 miles to a staging area for the proposed trenchless crossing of Route 6 into the proposed onshore substation site.

4.5.5.4 Candidate Route T4: East Bay Road, Main Street, and Eversource ROW #345

Candidate Route T4 is approximately 7.0 miles long. Candidate Route T4 begins in the parking lot of the Dowses Beach Landfall Site and proceeds generally northwest on Dowses Beach Road to East Bay Road. From there, the route proceeds approximately 0.7 miles in a northwesterly direction along East Bay Road. At the north end of East Bay Road, the route turns to the west and follows Main Street for approximately 1.4 miles to Osterville-West Barnstable Road, which it then follows in a northerly direction for approximately 1.1 miles to Eversource ROW #345. The route then proceeds along ROW #345 in a northeasterly direction for approximately 2.9 miles to Eversource ROW #381, where it turns north to follow ROW #381 for approximately 0.1 miles to Service Road. At Service Road, the route turns to the west and follows Service Road for approximately 0.5 miles to the staging area for the proposed trenchless crossing of Route 6 into the proposed onshore substation site. Approximately 43% of Candidate Route T4 is located off-road and within existing utility ROWs. The balance of the route is located within public roadway layouts or within the existing parking lot area at Dowses Beach.

4.5.5.5 Candidate Route T5: East Bay Road and South County Road

Candidate Route T5 is approximately 8.3 miles long and is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach. Candidate Route T5 begins in the parking lot of the Dowses Beach Landfall Site and proceeds generally northwest on Dowses Beach Road to East Bay Road. From there, the route proceeds approximately 0.7 miles in a northwesterly direction along East Bay Road. At the north end of East Bay Road, the route turns to the west and follows Main Street for approximately 1.4 miles to the intersection of Osterville-West Barnstable Road where it heads in a north/northwesterly direction and follows South County Road for approximately 1.0 mile to Falmouth Road (Route 28). At the intersection with Falmouth Road, Candidate Route T5 turns to the west and proceeds for approximately 0.5 miles on Falmouth Road (Route 28), then turns toward the northeast on Cotuit Road and Prospect Street (Route 149), which it follows for approximately 0.9 miles to Old Falmouth Road. At this point, the route follows Old Falmouth Road for approximately 2.1 miles to Old Stage Road. The route then turns east on Old Stage Road for approximately 0.2 miles then continues on Oak Street for approximately 1.0 mile before turning west on Service Road and continuing for another 0.2 miles to a staging area for the proposed trenchless crossing of Route 6 into the proposed onshore substation site.

4.5.5.6 Candidate Route T6: Wianno Avenue and Main Street

Candidate Route T6 is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach and has a total length of approximately 6.7 miles. The route begins in the parking lot of the Dowses Beach Landfall Site and proceeds generally northwest on Dowses Beach Road to East Bay Road. From there, the route proceeds approximately 0.2 miles in a southerly direction along East Bay Road. At the end of East Bay Road, the route turns northwest on Wianno Avenue, which it follows for approximately 0.9 miles to Main Street. The route continues north on Main Street for approximately 1.1 miles to Osterville-West Barnstable Road, which it then follows for approximately 1.9 miles to Old Falmouth Road. The route then turns and continues in a northeast direction and follows Old Falmouth Road for approximately 0.9 miles and then turns east on Old Stage for approximately 0.2 miles to the Oak Street intersection. Turning north on Oak Street, the route follows Oak Street for approximately 1.0 mile before turning west on Service Road and continuing for another 0.2 miles to a staging area for the proposed trenchless crossing of Route 6 into the proposed onshore substation site.

4.5.5.7 Candidate Route T7: Wianno Avenue and Old Mill Road

Candidate Route T7 is approximately 7.3 miles long and is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach. Candidate Route T7 begins in the parking lot of the Dowses Beach Landfall Site and proceeds generally northwest on Dowses Beach Road to East Bay Road. From there the route proceeds approximately 0.2 miles in a southerly direction along East Bay Road. At the end of East Bay Road, the route turns northwest on Wianno Avenue, which it follows for approximately 0.9 miles to Main Street. The route then turns east and follows Main Street for approximately 0.3 miles to Old Mill Road. The route proceeds in a northeasterly direction for approximately 1.7 miles on Old Mill Road, Bumps River Road, and Five Corners Road. The route then turns to the northwest on Lumbert Mill Road, which it follows for approximately 1.5 miles to Old Falmouth Road. The route then turns and continues in a northeast direction along Old Falmouth Road for approximately 0.9 miles to Old Stage Road. At Old Stage Road, the route turns to the east for approximately 0.2 miles to the Oak Street intersection. Turning north on Oak Street, the route follows Oak Street for approximately 1.0 mile before turning west on Service Road and continuing for another 0.2 miles to a staging area for the proposed trenchless crossing of Route 6 into the proposed onshore substation site.

4.5.6 *Environmental Analysis of Onshore Candidate Routes*

As part of its routing analysis to identify suitable routes for the onshore export cables from the Dowses Beach Landfall Site to the Project substation, the Company conducted an environmental scoring analysis for the seven Candidate Routes described in Section 4.5.5. The environmental scoring analysis included 12 individual criteria that compare the relative levels of potential impacts to the developed and natural environments along the Candidate Routes. As previously identified, the other three elements of the siting analysis to identify a Preferred Route for the onshore export cables are a cost analysis, a reliability analysis, and a public benefit analysis, which are provided in Sections 4.5.8, 4.5.9, and 4.5.10, respectively. The overall purpose of the multi-layered siting analysis is to identify the routes that best balance reliability, cost, minimization of environmental effects, and the potential for maximum public benefit.

The following sections provide a detailed description of the environmental scoring analysis completed for the Candidate Routes.

4.5.6.1 Criteria and Weight Assessment

The Company evaluated the Candidate Routes using a set of 12 individual criteria related to both developed and natural environment considerations. These criteria were developed to reflect the defined routing objectives, feedback from stakeholders obtained during outreach meetings, and environmental (developed and natural) considerations. The seven developed environment criteria, defined in Section 4.5.6.3.1, compare existing conditions of, and potential impacts to, the developed environment along each Candidate Route. The five natural environment criteria, defined in Section 4.5.6.3.2, compare existing conditions of, and potential impacts to, the natural environment along each Candidate Route.

After calculating a raw "score" for each criterion, the Company calculated a ratio score as defined in Table 4-8 to arrive at a relative score for each criterion on each route. The Company then assigned weights to all criteria based on an assessment of the potential for temporary and permanent impacts, as well as the magnitude of disruption from those impacts and regulatory importance for permitting. The weighting scale ranges from 1 to 3, with 1 being the lowest weight and 3 being the highest weight that could be applied to a particular criterion.

The scoring criteria identified by the Company to evaluate and compare each Candidate Route are defined in Table 4-8 and are described in greater detail in Section 4.5.6.3; weighting of each criterion is defined in Table 4-9.

Table 4-8 Scoring Criteria for the New England Wind 2 Connector Routing Analysis

Criteria	Purpose	Data Source	Scoring	Ratio Score
Developed Environment Criteria				
Residential Units	Residents along a Candidate Route could be subject to temporary impacts from construction, such as traffic disruption, noise, dust, and/or other short-term construction-related impacts.	MassGIS, aerial photography, municipal records (including large multi-unit complexes where possible)	# of residential units with parcels directly abutting the Candidate Routes.	Calculated for each Candidate Route based on the total # of individual residential units determined for each Candidate Route divided by the highest # of residential units found along all the Candidate Routes.
Commercial / Industrial Units	Commercial and Industrial businesses along a Candidate Route could be subject to temporary impacts from construction, such as traffic disruption, noise, dust, and/or other short-term construction-related impacts.	MassGIS, aerial photography, municipal records (including large multi-unit complexes where possible)	# of commercial and industrial units with parcels directly abutting the Candidate Routes.	Calculated for each Candidate Route based on total # of individual commercial and industrial units determined for each Candidate Route divided by the highest # of units found along all the Candidate Routes.
Sensitive Receptors (hospitals, schools, police stations, fire stations, elder care facilities, daycares, district courts, and religious facilities)	Sensitive receptors could be subject to temporary construction impacts such as traffic disruption, street closures, noise, dust, and/or other short-term construction-related impacts. If a receptor has multiple entrances, the impact can be less pronounced than under single-entrance scenarios.	Property assessment data from MassGIS and local online databases, Google and Bing 2015-2016 aerial imagery as well as Google Earth/Google Maps data and imagery	# of sensitive receptors with parcels directly abutting each Candidate Route.	Calculated by dividing the total # of sensitive receptor parcels for each Candidate Route by the highest # of sensitive receptor parcels found among all the Candidate Routes.
Potential for Traffic Congestion	Installation of new underground export cables within public roadway layouts could result in temporary traffic delays, detours, and street closures.	MassDOT Road Inventory and MassGIS aerial photography	Candidate Route segments were assigned a ranking of 1 through 3 for the potential for traffic delays. Congestion scores for individual segments were assigned based on detour route length, higher or lower functional class of the detour route, and the presence of traffic signals. Then the % of the total route each segment commands was calculated and multiplied by the segment's score. Segment scores were then added to generate a proportional score for the entire Candidate Route.	Overall score calculated for each Candidate Route to provide a comparison of traffic-related impacts along each Candidate Route. The ratio score is calculated by dividing the total proportional score for each Candidate Route by the highest proportional score found among all the Candidate Routes.
Historic Resources (*Archaeology also evaluated separately, below, given the relative regional importance of these resources to undeveloped areas of Cape Cod)*	Could potentially be affected by temporary construction impacts.	MassGIS data from MHC's Massachusetts Cultural Resource Information System (July 2022)	# of historic resources derived from the total number of historic sites directly abutting each Candidate Route. If the abutting historic resource is an area or district with multiple parcels, then the area/district was counted and then the parcels within the area/district directly abutting the route were counted as well (but non-abutting parcels are not counted). If identified archaeological sites abut the routes, they were also included in the count.	Calculated for each Candidate Route based on the total # of historic resources determined for each Candidate Route divided by the highest # of historic resources found among all of the Candidate Routes.

Table 4-8 Scoring Criteria for the New England Wind 2 Connector Routing Analysis (Continued)

Criteria	Purpose	Data Source	Scoring	Ratio Score
Developed Environment Criteria				
Archaeological Resources	Areas of moderate to high archaeological sensitivity were identified based on environmental attributes, such as well drained soils on level to slightly sloping terrain in proximity to settings with high natural resource potential such as tidal flats, salt marsh and creek systems, freshwater rivers, wetlands and ponds, and proximity to recorded archaeological sites. Areas observed as having obvious disturbance were ranked as low sensitivity zones. Areas of greater than 15% slope, or bodies of standing water had no archaeological sensitivity.	Archaeological Sensitivity Assessment by archaeology consultant	Derived from the total length (miles) of each Candidate Route passing through areas of "moderate" and "high" archaeological sensitivity.	Calculated for each Candidate Route based on the total # of miles of archaeologically sensitive areas determined for each Candidate Route divided by the highest # of miles found among all of the Candidate Routes.
Potential to Encounter Subsurface Contamination	Subsurface contamination could add complexities to construction.	MassGIS Activity and Use Limitation (AUL) and Chapter 21E Tier Classified Sites data layers MassDEP Bureau of Waste Site Cleanup (BWSC) online database	Derived from the number of sites on or within 300 feet of each Candidate Route where a documented release of oil and/or hazardous materials occurred, or where past land uses potentially resulting in contamination have been documented in the BWSC database, pursuant to the Massachusetts Contingency Plan (MCP) (310 CMR 40.0000).	Calculated by dividing the total # of documented sites determined for each Candidate Route by the highest # of documented sites found among all the Candidate Routes.
Natural Environment Criteria				
Wetland Resource Areas	Wetland resource areas could potentially be affected by construction impacts.	MassGIS and field delineation	Derived from the total length that each Candidate Route right-of-way passes through mapped or delineated jurisdictional wetland resource areas, including 200-foot riverfront area, and 100-year floodplain (but excluding buffer zones).	Calculated by dividing the total combined length of jurisdictional areas crossed by each Candidate Route by the longest total combined length among all the Candidate Routes.
State-Listed Rare Species Habitat	Construction could potentially impact protected habitats for state-listed rare species.	ArcGIS and applying MassGIS mapping of NHESP Priority and Estimated Habitat areas	Derived from the total length that each Candidate Route passes through mapped protected habitat (Priority or Estimated habitats) for state-listed species.	Calculated by dividing the total combined length of mapped NHESP Priority and Estimated Habitat areas crossed by each Candidate Route by the longest total combined length among all the Candidate Routes.
Public Water Supplies	Public water supply areas considered in this routing analysis include Zone I and Zone II Water Supply Protection Areas and Interim Wellhead Protection Area (IWPA).	MassGIS	Derived from the total length that each Candidate Route passes through a mapped public water supply area identified through MassGIS.	Calculated by dividing the total combined length of mapped public water supply areas crossed by each Candidate Route by the longest total combined length among all the Candidate Routes.
Article 97-Jurisdictional Land	Conservation lands defined as those properties that were primarily protected for conservation purposes (subject to Article 97 jurisdiction) as identified through MassGIS.	MassGIS	Number of distinct areas subject to Article 97 jurisdiction as identified through MassGIS that are crossed by each Candidate Route. Public roadway layouts are excluded from the count.	Calculated by dividing the total number of areas subject to Article 97 jurisdiction as identified through MassGIS crossed by each Candidate Route by the highest number of areas subject to Article 97 jurisdiction among all the Candidate Routes.

Table 4-8 Scoring Criteria for the New England Wind 2 Connector Routing Analysis (Continued)

Criteria	*Purpose*	*Data Source*	*Scoring*	*Ratio Score*
Natural Environment Criteria				
Tree Clearing	Naturally vegetated areas containing a mature forest canopy provide habitat for various wildlife species and can provide visual screening. Routes that minimize tree clearing impacts are preferred.	MassGIS and current aerial photography	Derived from the total length that each Candidate Route requires clearing of forested habitat (expected only along transmission ROWs). This length was generated based on the length following utility ROWs but excluding non-forested areas such as at road crossings, cleared areas, and ROW access roads.	Calculated by dividing the total combined length of tree clearing required for each Candidate Route by the longest total combined length of tree clearing required among all the Candidate Routes.

The assignment of weights to individual scoring criteria allows route scoring results to reflect the relative importance of individual evaluation criteria. The Company assigned the individual criteria weights based upon an assessment of the potential for temporary and permanent impacts and to reflect public feedback. Using this approach, the highest weightings were given for criteria pertaining to the greatest risk for significant impacts, public benefits, Project cost, and schedule. Those criteria that are least likely to affect these considerations are given the lowest weighting. Table 4-9 describes the weights applied to each evaluation criterion.

A weight of three (most important) was assigned to 4 of the 12 criteria: Residents, Commercial/Industrial Businesses, Potential for Traffic Congestion, and Tree Clearing. A weight of two was given to four criteria: Sensitive Receptors, Wetland Resource Areas, Rare Species Habitat, and Article 97-Jurisdictional Land. The remaining four criteria (Historic Resources, Archaeological Resources, Potential to Encounter Subsurface Contamination, and Public Water Supplies) were given a weight of one.

Table 4-9 Weighting assigned to scoring criteria

Scoring Criteria	*Weight*	*Rationale Behind Assigned Weight*
Developed Environment		
Residential Units	3	The highest weighting was applied to residential units due to the potential for temporary disruption during construction.
Commercial/Industrial Units	3	The highest weighting was applied to commercial/industrial units due to the potential for temporary disruption during construction.
Sensitive Receptors	2	A middle weighting was applied to sensitive receptors in acknowledgement of their susceptibility to temporary disruption from construction activities, and the need to maintain access to these facilities throughout construction. A weighting of three was not selected since the Company will work with the Town and sensitive receptors to maintain access during construction.
Potential for Traffic Congestion	3	The highest weighting was applied to the potential for traffic congestion since this is always an area of significant interest and concern during any significant infrastructure construction project. Since this Project is largely proposed within existing roadway layouts, it will have some unavoidable temporary impacts to traffic, although Traffic Management Plans will help manage and mitigate these impacts.
Historic Resources	1	The lowest weighting was applied to historic resources, since the Project-related impacts to historic resources will be limited to temporary construction-related activities and since the completed Project, with the exception of the proposed onshore substation, will have no visual impacts.

Table 4-9 Weighting assigned to scoring criteria (Continued)

Scoring Criteria	*Weight*	*Rationale Behind Assigned Weight*
Developed Environment		
Archaeological Resources	1	The lowest weighting was applied to archaeological resources since the onshore export cable route is largely proposed within previously disturbed existing roadway layouts.
Potential to Encounter Subsurface Contamination	1	No sites on or within 300 feet of a Candidate Route where a documented release of oil and/or hazardous materials occurred or where past land uses potentially resulting in contamination have been documented in the BWSC database, pursuant to the MCP (310 CMR 40.0000), were identified for any Candidate Route.
Natural Environment		
Wetland Resource Areas	2	A middle weighting was applied to wetland resource areas for the onshore route due to the sensitivity of these environmental resources as well as the permitting challenges associated with related impacts.
Rare Species Habitat	2	A middle weighting was applied to rare species habitat for the onshore route due to the sensitivity of these environmental resources as well as the permitting challenges associated with related impacts.
Public Water Supplies	1	The lowest weighting was applied to public water supplies since the Project's construction-related activities will be performed in a manner that will avoid impacts to water supply resources, and because the Project is not of a type that would pose a significant threat to these resources.
Article 97-Jurisdictional Land	2	A middle weighting was applied to this criterion due to the Project crossing land identified as land subject to Article 97 jurisdiction, which is land held for natural resource purposes.
Tree Clearing	3	The highest weighting was applied to tree clearing since, while limited to transmission ROWs, this clearing would be a permanent impact within a designated utility corridor.

4.5.6.2 Scoring Evaluation Methods

After identifying the environmental scoring criteria, the Company completed a scoring evaluation for each Candidate Route. The Company scored, weighted, and ranked each Candidate Route to reflect its potential for impacts to the developed and natural environments and its relative ease of constructability. For a project of this type, the relative ease of constructability is directly related to several factors including the amount of available workspace, extent of densely developed residential and commercial areas, traffic, and potential conflicts with other buried infrastructure. These parameters were considered in developing some of the human environment criteria and are therefore represented in the Company's scoring process. For example, the potential for traffic congestion was considered when scoring the route options. In addition, the Company captured considerations of constructability in its evaluation of costs, as outlined in Section 4.5.8, for the various routing alternatives. Therefore, constructability criteria were not included in the scoring process for Candidate Routes in the same way that developed and natural environment criteria were reflected in the analysis.

After gathering mapping and data for each Candidate Route, the Company identified the Candidate Route that had the highest number for each criterion. All other routes were then compared against this number to arrive at a "ratio score" for each Candidate Route on a scale of 0 to 1. For example, if Candidate Route X had 5 sensitive receptors, Candidate Route Y had 10 sensitive receptors, and Candidate Route Z had 15 sensitive receptors, the ratio scores would be calculated as shown:

Candidate Route	Number of Sensitive Receptors	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 lowest ratio score therefore equates to the lowest potential for impact.

For each criterion, the ratio score was then multiplied by its assigned weight to produce a weighted score that reflected the relative importance of the individual criteria. As described above, a 1-to-3 scale for weighting was used to reflect the degree of importance of each criterion, with 1 being the lowest weight and lesser importance and 3 being the highest weight and greater importance.

For each Candidate Route, the analysis generated a "total ratio score" by summing all of the individual ratio scores from the scoring criteria as well as a "total weighted score" by summing all of the individual weighted scores from the scoring criteria. The total weighted scores were then sorted in order, from low to high, to identify a given Candidate Route's "rank." The lowest weighted score equates to the lowest potential for impact with emphasis on certain criterion as previously described in this section. The ranks developed in this routing analysis are based on the total weighted scores.

4.5.6.3 Description of Scoring Criteria

The scoring criteria for the developed environment and natural environment used to evaluate the Candidate Routes, as defined in Table 4-8 above, are described in greater detail below. Constructability factors, such as subsurface utility density, location of route (public roadway layouts versus electric transmission corridors), and property acquisition, are reflected in the cost analysis in Section 4.5.8. In general, subsurface utility density and street width are relatively homogeneous along the Candidate Routes and are not significant for route differentiation in the scoring evaluation.

4.5.6.3.1 Developed Environment Criteria

Developed environment criteria compare existing conditions of, and potential impacts to, the developed environment and surrounding population among the various Candidate Routes. The seven developed environment criteria included in the scoring analysis are:

- Residential Units;
- Commercial/Industrial Units;
- Sensitive Receptors;
- Potential for Traffic Congestion;
- Historic Resources;
- Archaeological Resources; and
- Potential to Encounter Subsurface Contamination.

Each of these developed environment criteria is described in greater detail below.

Residential Units

Residents along a Candidate Route could be subject to temporary impacts from construction, such as traffic disruption, noise, dust, or other short-term construction-related impacts. The number of residential units with parcels directly abutting the Candidate Routes were counted using MassGIS data, aerial photography, and municipal records to determine the number of units along each Candidate Route, including, when possible, unit counts for large multi-unit apartment or condominium complexes, where each individual unit that abuts the route was counted.

The ratio score was calculated for each Candidate Route based on the total number of individual residential units determined for each Candidate Route divided by the highest number of units found among all the Candidate Routes.

Commercial/Industrial Units

Commercial and Industrial businesses along a Candidate Route could be subject to the same types of temporary impacts as residential units due to construction. The number of commercial and industrial units were derived from the number of commercial/industrial units on parcels of land directly abutting each Candidate Route. Commercial/industrial land uses were identified using MassGIS data, aerial photography, and municipal records to determine the number of units along each Candidate Route, including, where possible, unit counts for multi-unit buildings or complexes, where each individual unit (i.e., business) that abuts the route was counted.

The ratio score was calculated for each Candidate Route based on the total number of individual commercial and industrial units determined for each Candidate Route divided by the highest number of units found along all the Candidate Routes.

Sensitive Receptors

Sensitive receptor land uses include hospitals, schools, police stations, fire stations, elder care facilities, daycare facilities, district courts, and religious facilities. Sensitive receptors along each Candidate Route could be subject to temporary traffic disruption, street closures, construction noise, or other temporary impacts due to Project construction.

The number of sensitive receptors includes the number of parcels directly abutting each Candidate Route with a land use type identified as sensitive to the above temporary impacts. The number of sensitive receptors was evaluated using available property assessment data from MassGIS and local online databases, Google and Bing 2015-2016 aerial and street imagery, and Google Earth/Google Maps data and imagery.

The ratio score was calculated for each Candidate Route by dividing the total number of sensitive receptor parcels for each Candidate Route by the highest number of sensitive receptor parcels found among all the Candidate Routes.

Potential for Traffic Congestion

The installation of underground cables within public roadway layouts could result in temporary increased traffic density and congestion, traffic disruption, street closures, construction noise, or other temporary impacts due to Project construction.

The potential for traffic congestion was determined by Stantec's transportation consultants. The traffic analysis took into consideration work zone requirements for construction activities and means of accommodating traffic. Work zone requirements were estimated at 18 feet. An additional minimal paved width of 10 feet was estimated to be required to accommodate a single lane of traffic past a work zone. As a result, a roadway width of 28 feet was considered to be the minimum that would support alternating one-way traffic past the work zone and not require a detour. The paved width of all roadways evaluated as part of this assessment are less than 28 feet. Therefore, the traffic assessment assumed that detours would be required along all Candidate Route roadway segments during construction work hours.

Identification of detour routes associated with individual roadway segments was based on a desktop review of roadway networks. A detour score (from 1 being the lowest to 3 being the highest) was calculated based on three factors (functional classification of the detour route, detour length, and presence of traffic signals). Instances where traffic would be detoured along roadways with a similar or higher functional classification were assigned a score of 1, reflecting an expectation of minimal delays as vehicles are routed to a roadway designed to carry comparable or higher traffic volumes. Higher scores were assigned to segments where the identified detour route included roadways with a lower functional classification. The detour score was then adjusted to account for the length of the detour relative to the closed section of road and the presence of traffic signals.

The Company then calculated the percentage of the total Candidate Route each segment commanded, multiplied that percentage by the segment's score, and then added the segment scores to generate a proportional score for the entire Candidate Route.

The ratio score was calculated by dividing the total proportional score for each Candidate Route by the highest proportional score found among all the Candidate Routes.

Historic Resources

Historic resources could potentially be affected by construction impacts such as earth movement, traffic disruption, street closings, and noise, as well as by the permanent placement of transmission facilities in or near cultural resources. Historic resources were evaluated using MassGIS data from the Massachusetts Historical Commission's (MHC) Massachusetts Cultural Resource Information System (MACRIS) to locate resources including buildings, local historic districts, and National Register-listed individual buildings and districts. Historic Resources located along the Candidate Routes are either included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory) or listed on the National Register of Historic Places (NR) or State Register of Historic Places (SR). Resources are either singular historic properties or listed in the NR or SR as a district or included in the Inventory as a single property or as an Area containing multiple properties.

For the purposes of scoring, single historic properties, Areas, and Districts immediately adjacent to the Candidate Routes were each counted once. If the Candidate Route passes through an Area or District with multiple parcels, then the Area or District is counted once and the parcels within the Area or District directly abutting the Candidate Route are counted as well (but non-abutting parcels are not counted).

If identified archaeological sites abut the routes, they are also included in the count; however, archaeological resources were also evaluated separately, as noted below.

The number of historic resources was derived from the total number of historic and archaeological sites and the number of parcels within historic districts or areas abutting each Candidate Route.

The ratio score was calculated for each Candidate Route based on the total number of historic resources determined for each Candidate Route divided by the highest number of historic resources found along all of the Candidate Routes.

Archaeological Resources

Archaeological resources can be impacted by the disturbance of subsurface artifacts through earth movement and excavation.

Areas of moderate to high archaeological sensitivity were identified based on environmental attributes, such as well drained soils on level to slightly sloping terrain in proximity to settings with high natural resource potential such as tidal flats, salt marsh and creek systems, freshwater rivers, wetlands and ponds, and proximity to recorded archaeological sites. Areas observed as having obvious disturbance were ranked as low sensitivity zones. Areas of greater than 15% slope, or bodies of standing water had no archaeological sensitivity.

The ratio score was calculated for each Candidate Route based on the total number of miles of archaeologically sensitive areas determined for each Candidate Route divided by the highest number of miles found along all of the routes.

Potential to Encounter Subsurface Contamination

Subsurface contamination could add complexities to construction. The potential to encounter subsurface contamination was derived from the number of sites on or within 300 feet of each Candidate Route where a documented release of oil and/or hazardous materials occurred, or where past land uses potentially resulting in contamination have been documented in the MassDEP Bureau of Waste Site Cleanup (BWSC) online database, pursuant to the Massachusetts Contingency Plan (MCP) (310 CMR 40.0000). This criterion was evaluated using the MassDEP BWSC online database. No documented BWSC sites were identified on or within 300 feet of any of the Candidate Routes.

4.5.6.3.2 Natural Environment Criteria

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

- Wetland Resource Areas;
- State-listed Rare Species Habitat;
- Public Water Supplies;
- Article 97-Jurisdictional Land; and
- Tree Clearing.

Each of these natural environment criteria is described in greater detail below.

Wetland Resource Areas

Onshore underground duct bank construction could affect wetland resource areas. This criterion score was derived from the total linear footage of each Candidate Route passing through mapped or field-delineated wetland resources, including 200-foot riverfront area and the 100-year floodplain (but excluding buffer zones). Wetland resource areas applicable to the routing analysis, as defined in the Massachusetts Wetland Protection Act (WPA) regulations (310 CMR 10.00) and/or local wetlands regulations, include the following:

- Coastal Bank;
- Coastal Dune;
- Salt Marsh;
- Bordering Vegetated Wetland (BVW);
- Isolated Vegetated Wetlands or Lands Subject to Flooding (IVW or LSF);
- Land Subject to Coastal Storm Flowage (LSCSF); and
- 200-foot Riverfront Area (RFA).

Wetland resource areas were identified utilizing ArcGIS with the most current data available and field delineation of the Dowses Beach parcel (Parcel 163-013). There were no Areas of Critical Environmental Concern (ACECs) or Outstanding Resource Waters (ORWs) present along any of the Candidate Routes.

The ratio score was calculated for each Candidate Route by dividing the total combined length of jurisdictional resource areas crossed by each Candidate Route by the longest total combined length among all the Candidate Routes.

State-listed Rare Species Habitat

Onshore underground duct bank construction could potentially impact protected habitats for state-listed rare species. Scoring of protected habitats for state-listed species from the areas of Priority or Estimated Habitat, as defined by Natural Heritage & Endangered Species Program (NHESP), was derived from the total linear footage of each Candidate Route passing through mapped Priority or Estimated Habitat.

Areas of rare species habitat were identified utilizing ArcGIS and applying MassGIS mapping of NHESP Priority and Estimated Habitat areas.

The ratio score for each Candidate Route was calculated by dividing the total combined length of mapped NHESP Priority and Estimated Habitat areas crossed by each Candidate Route by the longest total combined length among all the Candidate Routes.

Public Water Supplies

Public water supply areas considered in this aspect of the routing analysis included the boundaries of Zone I and Zone II Water Supply Protection Areas and Interim Wellhead Protection Areas (IWPA). These resources were identified using available data layers from MassGIS along the Candidate Routes. The length of each route that passed through a public water supply resource area was calculated using ArcGIS.

The ratio score was calculated for each Candidate Route by dividing the total combined length of public water supply resources along each Candidate Route by the longest total combined length among all the Candidate Routes.

Article 97-Jurisdictional Land

Onshore underground export cable construction could potentially result in impacts to Article 97 land, as identified in available MassGIS data. Underground installation within public roadway layouts was assumed to have no impact on adjacent Article 97 lands. The score for this criterion was derived from the total number of distinct areas shown as protected under Article 97 by MassGIS that are crossed by each Candidate Route. All work within roadway layouts was excluded from the count.

A ratio score was calculated for each Candidate Route by dividing the total number of protected areas crossed by each Candidate Route by the highest number of protected areas among all the Candidate Routes.

Tree Clearing

Portions of the Candidate Routes that follow utility ROWs may require tree clearing of forested habitat where those ROWs have not been maintained to their full widths. Underground installation within public roadway layouts was assumed to require no tree clearing for scoring purposes; however, depending on final duct bank design, selective tree removal and/or trimming may be required. Any vegetation removal would be completed in accordance with all applicable state and local laws and regulations.

The ratio score for each Candidate Route was calculated by dividing the total combined length of tree clearing required for each Candidate Route by the longest total combined length of tree clearing required among all the Candidate Routes. This estimated length was generated based on the length of the route following utility ROWs but excluding non-forested areas such as at road crossings, cleared areas, and ROW access roads.

4.5.7 Onshore Export Cable Routing Environmental Analysis Results

The Company applied the scoring and weighting methodology described above to each of the Candidate Routes. Table 4-10 presents the weighted scores for each criterion for each Candidate Route. Detailed scoring spreadsheets are provided in Attachment A.

Table 4-10 Comparison of Environmental Weighted Ratio Scores – Candidate Routes

Scoring Criteria	*Candidate Route T1 (Old Mill Rd)*	*Candidate Route T2 (Old Mill and ROW #345)*	*Candidate Route T3 (Main Street)*	*Candidate Route T4 (Main St and ROW #345)*	*Candidate Route T5 (South County Rd)*	*Candidate Route T6 (Wianno Ave and Main St)*	*Candidate Route T7 (Wianno Ave and Old Mill)*
Developed Environment							
Residential Units	2.16	2.50	2.64	3.00	2.88	2.25	2.54
Commercial/Industrial Units	0.07	0.05	2.25	2.22	3.00	1.82	1.07
Sensitive Receptors	0.50	0.33	1.50	1.33	1.00	2.00	1.17
Potential for Traffic Congestion	2.71	1.86	2.29	1.29	2.43	2.43	3.00
Historic Resources	0.27	0.23	0.76	0.72	1.00	0.65	0.55
Archaeological Resources	0.76	0.80	0.76	0.84	1.00	0.77	0.85
Potential to Encounter Subsurface Contamination	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal for Human Environment Criteria	*6.47*	*5.77*	*10.18*	*9.40*	*11.30*	*9.92*	*9.18*
Natural Environment							
Wetland Resource Areas	2.00	1.60	1.40	1.00	1.40	1.00	1.60
Rare Species Habitat	2.00	2.00	1.00	1.00	1.00	1.00	2.00
Public Water Supplies	0.46	0.54	0.90	1.00	1.00	0.90	0.46
Article 97-Jurisdictional Areas	0.00	2.00	0.00	2.00	0.00	0.00	0.00
Tree Clearing	0.33	2.44	0.33	3.00	0.00	0.33	0.33
Subtotal for Natural Environment Criteria	*4.80*	*8.58*	*3.64*	*8.00*	*3.40*	*3.24*	*4.40*
Total	**11.27**	**14.35**	**13.82**	**17.40**	**14.70**	**13.16**	**13.58**

Table 4-11 presents a summary of the Candidate Routes ranked by total weighted environmental score. The lowest total weighted score equates to the lowest potential for impact, with emphasis on certain criteria as described above.

Table 4-11 Summary of Environmental Weighted Scores and Rank between Candidate Routes

Route	*Route Length (miles)*	*Total Weighted Score*	*Rank*
Candidate Route T1 (East Bay Road and Old Mill Road)	6.6	11.27	1
Candidate Route T2 (East Bay Road, Old Mill Road, and Eversource ROW #345)	6.7	14.35	5
Candidate Route T3 (East Bay Road and Main Street)	6.6	13.82	4
Candidate Route T4 (East Bay Road, Main Street, and Eversource ROW #345)	7.0	17.40	7
Candidate Route T5 (East Bay Road and South County Road)	8.3	14.70	6
Candidate Route T6 (Wianno Avenue and Main Street)	6.7	13.16	2
Candidate Route T7 (Wianno Avenue and Old Mill Road)	7.3	13.57	3

As shown in Tables 4-10 and 4-11, Candidate Route T1 (East Bay Road and Old Mill Road) has the lowest weighted environmental score and would result in the lowest potential for impact of all the Candidate Routes evaluated. It is also the shortest Candidate Route. Candidate Route T6 had the second lowest weighted environmental score and would result in fewer potential impacts relative to the remaining five Candidate Routes. Candidate Route T6 is also a geographically distinct routing alternative to Candidate Route T1. Candidate Route T4 has the highest weighted environmental score and would result in the greatest potential for impacts of all the Candidate Routes.

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

4.5.7.1 Environmental Scoring Criteria Overview Tables

Tables 4-12 and 4-13 provide an overview of how each Candidate Route scores with respect to the Developed Environment and Natural Environment, respectively. The Candidate Route that has the lowest and highest potential for impact is highlighted in **GREEN** (lowest) and **RED** (highest), respectively.

Table 4-12 Overview of Developed Environment Scores

Candidate Route	*Developed Environment*	
	Weighted Score	*Rank*
Candidate Route T1 (East Bay Road and Old Mill Road)	6.47	2
Candidate Route T2 (East Bay Road, Old Mill Road, and Eversource ROW #345)	5.77	1
Candidate Route T3 (East Bay Road and Main Street)	10.18	6
Candidate Route T4 (East Bay Road, Main Street, and Eversource ROW #345)	9.40	4
Candidate Route T5 (East Bay Road and South County Road)	11.30	7
Candidate Route T6 (Wianno Avenue and Main Street)	9.92	5
Candidate Route T7 (Wianno Avenue and Old Mill Road)	9.18	3

Table 4-13 Overview of Natural Environment Scores

Candidate Route	*Natural Environment*	
	Weighted Score	*Rank*
Candidate Route T1 (East Bay Road and Old Mill Road)	4.80	5
Candidate Route T2 (East Bay Road, Old Mill Road, and Eversource ROW #345)	8.58	7
Candidate Route T3 (East Bay Road and Main Street)	3.64	3
Candidate Route T4 (East Bay Road, Main Street, and Eversource ROW #345)	8.00	6
Candidate Route T5 (East Bay Road and South County Road)	3.40	2
Candidate Route T6 (Wianno Avenue and Main Street)	3.24	1
Candidate Route T7 (Wianno Avenue and Old Mill Road)	4.40	4

As shown in these tables, Candidate Route T2 (East Bay Road, Old Mill Road, and Eversource ROW #345) has a lower potential for impacts to the developed environment criteria but has the highest potential for impacts to the natural environment. Conversely, Candidate Route T6 (Wianno Avenue and Main Street) has a lower potential for impact to the natural environment criteria but has a higher potential for impacts to the developed environment criteria (ranked 5th overall) with Candidate Routes T7, T4, and T6 having nearly identical scores: 9.18, 9.40, and 9.92, respectively.

4.5.7.2 Environmental Scoring Conclusion

As presented in Table 4-11, out of the seven candidate routes evaluated, Candidate Route T1 (East Bay Road and Old Mill Road) has the lowest collective potential for impact for all the environmental criteria considered. Candidate Route T6 (Wianno Avenue and Main Street) has the second lowest collective potential for impact for all the environmental criteria considered.

4.5.8 Cost Analysis

A variety of factors were considered in the cost analysis of these Candidate Routes, including:

- **Route Length.** Route length is directly related to cost, since certain fixed costs (e.g., cost of export cable, cost of duct bank) are determined by length.
- **Substation Type.** The Company has considered both Air Insulated Substation (AIS) and Gas Insulated Substation (GIS) designs for the proposed substation, the selection of which is largely based on the acreage of available suitable land and cost considerations. A GIS design, which is more compact than AIS, comes with a cost premium related to construction. However, a GIS design can be an efficient use of space and maximizes buffering. Since both the Preferred Route and Noticed Alternative utilize the same substation site and design (GIS), the related costs are the same.
- **Land Acquisition or Easement Rights.** Since the Project will involve construction of a new onshore substation, the Company must acquire suitable land for this infrastructure. In this case, all candidate routes would utilize the same substation site, and thus related costs are the same. All Candidate Routes would also require the same Article 97 easement rights within the Dowses Beach parcel.
- **Construction Type.** Some of the Candidate Routes are located entirely within public roadway layouts along their entire length, while others contain segments that are located along existing electric transmission corridors. In general, construction of underground duct bank along existing electric transmission corridors is less costly than constructing duct bank within public roadway layouts. Some key factors that lead to cost-savings for constructing within existing electric transmission corridors include, but are not limited to, the following: (1) re-paving is not necessary along electric transmission corridors; (2) there are few or no underground utilities to relocate or navigate around, so the construction period is shorter, which reduces costs; and the costs associated with traffic management are reduced.
- **Trenchless Crossings.** Trenchless crossing techniques such as HDD and micro tunneling may be necessary based on physical constraints, environmental concerns, and the need to avoid existing infrastructure (e.g., the offshore-to-onshore transition at the landfall site, and the Route 6 crossing); these types of construction methods are more costly than simple trenching. However, all the Candidate Routes considered include the HDD at the landfall site and at the Route 6 crossing, and none include other trenchless construction, so the costs of such methodologies are the same for all routes.

- **Existing Subsurface Utility Density.** The number of existing utilities in the roadway layout can determine the available lateral and below-grade space to physically accommodate an underground duct bank. Increased utility density can complicate the construction process, resulting in greater costs. For those portions of Candidate Routes proposed within roadway layouts, the Company mapped existing subsurface utilities using publicly available data and through limited field investigations. Subsurface utilities present along the Candidate Routes considered include water, sewer, drainage, and natural gas. The Company determined that the densities of the various subsurface utilities are relatively homogeneous along all Candidate Routes and are not determinative in differentiating between the Candidate Routes in the cost analysis.

The differences in cost associated with each Candidate Route is driven by a combination of the total length of each route combined with the construction type (length within public roadway layouts or along existing electric transmission corridors). In summary, longer routes entirely within public roadway layouts have the highest associated cost. Table 4-14 provides the results of the Company's cost analysis for each Candidate Route. The Candidate Route that has the lowest associated cost and highest associated cost is highlighted in **GREEN** (lowest) and **RED** (highest), respectively.

Candidate Routes T2 and T4 have the lowest associated cost given that 40% of their routes are within existing electric transmission corridors. Of the remaining five Candidate Routes, T1 and T3 would have the same relative cost given that they are of equal length and both entirely within public roadway layouts. Candidate Route T5 would have the highest associated cost given that it is entirely within public roadway layouts and is the longest of any Candidate Route considered.

Table 4-14 Cost Analysis

Candidate Route	*Total Length*	*Length Along Public Roadway Layout*	*Length Along Electric Transmission Corridor*	*Cost Ranking*
Candidate Route T1 (Old Mill Road)	6.6	6.6	0	T – 3/4
Candidate Route T2 (Old Mill Road and Eversource ROW #345)	6.7	4.3	2.4	1
Candidate Route T3 (Main Street)	6.6	6.6	0	T – 3/4
Candidate Route T4 (Main Street and Eversource ROW #345)	7.0	4.1	2.9	2
Candidate Route T5 (South County Road)	8.3	8.3	0	7
Candidate Route T6 (Wianno Avenue and Main Street)	6.7	6.7	0	5
Candidate Route T7 (Wianno Avenue and Old Mill Road)	7.3	7.3	0	6

4.5.9 *Reliability Analysis*

The Company considered whether any of the Candidate Routes could be distinguished based on reliability. Increased length of a transmission system, in theory, could introduce additional exposure to potential faults. In this case, however, the lengths of the Candidate Routes are similar enough that route length would not result in any significant reliability difference from a system perspective. All of the Candidate Routes considered are also proposed to be located entirely underground. Underground transmission facilities may be less susceptible to weather-induced outages than overhead lines, so that factor cannot be used to distinguish between the Candidate Routes based on reliability. Accordingly, reliability was not found to be a determining factor when comparing the Candidate Routes. Reliability is also tied to a proponent's ability to successfully permit and construct a project on a predictable and efficient timeline.

4.5.10 *Public Benefits Analysis*

The Town of Barnstable is implementing a CWMP to protect the Town's coastal waters, ponds and drinking water by managing nutrient pollution from wastewater. The CWMP includes the expansion of the Town's sewer system to mitigate negative wastewater quality impacts to the regional watershed which is primarily caused by septic systems. As described in the CWMP, "The 30-year plan is comprised of three 10-year phases, predominantly focused on sewer expansion. Each phase consists of multiple individual projects that will proceed through permitting. The plan is designed to reduce nutrient pollution in embayments to a level consistent with regulatory thresholds known as Total Maximum Daily Loads (TMDLs). By reducing nutrient pollution in embayments, the plan also protects water quality in ponds, and drinking water sources. In addition to meeting water quality thresholds, the plan is designed to provide the wastewater infrastructure needed to support community economic development and affordable housing needs."[4]

The Vineyard Wind Connector 1 project and the NE Wind 1 Connector project, pursuant to HCAs between the companies and the Town of Barnstable, are working with the Town to coordinate the construction of the onshore export cables with the Town's installation of sewer infrastructure where there is overlap with the onshore export cable routes (the overlap with the Vineyard Wind Connector 1 project is referred to as the Strawberry Hill Road Sewer Expansion project). This coordination is beneficial to the Town as it reduces the potential need to disrupt local roads and neighborhoods with repeat construction activities, coordinates utility corridors, and will provide significant cost savings. The cost savings arise due to the fact that the Company will pay for pre-design investigative work and the final coating and repaving.

Although the Company has not yet entered into HCA discussions with the Town of Barnstable for the NE Wind 2 Connector to date, the Company intends to coordinate with the Town on the planned installation of municipal sewer infrastructure along the selected route for the onshore

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[4] https://barnstablewaterresources.com/comprehensive-waste-water-management-plan/

export cables which may result in similar benefits and significant cost savings for the Town. As part of the siting analysis for the Onshore Export Cable Route, the Company compared the potential for collaboration with the Town of Barnstable's CWMP along each Candidate Route considered. However, it is important to note that the Town recognizes the potential need for change and adaptation to the plan. Specifically, the Town's CWMP Financial Year 2022 (FY2022) Annual Report prepared by the Barnstable Department of Public Works, dated August 2022 states, "The Town of Barnstable continues to utilize the principle of Adaptive Management as it implements the CWMP in order to allow the Town to respond to opportunities to improve construction efficiency, reduce project costs, react to changing environmental conditions, respond to land use updates, improved technologies, future opportunities and unknowns."[5] The CWMP FY2022 Annual Report describes three updates to the 30-Year Sewer Expansion Phasing Plan and the Phase I Implementation Plan. One of these three updates being the NE Wind 1 Connector (referred to as the Park City Wind project in the CWMP FY2022 Annual Report). The NE Wind 1 Connector was not anticipated during the development of the CWMP. As a result, the Phasing Plan has been updated by the Town to show the entirety of the Preferred Route in Phase 1 of the Sewer Expansion Plan with a note that this could be further updated should the Noticed Alternative be utilized.

Figure 4-8 depicts all Candidate Routes in relation to the different phases proposed as part of the Barnstable CWMP. Currently, sewering along Main Street in Osterville is in Phase 2 of the plan, to be installed in 2031-2040. As shown on Figure 4-8, Candidate Routes T3, T4, and T5 and the Preferred Onshore Export Cable Route (Candidate Route T6) proposed for the Project present a significant opportunity to coordinate construction of the onshore export cable route with installation of sewer infrastructure within areas of Osterville proposed for sewering in Phase 2 of the CWMP. Additionally, there is also opportunity for sewer collaboration within planned Phase 1 and 3 areas along Osterville-West Barnstable Road and along Lumbert Mill Road (scheduled for FY28 and FY29; see CWMP FY2022 Annual Report, FY23 – FY 27 Capital Improvement Plan Schedule). Coordinating with the Project schedule could potentially result in years of acceleration of sewering within Osterville depending on the location and planned CWMP phase. For example, coordinating with the Project schedule would result in an almost 10-year acceleration of sewering for the downtown Osterville area, a main contributor of wastewater to the surrounding watershed. Coordination presents the opportunity to accelerate the sewer expansion program so that water quality improvements can be realized sooner than the current schedule of implementation. Table 4-15 summarizes the potential for significant public benefit along each Candidate Route. While Candidate Routes T1, T2, and T7 have limited potential public benefit based on overlap with the existing CWMP phases, these routes do have some overlap with Phases 1 and 2 of the CWMP.

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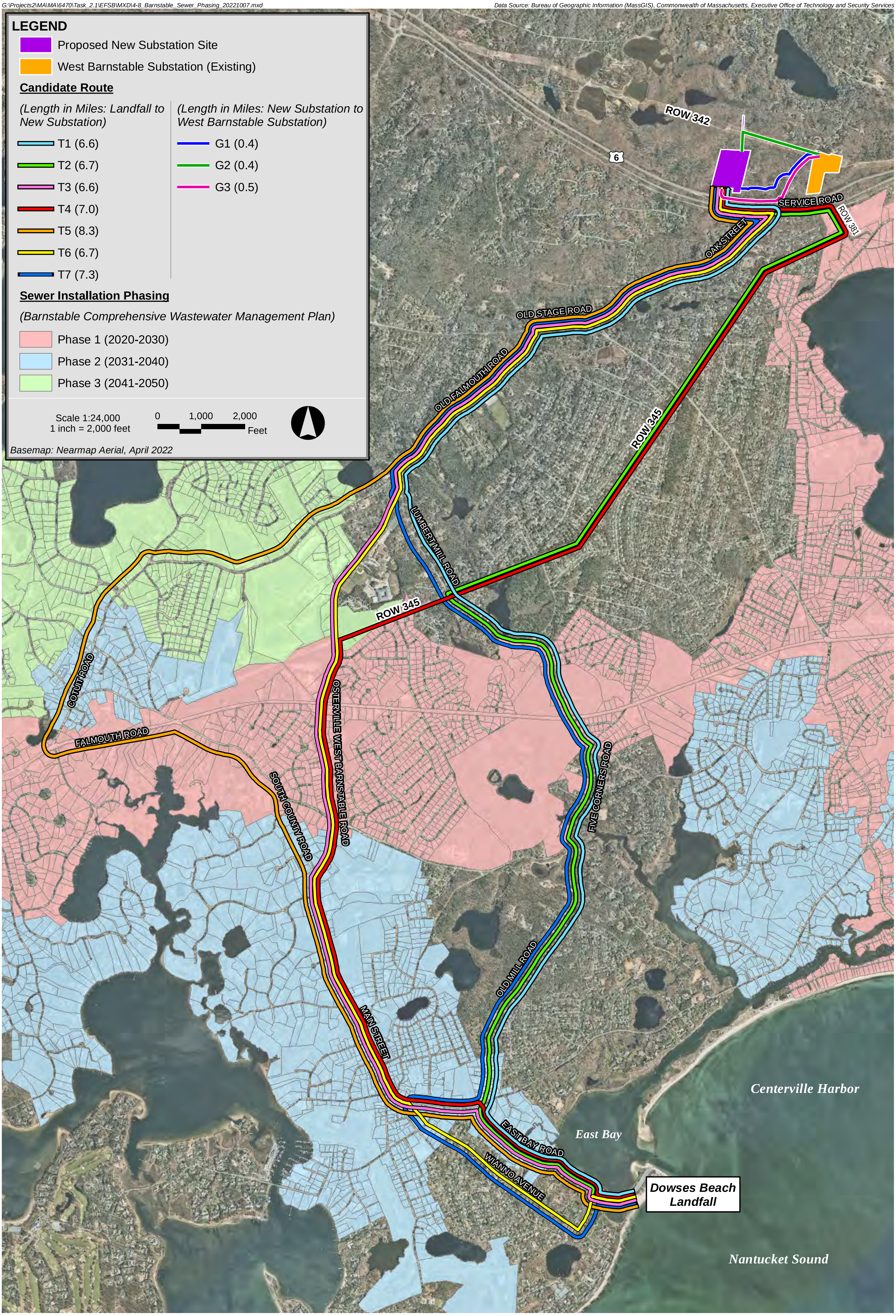
5 https://barnstablewaterresources.com/wp-content/uploads/2022/09/Barnstable_FY22-CWMP-Annual-Report.pdf



New England Wind 2 Connector Project

AVANGRID | Offshore Wind

Figure 4-8

Potential Collaboration with Barnstable Comprehensive Wastewater Management Plan - Candidate Routes

Table 4-15 Summary of Potential for Significant Public Benefits

Candidate Route	*Total Length*	*Length Along CWMP Planned Phases 1- 3*	*Percentage of Overlap*	*Potential for Significant Public Benefit*
Candidate Route T1 (Old Mill Road)	6.6	1.4	21%	No
Candidate Route T2 (Old Mill Road and Eversource ROW #345)	6.7	1.6	24%	No
Candidate Route T3 (Main Street)	6.6	3.3	50%	Yes
Candidate Route T4 (Main Street and Eversource ROW #345)	7.0	3.4	49%	Yes
Candidate Route T5 (South County Road)	8.3	5.2	63%	Yes
Candidate Route T6 (Wianno Avenue and Main Street)	6.7	2.8	42%	Yes
Candidate Route T7 (Wianno Avenue and Old Mill Road)	7.3	1.5	21%	No

As noted above, the CWMP recognizes and provides for the potential need for change and adaptation, which could include the expansion and adjustment of areas of sewer expansion. As such, the potential for sewer expansion could be further expanded to include additional areas not currently identified in the existing CWMP, (e.g., additional areas along Wianno Avenue, Osterville-West Barnstable Road with residential and/or commercial density appropriate for sewer expansion) in Phases 1, 2 and 3. Coordination between the sewer expansion program and the Project could reduce construction-related disruption to local roads and neighborhoods, coordinate utility corridors, and potentially result in significant cost savings to the Town as a result of the Company undertaking early survey and utility location work, necessary utility relocation, and final road resurfacing.

4.5.11 Selection of the Preferred Route, Noticed Alternative, and a Noticed Variation

In accordance with the Siting Board's standard of review, the Company objectively and comprehensively assessed a wide array of potential routes within the bounds of a defined study area. At the conclusion of this process, the Company selected Candidate Route T6 (Wianno Avenue and Main Street) as the Preferred Route and Candidate Route T1 (Old Mill Road) as the Noticed Alternative. Figure 1-3 shows the Preferred Route and Noticed Alternative Route. Table 4-16 provides an overview of how each Candidate Route ranked with respect to potential for environmental impacts, cost, and public benefit.

Table 4-16 Summary of Candidate Route Ranking – Environmental Impact, Cost and Potential for Significant Public Benefit

Candidate Route	*Weighted Environmental Score Ranking*	*Cost Ranking*	*Potential for Significant Public*
Candidate Route T1 (Old Mill Road)	1	T – 3/4	No
Candidate Route T2 (Old Mill Road and Eversource ROW #345)	5	1	No
Candidate Route T3 (Main Street)	4	T – 3/4	Yes
Candidate Route T4 (Main Street and Eversource ROW #345)	7	2	Yes
Candidate Route T5 (South County Road)	6	7	Yes
Candidate Route T6 (Wianno Avenue and Main Street)	2	5	Yes
Candidate Route T7 (Wianno Avenue and Old Mill Road)	3	6	No

Both the Preferred Route and the Noticed Alternative Route are of similar length and are equivalent from a cost and engineering perspective. There are some differences in potential impacts to various natural and developed environmental features along each of the routes. The Preferred Route will be within public roadway layouts that pass a greater number of businesses, residences, and aboveground historic features than the Noticed Alternative Route. The Noticed Alternative Route is located within public roadway layouts closer to the coastline (East Bay Road) for a greater distance, increasing potential impacts to wetlands resources. While there are more businesses located along the Preferred Route, the Company's current traffic impact analysis indicates that detours for the Noticed Alternative Route will be of longer distances than the detours identified thus far for the Preferred Route. The Company anticipates working with the Town and community members, including residents and business owners to minimize construction-related traffic and other impacts.

The potential opportunity to accelerate water quality improvements in Osterville by coordinating with Town sewering plans along the Preferred Route provides a compelling public-interest basis to support the selection of Candidate Route T6 (Wianno Avenue and Main Street) as the Preferred Route over the Noticed Alternative. In addition, as presented in Section 4.5.10 above, the Vineyard Wind Connector 1 project collaborated with the Town and the NE Wind 1 Connector project is collaborating with the Town on the installation of sewer infrastructure resulting in reduced road closures and millions of dollars in cost savings to the Town associated with pre-design investigative work and the final coating and repaving. The Company believes that a similar coordination for the NE Wind 2 Connector has the potential to result in similar benefits. Coordinating construction activities with the Town's sewer project has the potential to accomplish several important objectives: minimizing the overall disturbance to residents and businesses along the route; expediting immediate improvements in water quality in Osterville; and saving the Town significant costs. The Company understands that Main Street will be excavated for the installation of a gravity sewer main whether or not the NE Wind 2 Connector duct bank is installed within Main Street. Installing the onshore export cables along the Preferred Route in the areas that overlap with the Town's sewer project could result in the important public benefits listed above, whereas based on the current CWMP, the potential for similar public benefits along Noticed Alternative Route is less.

After selection of the Preferred Route and the Noticed Alternative Route, the Company included a Noticed Variation to provide maximum flexibility if the Preferred Route without variant cannot practicably be constructed. This Noticed Variation, which provides a link between the Preferred Route and Noticed Alternative, is approximately 0.3 miles long and traverses Main Street between the intersection of East Bay Road, Main Street, and Old Mill Road and the intersection of Wianno Avenue and Main Street. This Noticed Variation provides an alternate method to allow the onshore export cable route to leave the Dowses Beach Landfall area and reach the wider roadway network, should the Preferred Route not be practicable in this area.

Section 5.0 of this Petition contains a more detailed examination and comparison of the Preferred Route and the Noticed Alternative Route.

4.6 Potential Grid Interconnection Route Options

The Company has identified three grid interconnection route options for the 345-kV portion of the onshore export cable that will connect the new onshore substation to the regional electrical grid at the West Barnstable Substation. The three grid interconnection route options are described below (see Figure 1-3). Engineering review of the grid interconnection route options is ongoing. This section describes the three options under consideration for the grid interconnection route.

4.6.1 Grid Interconnection Option G1 – Fire Tower Access Road to Oak Street

Grid interconnection Option G1 is approximately 0.4 miles in length and includes installing the grid interconnection cables within the existing Fire Tower access road off Oak Street, then north along Oak Street, then into the northern portion of the West Barnstable Substation parcel. This grid interconnection option requires widening the existing Fire Tower access road to accommodate construction period activities and long-term maintenance and operation of the new onshore substation. This option would likely include work on land subject to Article 97 jurisdiction.

4.6.2 Grid Interconnection Option G2 – Eversource ROW #342

Grid interconnection Option G2 is approximately 0.4 miles in length and includes installing the grid interconnection cables to the north within the approximately 40 foot wide "panhandle" to the existing electric transmission corridor (Eversource ROW #342). The route would then turn to the east and be constructed within the existing Eversource ROW #342 corridor and connect into the northern portion of the West Barnstable Substation parcel. The “panhandle” does not include an existing access road and construction of this alternative would require tree clearing and grading on topographically challenging terrain from the new onshore substation to Eversource ROW #342. Because this option would utilize the narrow “panhandle,” grading and vegetation removal on adjacent land subject to Article 97 jurisdiction may be warranted. Additional rights would need to be obtained from Eversource to locate the grid interconnection cables within their ROW.

4.6.3 Grid Interconnection Option G3 – Route 6 State Highway Layout to Oak Street

Grid interconnection Option G3 is approximately 0.5 miles in length and includes installing the grid interconnection cables that would be constructed within the northern portion of the existing Route 6 State Highway Layout from the proposed onshore substation site to Oak Street. This route would be located within the new proposed access road up to the intersection with Oak Street and then would turn north onto Oak Street and would be located within Oak Street and into the northern portion of the West Barnstable Substation parcel. This grid interconnection option would require additional access permits and coordination with MassDOT. Clearing vegetation within the state highway layout would be required and could reduce the vegetative visual buffer between Route 6 and the new onshore substation.

Section 5.0

Environmental Considerations and Construction Methodologies

5.0 ENVIRONMENTAL CONSIDERATIONS AND CONSTRUCTION METHODOLOGIES

5.1 Introduction and Overview

This section presents the construction methodologies and environmental considerations for the Project, that is, the offshore and onshore components within state jurisdictional areas. Environmental impacts and proposed mitigation measures for the OECC are presented in Section 5.2. Section 5.3 presents a detailed examination and comparison of the Preferred Route and the Noticed Alternative Route for the onshore export cables selected by the Company. Section 5.4 describes the electric and magnetic field assessments that will be completed for the offshore and onshore export cables. Specific construction methods for the Project are presented in Section 5.5.

5.2 Environmental Considerations Along Offshore Export Cable Corridor

As described further below, the proposed offshore export cable installation methods proposed for the project are well-tested and documented as environmentally conscious operations with minimal temporary impacts to the seafloor and water quality and sediment mobilized during cable-laying is expected to resettle rapidly (within a number of hours). The Company will continue to consult with NHESP to ensure that impacts to rare species from offshore export cable installation in Nantucket Sound are avoided or minimized to the greatest extent practicable. The OECC has been aligned to avoid North Atlantic Right Whale core habitat, and the Dowses Beach Landfall Site was assessed and selected partially on the basis of avoiding eelgrass. In addition, the alignment of the OECC reflects an effort to minimize the areas of hard and complex bottom that may be affected by cable installation (see Section 5.2.4). No direct evidence of pre-Contact Native American cultural materials has been recovered during investigations to date. However, geoarchaeological analysis of geophysical and geotechnical data indicate there are stream channel, lake, and estuarine landscape features within the Project area that may have the potential to contain archaeological materials. Potential impacts to avian resources during the offshore cable installation period will be limited since the OECC avoids and minimizes impacts to sensitive or unique habitats and cable installation activities will be of short duration. The Company does not expect these impacts to be significant. The Company is not proposing any restrictions on navigation, fishing, or the placement of fixed or mobile fishing gear; however, construction and installation activities may temporarily affect navigation and/or fishing activities in the vicinity of construction and installation vessels. These impacts are localized and temporary in nature and largely limited to the Project's construction and installation period. Given that construction-period impacts will be temporary and spatially constrained, the impacts will not be significant. The Company will collaborate with BOEM and NOAA to integrate practicable technology choices in equipment, mitigation, and monitoring to meet the necessary permitting standards for protecting marine mammals within the OECC.

5.2.1 Wetlands

This section addresses coastal resource areas affected by the Project that are below mean low water (MLW). Wetland resource areas affected above MLW are discussed in Section 5.3.1. Direct impacts associated with installation of the offshore export cables are shown in Table 5-1 and are discussed in the subsequent sections.

Marine surveys described in Section 4.1.2 have enabled the Company to assess installation methods and challenges. The OECC is suitable for cable installation, but large sand waves are present in certain areas, and pre-cable-laying dredging may be needed to ensure sufficient cable burial beneath the stable seabed (see Section 5.2.1.4). Sand wave dredging is most likely to be necessary in the areas of bedforms shown in Attachment C1, although some sand waves outside these areas are possible since they are mobile features. Dredged material release (from a trailing suction hopper dredge [TSHD]) may occur within surveyed areas identified as sand waves within the OECC. Dredged material releases will not occur within areas mapped as hard bottom.

Although the priority will be to achieve sufficient cable burial depth along the entire cable alignment, if burial is unsuccessful, it may be necessary to use cable protection (described in Section 5.2.1.3) to protect the cable; the Company will seek to avoid and/or minimize the use of such cable protection, thus minimizing potential impacts.

As described in Section 5.5.1, the same family of installation equipment proposed for the NE Wind 1 Connector will be utilized for the NE Wind 2 Connector. Those pieces of equipment are highly specialized and, in some cases, only one or two may be available globally, adding uncertainty about the specific piece(s) of equipment that will be available for Project installation. The range of installation tools described in Section 5.5.1, coupled with the conservative impact assumptions in the following sections, ensures that a suite of installation equipment remains an option for the Project, providing the greatest chance of achieving target burial depth.

For all portions of the OECC, recolonization and recovery to pre-construction species assemblages is expected given the similarity of nearby habitat and species. Nearby, unimpacted seafloor will likely act as refuge area and supply a brood stock of species, which will begin recolonizing disturbed areas post-construction. Recovery timeframes and rates in a specific area depend on disturbance, sediment type, local hydrodynamics, and nearby species virility. Previous research conducted on benthic community recovery after disturbance found that recovery to pre-construction biomass and diversity values took two to four years. Other studies have observed differences in recovery rates based on sediment type, with sandy areas recovering more quickly (within 100 days of disturbance) than muddy/sand areas.

Table 5-1 Summary of Estimated OECC Impacts within State Waters

Activity	Duration of Impact (Temporary / Permanent)	Scenario 1	Scenario 2	Scenario 3
		3 Cables in OECC (acres)	2 Cables in the OECC and 1 Cable in Western Muskeget Variant (acres)	1 Cable the OECC and 2 Cables in Western Muskeget Variant (acres)
Dredging Prior to Cable Installation (area of impact)[1]	Temporary	27	30	33
Offshore Export Cable Installation (within OECC)[2,3]	Temporary	110	107	104
Use of Jack-up and/or Anchored Vessels and Vessel Grounding[4,5, 6]	Temporary	27	27	26
Offshore Export Cable Protection (within OECC)[7]	Permanent	29.4	32.5	35.6
Totals[8]		180	182	183

Notes:

1. To avoid double-counting impacts, the total area of dredging disturbance does not include the 3.3-foot-wide cable installation trench and approximately 10-foot skid/track width counted above. Dredge volumes are presented in Table 5-2.
2. Cable installation impacts assume a 13.1-foot-wide disturbance zone (3.3 ft for the cable trench and 9.8 ft for skids/tracks).
3. Some pre-pass jetting may occur along limited sections of the offshore export cable route; however, impacts will occur within the same geographical space as cable installation.
4. Anchoring estimates conservatively assume a nine-anchor spread where each anchor impacts 323 ft^2 and two spud legs that impact 108 ft^2. Depending on the scenario, the number of anchor sets range from 263 (Scenario 3) to 278 (Scenario 1). The anchoring footprint excludes anchor sweep, which cannot be quantified at this early stage in the construction planning process.
5. Vessels may be jack-up, anchored, or dynamic positioning vessels. It is estimated that each jack-up vessel would impact approximately 0.30 acres of seafloor, whereas each anchored vessel will only disturb approximately 0.19 acres, excluding anchor sweep (which cannot be quantified at this early stage in the construction planning process). Thus, the maximum seafloor disturbance is calculated assuming all vessels jack-up.
6. Grounding estimates are based on the footprint of a 492 x 164 foot vessel, with extra contingency to account for multiple groundings at the same location. A total of three groundings are assumed.
7. The estimated length of cable protection for each of the three offshore export cables is approximately 2.7 miles (4.4 km), for a total of 8.2 miles (13.2 km) for all three cables. The estimated area of cable protection in state waters assumes a width of approximately 30 feet (9 m) (the width for rock protection). It should be noted that if concrete mattresses or rock gabion bags are employed, the estimated area of impact would be reduced by approximately 2/3, reflecting the reduced width, approximately 10 feet (3 m), associated with these types of cable protection. The cable protection used in limited areas to cover offshore export cable joints or cable crossings may be wider, but the total cable protection area will remain the same.
8. To avoid double-counting impacts, the total seafloor disturbance in the OECC does not include the 3.3-foot-wide cable installation trench or approximately 10-foot skid/track width for the length of cable covered by cable protection.

5.2.1.1 Cable Installation Tool Impact Summary

A variety of tools may be used for portions of the OECC, many of which are specialized and would be used only in limited areas where specific conditions are encountered. Typical techniques include jetting techniques (e.g., jet-plow or jet trenching) or a mechanical plow, either of which would have a temporary trench disturbance up to approximately 3.3 feet (1 m) wide. In addition to the trench impact on the seafloor, the cable installation tool may move along the seafloor on skids or tracks. These skids or tracks, each up to approximately 5 feet (1.5 m) wide, will slide over the surface of the seafloor, and as such have the potential to disturb benthic habitat; however, they are not expected to dig into the seabed, and therefore the impact is expected to be minor.

Since the cable installation will affect a corridor that will pass similar habitats on adjacent sides, the area affected by cable burial or skids/tracks on the installation tool is expected to recolonize relatively quickly.

As described in Section 5.2.2.1, cable installation activities will result in some temporary elevated turbidity and localized sediment dispersion in the water column. The sediment, which is briefly fluidized by the cable installation tool, will quickly settle out of the water column.

A BOEM study published in March 2017 assessed impacts from cable-laying activities associated with construction of the Block Island Wind Farm.[1] That study identified formation of a temporary 2.7-inch-high "overspill levee" on either side of the cable placement. The overspill levee consisted of material deposited outside of the trench during jet-plow activities. The BOEM study indicated that overspill levees were observed an average distance of 12.5 feet (3.8 m) from the centerline of the trench (for an average total impact width of 25 feet) at an average thickness of 2.7 inches (7 centimeters [cm]). Importantly, the study described the overspill levees as very temporary features that were only apparent for a few days following cable installation, and that they were gone within one to two weeks. The study authors noted:

> *We attribute the ability to discern the overspill levees to surveying during jet-trenching and within a few days after the jet-trenching occurred from the mainland cable lay… We have noted that on post-lay surveys conducted 1 to 2 weeks after trenching, that overspill levees are rarely distinguishable.*[2]

Given the dynamic marine environment, the Company anticipates that the trench area, regardless of which cable installation method is used, will be quickly reworked by currents, refilling possible low portions of the trench as quickly as they would remove any potential "overspill levees". The Company is coordinating with state and federal agencies regarding benthic habitat monitoring.

The Company will prioritize the least environmentally impactful cable installation alternative(s) that is/are practicable for each segment of cable installation. In addition to selecting an appropriate tool for the site conditions, the Company will work to minimize the likelihood of insufficient cable burial. For example, if the target burial depth is not being achieved, operational modifications may be required. Subsequent attempts with a different tool (such as controlled flow excavation) may be required where engineering analysis indicates subsequent attempts may help achieve sufficient burial.

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1 James Elliott, K. Smith, D.R. Gallien, and A. Khan. 2017. *Observing Cable Laying and Particle Settlement during the Construction of the Block Island Wind Farm*. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2017-027. 225 pp.

2 James Elliott, K. Smith, D.R. Gallien, and A. Khan. 2017. Observing Cable Laying and Particle Settlement during the Construction of the Block Island Wind Farm. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2017-027. p.46.

5.2.1.2 Anchoring

Anchored cable-laying vessels may be used along the entire length of the OECC, and particularly in areas of shallow water and/or strong currents, because many portions of the OECC are too shallow for Dynamic Positioning (DP) vessels. Anchored vessels will avoid sensitive seafloor habitats to the greatest extent practicable. Contractors will be provided with a map of sensitive habitats prior to construction with areas to avoid and shall plan their mooring positions accordingly. Vessel anchors will be required to avoid known eelgrass beds and will avoid other sensitive seafloor habitats and SSU areas (e.g., hard or complex bottom) as long as it does not compromise the vessel's safety or the cable installation. Where it is considered impossible or impracticable to avoid a sensitive seafloor habitat when anchoring, use of mid-line anchor buoys will be considered, where feasible and considered safe, as a potential measure to reduce and minimize potential impacts from anchor line sweep. Mid-line buoys are placed somewhere along the length of an anchor line to support the weight of the line and hold a portion of the line off the seabed. By suspending the anchor lines, mid-line buoys prevent the line from dragging and scouring the seafloor, which minimizes anchor sweep and associated impacts. Vessel operators will determine when the use of mid-line anchor buoys is considered infeasible and/or unsafe.

The Company is committed to avoiding anchoring except where necessary. The discussion below presents a conservative estimate of potential anchoring impacts.

Project engineers estimate approximately 323 square feet (ft^2) (30 m^2) of disturbance from each anchor (assuming an approximately 10-ton anchor), such that a vessel equipped with nine anchors would disturb approximately 2,900 ft^2 (270 m^2) per each anchoring set. A nine-point anchor spread provides greater force on the cable burial tool than a spread with fewer anchors, enabling greater burial depth, and the assumptions herein include a larger anchor to accommodate larger installation vessels. In addition, anchored vessels may deploy up to two spud legs at each anchoring location to secure the cable-laying vessel while its anchors are being repositioned. Each deployment of two spuds would affect approximately 108 ft^2 (10 m^2) of seafloor, making the total disturbance per anchoring set approximately 3,008 ft^2 (280 m^2). Potential impacts from anchoring are summarized in Table 5-1. Anchoring will not be performed in eelgrass. To install the cable close to shore using tools that are best optimized to achieve sufficient cable burial, the cable laying vessel may temporarily ground nearshore, impacting an area of up to 2.4 acres (9,750 m^2) per cable. Any anchoring, spud leg deployment, or grounding will occur within surveyed area of the OECC.

5.2.1.3 Cable Protection

The Company's priority will be to achieve adequate burial depth of the three offshore export cables and to avoid the need for any cable protection. However, achieving adequate burial depth may be unsuccessful in areas where the seafloor is composed of consolidated materials, making complete avoidance of cable protection measures infeasible. If sufficient burial depth cannot be achieved, cable protection methods may be necessary. The Company will seek to avoid and/or minimize the use of such cable protections, and cable protection will only be used where necessary, thus minimizing potential impacts. If needed, the methods for cable protection will be:

- **Rock placement:** Rock placement would involve the laying of rocks on top of the cable to provide protection. Rock would be installed in a controlled and accurate manner on the seafloor using a dynamic positioning fall-type vessel. Rocks used for cable protection would be sized for site-specific conditions; where feasible, this protection would consist of rocks 2.5 inches (6.4 cm) in diameter or larger. Should rock placement be the required methodology of cable protection, a greater width of approximately 30 feet (9 m) would be needed to account for sideslopes.

- **Gabion rock bags:** This method involves rocks encased in a net material (e.g., a polyester net) that can be accurately deployed on top of the cable and subsequently recovered, if necessary, for temporary or permanent cable protection. Each bag would be equipped with a single lifting point to enable its accurate and efficient deployment and recovery. These rock bags have been deployed in other high-energy marine environments such as the North Sea, and the net material used for the rock bags would be designed to have an approximately 50-year lifespan. Project engineers have determined that cable protection of approximately 10 feet (3 m) wide would be sufficient to protect the cable.

- **Concrete mattresses:** These “mattresses” are prefabricated flexible concrete coverings consisting of high-strength concrete profiled blocks cast around a mesh material (e.g., ultra-violet stabilized polypropylene rope) that holds the blocks together. This mattress construction provides flexibility, enabling the mattress to settle over the contours of the cable and seafloor. If needed, the mesh in this application would be designed to have a decades-long lifespan. Project engineers have determined that cable protection of approximately 10 feet (3 m) wide would be sufficient to protect the cable.

- **Half-shell pipes or similar (only for cable crossings or where the cable is laid on the seafloor):** These products are made from composite materials and/or cast iron with suitable corrosion protection and would be fixed around the cable to provide mechanical protection. Half-shell pipes or similar solutions are not used for remedial cable protection but could be used at cable crossings or where cable must be laid on the surface of the seabed. The half-shell pipes do not ensure protection from damage due to fishing trawls or anchor drags (although they would offer some protection, they would not prevent damage).

The Company intends to avoid or minimize the need for cable protection to the greatest extent feasible through careful site assessment and thoughtful selection of the most appropriate cable installation tool to achieve sufficient burial. Areas requiring cable protection, if any, will be the only locations where post-installation conditions at the seafloor may permanently differ from existing conditions; however, such cable protection would only be expected within hard bottom areas, and the cable protection itself would function as hard bottom. Estimated impact calculations are presented in Table 5-1.

5.2.1.4 Sand Wave Dredging

As described in Section 4.1.2, some portions of Nantucket Sound have areas of complex bottom composed of active sand waves, which the Company has assessed over multiple seasons of marine surveys. Sand waves are dynamic features with changing morphology that move across the seafloor. As a result, where sand waves are large, it may be necessary to perform pre-cable-laying dredging to remove the tops of these features along the cable alignment to ensure sufficient burial within the underlying stable seabed.

The stretch of the OECC where sand wave dredging may be needed is largely coincident with areas mapped as complex bottom as shown in Attachment C1. It is important to note that dredging, if performed, would not occur along the entire stretch where sand waves may be present; rather, dredging would only be performed to remove the tops of each sand wave and only to the extent needed at the time of construction to ensure sufficient burial within the stable seabed. Dredging will be performed as close in time to cable installation as possible to avoid mobile sand waves recovering the dredged area.

Where dredging is necessary, it is conservatively assumed that the dredged area will typically be approximately 50 feet (15 m) wide at the bottom (to allow for equipment maneuverability) with approximately 1:3 sideslopes for each of the three cables. The depth of dredging will vary with the height of sand waves, and hence the dimensions of the sideslopes will likewise vary with the depth of dredging and sediment conditions. This dredge corridor includes the up to 3.3-foot-wide (1-m-wide) cable installation trench and the up to 10-foot-wide (3-m-wide) temporary disturbance zone from the tracks or skids of the cable installation equipment.

As previously presented in Table 5-1, for all three offshore export cables combined, the Company's engineers anticipate that the area impacted by dredging in state waters would be up to approximately 33 acres (inclusive of sideslopes but excluding the overlapping impacts from trenching and tool skids). As presented in Table 5-2 below, the estimated volume of dredged material in state waters is up to approximately 131,100 cubic yards. Actual dredge volumes will depend on the final cable alignments and cable installation method; a cable installation method that can achieve a deeper burial depth will require less dredging.

Table 5-2 Summary of OECC Characteristics and Dredge Volumes in State Waters

	State Waters
Offshore Export Cable Corridor	**miles**
Maximum Length of OECC[1]	21.9
Maximum Length of OECC[1] using the Western Muskeget Variant	19.6
Offshore Export Cables	**miles**
Maximum length of each cable within the OECC[2]	23.0
Maximum length of each cable within the OECC using the Western Muskeget Variant	20.7
Dredge Volume	**cy**
Scenario 1 – 3 cables in the OECC	91,500
Scenario 2 – 2 cables in the OECC and 1 cable in Western Muskeget Variant	124,900
Scenario 3 – 1 cable in the OECC and 2 cables in Western Muskeget Variant	131,100

Notes:

1. The length of the OECC is measured from the offshore edge of the corridor at the Landfall Site within state waters.
2. The offshore export cable length includes a 5% allowance for micro-siting within the OECC.

With respect to potential habitat impacts, because sand wave areas are intrinsically dynamic and unstable, those areas are typically sub-optimal areas for benthic organisms.

Dredging could be accomplished by several techniques. European offshore wind projects have typically used a TSHD. A TSHD vessel contains one or more drag arms that extend from the vessel, rest on the seafloor, and suction up sediments. Dredges of this type are also commonly used in the U.S. for channel maintenance, beach nourishment, and other uses. For the NE Wind 2 Connector, a TSHD would be used to remove enough of the top of a sand wave to allow subsequent cable installation within the stable seabed. Where a TSHD is used, it is anticipated that the TSHD would dredge along the cable alignment until the hopper is filled to an appropriate capacity, then the TSHD would sail several hundred meters away and deposit the dredged material within an area of the surveyed corridor that also contains sand waves.

A second dredging technique involves jetting by controlled flow excavation. Controlled flow excavation uses a pressurized stream of water to push sediments to the side. The controlled flow excavation tool draws in seawater from the sides and then propels the water out from a vertical downpipe at a specified pressure and volume. The downpipe is positioned over the cable alignment, enabling the stream of water to fluidize the sediments around the cable, which allows the cable to settle into the trench. This process causes the top layer of sediments to be sidecast to either side of the trench; therefore, controlled flow excavation would both remove the top of the sand wave and bury the cable. Typically, a number of passes are required to lower the cable to the minimum sufficient burial depth.

A TSHD can be used in sand waves of most sizes, whereas the controlled flow excavation technique is most likely to be used in areas where sand waves are less than 6.6 feet (2 m) high. Therefore, the sand wave dredging could be accomplished entirely by the TSHD on its own, or the dredging could be accomplished by a combination of controlled flow excavation and TSHD, where controlled flow excavation would be used in smaller sand waves and the TSHD would be used to remove the larger sand waves.

No dredging is proposed in hard-bottom areas (e.g., boulders, cobble bottom). The only dredging proposed for the Project is where large sand waves, features that can be considered “complex” due to their bathymetric relief, necessitate pre-cable-laying dredging to ensure that adequate burial depth can be achieved. As noted previously, sand waves, although they do provide bathymetric variability, are seafloor features that change quickly and hence do not enable the formation of complex benthic communities.

5.2.2 Water Quality and Sediment Dispersion Modeling

Installation of the proposed offshore export cables will have localized and temporary effects on water quality, primarily related to trenching and limited dredging where sand waves are encountered. Temporary sediment disturbance associated with Project activities will cause minor, short-term, and localized increases in total suspended solids (TSS) along the OECC. Jet-plowing and minimizing the amount of sand wave dredging will minimize sediment disturbance.

Furthermore, the buried offshore export will have no thermal effect on the water column. As documented in the Rhode Island Ocean Special Area Management Plan, the effect of heat from cables on sediments or water table is negligible:

> *Studies on the effects of radiated heat from buried cables have found a rise in temperature directly above the cables of 0.19°C (0.342° F) and an increase in the temperature of seawater of 0.000006°C (0.0000108°F). This is not believed to be significant enough to be detectable against natural fluctuations.*

5.2.2.1 Sediment Dispersion Modeling

To assess the potential impacts of cable installation activities, a sediment dispersion modeling assessment was carried out through two interconnected modeling tasks:

1. Development of a three-dimensional hydrodynamic model application of a domain encompassing Project activities using the HYDROMAP modeling system; and
2. Simulations of the suspended sediment fate and transport (including evaluation of seabed deposition and suspended sediment plumes) using the SSFATE modeling system to simulate installation activities. Velocity fields developed using the HYDROMAP model are used as the primary forcing for SSFATE.

The modeling was performed to characterize the effects associated with the offshore cable installation activities. The effects were quantified in terms of the above-ambient TSS concentrations as well as seabed deposition of sediments suspended in the water column during cable installation activities.

Details regarding the models, their applications, and the results of the calculations are provided in Attachment E and summarized here. As described in Sections 5.2.1 and 5.5.1, several possible techniques may be used for cable installation, though the majority of the offshore export cables are expected to be installed using jetting techniques (e.g., jet plow or jet trenching) or mechanical plow. In addition, within the OECC, dredging may be required prior to cable installation to remove the upper portions of sand waves (see Section 5.2.1.4). Installation methodologies that were modeled in the sediment dispersion study include:

- **Trailing Suction Hopper Dredge (TSHD):** Suction dredging through a drag arm near the seabed, overflow of sediment-laden waters from a hopper and disposal of sediments from the hopper. Use of a TSHD was modeled for removal of all sand wave sizes where dredging is needed.

- **Limited TSHD:** This method is the same as THSD; the TSHD, however, is "Limited" in that it is only applied to larger (greater than 6.6-foot-tall [2-m-tall]) sand waves where dredging is needed.

- **Cable Installation:** Cable installation is accomplished by jetting techniques (e.g., jet plow, jet trenching, or similar) in areas where sand waves do not exist or have been cleared.

- **Cable Installation Aided by Jetting:** Cable installation is accomplished as described above; however, this method includes additional jetting by controlled flow excavation in areas of small sand waves.

- **Cable Installation using Vertical Injector:** Cable installation is accomplished in areas with or without sand waves through the use of the vertical injector tool (essentially a type of jet plow), which is a high-volume low-pressure water jetting tool that uses directed water jets to fluidize the seabed and lower the cable via the integral depressor to the bottom of the fluidized trench.

The modeled scenarios include a representative offshore export cable route for the full length of the OECC and representative sections of cable routes within the OECC. To aid federal permitting, the model scenarios presented in Attachment E also include a representative inter-array cable route within the Southern Wind Development Area (SWDA) – this installation will occur entirely outside of Massachusetts waters and will not significantly impact state waters; it is therefore outside the scope of the Siting Board's review, although the results of the analysis are included in Attachment E. The model scenarios include:

- OECC sand wave dredging by TSHD;

- OECC sand wave dredging by Limited TSHD;
- OECC cable installation with typical burial installation parameters;
- OECC cable installation aided by jetting with typical burial installation parameters;
- OECC section of cable installation with vertical injector with typical burial installation parameters; and
- OECC section of cable installation along the landfall approach with typical burial installation parameters.

Simulations of sand wave dredging using a TSHD and associated disposal activities along the OECC show that above-ambient TSS originating from the source is intermittent along the route, matching the intermittent need for dredging. Above-ambient TSS concentrations may be present throughout the entire water column since sediments are released at or near the water surface. Above-ambient TSS concentrations of 10 mg/L extend up to 10 miles (16 km) and 5.3 miles (8.5 km) from the area of activity for the TSHD and limited TSHD model scenarios, respectively; however, these concentrations persist for less than six hours for TSHD activities and for less than four hours for limited TSHD activities. Figures 25 through 30 in Attachment E provide the modeled TSS concentrations for simulations of sand wave dredging using a TSHD.

Simulations of several possible cable installation methods using typical installation parameters within the OECC predict a plume that is localized to the seabed. The plume may be located in the lower approximately 20 feet (6 m) of the water column, which is typically a fraction of the water column given water depths in the area; however, in shallow waters, the plume may occupy the entire water column. Simulations of cable installation found that above-ambient TSS greater than 10 mg/L and sediment deposition over 1 millimeter (mm) (0.04 inches) stayed closer to the cable alignment as compared to the dredging footprints; this is due to the fact that sediments are introduced to the water column closer to the seabed. Above-ambient TSS concentrations greater than 10 mg/L typically stay within approximately 650 feet (200 m) of the alignment and extend up to a maximum distance of approximately 1.3 miles (2.1 km). The spatial extent of above-ambient TSS concentrations decreases at higher concentration thresholds, meaning pockets of higher above-ambient TSS concentrations remain closer to the sediment-disturbing activity. Sediment deposition over 1 mm thick is predicted to remain within 330 feet (100 m) of the route alignment.

Above-ambient TSS concentrations stemming from cable installation for the various model scenarios remain relatively close to the cable alignment, are constrained to the bottom of the water column, and are short-lived. Above-ambient TSS concentrations substantially dissipate within one to two hours and fully dissipate in less than four hours for most of the model scenarios. Similarly, for the vertical injector model scenario, above-ambient TSS concentrations substantially dissipate within one to two hours and fully dissipate within six hours, likely due to the relatively slower installation rate and deeper trench (greater volume disturbed per unit length). Figures 32 through 46 in Attachment E provide the modeled TSS concentrations for simulations of cable installation. Ancillary cable installation activities such as boulder relocation and the pre-lay grapnel run could also generate some TSS, but impacts are expected to be less than typical cable installation.

Given the coarseness of sediment along the OECC, bioassay testing is not necessary. This kind of testing, which is used to assess the potential for biological impacts from suspension of contaminated sediments, is more appropriate for finer-grained sediments where historical contamination may be evident.

In summary:

- For sand wave dredging:
  - TSS originating from the source is intermittent along the route, matching the intermittent need for dredging and dredged material release.
    - Above-ambient TSS concentrations may be present throughout the entire water column since sediments are released at or near the water surface.
  - Above-ambient TSS concentrations of 10 mg/L extend up to 10 miles (16 km) and 5.3 miles (8.5 km) from the area of activity for the TSHD and limited TSHD model scenarios, respectively; however, these concentrations persist for less than six hours for TSHD activities and for less than four hours for limited TSHD.

- For cable installation activities:
  - Above-ambient TSS concentrations substantially dissipate within one to two hours and fully dissipate in less than four hours for most model scenarios (six hours for the vertical injector scenario).
    - Above-ambient TSS concentrations greater than 10 mg/L typically stay within approximately 650 feet (200 m) of the alignment, extending up to a maximum distance of approximately 1.3 miles (2.1 km).
  - The suspended sediment plume is localized to the seabed and may be located in the lower approximately 20 feet (6 m) of the water column.
    - Sediment deposition over 1 mm thick is predicted to remain within 330 feet (100 m) of the route alignment.

Simulations of typical cable installation parameters (without sand wave removal) in the OECC indicated that deposition of 1 mm (0.04 in) or greater (i.e., the threshold of concern for demersal eggs) was constrained to within approximately 330 feet (100 m) from the route centerline and maximum deposition was typically less than 5 mm (0.20 in), though there was a small isolated area associated with the vertical injector model scenario with deposition between 5 to 10 mm (0.2 to 0.4 in). At this deposition thickness, there are limited areas with potential temporary negative impacts to demersal eggs and species of similar sensitivity.

5.2.2.2 Offshore Vessel Refueling and Spill Prevention

A variety of offshore vessels will be used for Project construction and will require refueling. The environmental risks associated with such refueling are small and will be minimized using appropriate best practices, compliance with all applicable requirements, and effective advanced planning. Smaller vessels will likely refuel in port. Offshore refueling of large installation vessels may occur. The method of refueling will be dependent on the final selection of contractors, their vessel spread, the type of fuel used by those vessels, and fuel availability. In the case of offshore refueling, a Jones Act-compliant bunker barge or vessel would likely be used. The offshore refueling process would consist of the following three steps: (1) mooring the bunker barge/vessel to the installation vessel; (2) pumping the fuel from the bunker barge/vessel to the installation vessel; and (3) de-mooring the bunker barge/vessel. Vessels may need to travel to a more sheltered location (i.e., an area with more quiescent seas) before refueling can take place.

Vessel fuel spills are not expected. Nonetheless, the Company is drafting an Oil Spill Response Plan (OSRP) in accordance with the requirements of 30 Code of Federal Regulations (CFR) Part 254, Subpart B, Oil Spill Response Plans for Outer Continental Shelf Facilities that will pertain to construction activities. In accordance with 30 CFR 254, the OSRP will demonstrate that the Company can respond effectively in the unlikely event that oil is discharged from the Project. The OSRP will provide for rapid spill response, clean up, and other measures that would minimize any potential impact to affected resources from spills or accidental releases, including spills resulting from catastrophic events. Routine training and exercises regarding the content of the OSRP will be carried out regularly to prepare personnel to respond to emergencies should they occur. Secondary containment systems will be provided at operating areas more prone to spillage.

In the event of a spill or incident, the vessels' and construction firms' plans will be used to contain and/or stop an incident in compliance with requirements of the Project's OSRP. As such, these plans will be checked and reviewed by the Company to make sure that they are in accordance with regulatory and Project requirements and that a spill plan is in place.

5.2.3 Rare Species

The Massachusetts NHESP has mapped all state waters within Nantucket Sound as priority habitat of state-listed rare species for certain shorebirds such as piping plover, least tern, and roseate tern (Massachusetts Natural Heritage Atlas, 14th Edition, 2017). As a result, the OECC will necessarily cross priority habitat within state waters. In accordance with the MESA (321 CMR 10.14), the Company is consulting with NHESP to ensure that impacts to rare species from offshore export cable installation in Nantucket Sound are avoided or minimized to greatest extent practicable.

5.2.4 SSU Areas

As described in Section 4.1.1, the Massachusetts OMP identifies the following SSU areas for cable projects: (1) core habitat of the North Atlantic right whale, fin, and humpback whales; (2) hard/complex seafloor; (3) eelgrass; and (4) intertidal flats. For this Project, North Atlantic Right Whale core habitat, hard/complex seafloor, and eelgrass are all mapped within the general Project area; core habitat for other whale species is not present in the Project area. The OECC has been aligned to avoid North Atlantic Right Whale core habitat, and the Landfall Site was assessed and selected partially on the basis of avoiding eelgrass.

In addition, the alignment of the OECC reflects an effort to minimize the areas of hard and complex bottom that may be affected by cable installation. As described above, an installation corridor has been identified to provide some flexibility for final cable alignments. The installation corridor is narrower where necessary to avoid features such as SSU areas (e.g., hard/complex bottom). Nonetheless, some areas of mapped hard/complex bottom cannot be avoided.

Section 6.4.5 describes Project consistency with the Massachusetts OMP, including an expanded discussion of management standards applicable to SSU areas as well as efforts to avoid and minimize impacts.

5.2.5 Marine Archaeology

The Company has conducted a marine archaeological assessment in accordance with BOEM's requirements that will assist in avoiding and mitigating potential adverse effects to significant cultural resources resulting from the Project. Survey activities took place over multiple seasons from 2016 to 2020, with the 2020 survey season extending into February 2021. The initial two survey seasons in 2016 and 2017 were used for reconnaissance, feasibility assessment of testing methods, and site characterization. During these initial surveys, single survey track lines along selected alignments were surveyed to examine potential corridors, and additional survey lines were employed in SSU areas covering approximately 156.5 nautical miles (290 km), with 92 nautical miles (171 km) acquired in the present OECC. During the 2018 survey, a comprehensive survey was conducted along the OECC as well as other OECC options that encompassed 2,878 nautical miles (5,330 km), with 1,886 nautical miles (3,492 km) collected in the present OECC. During the 2020 to 2021 survey, additional survey lines were employed to complement the 2018 surveys that were comprised of 1,413 additional nautical miles (2,617 km).

Archival and documentary research and field investigations were conducted as part of the cultural resource examination. Background research included review of historical documents, previous research reports, shipwreck inventories, secondary sources, and historical map analysis. Much of this research was conducted utilizing material from the archives of the MBUAR.

Field investigations conducted in 2017, 2018, and 2020 included high-resolution geophysical surveys utilizing magnetometer, side-scan sonar, shallow and medium penetration sub-bottom profilers, and a multibeam echosounder. Geophysical data collected were analyzed for both materials of pre-contact and historical origin that might be affected by Project activities. Geotechnical explorations, bottom grabs, CPTs, bores, and/or vibracores were conducted. The geotechnical surveys provided information on the nature of the Pleistocene/Holocene interface (ravinement surface), geomorphological landscape features, and provided material for sample radiocarbon dating. Geotechnical data also provide general verification of the geophysical interpretations and data throughout the OECC.

Archaeological investigations of the OECC (within the Nantucket Sound Traditional Cultural Property) have recovered no pre-Contact Native American cultural materials to date. However, geoarchaeological analysis of geophysical and geotechnical data indicate there are ancient stream channel, lake, pond, and estuarine landscape features within the Project area that may have the potential to contain archaeological materials. Geotechnical ground-truthing of some of these features provided needed data on their actual physical make-up and, in some instances, their age and depositional origin. Together, the geophysical and geotechnical investigation indicate that throughout much of the OECC, there is little potential for submerged cultural resources. This is due to the general lack of preserved former terrestrial landscape or landform features. Areas where such preserved former terrestrial landscape or landform features exist make up a small percentage of the overall Project area. As the submerged ancient landforms are scattered throughout the Project area, avoidance of these features will likely not be possible, and a preliminary mitigation proposal is being included with the marine archaeological resources assessment.

Additionally, a single potential shipwreck site was identified just outside state waters in a federal portion of the OECC; this site will be avoided and no potential impacts are expected. Mitigation measures, as necessary, will be further developed and finalized through the NEPA process, with MBUAR and MHC participating, along with Tribal representatives and other consulting parties.

Offshore geotechnical work is only conducted in areas already reviewed and cleared for cultural resources. Any unanticipated discoveries of cultural resources would be managed in accordance with an unanticipated discoveries plan that will be developed through the NEPA process, with MBUAR and MHC participating.

5.2.6 Offshore Avian Resources

Some marine birds may be temporarily disturbed by vessels engaged in construction activities, which may lead to temporary displacement during cable installation. However, the duration of cable installation activities is temporary and short-term in any particular location, and most birds are likely habituated to vessel traffic in the Project area and specifically Muskeget Channel. There is a small possibility of collision with lighted vessels during construction in low-visibility conditions. Mitigation measures will reduce any impacts to insignificant levels because most birds, with the exception of gulls, are less likely to be attracted to vessels during fair weather conditions. Because of the limited exposure, short-term duration of the proposed activities, and low behavioral vulnerability, population-level impacts are expected to be unlikely for coastal and marine birds.

In addition to the slight potential for bird collisions with vessels, there may be temporary disruption to limited areas where such species forage. These potential impacts will be limited since the OECC avoids and minimizes impacts to sensitive or unique habitats and cable installation activities will be of short duration. The Company does not expect these impacts to be significant.

Protected habitat for roseate terns is mapped within Nantucket Sound. Roseate terns, particularly those nesting in southern New England and the Gulf of Maine, are reliant on sand lance as their primary food source. Roseate terns only dive about 20 inches below the surface to catch sand lance, and hunt in the shallows rather than in deeper waters where cables will be predominantly laid. The sediment dispersion modeling study of dredging and cable installation demonstrates that suspended sediments in Muskeget Channel will be temporary and localized (see Section 5.2.2.1). Excess suspended sediments at any given point are only present for a short duration (typically less than six hours, and only one to two hours for cable installation) and will only occupy the bottom few meters of the water column during and after cable installation. These concentrations and durations of exposure from suspended sediments are below those causing sub-lethal or lethal effects to fish and benthic organisms, including sand lance. Accordingly, suspension of sediments from dredging and cable installation operations are expected to have little to no effect on mobile organisms and many burrowing invertebrates.

As roseate terns generally feed by shallow plunge-diving or surface-dipping, temporary increased turbidity in the bottom few meters of the water column caused by offshore export cable installation is unlikely to adversely affect foraging behavior or efficiency. Furthermore, of the two sand lance species most prevalent in the region (American sand lance [*Ammodytes americanus*] and Northern sand lance [*A. dubius*]), americanus is more likely to occupy nearshore, shallow habitats (less than 65 feet [20 m] but often less than 6.5 feet [2 m]) outside the deeper parts of the channel where cables will be installed. This predicted shallower distribution of americanus sand lance matches the observed distribution of breeding and staging terns in the area, which appear to spend most of their time foraging close to the shores of Tuckernut and Muskeget Island and surrounding shoals, not in the deeper waters of the Muskeget Channel itself.

In summary, roseate terns are expected to have only temporary and localized exposure to offshore export cable installation activities.

5.2.7 Fish and Fisheries Resources

The Project has been and continues to be designed to avoid and minimize impacts, including impacts to fish and fisheries resources. The alignment of the OECC is intended to minimize impacts to fish and fishing, while enabling the delivery of clean renewable energy to the electrical grid. Measures that have been taken to site the Project, while minimizing impacts, include, but are not limited to:

- Routing of offshore export cables to avoid sensitive habitats used by fish to the greatest degree possible, including routing of the cable to avoid all eelgrass (see Section 6.4.5 for a discussion of consistency with the Massachusetts OMP);

- Consultation with commercial and recreational fisherman on the location of the cables;
- Prioritization of cable burial to reduce impacts to fishing during Project operations; and
- Implementation of a Fisheries Communications Plan (FCP), including the use of Fisheries Liaisons and multiple Fisheries Representatives, before, during, and after cable installation (see Attachment D for a draft FCP).

The Company has leveraged and is continuing to build on relationships with fishermen and the broader fishing community that were cultivated by its predecessors and affiliates since 2010, and has had direct outreach with scores of individual fishermen in the region to understand, as fully as possible, historic, current, and potential fisheries within the affected area. The Company has also been actively consulting with the MA Fishery Working Group, NE Fishery Management Council Habitat Committee, and various local MA fishing alliances and partnerships. The Company has hired several fishery representatives, including a representative fisherman on Martha's Vineyard, who serves the fisheries' interest and serves as a liaison between the Company and the local fishing community.

Close coordination with fixed-gear fisheries will be necessary prior to construction to ensure fishermen are not placing gear along the cable alignments at the time construction activities begin in a particular section of the route. Although bottom trawl gear typically interacts with the seafloor, target burial depths for the cables will allow for safe deployment of such gear immediately after cable installation. Should the Project not be able to achieve target burial depth in certain areas, cable protection may be required. In such cases, it will be designed to minimize impacts to fishing gear, when possible, and fishermen will be informed of the areas where protection is used.

To further avoid and minimize impacts to commercial fishing activities, the Company will implement a comprehensive communications plan with the various port authorities, federal, state, and local authorities, and other key stakeholders, including recreational fishermen and boaters, commercial fishermen, harbormasters, the Northeast Marine Pilots Association, and other port operators.

5.2.8 Marine Mammals

Marine mammal species that are likely to occur in the vicinity of the OECC include the North Atlantic Right Whale (*Eubalaena glacialis*), Humpback Whale (*Megaptera novaeangliae*), Fin Whale (*Balaenoptera physalus physalus*), Sei Whale (*Balaenoptera borealis*), Minke Whale (*Balaenoptera acutorostrata acutorostrata*), Long-Finned Pilot Whale, Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*), Short-Beaked Common Dolphin, Bottlenose Dolphin (*Tursiops truncates*), Western North Atlantic Offshore Stock, Harbor Porpoise (*Phocoena phocoena*), Harbor Seal (*Phoca vitulina concolor*), and Gray Seal (*Halichoerus grypus*). These and other marine mammals that may infrequently occur near the OECC during construction could be exposed to temporary stressors such as noise, increased vessel traffic, and equipment in the water that may result in short-term, localized disturbance of individuals.

Recognizing the possibility of these temporary impacts, the Company will collaborate with BOEM and NOAA to integrate practicable technology choices in equipment, mitigation, and monitoring to meet the necessary standards for permitting and species protection. BMPs to avoid and minimize impacts to marine mammals, as well as any mitigation for unavoidable impacts, will be integrated and applied to construction and installation to meet the required standards of applicable statutes, regulations, and policies in collaboration with implementing agencies. Certain BMPs or mitigation measures that may be individually practicable may not be practicable in concert. Thus, a suite of measures will be developed as part of the permitting processes to ensure efficacy and practicability of the mitigation as an integrated whole.

The Company will adhere to legally mandated speed, approach, and other requirements for North Atlantic Right Whale in the offshore Project area. As safe and practicable, NOAA's vessel strike guidance will also be implemented. Technology used to prevent harm to marine mammals from activities associated with installation and operation the Project may include, but is not limited to, passive acoustic monitoring recorders and thermal cameras.

These measures will be refined throughout the permitting process.

5.2.9 Noise

During offshore export cable installation, potential acoustic impacts would consist of vessel noise produced during transit to and from ports as well as the vessel noise produced during cable installation. The primary source of noise during offshore export cable installation will come from the ships' engines.

Marine mammals in the Project area are regularly subjected to commercial shipping noise and would potentially be habituated to vessel noise as a result of this exposure.[3] For example, North Atlantic Right Whales are known to continue to feed in Cape Cod Bay despite disturbance from passing vessels[4], indicating some level of habituation to the sound levels of local traffic. This habituation may also apply to sea turtles and fish. As noise from vessel traffic associated with construction is likely to be similar to background vessel traffic noise, additional vessel noise risk to marine mammals and sea turtles would be low. Furthermore, construction activities will be temporary and short-term in nature, especially for cable-laying, which typically involves continuous movement as the cable is installed along the route. Cable installation is expected to progress at a rate ranging from 100-500 meters/hour (well under 1 knot).

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3 BOEM. 2014. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS EIS/EIA BOEM 2014-603.

4 Brown, M. W., & Marx, M. K. (2000). Surveillance, monitoring, and management of North Atlantic right whales, Eubalaena glacialis, in Cape Cod Bay, Massachusetts: January to mid-May, 2000. Final Report submitted to Division of Marine Fisheries, Department of Fisheries, Wildlife and Environmental Law Enforcement, Boston, Massachusetts. Contract No. SCFWE3000-8365027.

NOAA has established acoustic guidelines for marine mammals. The Company will comply with those guidelines. NOAA has not established acoustic guidelines for sea turtles in the Project area. However, it is believed that sea turtles are far less sensitive to sound than marine mammals, and therefore measures put in place to minimize impacts for marine mammals are more stringent than those required for sea turtles and other animals.

Mitigation of noise impacts specific to activities in federal waters, such as pile-driving activities associated with installation of WTGs, will be comprehensively and specifically addressed through federal review processes. The Company anticipates that mitigation of noise associated with pile-driving in federal waters may include Time of Year (TOY) restrictions, dampening measures, and/or visual monitoring efforts and will include Passive Acoustic Monitoring (PAM).[5]

In addition, monitoring for marine mammals and turtles, and associated setbacks and speed-regulation procedures, will reduce the sound level of ships when in proximity to marine mammals and turtles, thus mitigating exposure of those species to engine noise.

The Company will follow reporting requirements as part of monitoring and mitigation plans.

5.2.10 Air Quality

Offshore Project-related emissions are primarily from internal combustion engines, including marine diesel engines, diesel engines on construction equipment, and diesel generators. While the specifics vary by engine type, emissions are generally minimized by ensuring complete combustion to avoid formation of carbon monoxide (CO), particulate matter (PM), and volatile organic compounds (VOC) and by controlling mixing of fuel and oxygen in the combustion process to avoid “hot spots” that generate nitrogen oxides (NOx). Engine manufacturers will optimize the combustion process to avoid incomplete combustion and avoid “hot-spots.” These optimization steps will differ from engine to engine and can include changes to “fuel injection timing, pressure, and rate (rate shaping), fuel nozzle flow area, exhaust valve timing, and cylinder compression volume.” Controls can also include the use of water injection and exhaust gas recirculation to cool the combustion temperature.

The Project will minimize sulfur dioxide (SO_2) and PM emissions through the use of clean, low-sulfur fuels in compliance with the air pollution requirements detailed in this section. Annex VI of the International Maritime Organization’s International Convention for the Prevention of Pollution from Ships (MARPOL) treaty is the main international treaty that addresses air pollution from marine vessels. In the U.S., MARPOL Annex VI is implemented through the *Act to Prevent Pollution from Ships* (33 U.S.C. §§ 1901-1905) and Control of NO_x, SO_x, and PM Emissions from Marine Engines and Vessels Subject to the MARPOL Protocol (40 C.F.R. Part 1043). Under MARPOL

[5] The Company will also implement a soft start during pile driving that will allow sensitive species to swim away from the noise before it gets louder. There are a variety of sound dampening measures that may be used during pile driving, including hammers that are optimized for sound reduction, underwater noise abatement systems, and/or bubble curtains.

Annex VI and EPA's corresponding regulations, any foreign and domestic vessel used during the Project will comply with the fuel oil sulfur content limit of 1,000 parts per million (ppm). All non-road engines (e.g., generators used offshore) will comply with the non-road diesel fuel sulfur limit of 15 ppm under Regulations of Fuels and Fuel Additives (40 CFR Part 80).

The marine engines and generators used during this Project will be certified by the manufacturer to meet or emit less than the applicable marine engine emission standards for NOx, CO, VOCs (as hydrocarbons), and PM, which include:

- **MARPOL Annex VI:** Annex VI of the MARPOL treaty establishes global limits on the sulfur content of fuel oil used aboard any foreign or domestic vessel and NOx emissions limits from foreign vessels built after 2000 with engine sizes greater than 130 Kilowatts (kW) (~174 horsepower).

- **40 CFR Part 89, Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines:** 40 CFR § 89 sets emission standards and certification requirements for domestic Tier 1 and 2 domestic marine diesel engines below 37 kW (~50 horsepower).

- **40 CFR Part 94, Control of Emissions from Marine Compression-Ignition Engines:** 40 CFR § 94 sets emission standards and certification requirements for Tiers 1 and 2 domestic marine diesel engines at or above 37 kW and manufactured on or after January 1, 2004.

- **40 CFR Part 1042, Control of Emissions from New and In-Use Marine Compression-Ignition Engines and Vessels:** 40 CFR § 1042 sets emission standards and certification requirements for Tiers 3 and 4 domestic marine diesel engines.

EPA's emission standards for marine compression-ignition engines contained in the above regulations are structured as a tiered progression, with each tier of emission standards becoming increasingly stringent. These standards are primarily a function of the size, engine displacement, and age of the marine diesel engine. Each tier phased in over several years (by categories of engine size).

At this time, the specific vessels (and hence, engines) that will be used for the Project are unknown; vessel data are highly speculative at this stage of the Project. While vessel details are anticipated to be further refined in the Fabrication and Installation Report (FIR) to be submitted to BOEM, due to variable availability and limitations associated with the Jones Act, vessels may even be changed out just prior to or during construction. The Company will not be able to maintain the Project's construction schedule without the flexibility to draw vessels from the existing fleet of construction vessels as needed to meet Project construction demands. Furthermore, manufacturers have strict restrictions on installing upgrades to avoid violating warranties and emission standard certifications. Thus, it is not technically feasible for the Company to propose process modifications for individual marine diesel engines, either by retrofitting or replacing specific marine engines.

The Project's emissions on the OCS (i.e., federal waters) are regulated through the EPA's OCS Air Permit process under the Outer Continental Shelf Air Regulations (40 CFR Part 55). The OCS Air Regulations, which implement Section 328(a)(1) of the CAA, establish federal air pollution control requirements for OCS Sources located beyond a state's seaward boundaries. An OCS source is defined as "any equipment, activity, or facility which—(i) emits or has the potential to emit any air pollutant, (ii) is regulated or authorized under the Outer Continental Shelf Lands Act [43 U.S.C. 1331 et seq.], and (iii) is located on the Outer Continental Shelf or in or on waters above the Outer Continental Shelf." Per 40 CFR Part 55.2, vessels are only considered OCS sources when they are: "(1) Permanently or temporarily attached to the seabed and erected thereon and used for the purpose of exploring, developing, or producing resources therefrom, within the meaning of section 4(a)(1) of Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. § 1331 et seq.); or (2) Physically attached to an OCS facility, in which case only the stationary sources aspects of the vessels will be regulated." The Project's activities and equipment that meet the definition of an OCS source are expected to include engines and equipment on the WTGs, ESP(s), and certain vessels (e.g., jack-up vessels, stationary anchored vessels) operating within the SWDA.

Under 40 CFR Part 55, OCS Sources located within 25 miles beyond a state's seaward boundary are also required to comply with the air quality requirements of the Corresponding Onshore Area (COA). Massachusetts has been designated as the COA. Therefore, the Project's OCS sources will be required to comply with the applicable Massachusetts air quality regulations including Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) under 310 CMR § 7.00. To satisfy BACT and LAER, the Company's OCS Air Permit will contain, at a minimum, emission limitations, monitoring, testing, and reporting requirements for OCS Sources. The Company expects to meet LAER and BACT for vessels that operate as an OCS source by using vessels with engines meeting or emitting less than the highest EPA and/or MARPOL Annex VI Tier emission standards that are available at the time of deployment, operating engines efficiently, using good combustion practices, and using clean fuels. Additionally, through the OCS Air Permit Process, the Project will offset applicable NOx and VOC operational emissions by acquiring emissions offsets in compliance with the Nonattainment New Source Review program.

5.2.11 Conclusion

As described in Sections 5.2.1 and 5.2.2, the proposed offshore export cable installation methods are well-tested and documented as environmentally conscious operations with minimal temporary impacts to the seafloor and water quality. Installation of the export cables will require some displacement of marine sediments to achieve desired cable burial depths, but in most areas the method of installation will result in minimal alteration to seafloor topography. More alteration will be required in high-energy areas where large sand waves are encountered, but these high-energy areas are characterized by constantly changing bathymetry, and any alteration due to the Project is expected to be temporary. None of the affected areas will be altered to the extent that it results in significant impacts to water circulation or sediment grain size distribution.

As discussed in Section 5.2.2.1, sediment mobilized during cable-laying is expected to resettle rapidly (within a number of hours), meaning that sediment mobilized during installation of the first cable will settle well before installation of the subsequent cable. Consequently, the impacts of offshore cable installation on water turbidity and sediment dispersal will not be additive; instead, similar impacts would be repeated for each of the offshore export cables installed.

The Massachusetts NHESP has mapped all state waters within Nantucket Sound as priority habitat of state-listed rare species for various shorebirds (e.g., piping plover, least tern, roseate tern) (Massachusetts Natural Heritage Atlas, 14th Edition, 2017) (see Section 5.2.3). As a result, the OECC will necessarily cross priority habitat within state waters. In accordance with the MESA (321 CMR 10.14), the Company will continue to consult with NHESP to ensure that impacts to rare species from offshore export cable installation in Nantucket Sound are avoided or minimized to the greatest extent practicable.

The Massachusetts OMP identifies the following SSU areas for cable projects: (1) core habitat of the North Atlantic right whale, fin, and humpback whales; (2) hard/complex seafloor; (3) eelgrass; and (4) intertidal flats. The OECC has been aligned to avoid North Atlantic Right Whale core habitat, and the Landfall Site was assessed and selected partially on the basis of avoiding eelgrass. In addition, the alignment of the OECC reflects an effort to minimize the areas of hard and complex bottom that may be affected by cable installation (see Section 5.2.4).

As described in Section 5.2.5, no direct evidence of pre-Contact Native American cultural materials has been recovered during investigations to date. However, geoarchaeological analysis of geophysical and geotechnical data indicate there are stream channel, lake, and estuarine landscape features within the Project area that may have the potential to contain archaeological materials. The expanded portion of the OECC will be similarly assessed for either direct evidence of pre-Contact Native American cultural materials or preserved landscape features that may have the potential to contain archaeological materials. Other mitigation measures, agreed to by consulting parties during the Section 106 process, may be appropriate.

Muskeget Channel has high species richness and abundance (see Section 5.2.6). Some marine birds may be disturbed by vessels engaged in construction activities, and there is slight potential for bird collisions with vessels. There may also be temporary disruption to limited areas where such species forage. These potential impacts will be limited since the OECC avoids and minimizes impacts to sensitive or unique habitats and cable installation activities will be of short duration. The Company does not expect these impacts to be significant.

As described in Section 5.2.7, the Company is not proposing any restrictions on navigation, fishing, or the placement of fixed or mobile fishing gear; however, construction and installation activities may temporarily affect navigation and/or fishing activities in the vicinity of construction and installation vessels. These impacts are localized and temporary in nature and largely limited to the Project's construction and installation period. Given that construction-period impacts will be temporary and spatially constrained, the impacts will not be significant.

Marine mammal species are likely to occur in the vicinity of the OECC, including various species of whales, dolphins, porpoises, and seals (see Section 5.2.8). When near the OECC during construction, these species could be exposed to temporary stressors such as noise, increased vessel traffic, and equipment in the water that may result in short-term, localized disturbance of individuals. Recognizing the possibility of these temporary impacts, the Company will collaborate with BOEM and NOAA to integrate practicable technology choices in equipment, mitigation, and monitoring to meet the necessary standards for permitting and species protection.

5.3 Environmental Considerations for Onshore Project Components

As presented in Section 4, the Company identified a Preferred Route and a Noticed Alternative Route for the onshore export cables connecting the Preferred Landfall Site at Dowses Beach to the proposed onshore Project substation. The Company identified Candidate Route T6 (Wianno Avenue and Main Street Route) as the Preferred Route based on the best balance of the applied route selection criteria including environmental impacts, cost, reliability, and potential for public benefits. A geographically distinct routing alternative, Candidate Route T1 (Old Mill Road Route), was identified as the Noticed Alternative. The Preferred Route and Noticed Alternative Route have 2.7 miles of common segments including Dowses Beach Road to East Bay Road near the Dowses Beach Landfall Site (0.2 miles) and then from the intersection of Lumbert Mill Road and Old Falmouth Road to the proposed onshore substation site (2.5 miles) (see Figure 4-7).

The Preferred Route is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach and has a total length of approximately 6.7 miles (see Figure 4- 7).

The Noticed Alternative Route is approximately 6.6 miles long and is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach (see Figure 4-7).

The Main Street Variation provides a link between the Preferred Route and Noticed Alternative. The Main Street Variation is approximately 0.3 miles long and traverses Main Street between the intersection of East Bay Road, Main Street, and Old Mill Road and the intersection of Wianno Avenue and Main Street. The Main Street Variation provides route flexibility for how the onshore export cable route leaves the Dowses Beach Landfall area and reaches the wider roadway network. The Main Street Variation provides the flexibility to respond to changing circumstances during the Siting Board process should East Bay Road or Wianno Avenue become the preferred route segment in this area based on more detailed engineering design and additional community and stakeholder outreach. In addition, the Main Street Variation allows for flexibility as discussions advance with the Town of Barnstable regarding the potential to coordinate with future proposed sewer projects.

Both the Preferred Route and the Noticed Alternative Route will utilize the same landfall site and the same grid interconnection route to the West Barnstable Substation. As described in detail in Section 4.6, the Company has identified three grid interconnection route options for the 345-kV portion of the onshore export cable that will connect the new onshore substation to the regional electric grid at the West Barnstable Substation. The Company is completing further engineering review of the grid interconnection options.

The following sections present a comparison of the environmental considerations along the Preferred Route and the Noticed Alternative, including the common landfall site and the grid interconnection route, and presents mitigation measures that are anticipated to be implemented.

5.3.1 Wetland Resources

The Company assessed wetland resource areas and filled and flowed tidelands subject to Chapter 91 regulatory jurisdiction (310 CMR 9.00) that would potentially be crossed by the Routes. The evaluation of wetland and waterbody crossings involved reviewing MassGIS data and conducting field delineations within the Dowses Beach parcel (Parcel 163-013) to determine the wetland resource areas, as defined in the Massachusetts Wetlands Protection Act regulations (310 CMR 10.00 et seq.) and Barnstable Wetlands Protection Act (Chapter 237) along the Routes. Wetland resource areas potentially crossed included Coastal Beach, Coastal Dune, Coastal Bank, Salt Marsh, Salt Pond, BVW, and their associated 100-foot Buffer Zones, LSCSF, Bordering Land Subject to Flooding (BLSF), and 200-foot RFA. Wetland resource areas in the vicinity of the Preferred Route and Noticed Alternative Route are shown in a multi-sheet graphics set provided as Figure 5-1. Delineated wetland resource areas at Dowses Beach and along Dowses Beach Road are depicted in Figure 5-1.

5.3.1.1 Preferred Route

The preferred onshore export cable route will be located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach, where direct impacts to wetland resource areas will be avoided and there will be no permanent impacts. The Preferred Route will temporarily impact buffer zone to coastal wetland resource areas in the vicinity of the Dowses Beach Landfall Site and Dowses Beach Road. The route will pass within the 100-foot buffer zone of BVW near the intersection of Dowses Beach Road and East Bay Road and within the 100-foot buffer zone of several freshwater wetlands along Main Street, Old Falmouth Road, Old Stage Road, and Oak Street. In total, the route will cross approximately 0.5 miles (2,447 linear feet) of buffer zone. The Project will pass through approximately 0.3 miles (1,514 linear feet) of LSCSF, but the Project will have no permanent impacts to this resource since the underground duct bank will not alter existing topography or flood storage capacity. The route will also cross approximately 0.2 miles (872 linear feet) of RFA associated with two perennial streams along Old Falmouth Road and Oak Street. Wetland resource areas in the vicinity of the Preferred Route are shown on Figure 5-1 and in Attachment B1. Regarding Chapter 91 jurisdictional areas, this route involves work in filled tidelands presently occupied by existing parking lot area at Dowses Beach and Dowses Beach Road (see Figure 5-2).

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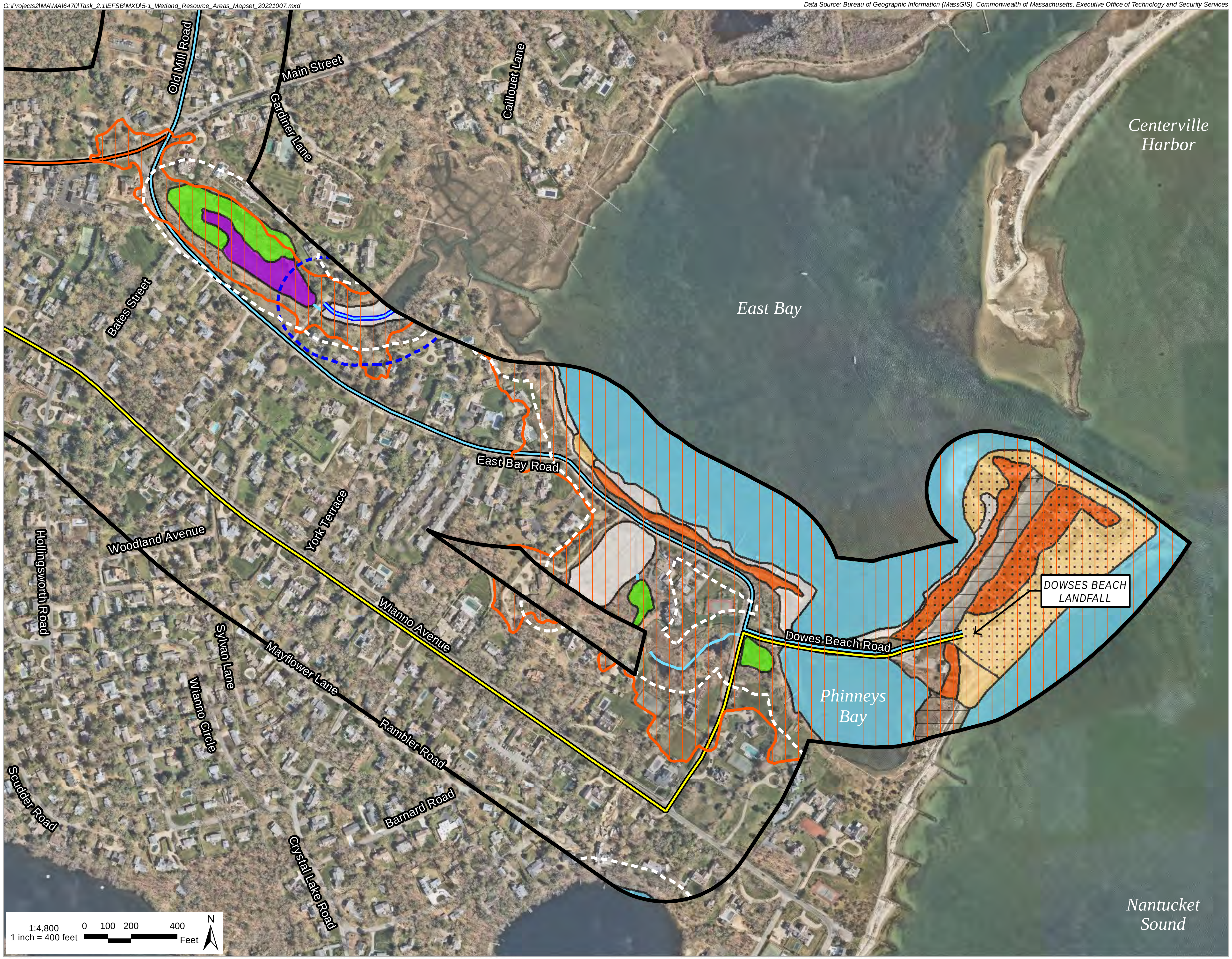
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



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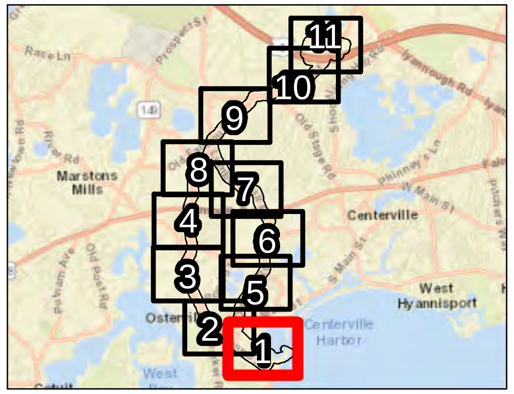

LEGEND

- 400-ft Radius from Project Routes
- Preferred Route
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- Main Street Variation
- Grid Interconnect Route Option G1
- Grid Interconnect Route Option G2
- Grid Interconnect Route Option G3
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- 100-ft Wetland Buffer Zone
- 200-ft Riverfront Area
- FEMA LSCSF/BLSF
- USGS Perennial Stream
- DEP Hydrologic Connection

DEP Wetland

- Barrier Beach System
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- Barrier Beach - Coastal Dune
- Barrier Beach - Salt Marsh
- Bog
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- Coastal Dune
- Shallow Marsh
- Cranberry Bog
- Shrub Swamp
- Deep Marsh
- Wooded Swamp

Figure 5-1

Wetland Resource Areas

Sheet 1 of 11

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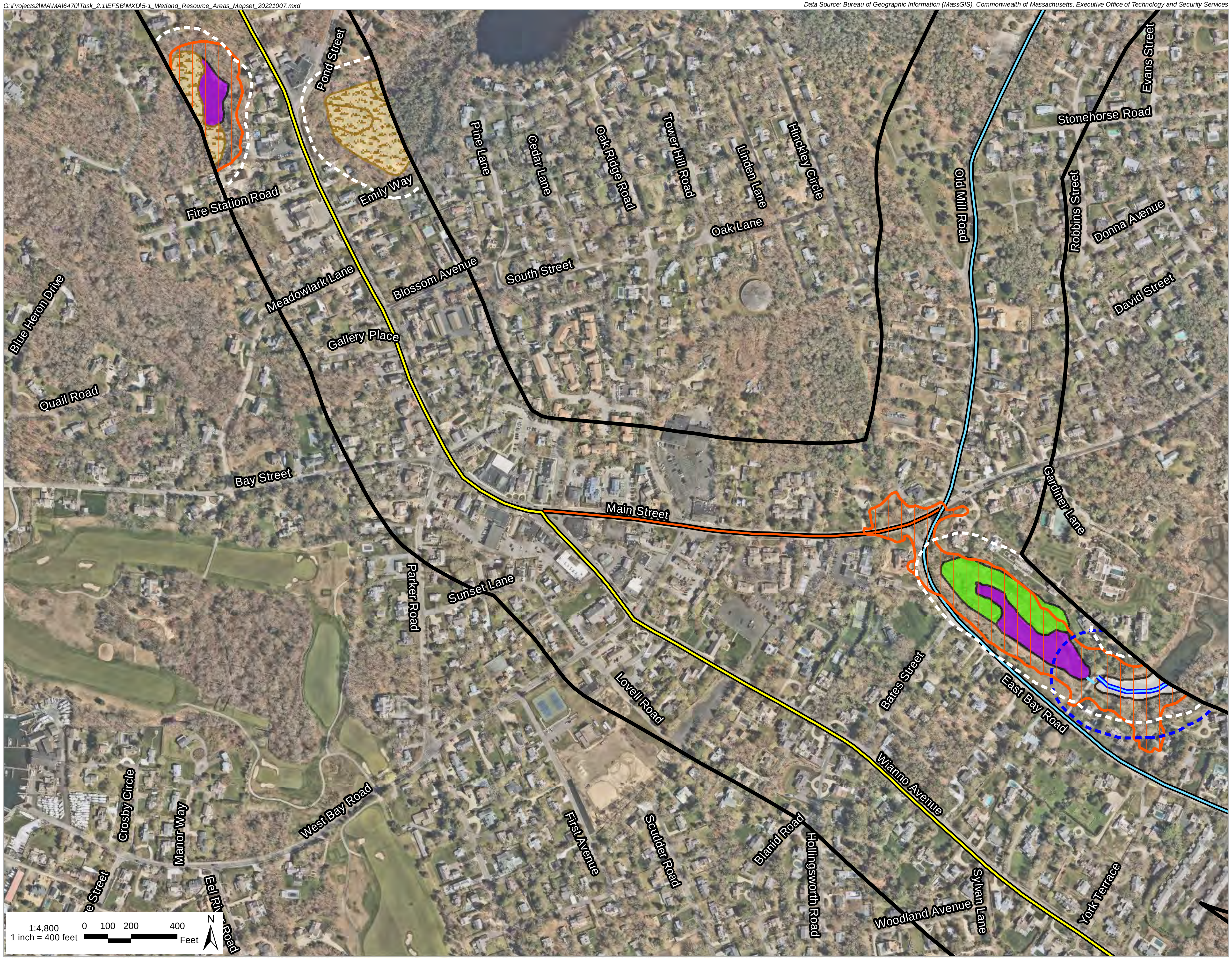

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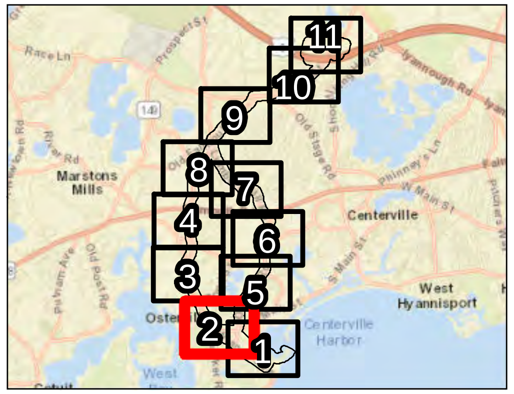

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Figure 5-1

Wetland Resource Areas

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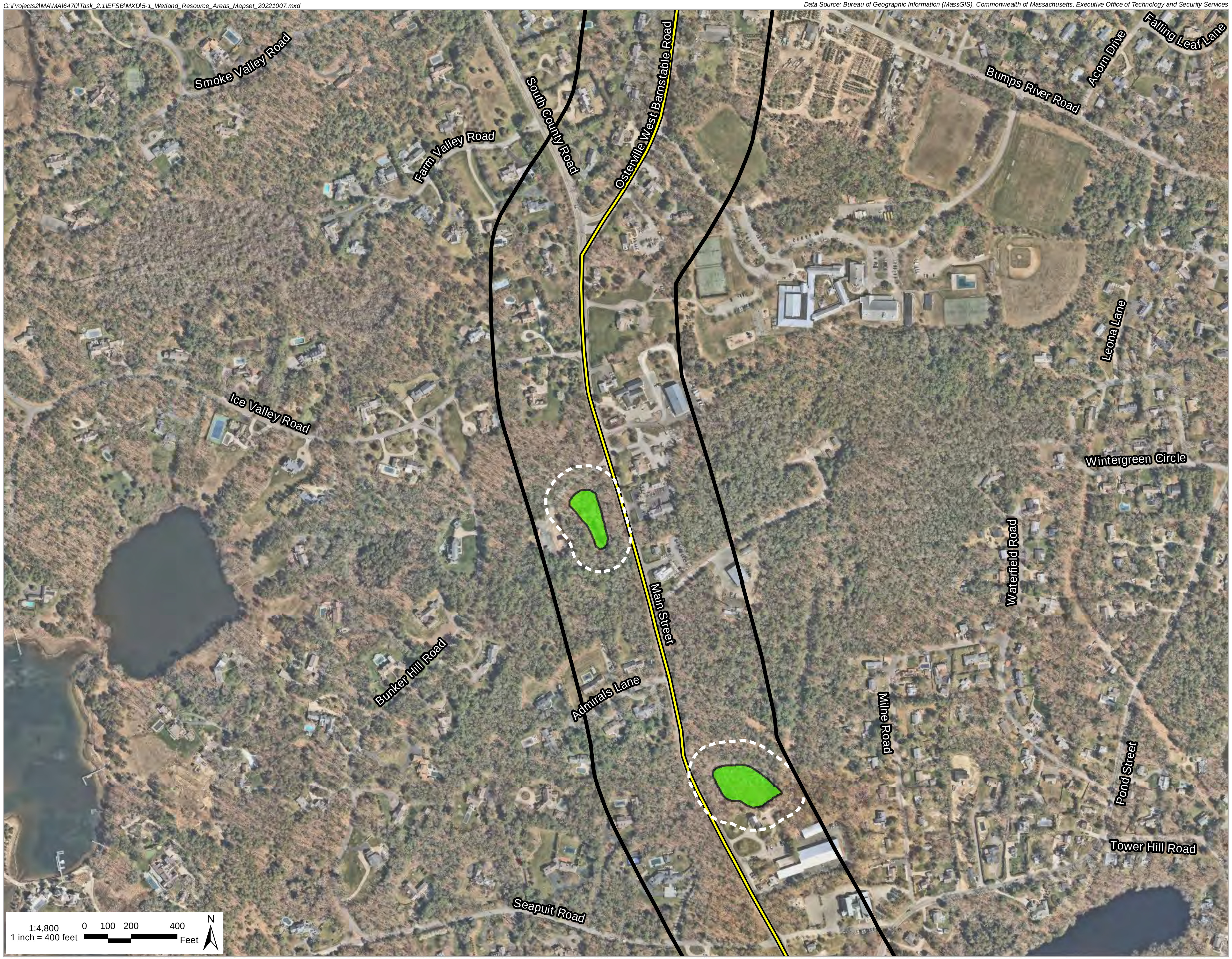

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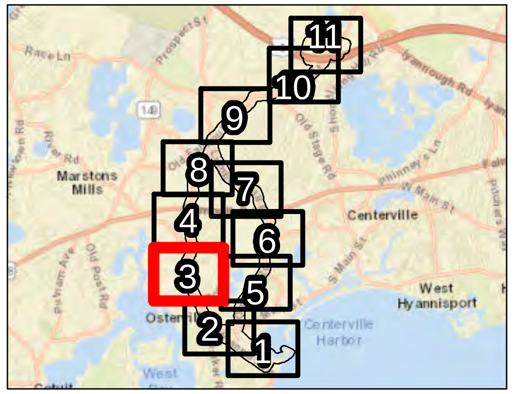

LEGEND

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Figure 5-1

Wetland Resource Areas

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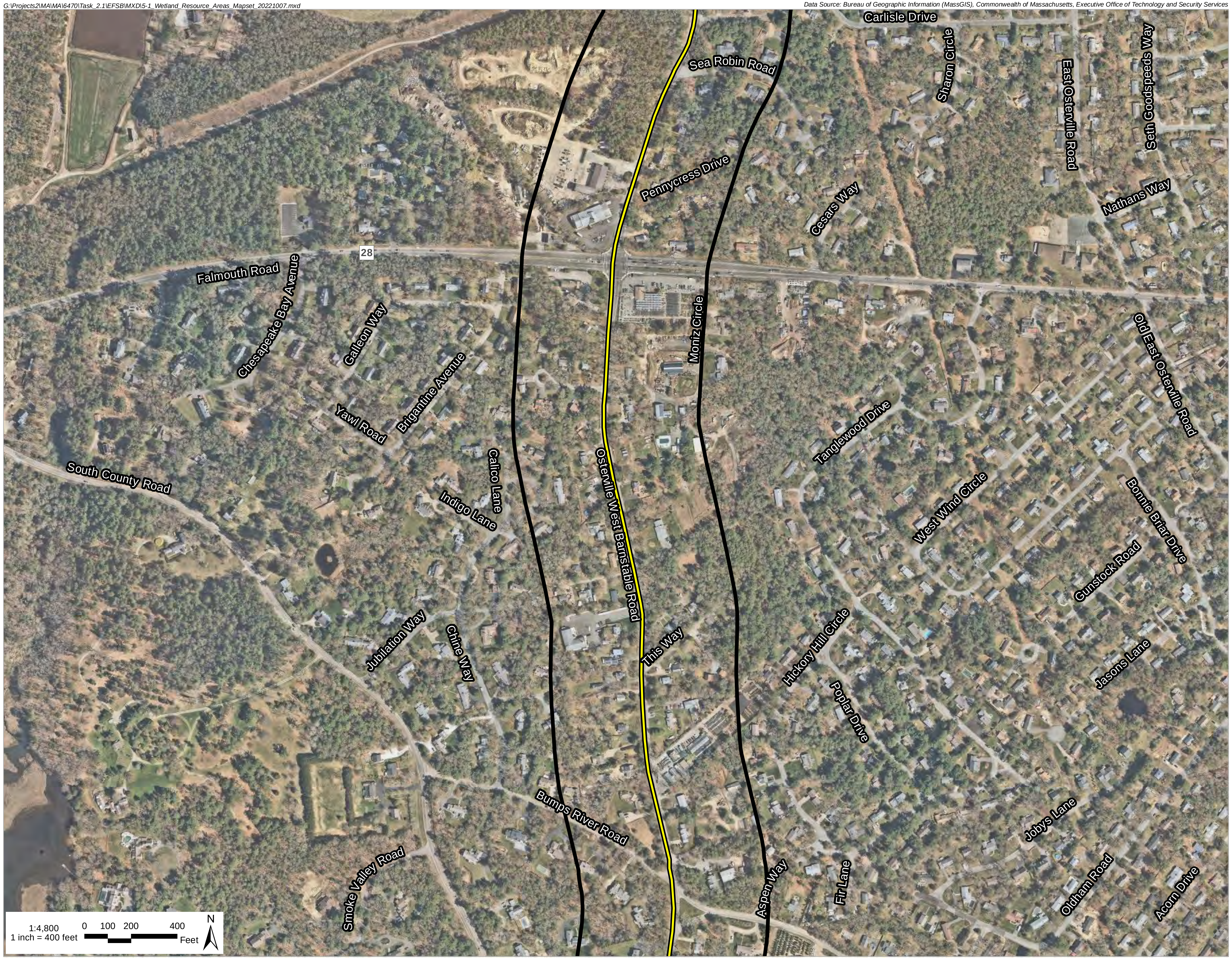

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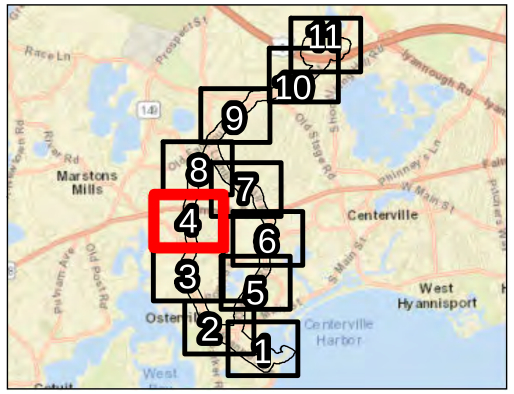

LEGEND

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Figure 5-1

Wetland Resource Areas

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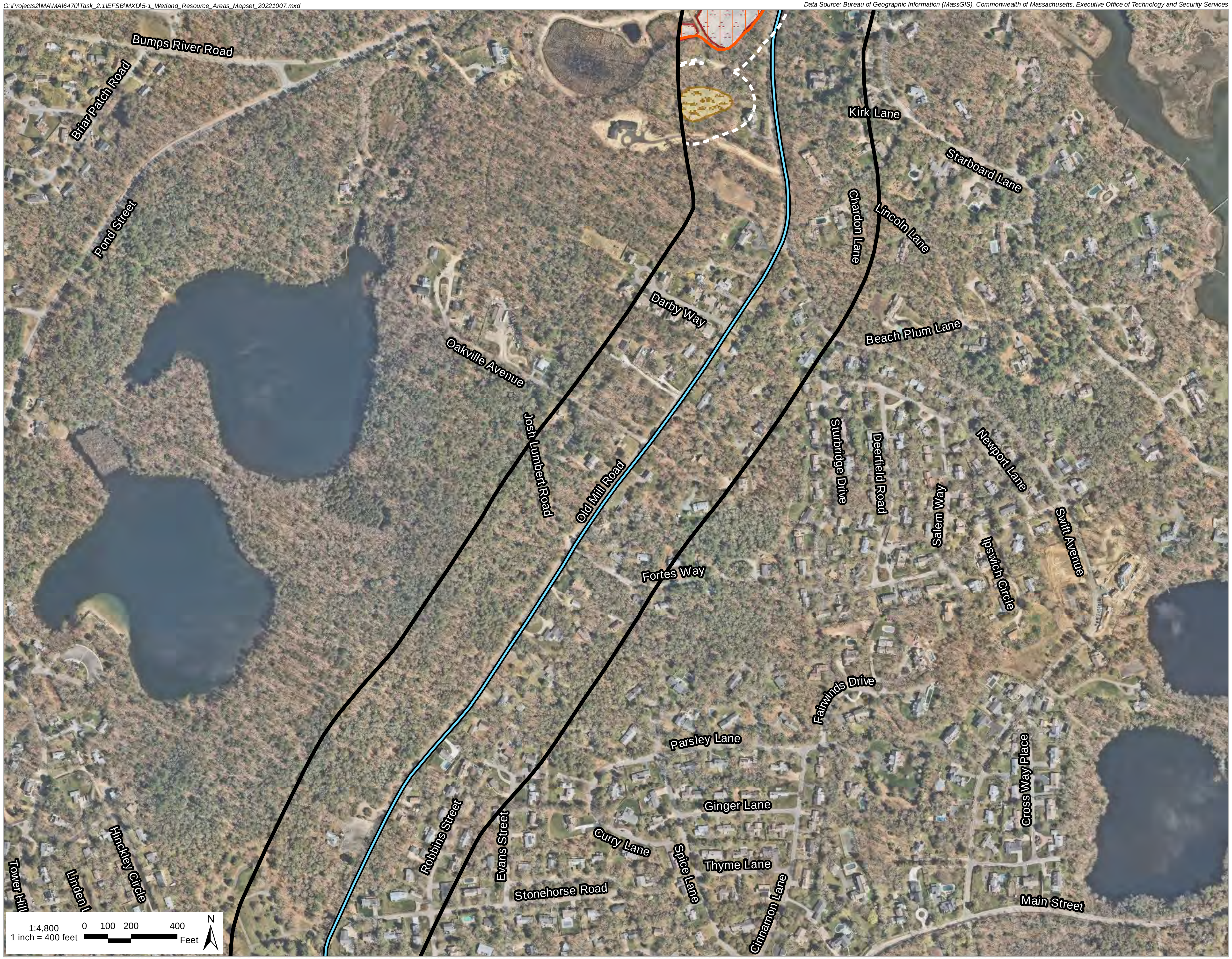

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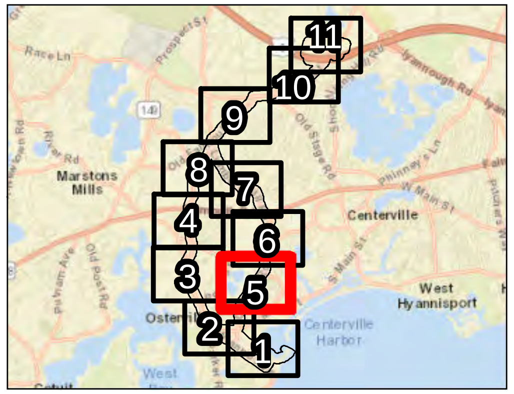

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Figure 5-1

Wetland Resource Areas

Sheet 5 of 11

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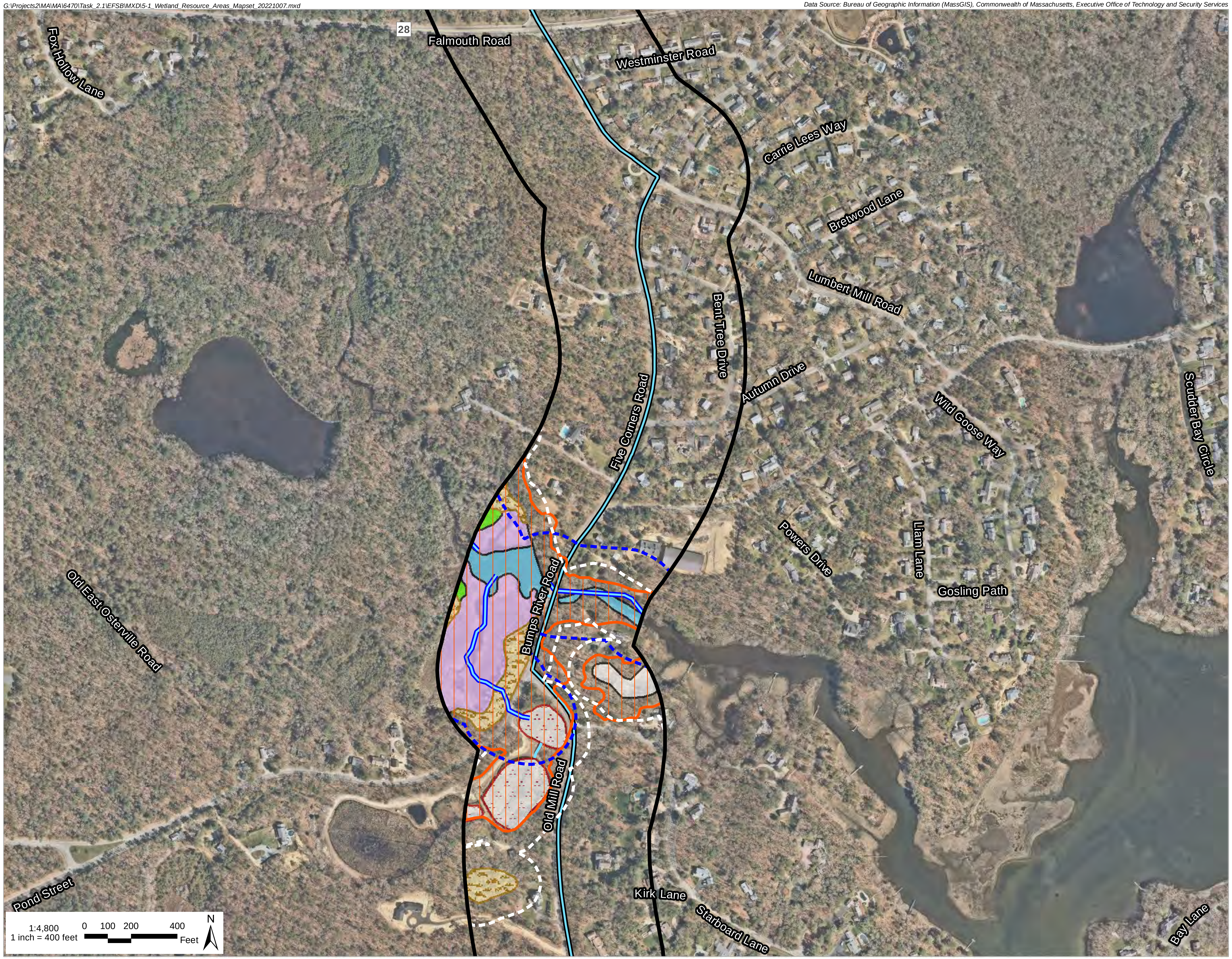

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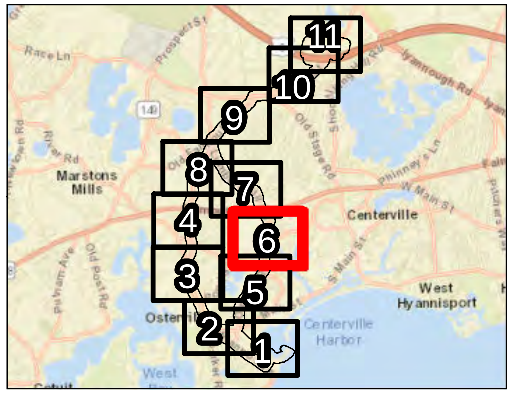

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Figure 5-1

Wetland Resource Areas

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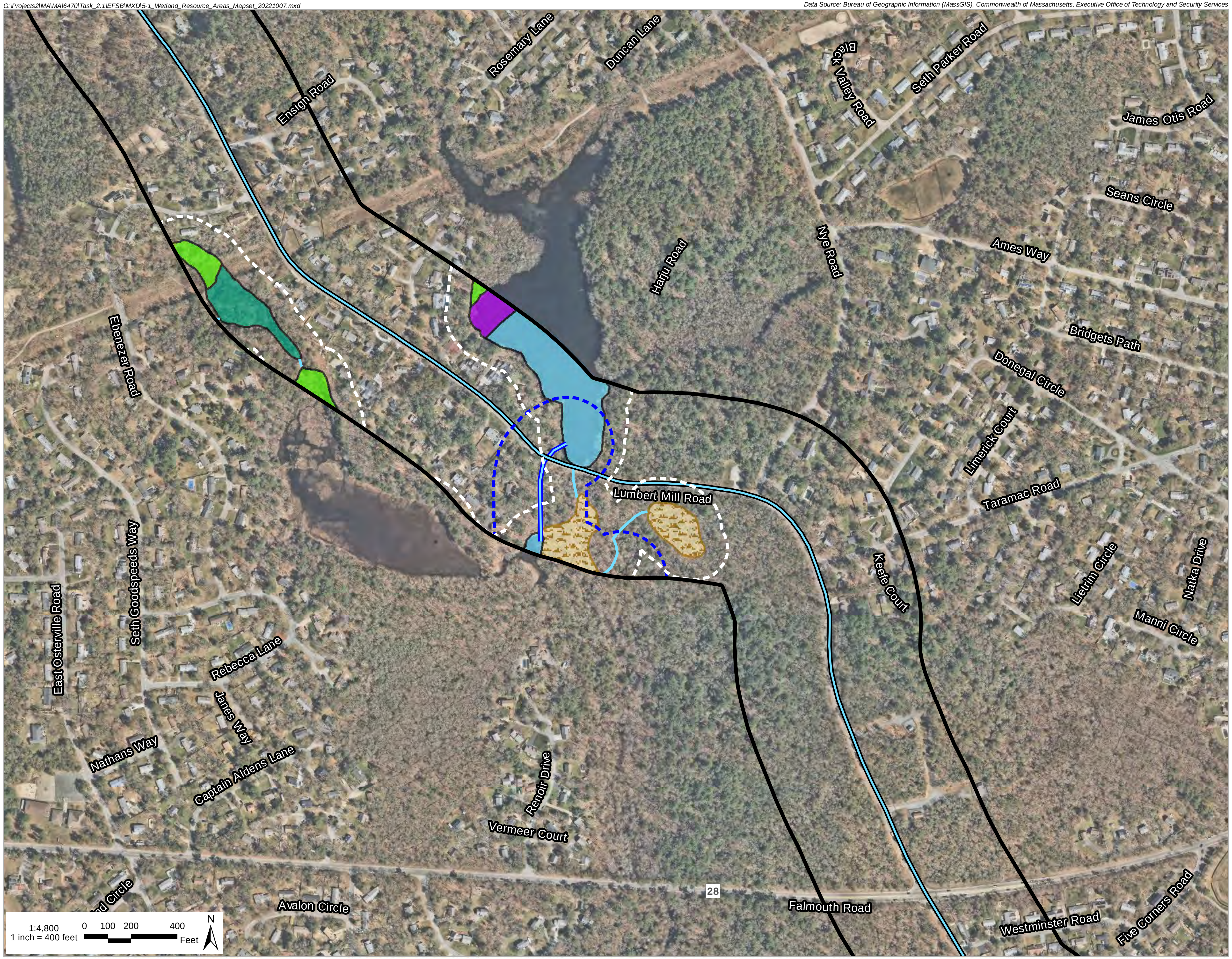

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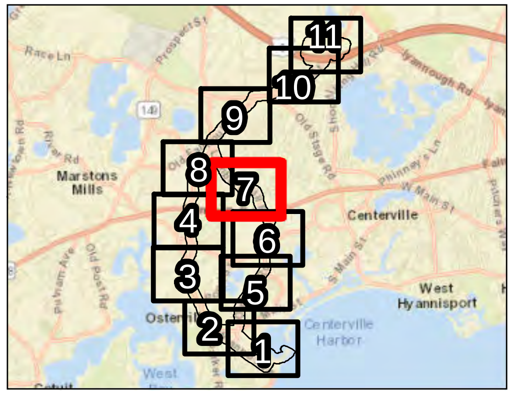

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Figure 5-1

Wetland Resource Areas

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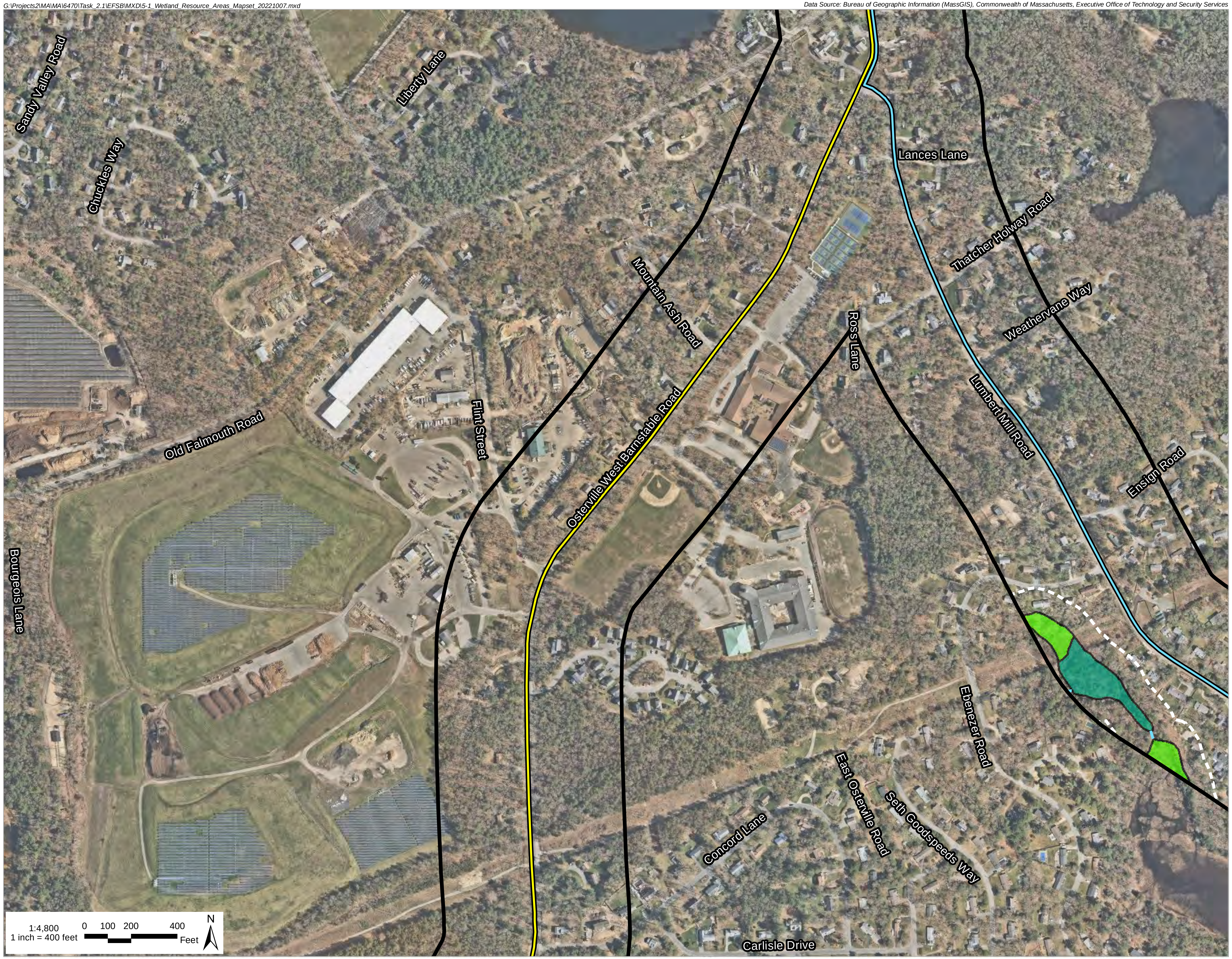

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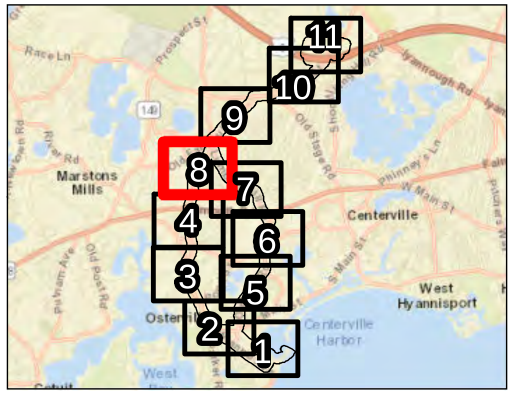

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Figure 5-1

Wetland Resource Areas

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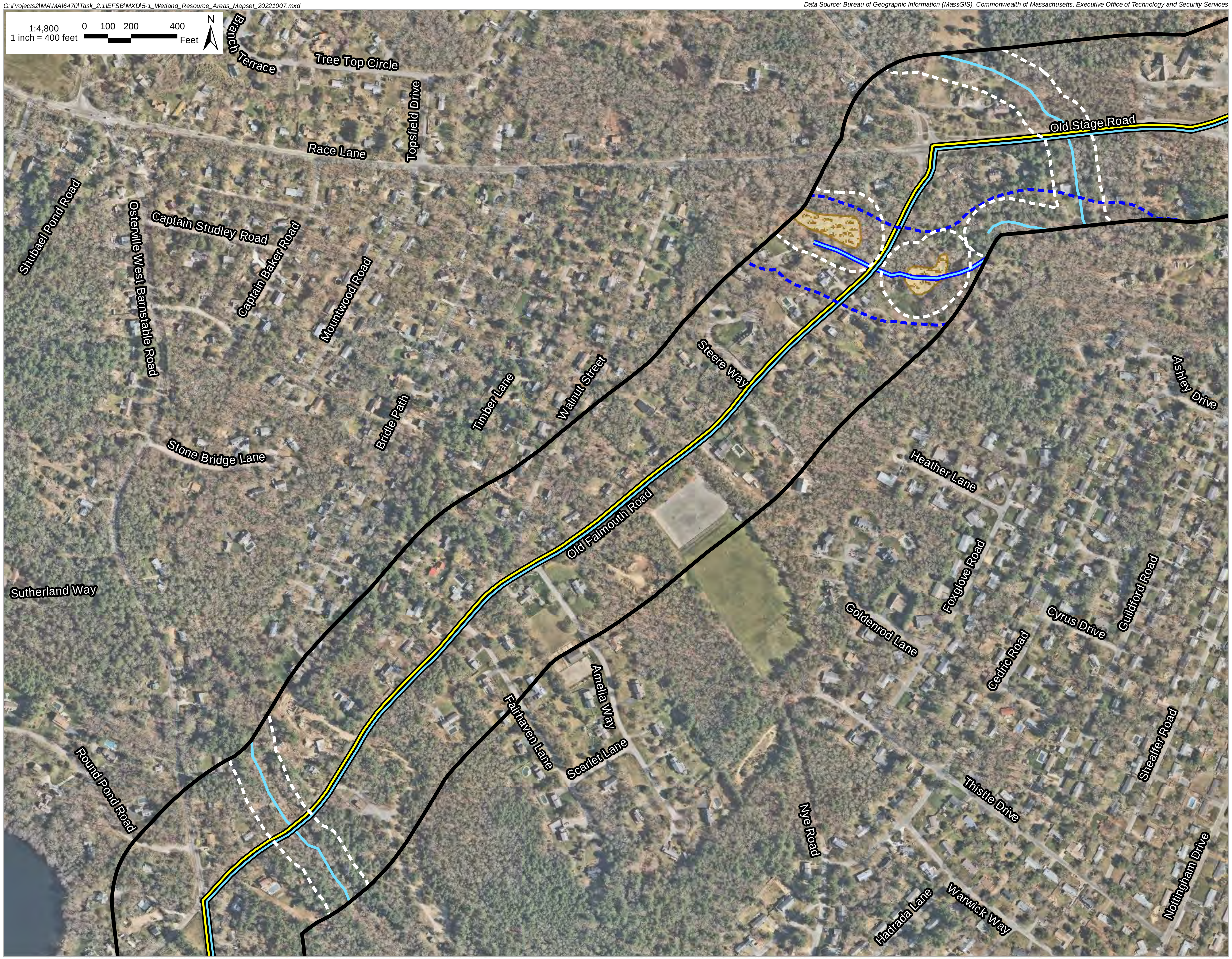
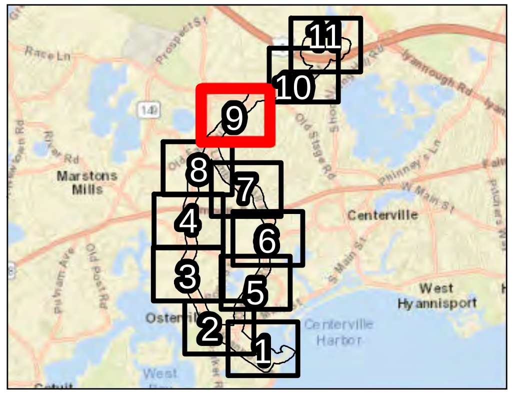
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



LEGEND

- 400-ft Radius from Project Routes
- Preferred Route
- Noticed Alternative Route
- Main Street Variation
- Grid Interconnect Route Option G1
- Grid Interconnect Route Option G2
- Grid Interconnect Route Option G3
- Proposed New Substation Site
- West Barnstable Substation (Existing)
- 100-ft Wetland Buffer Zone
- 200-ft Riverfront Area
- FEMA LSCSF/BLSF
- USGS Perennial Stream
- DEP Hydrologic Connection

DEP Wetland

- Barrier Beach System
- Barrier Beach - Coastal Beach
- Barrier Beach - Coastal Dune
- Barrier Beach - Salt Marsh
- Bog
- Coastal Beach
- Coastal Dune
- Cranberry Bog
- Deep Marsh
- Open Water
- Salt Marsh
- Shallow Marsh
- Shrub Swamp
- Wooded Swamp

Figure 5-1

Wetland Resource Areas

Sheet 9 of 11

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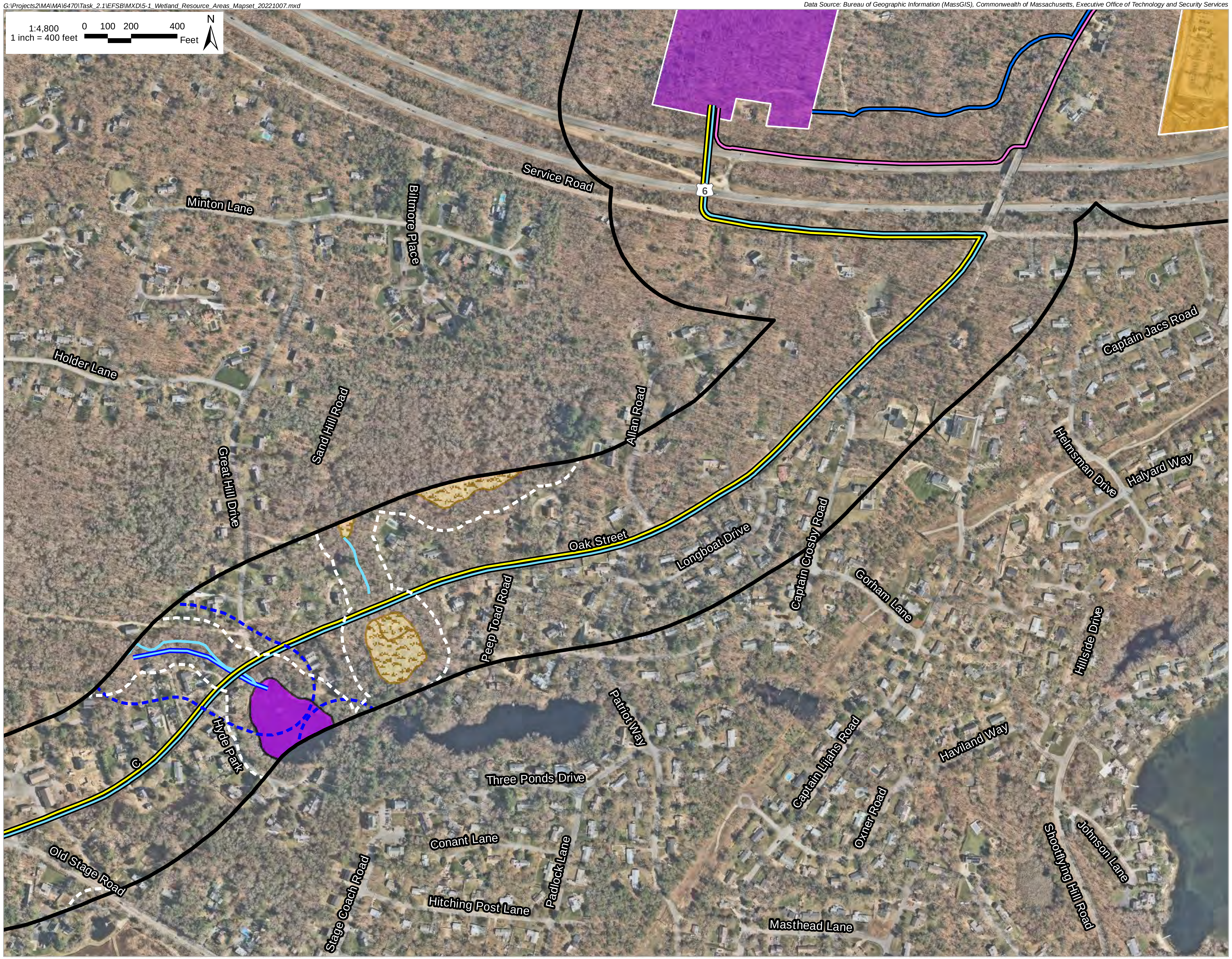
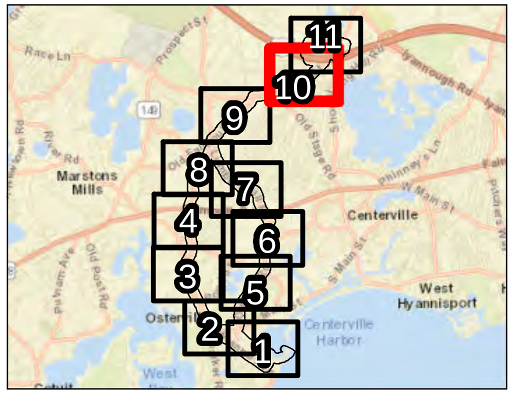
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



LEGEND

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- Preferred Route
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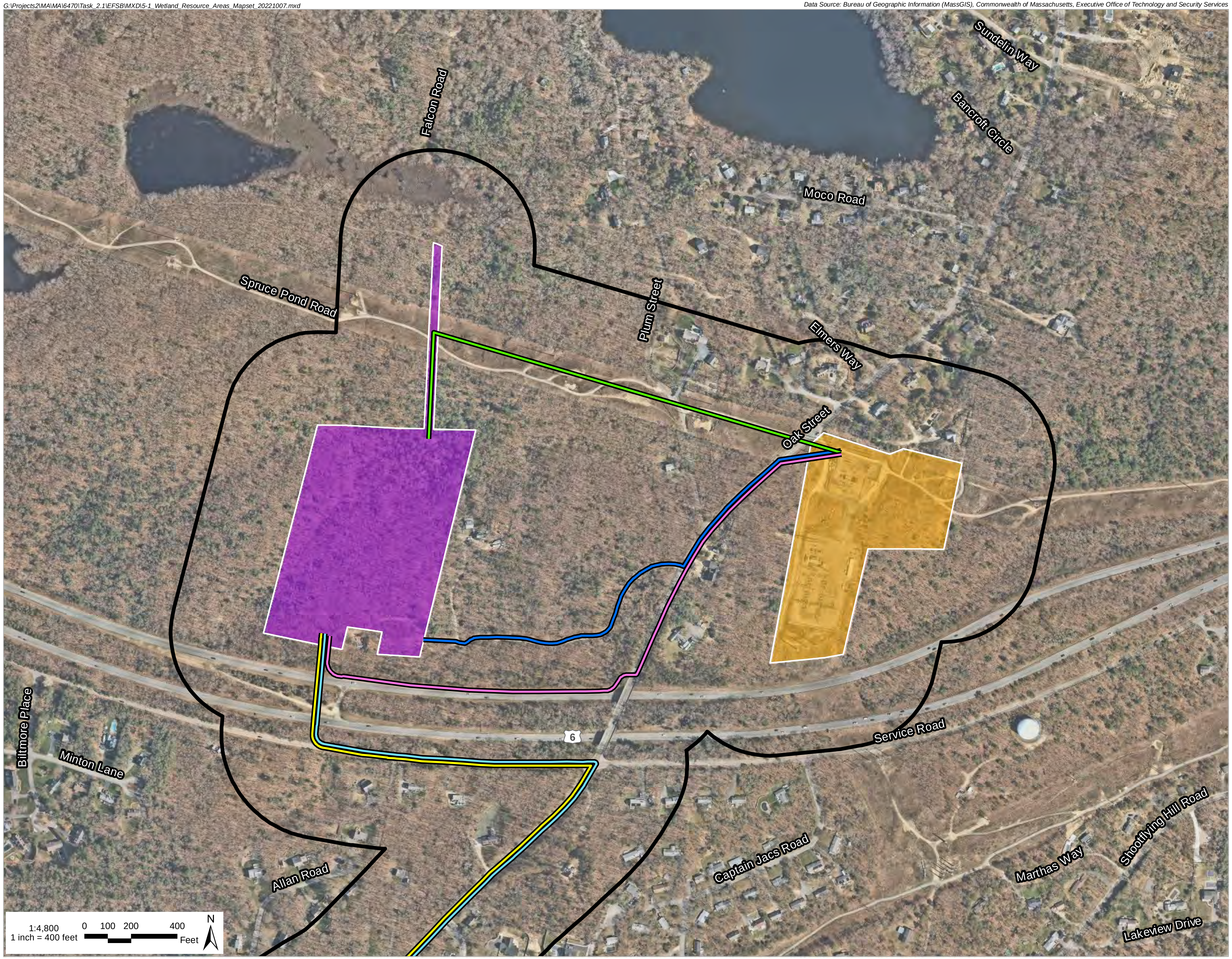
- Salt Marsh
- Shallow Marsh
- Shrub Swamp
- Wooded Swamp

Figure 5-1

Wetland Resource Areas

Sheet 10 of 11

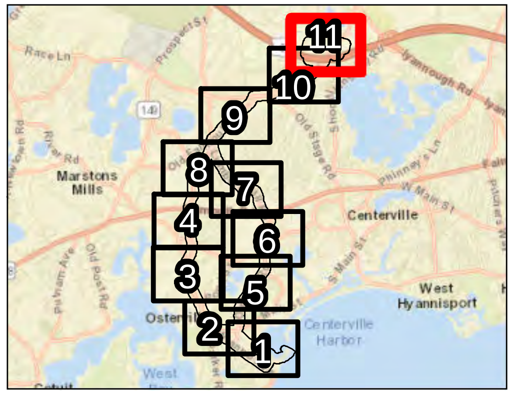
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



LEGEND

- 400-ft Radius from Project Routes
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- Barrier Beach - Coastal Dune
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- Bog
- Open Water
- Coastal Beach
- Salt Marsh
- Coastal Dune
- Shallow Marsh
- Cranberry Bog
- Shrub Swamp
- Deep Marsh
- Wooded Swamp

Figure 5-1

Wetland Resource Areas

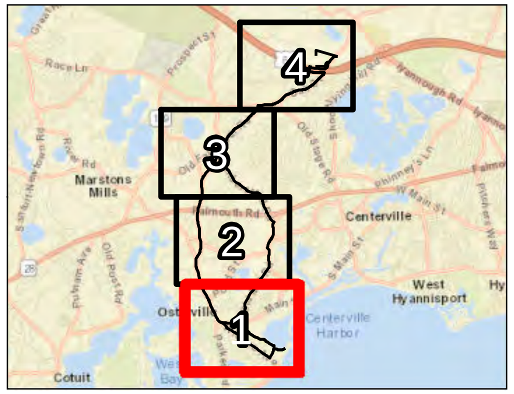
Sheet 11 of 11

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

New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



SCALE

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1 inch = 700 feet

0 175 350 700 Feet

N

LEGEND

- Preferred Route
- Noticed Alternative Route
- Main Street Variation
- Grid Interconnect Route Option G1
- Grid Interconnect Route Option G2
- Grid Interconnect Route Option G3
- Proposed New Substation Site
- West Barnstable Substation (Existing)
- Article 97 Land
- USGS Perennial Stream
- DEP Hydrologic Connection
- DEP Wetland
- DEP Open Water
- DEP Historic High Water Line
- NHESP Certified Vernal Pool
- NHESP Priority Habitat of Rare Species
- NHESP Estimated Habitat of Rare Wildlife

Figure 5-2

Environmental Constraints

Sheet 1 of 4

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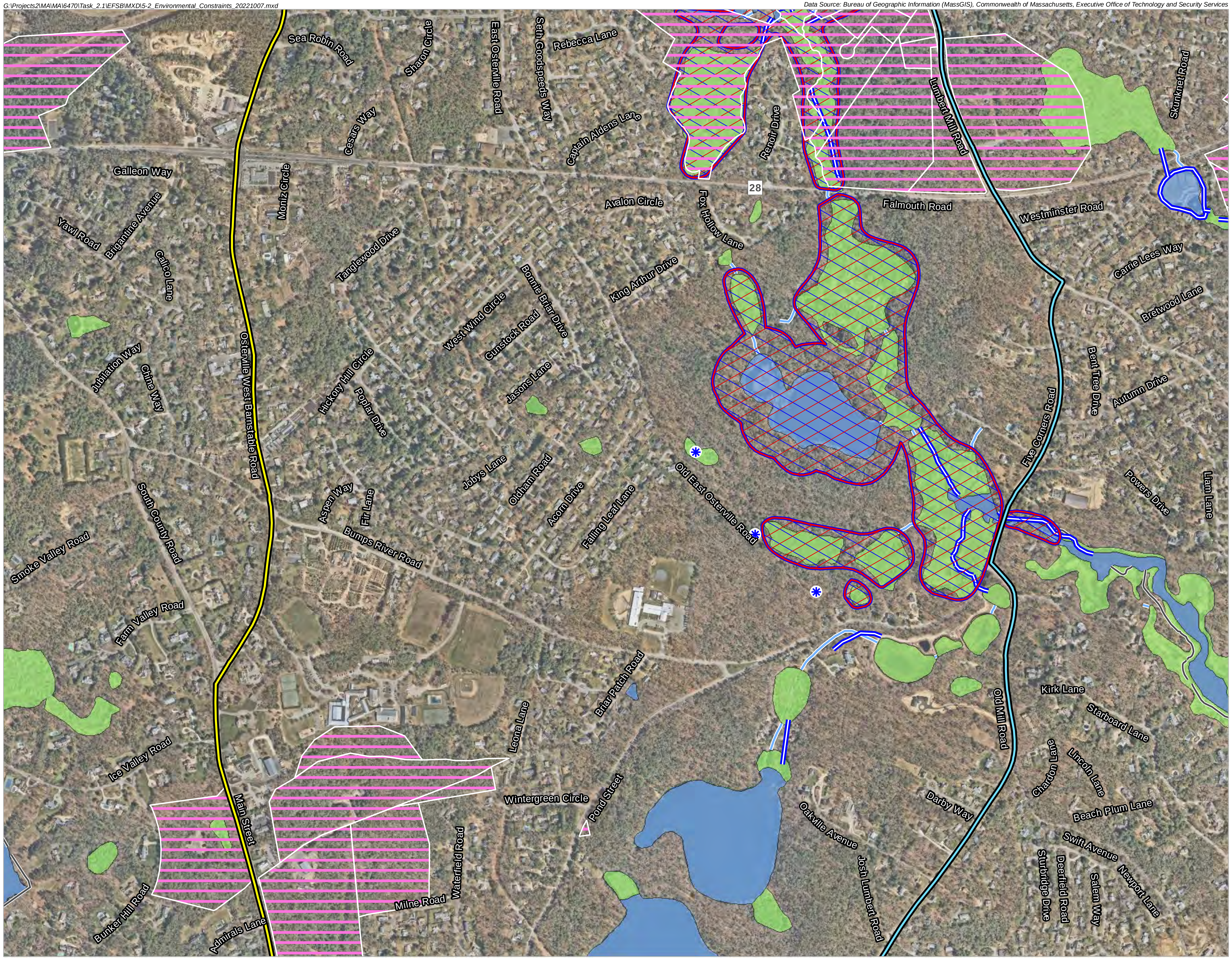
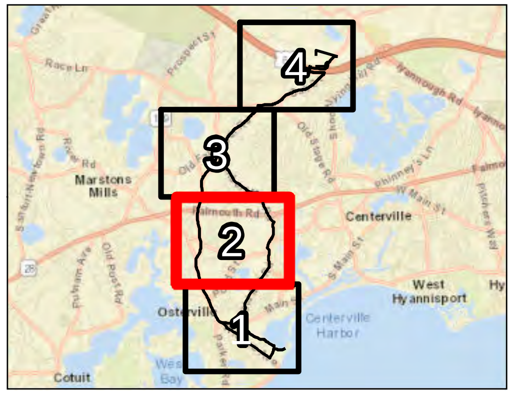
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



SCALE

1:8,400
1 inch = 700 feet

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N

LEGEND

- Preferred Route
- Noticed Alternative Route
- Main Street Variation
- Grid Interconnect Route Option G1
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- NHESP Certified Vernal Pool
- NHESP Priority Habitat of Rare Species
- NHESP Estimated Habitat of Rare Wildlife

Figure 5-2

Environmental Constraints

Sheet 2 of 4

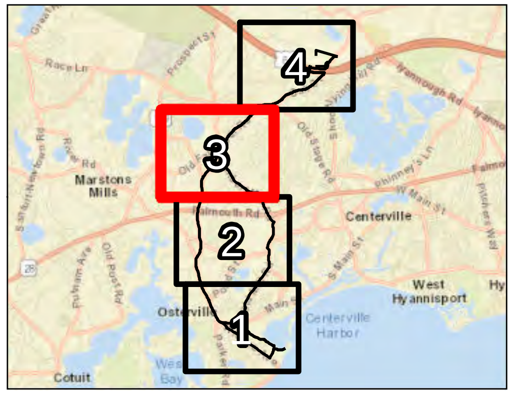
G:\Projects2\MA\MA\6470\Task_2.1\EFSB\MXD\5-2_Environmental_Constraints_20221007.mxd

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

New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



SCALE

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1 inch = 700 feet

0 175 350 700
Feet

N

LEGEND

- Preferred Route
- Noticed Alternative Route
- Main Street Variation
- Grid Interconnect Route Option G1
- Grid Interconnect Route Option G2
- Grid Interconnect Route Option G3
- Proposed New Substation Site
- West Barnstable Substation (Existing)
- Article 97 Land
- USGS Perennial Stream
- DEP Hydrologic Connection
- DEP Wetland
- DEP Open Water
- DEP Historic High Water Line
- NHESP Certified Vernal Pool
- NHESP Priority Habitat of Rare Species
- NHESP Estimated Habitat of Rare Wildlife

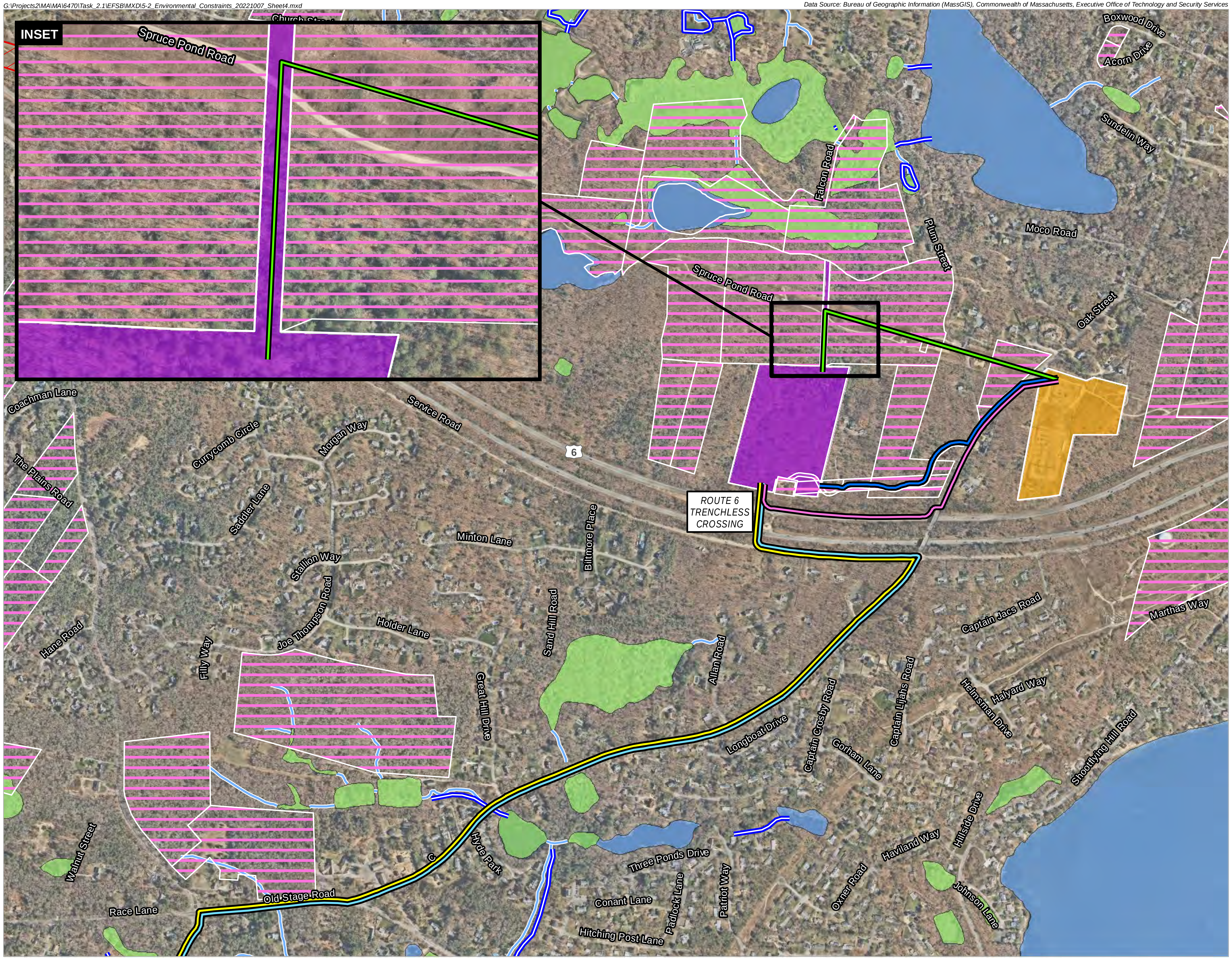
Figure 5-2

Environmental Constraints

Sheet 3 of 4

G:\Projects2\MA\MA\6470\Task_2.1\EFSB\MXD\5-2_Environmental_Constraints_20221007_Sheet4.mxd

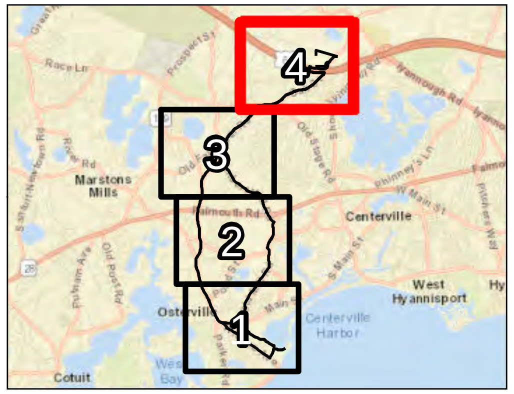
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



SCALE

1:8,400
1 inch = 700 feet

0 175 350 700 Feet

N

LEGEND

- Preferred Route
- Noticed Alternative Route
- Main Street Variation
- Grid Interconnect Route Option G1
- Grid Interconnect Route Option G2
- Grid Interconnect Route Option G3
- Proposed New Substation Site
- West Barnstable Substation (Existing)
- Article 97 Land
- USGS Perennial Stream
- DEP Hydrologic Connection
- DEP Wetland
- DEP Open Water
- DEP Historic High Water Line
- NHESP Certified Vernal Pool
- NHESP Priority Habitat of Rare Species
- NHESP Estimated Habitat of Rare Wildlife

Figure 5-2

Environmental Constraints

Sheet 4 of 4

Although there are BVWs and Riverfront Areas along the public roadway layouts, duct bank installation will occur within the roadway layout and no direct impacts are expected to wetland resource areas. Additionally, construction period BMPs would be implemented to avoid and minimize potential impacts to these wetland resource areas and their buffer zones (see Section 5.5).

5.3.1.2 Noticed Alternative

The Noticed Alternative route will also be located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach where direct impacts to wetland resource areas will be avoided and there will be no permanent impacts. Similar to the Preferred Route, the Noticed Alternative will temporarily impact buffer zone to coastal wetland resource areas in the vicinity of the Dowses Beach Landfall Site and Dowses Beach Road (see Figure 5-1 and Attachment B1). From the Dowses Beach Landfall Site to the intersection of East Bay Road and Main Street, the Noticed Alternative will pass through approximately 0.5 miles (2,790 linear feet) of LSCSF. The Project will have no permanent impacts to this resource since the buried duct bank will not alter existing topography or flood storage capacity. No above-ground structures or changes to topography are proposed within LSCSF. The route will also traverse buffer zone and RFA. Wetland resource areas are shown in the vicinity of the Preferred Route in Figure 5-1 and in Attachment B1. With regard to Chapter 91 jurisdictional areas, this route also involves work in filled tidelands presently occupied by existing parking lot area at Dowses Beach and Dowses Beach Road (see Figure 5-2).

5.3.1.3 Dowses Beach Landfall Site

The Dowses Beach Landfall Site is located on a barrier beach system with dune, bank, beach, and salt marsh wetland resources in the area. In addition, the entire area is within LSCSF. All proposed work activities at this location have been sited to avoid being located within dune, bank, beach, and salt marsh. HDD will be used to complete the offshore-to-onshore transition to minimize potential impacts to wetland resources including coastal beach and dune. HDD construction activities at Dowses Beach will occur entirely within the existing paved parking lot.

5.3.1.4 Grid Interconnection Routes

As shown on Figure 5-1, there are no mapped wetland resource areas along any of the potential grid interconnection routes.

5.3.1.5 Comparison of Impacts

The Preferred and Noticed Alternative routes have been selected to avoid and minimize wetland impacts, but the onshore export cable routes will require some work within wetland resource areas, mainly in the vicinity of the Landfall Site in the Dowses Beach parking lot area, Dowses Beach Road, and East Bay Road. Table 5-3 summarizes temporary wetlands impacts from the parking lot of the Dowses Beach Landfall Site to the proposed onshore substation.

Table 5-3 Temporary Wetlands Impacts on the Preferred and Noticed Alternative Onshore Export Cable Routes (linear feet, approximate)

	Wetland Resource Areas Temporarily Impacted (linear feet crossed)[a]			
Route	***LSCSF***	***BLSF***	***RFA***	***Buffer Zone***
Preferred Route	1,514	0	872	2,447
Noticed Alternative	2,790	810	2,146	5,353

[a] All impacts within wetland resource areas will be temporary and within paved surfaces.

No above-ground structures or changes to topography are proposed within LSCSF or RFA, and therefore the project is not anticipated to have an impact on flood velocities or floodplain storage capacity, and therefore no permanent impact to LSCSF is anticipated. Any temporary impacts to the barrier beach system will be entirely within paved surfaces.

Of the Preferred Route and the Noticed Alternative, the Noticed Alternative would have the longest stretches through wetland resource areas and their buffer zones. However, the Noticed Alternative would result in greater temporary construction period impacts.

5.3.1.6 Mitigation

Construction period considerations, including measures that will protect wetlands, are described in Section 5.5. No post construction period mitigation requirements are expected given that all impacts within wetland resource area related jurisdiction are temporary.

5.3.2 State-Listed Rare Species Habitat

Areas mapped as Priority Habitats of Rare Species and/or Estimated Habitats of Rare Wildlife by the NHESP under the Massachusetts Endangered Species Act (MESA) and the WPA, respectively, are described below. According to the NHESP, the Project site or a portion thereof is located within areas of Priority and Estimated Habitats for rare species include Least Tern (*Sternula antillarum*) and Piping Plover (*Charadrius melodus*) (NHESP File No.: 17-37398). Areas mapped by NHESP as Priority Habitats of Rare Species and/or Estimated Habitats of Rare Wildlife along the Preferred and Noticed Alternative onshore export cable routes are shown on Figure 5-2.

5.3.2.1 Preferred Route

The Preferred Route from the Dowses Beach Landfall Site to the proposed onshore substation site will pass through or directly adjacent to approximately 810 linear feet of mapped rare species habitat (see Figure 5-2). The only location where the Preferred Route will pass through or directly adjacent to mapped rare species habitat is within the existing parking lot area at Dowses Beach and along Dowses Beach Road. Along Dowses Beach Road, rare species habitat is mapped along the north side (East Bay side) of Dowses Beach Road. The duct bank will be located within the paved Town-owned parking lot and the three-circuit duct bank will be arranged in a twelve conduit wide by one conduit deep configuration, when crossing the box culvert in Dowses Beach

Road in order to avoid impacting the functionality of the culvert and to avoid impacting coastal wetland resources such as bank, dune, or salt marsh. The construction footprint would be limited to the roadway layout of the Dowses Beach Road Causeway and East Bay Road.

The implementing regulations of the MESA (321 CMR 10.00) contain an exemption from review for projects in Priority Habitat for *"installation, repair, replacement, and maintenance of utility lines (gas, water, sewer, phone, electrical) for which all associated work is within ten feet from the edge of existing paved roads"* (321 CMR 10.14(b)(10)). Because the onshore duct bank will be installed beneath or within ten feet of road pavement where the duct bank route will pass directly adjacent to rare species habitat, construction in those areas is exempt from review under the MESA, and accordingly, there is not expected to be any impact to rare species habitats by the duct bank installation.

5.3.2.2 Noticed Alternative

The Noticed Alternative shares the same common segment from the Dowses Beach Landfall Site along Dowses Beach Road to East Bay Road. As such, the Noticed Alternative passes through or directly adjacent to the same approximately 810 linear feet of mapped rare species habitat along Dowses Beach Road (see Figure 5-2). The Noticed Alternative also passes through or directly adjacent to mapped rare species habitat from the intersection of Old Mill Road and Bumps River Road, north of the crossing with Bumps River (see Figure 5-2). Along this stretch, the Noticed Alternative passes through or directly adjacent to approximately 444 linear feet of mapped rare species habitat. No impacts to rare species habitat are expected along the onshore Noticed Alternative.

5.3.2.3 Dowses Beach Landfall Site

On behalf of the Company, on April 29, 2022, Epsilon Associates, Inc. (Epsilon) filed a Request for State-listed Species Information Form with the NHESP. In NHESP's May 27, 2022 response, NHESP notes that the Project site or a portion thereof (Dowse's Beach parking lot), is located within Priority Habitat 2156 (PH 2156) and Estimated Habitat 693 (EH 693) as indicated in the Massachusetts Natural Heritage Atlas (15th Edition) for two state-listed bird species. The Company will continue to consult with NHESP to determine if the Project will result in a take of a state-listed endangered or threatened or special concern species.

HDD will be used to complete the offshore-to-onshore transition to minimize potential impacts to rare species habitat. HDD construction activities at Dowses Beach will occur entirely within the existing paved parking lot.

5.3.2.4 Grid Interconnection Routes

As shown on Figure 5-2, there are no mapped rare species habitat areas along any of the potential grid interconnection routes.

5.3.2.5 Comparison of Impacts

The onshore routes begin within the existing parking lot at Dowses Beach which has been identified by NHESP as an area of Priority and Estimated Habitat for rare species. From the parking lot, the two onshore routes traverse Dowses Beach Road where rare species habitat is mapped within or immediately adjacent to the Dowses Beach Road Causeway along the north side (East Bay side) of Dowses Beach Road. As noted above, all construction and staging activities at the Dowses Beach Landfall Site will occur within existing paved portions of the parking lot and the duct bank will be installed beneath or within ten feet of road pavement where the duct bank route will pass directly adjacent to rare species habitat. Along this common segment, the routes are equivalent with regard to associated impacts.

As described above, the Noticed Alternative passes through or directly adjacent to rare species habitat near the Bumps River crossing. Crossing of the Bumps River will be designed to avoid or minimize impacts on rare species habitat.

Table 5-4 summarizes the length each route crosses or directly abuts Priority and Estimated Habitat for rare species. The Noticed Alternative would have longer stretches through or adjacent to rare species habitat than the Preferred Route. As such, the Noticed Alternative has greater potential to result in temporary construction-period impacts near the Bumps River crossing, although the Bumps River crossing would be designed to avoid or minimize impacts on rare species habitat.

Table 5-4 Priority and Estimated Habitats for Rare Species Crossed or Directly Adjacent to Preferred and Noticed Alternative Onshore Export Cable Routes (linear feet, approximate)

Route	*Priority and Estimated Habitats of Rare Species (linear feet crossed or directly adjacent to)*
Preferred Route	810
Noticed Alternative	1,254

5.3.2.6 Mitigation

Construction period considerations, including measures that will protect rare species habitats, are described in Section 5.5.

For the Vineyard Wind Connector 1 (EEA #15787) and the NE Wind 1 Connector (formerly Vineyard Wind Connector 2) (EEA #16231), the Project Proponent and NHESP collaborated on Piping Plover Protection Plans (PPPP). NHESP's MESA Determination for NE Wind 1 Connector (NHESP File No.: 17-37398) and Vineyard Wind Connector 1 (NHESP File No.: 17-37398) stated that to avoid impacts to Piping Plovers and their habitats during the nesting season, all work and activities associated with the Project shall follow the protection measures and procedures outlined in the Draft Piping Plover Protection Plan, including, all work associated with HDD cable installation shall not commence during April 1 – August 31 and HDD work initiated in advance of April 1 may continue provided the Protection Plan is fully implemented. The NE Wind 2 Connector is located within rare species habitat for the Piping Plover and Least Tern. In accordance with the MESA (321 CMR 10.14), the Company will continue to consult with NHESP to ensure that impacts to rare species are avoided and in an effort to avoid a Take for either species. Based upon MESA consultation completed for the Vineyard Wind Connector 1 and NE Wind 1 Connector, the Company anticipates the need to repeat similar protective measures for the Piping Plover. The Company will consult with NHESP regarding Least Tern and Piping Plover at the NE Wind 2 Connector landfall site at Dowses Beach.

5.3.3 Public Water Supply Protection Areas

This section assesses mapped public water supply protection areas along the onshore Preferred and Noticed Alternative routes. Resources identified and evaluated include MassDEP Zone I and II areas and IWPA determined by hydro-geologic modeling and approved under MassDEP's Drinking Water Program.

The onshore portion of the Project is essentially a civil construction project predominantly located within existing roadway layouts that involves standard inert materials such as concrete, PVC conduit, and solid dielectric cable. The solid dielectric cables do not contain any type of insulating fluids. The Project will employ proper erosion and sedimentation controls and implement construction best management practices as described in Section 5.5.5.

Figure 5-3 illustrates the mapped public water supply protection areas along the Preferred Route and Noticed Alternative.

5.3.3.1 Preferred Route

The Preferred Route passes through approximately 3.7 miles of mapped Zone I and II wellhead protection areas. The Preferred Route is not located within any IWPA.

The Preferred Route also passes through a Freshwater recharge area identified by the CCC's Regional Policy Plan and directly adjacent to three Potential Public Water Supply Areas, mapped by the CCC's Priority Land Acquisition Assessment Project. Coincident with the Zone II area, the Preferred Route also passes through a Barnstable Groundwater Protection Overlay District.

5.3.3.2 Noticed Alternative

The Noticed Alternative passes through approximately 1.9 miles of mapped Zone I and II wellhead protection areas. Similar to the Preferred Route, the Noticed Alternative is not located within any Interim Wellhead Protection Areas.

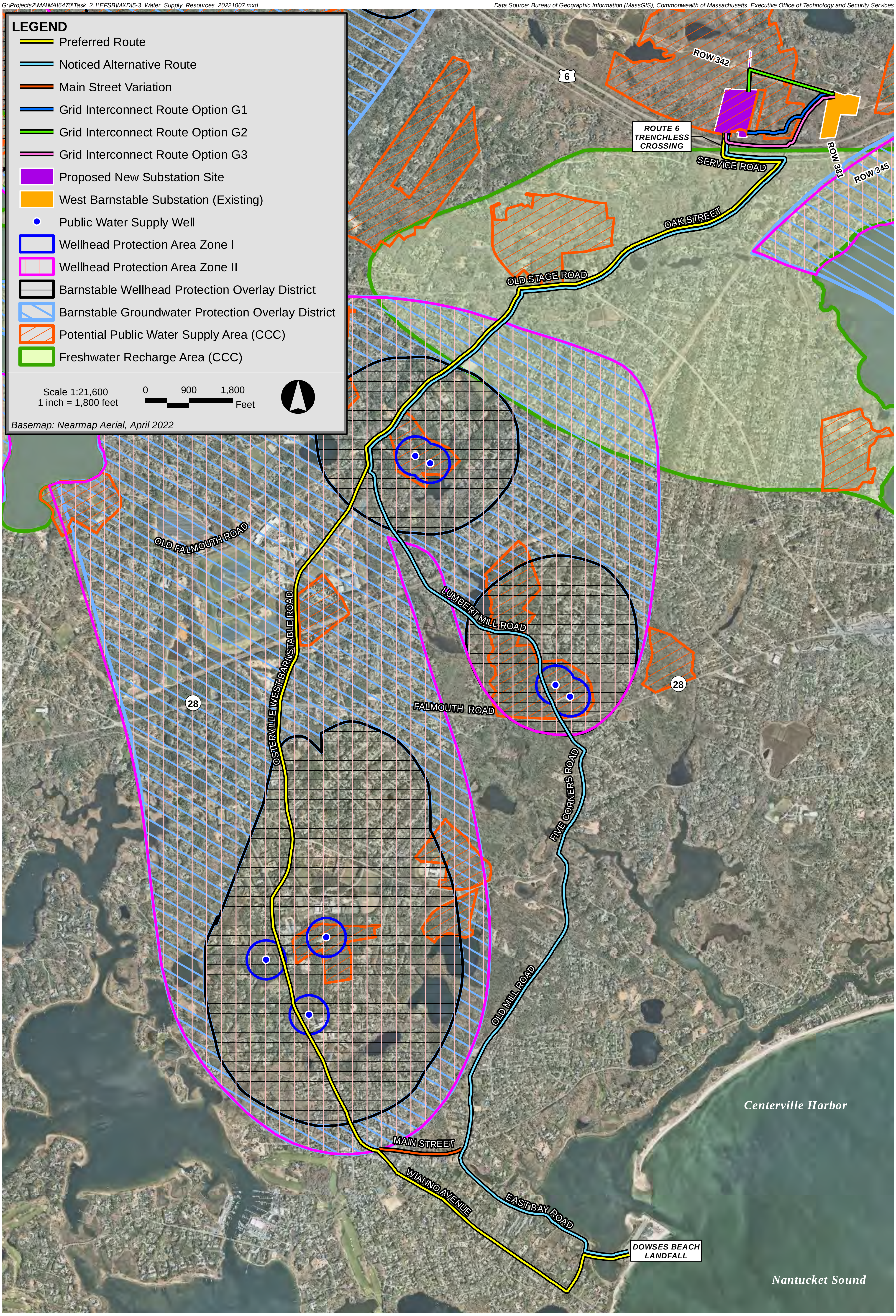


Figure 5-3
Water Supply Resources

The Noticed Alternative passes through the same Freshwater recharge area as the Preferred Route as the routes share a common segment from the intersection of Lumbert Mill Road and Old Falmouth Road to the proposed onshore substation site (2.5 miles). The Noticed Alternative passes through one area mapped as a CCC Potential Public Water Supply Area and adjacent to two Potential Public Water Supply Areas. Coincident with the Zone II area, the Noticed Alternative also passes through a Barnstable Groundwater Protection Overlay District.

5.3.3.3 Dowses Beach Landfall Site

There are no existing or potential public water supply protection areas mapped at the Dowses Beach Landfall Site.

5.3.3.4 Grid Interconnection Routes

As shown on Figure 5-3, two of the three potential grid interconnection route options traverse through an area identified as a Potential Public Water Supply Area as mapped by the CCC.

5.3.3.5 Comparison of Impacts

With regard to the onshore export cable routes connecting the Dowses Beach Landfall Site to the proposed onshore substation, the Preferred Route passes through approximately 3.7 miles of Zone I and II protection areas, while the Noticed Alternative passes through approximately 1.9 miles of Zone I and II protection areas. Neither route passes within IWPAs. Both routes pass through sections of a Barnstable Groundwater Protection Overlay District as well as a Freshwater Recharge Area mapped by the CCC and the Noticed Alternative passes through a Potential Public Water Supply Area mapped by the CCC.

As described above, the onshore export cable routes are primarily located along roadway layouts and involve standard inert materials such as concrete, PVC conduit, and solid dielectric cables. The solid dielectric cables do not contain any type of insulating fluids. The Project will employ proper erosion and sedimentation controls and implement construction best management practices as described in Section 5.5.5.

The operational phase of the Project will have no impact on water quality or water supplies, regardless of which route is constructed. Once the proposed duct bank is installed, backfilled, and repaved, there will be no Project-related sources of erosion or sedimentation, and the export cables will have no capability to generate hazardous waste. As noted above, the solid dielectric cables do not contain any type of insulating fluids. No sources of TSS will be created by the Project's onshore duct bank and onshore export cables. As a result, since the Project will have no impact on water quality or water supplies, the onshore export cable routes are equivalent to one another.

5.3.3.6 Mitigation

For the construction period, procedures for refueling construction equipment will be finalized during consultations with the CCC to ensure proper safety and spill prevention and are discussed in Section 5.5.5.3. High groundwater levels are not expected along the route, although depending on the relative elevation of proposed duct bank, dewatering may be necessary in the trench during construction and if affected by stormwater. Construction-period dewatering procedures are described in greater detail in Section 5.5.3.2. Standard erosion control practices will be employed to minimize erosion during trenching and construction activities, as described in further detail in Section 5.5.5.2.

As described in Sections 5.3.3.1 and 5.3.3.2, the Preferred Route and Noticed Alternative onshore export cable routes pass through Zone I and Zone II protection areas. Project construction is not expected to result in impacts to any of these water supply protection areas.

Storage areas for hazardous materials such as oils, greases, and fuels will be provided with secondary containment to ensure that no spills reach stormwater or other wetlands or waters. Contingencies for the proper disposal of contaminated soils shall be established (e.g., use of a licensed hauler and approved landfill) early in the construction period. The Company will develop an SPCC Plan which will be overseen by the contractor’s environmental compliance manager. The contractor’s responsibilities will include:

- Monitoring waste collection and disposal;
- Preparing a pre-job inventory of lubricants, fuels, and other materials that could potentially be discharged;
- Consulting with the Company to determine reportable spill quantities for materials identified in the inventory;
- Classifying each material on the pre-job inventory as hazardous or non-hazardous waste;
- Identifying the approved waste transporters and disposal sites for both hazardous and non-hazardous wastes;
- Approving the contractor's list of equipment and spill procedures and impact minimization measures;
- Defining the duties and coordinating the responses of all persons involved in cleaning up a spill;
- Maintaining, with support from the Company, an up-to-date list of names, addresses, and phone numbers of all persons to be contacted in case of a spill;
- Conducting training for spill prevention and impact minimization; and
- Conducting pre-planning meetings and trainings with foremen and crews for any work within 100 feet of wetlands waterways, or within 100 feet of known private or community potable wells, or when working within the Zone I of any Town wells.

Temporary construction period considerations related to water quality, drainage, and water supply protection, including refueling considerations, are discussed in Section 5.5. Temporary construction period considerations related to erosion and sediment control are discussed in Section 5.5.5.2.

5.3.4 Article 97-Jurisdictional Land

Article 97 lands have been acquired for conservation purposes and are protected under Article 97 of the Amendments to the Massachusetts Constitution. Construction could potentially result in temporary impacts to Article 97 open space areas. Each distinct open space area protected under Article 97 crossed was identified using MassGIS data. A permanent change of use or a disposition of these lands (including underground easements) require legislative approval under Article 97 of the Massachusetts constitution.

By routing within public roadway layouts and existing parking areas, the Project's onshore-to-offshore transition at the landfall and the onshore export cable route from the landfall to the new onshore substation will generally avoid crossing protected Article 97 open spaces. Figure 5-2 illustrates protected open spaces along the onshore components of the Project.

5.3.4.1 Preferred Route

As shown on Figure 5-2, the Preferred Route does not require crossing any Article 97 protected open space, conservation, or recreational lands except for the beach and paved parking lot at the Dowses Beach Landfall Site. The parking lot and the beach are both subject to Article 97 jurisdiction.[6] The HDD trajectory offshore to the parking lot will pass well beneath the beach; the HDD will have no temporary or permanent impacts to the beach itself. HDD activities and installation of the transition vaults and duct bank in the parking lot will have only temporary construction-related impacts. Because all infrastructure will be buried except for ground-level manhole covers, the Project will have no permanent impact on use of the parking lot after construction is complete.

In addition, the Preferred Route is located adjacent to four parcels mapped as Article 97 lands. These include three parcels along Main Street identified as Water Department Land managed by the Centerville Osterville Marstons Mills Fire District and owned by the Town of Barnstable and one parcel along Old Stage Road identified as the Old Stage Road Conservation Area (aka Whelan Conservation Area) managed by the Barnstable Conservation Commission and owned by the Town of Barnstable. The Whelan Conservation Area is an approximately 13-acre conservation area with walking trails. The parking area for this conservation area is not along the segment of

6 The Dowses Public Beach Landfall Site is located on Parcel 163-013, owned by the Town of Barnstable.

Old Stage Road associated with the Preferred Route and as such, construction of the Project along this route will have no impacts to the use of this conservation area during construction. The Preferred Route will not result in any significant impacts on these parcels.

5.3.4.2 Noticed Alternative

As with the Preferred Route, the Noticed Alternative utilizes the Dowses Beach Landfall Site, which is subject to Article 97 jurisdiction. As described in Section 5.3.1.2, the use of HDD and installation of below-grade infrastructure (with the exception of ground-level manhole covers) will avoid any permanent impact on use of the parking lot after construction is complete, and there will be no temporary or permanent impacts to the beach itself.

In addition, the Noticed Alternative is located adjacent to 16 parcels mapped as Article 97 lands. Of these parcels, 13 are located along Lumbert Mill Road, just north of Route 28 and are identified as Lumbert Mill Road Conservation Area and are managed by the Barnstable Conservation Commission or the Barnstable Land Trust and owned by the Town of Barnstable or the Barnstable Land Trust. This approximately 61-acre conservation area includes hiking trails. The parking area for this conservation land is located off Lumbert Mill Road along the Noticed Alternative Route. The Company would need to coordinate with the Town of Barnstable to ensure that there are no disruptions to parking and the use of this area during construction. Another parcel along Lumbert Mill Road is identified as Barnstable Water Supply Land and is managed by the Centerville Osterville Marstons Mills Fire District and owned by the Town of Barnstable. Another parcel along Lumbert Mill Road is identified as the Weathervane Way Conservation Area and is managed by the Barnstable Conservation Commission and owned by the Town of Barnstable. This approximately 7.4-acre parcel is conservation land with no existing hiking or walking trails. Lastly, the Noticed Alternative Route, like the Preferred Route, is adjacent to the Old Stage Road Conservation Area (aka Whelan Conservation Area) as discussed in Section 5.3.4.1. Construction of the Project along this route will have no impacts to the use of this conservation area during construction.

5.3.4.3 Substation

The new onshore substation will be located on three parcels located off the westerly side of Oak Street and the northerly side of Mid-Cape Highway (Route 6) in Barnstable, identified as Parcels 195-005, 195-006, and 194-016, and containing a total of approximately 15.2 acres. While the proposed onshore substation parcels themselves are not shown in MassGIS as Article 97 lands, two parcels to the north (i.e., Parcels 195-004 and 195-033) that are managed by the Barnstable Conservation Commission and owned by the Town of Barnstable, and one parcel to the south (i.e., Parcel 194-017) that is used as a fire monitoring tower and is managed by the Department of Conservation and Recreation and owned by the Commonwealth of Massachusetts, are shown in MassGIS as Article 97 lands. Vehicular and pedestrian access from the proposed onshore substation parcels to Oak Street is over an existing private way that crosses four parcels to the east and is shared with the fire tower parcel. Of the four parcels to the east, one of these parcels (i.e., Parcel 195-009) is managed by the Barnstable Conservation Commission and owned by the

Town of Barnstable and is shown in MassGIS as Article 97 land. In addition, another of these four parcels (i.e., Parcel 195-010), while not shown in MassGIS as Article 97 land, is owned by the Barnstable Fire District and may be Article 97 land.

5.3.4.4 Grid Interconnection Routes

As shown on Figure 5-2, two of the three potential grid interconnection route options traverse Article 97 lands. The only grid interconnection route option that does not traverse protected open space, conservation, or recreation lands, including parcels shown on MassGIS as subject to Article 97 jurisdiction, is the grid interconnection route option that follows the Route 6 state highway layout and shown on Figure 5-2 as Grid Interconnection Route Option G3.

5.3.4.4.1 Grid Interconnection Route Option G1 – Fire Tower Access Road to Oak Street

This option follows the existing private way that provides access to the proposed onshore substation parcels and then travels northeasterly along Oak Street to the West Barnstable Substation. As discussed in Section 5.3.4.3, the existing private way crosses four parcels to the east and is shared with the fire tower parcel and the four parcels to the east. Of the four parcels to the east, one of these parcels (i.e., Parcel 195-009) is managed by the Barnstable Conservation Commission and owned by the Town of Barnstable and is shown in MassGIS as Article 97 land. In addition, another of these four parcels (i.e., Parcel 195-010), while not shown in MassGIS as Article 97 land, is owned by the Barnstable Fire District and may be Article 97 land.

5.4.4.4.2 Grid Interconnection Route Option G2 – Eversource ROW #342

This option follows along a 40 foot-wide strip at the northerly portion of the substation parcels and then turns easterly and travels along a segment of Eversource ROW #342 to the West Barnstable Substation. The 40 foot-wide strip runs between two parcels shown in MassGIS as Article 97 land (i.e., Parcels 195-004 and 195-033) that are managed by the Barnstable Conservation Commission and owned by the Town of Barnstable. The segment of Eversource ROW #342 traverses two parcels shown in MassGIS as Article 97 land (i.e., Parcels 195-033 and 195-027) that are managed by the Barnstable Conservation Commission and owned by the Town of Barnstable. Construction of the underground duct bank within the 40 foot-wide strip may require a grant of a short-term license or other rights from the Town of Barnstable within Parcels 195-004 and 195-033 for temporary staging and other disruptions during construction. Construction of the underground duct bank within Eversource ROW #342 would temporarily restrict access to a portion of this site during installation, but the Project does not involve any above-ground infrastructure and would have no permanent impacts on use of existing ROW #342. While Parcels 195-033 and 195-027 may be subject to Article 97 protection, ROW #342 is an existing utility easement currently developed with overhead high voltage electric transmission lines. The Company believes that neither the temporary construction period staging and other disruptions to Parcels 195-004 and 195-033 nor the proposed installation of the grid interconnection duct bank within existing Eversource ROW #342 requires Article 97 approval.

5.3.4.5 Comparison of Impacts

For the onshore export cable routes from the landfall site to the proposed onshore substation, other than use of the paved parking lot at the landfall site and the HDD trajectory, which will pass beneath the beach, areas that are subject to Article 97 jurisdiction, the Preferred and Noticed Alternative onshore export cable routes, do not require crossing any protected open spaces. Because the same protected lands are impacted by both routes, neither route has more impact than the other.

For the grid interconnection routes from the proposed onshore substation site to the West Barnstable Substation, Grid Interconnection Route Option G3 does not cross Article 97-jurisdictional parcels. Grid Interconnection Route G1 follows the same route as the private way that provides vehicular and pedestrian access to the proposed onshore substation parcels and crosses one parcel that is Article 97 jurisdictional and another parcel that may be Article 97 jurisdictional. Grid Interconnect Route Option G2 would require temporary construction related disruptions to three parcels that are Article 97-jurisdictional and would cross two parcels that is Article 97-jurisdictional. However, the crossing would be via an existing utility ROW that should not require legislative approval.

Since the proposed onshore export cables will be installed within a buried concrete duct bank, the Project will have no permanent impact on appearance or use of any Article 97-jurisdictional parcels except for ground-level manhole covers installed to access buried splice vaults.

5.3.4.6 Mitigation

Construction period considerations, including measures that will protect Article 97 lands, are consistent with the measures described in Sections 5.5.2 and 5.5.3. In addition, the Company will coordinate with the Town of Barnstable and the Barnstable Land Trust to ensure that existing parking for conservation areas that have walking/hiking trails remains available and accessible during construction of the onshore duct bank. Furthermore, the Company will coordinate with the Town of Barnstable, the Barnstable Fire District, and the Department of Conservations and Recreation to ensure the construction of the new onshore substation and improvements to the private way (including any construction of an underground duct bank within the private way) do not adversely interfere with access to their respective parcels.

5.3.5 Tree Clearing

At the current level of design, the Onshore Export Cable Routes, located entirely within public roadway layout, are assumed to require no tree removal. However, depending on final duct bank design, selective tree removal and/or trimming may be required. Any vegetation removal will be completed in accordance with all applicable state and local laws and regulations.

5.3.5.1 Preferred Route

The Preferred Route is located entirely within public roadway layout. As noted above, at the current level of design, it is not anticipated that construction of the Preferred Route will result in tree removal.

5.3.5.2 Noticed Alternative

The Noticed Alternative is located entirely within public roadway layout. As noted above, at the current level of design, it is not anticipated that construction of the Noticed Alternative will result in tree removal.

5.3.5.3 Dowses Beach Landfall Site

Regarding the HDD and transition vault work at the Dowses Beach Landfall Site, there will be no impacts to trees on this parcel as all work including construction staging and laydown will be located within the existing parking lot area at Dowses Beach.

5.3.5.4 Grid Interconnection Routes

Grid interconnection Option G1 (Fire Tower Access Road to Oak Street) would require tree removal and tree trimming along the existing Fire Tower Access Road between the proposed onshore substation site and Oak Street in order to install the 345-kV grid interconnection duct bank.

Installation of the 345-kV grid interconnection duct bank within Grid interconnection Option G2 (Eversource ROW #342) would also require tree removal and tree trimming. Tree removal and trimming would be required along the approximately 40 foot-wide “panhandle” to the existing Eversource ROW #342. Because this option would utilize the narrow “panhandle,” grading and vegetation removal on adjacent conservation land may be warranted.

Grid interconnection Option G3 (Route 6 State Highway Layout to Oak Street) includes installing the grid interconnection cables within a new access road that would be constructed within the northern portion of the existing Route 6 State Highway Layout from the proposed onshore substation site to Oak Street. Installation of a new access road within the SHLO would require tree removal and tree trimming.

5.3.5.5 Comparison of Impacts

As noted above, both the Preferred Route and Noticed Alternative are located entirely within public roadway layout or within the existing parking lot area at Dowses Beach. The Company will avoid tree removal and/or trimming to the maximum extent practicable. However, depending on final duct bank design, selective tree removal and/or trimming may be required along in-road sections of the onshore export cable routes. Any vegetation removal will be completed in accordance with all applicable state and local laws and regulations. The trenchless crossing of

Route 6 will be utilized regardless of which routing alternative is ultimately selected and will require tree clearing within the MassDOT and/or Service Road layouts for staging. Additionally, the two routes have approximately 2.7 miles of common segments (approximately 40%) of the routes. Therefore, at the current level of design, the Company determined that both routes are comparable and removal and/or trimming will be confirmed during the detailed design phase.

All three grid interconnection route options would require tree removal and tree trimming as described above. At the current level of design, it is anticipated that Grid Interconnection Option G1 would require the fewest number of trees to be removed as there is an existing access road and tree removal would be associated with access road improvements.

5.3.5.6 Mitigation

The Company will implement the same practice to protect trees regardless of the routes (onshore export and grid interconnection) selected. Prior to construction, the Company will meet with the Town of Barnstable Tree Warden and/or MassDOT to confirm the location and condition of trees along the route relative to construction work areas. As required, the Company will obtain permits from the Tree Warden and MassDOT and work with the Tree Warden and MassDOT to identify appropriate mitigation. Mitigation measures may include, but are not limited to tree protection, temporary fencing, and excavation by means other than mechanical excavation techniques. If impacts to trees and vegetation along the duct bank route cannot be avoided, appropriate mitigation measures will be identified as needed.

5.3.6 Residential Land Uses

Residential land uses consist of single- and multi-family housing units, including apartments and condominiums. The Company tallied the total number of units within parcels identified as residential directly abutting the routes. The results are presented below in Table 5-5.

Table 5-5 Number of Residential Units Adjacent to the Preferred Route and Noticed Alternative Route

Route	*Residential Units*
Preferred Route	327
Noticed Alternative	314

There are 13 more residential units along the Preferred Route versus the Noticed Alternative Route. The potential for impacts to residential units is effectively the same for each route.

As described throughout this section, construction period impacts from the Project will be spatially constrained and temporary. Appropriate construction management and mitigation measures will avoid and minimize impacts to residences related to air quality, noise, and traffic congestion.

5.3.7 Commercial/Industrial Land Uses

Commercial/Industrial land uses consist of shopping centers, restaurants, larger strip commercial areas, neighborhood stores, medical offices, and light industrial facilities used for manufacturing, storage, or assembly of raw or processed products. The Company tallied the total number of units within parcels identified as commercial/industrial directly abutting the routes. The results are presented below in Table 5-6.

Table 5-6 Number of Commercial/Industrial Units Adjacent to the Preferred Route and Noticed Alternative Route

Route	*Commercial/Industrial Units*
Preferred Route	157
Noticed Alternative	6

There are 151 more commercial/industrial units along the Preferred Route versus the Noticed Alternative Route. The Preferred Route will impact more commercial/industrial units during the construction phase of the Project. As described throughout this section, construction-period impacts from the Project will be spatially constrained and temporary. Appropriate construction management and mitigation measures will avoid and minimize impacts to commercial/industrial units related to air quality, noise, and traffic congestion.

5.3.8 Sensitive Receptors

Sensitive receptors consist of hospitals, schools, police stations, fire stations, elder care facilities, day care facilities, district courts, and religious facilities. These are land use types where occupants are considered to be more susceptible to potential impacts from a project and where extra consideration must be made in considering potential mitigation measures to minimize these impacts. The Company tallied the total number of parcels identified as sensitive receptors directly abutting the routes (see Figure 5-4). The results are presented below in Table 5-7.

Table 5-7 Number of Sensitive Receptors Adjacent to the Preferred Route and Noticed Alternative Route

Route	*Sensitive Receptors*
Preferred Route	12
Noticed Alternative	3

There are nine more sensitive receptors along the Preferred Route versus the Noticed Alternative Route. The Preferred Route will impact more sensitive receptors during the construction phase of the Project. As described throughout this section, construction period impacts from the Project

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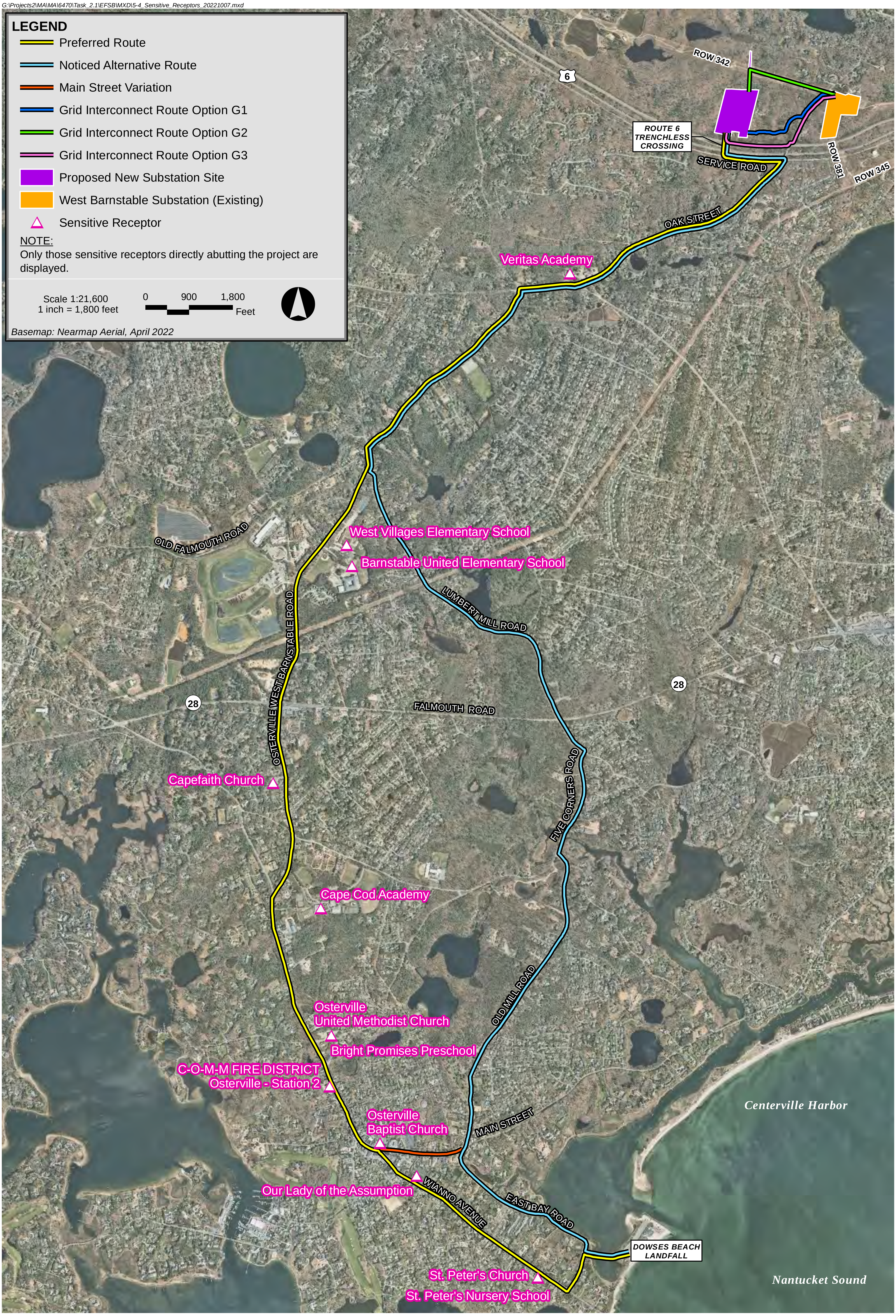

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Figure 5-4
Sensitive Receptors

will be spatially constrained and temporary. Appropriate construction management and mitigation measures will avoid and minimize impacts to sensitive receptors related to air quality, noise, and traffic congestion.

5.3.9 Traffic

The proposed onshore export cable route is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach (see Figure 4-7). As a result, the Company has assessed potential traffic-related impacts and has proposed the mitigation measures described below. The traffic analysis took into consideration MassDOT's road classification system, work zone requirements for construction activities, and means of accommodating traffic. Based on estimated work zone requirements, estimated paved area to accommodate a single lane of traffic past a work zone, and paved roadway widths, the traffic assessment conservatively assumed that detours would be required along all roadway segments during construction work hours. Identification of detour routes associated with individual roadway segment was based on a desktop review of roadway networks. Detours were then assessed for potential traffic impacts based on three factors: functional classification of the detour route; detour length, and presence of traffic signals. As outlined in detail in Section 4.5.6.3.1, the potential for traffic-related impacts along each onshore export cable route is largely related to these three factors.

Public transportation is somewhat limited in the Project area, and the busiest transportation facilities, such as the Barnstable Municipal Airport Terminal and Hyannis Transportation Center, are well removed from the onshore routes. In addition, the Project is striving to minimize impacts to traffic by avoiding construction in roadways during the busiest times of the year and will also provide suitable detours during construction. For these reasons, potential impacts to public transit or other transportation corridors were not regarded as an important siting criterion for the Project.

5.3.9.1 Preferred Route

The Preferred Route is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach and has a total length of approximately 6.7 miles.

The highest potential for traffic delays along the Preferred Route is anticipated to be associated with work on a section of Oak Street where Old Stage Road would serve as the detour route, a roadway with a lower functional classification. From a traffic management perspective, there are no road segments of the Preferred Route that are considered unique or unusual for this type of construction.

5.3.9.2 Noticed Alternative

The Noticed Alternative is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach and has a total length of approximately 6.6 miles (see Figure 4- 7).

Segments with the highest potential for congestion include the short portion along Five Corners Road where traffic would be detoured from a minor arterial to collector/local roadways (roadways with lower functional classification); Lumbert Mill Road, which would require a long detour to Osterville-West Barnstable Road and Oak Street, where traffic would be detoured to Old Stage Road, a roadway with a lower functional classification. From a traffic management perspective, there are no road segments on the Noticed Alternative that are considered unique or unusual for this type of construction.

5.3.9.3 Comparison of Impacts

While both routes will require thoughtful traffic management, in terms of the potential for traffic congestion along the onshore export cable routes, the Preferred Route is considered superior to the Noticed Alternative because it has shorter detours as compared to the Noticed Alternative. Additionally, as described in Section 5.3.9.2, the Noticed Alternative follows some roadways where the identified detour routes would involve diverting traffic to roadways with a lower functional classification.

5.3.9.4 Mitigation

Regardless of the route selected, the Company or its contractors will use signage, lane restrictions, police details, and other appropriate traffic management measures to maintain traffic flow, and traffic management will always be coordinated with Town officials. The Company will utilize various methods of public outreach prior to and during the construction phase to keep residents, business owners, and officials updated on the Project construction schedules, vehicular access to abutting properties, lane closures, detours, and other traffic management information, local parking availability, emergency vehicle access, construction crew movement and parking, laydown areas, staging, equipment delivery, nighttime or weekend construction, and road repaving. The Company will work with the local police and emergency service departments prior to commencement of any work and will formulate a comprehensive traffic plan for each phase of the upland works.

Draft Traffic Management Plans for the Preferred Route are included in Attachment B2. The Company will work closely with the Town of Barnstable on the TMP for construction including submittal of the TMPs for review and approval by appropriate municipal authorities (typically DPW/Town Engineer and Police). A TMP will also be prepared and submitted to MassDOT for work on roadways under MassDOT jurisdiction. The TMP will be a living document such that any unanticipated change in construction location, timing, or method previously identified will result in revision of the TMP and approval by the appropriate authorities before any construction changes are implemented.

The Company will work closely with the Barnstable DPW and MassDOT District 5 traffic engineers to develop a series of temporary TMPs that include the following mitigation measures:

- Use of Advanced Warning Signs and Changeable Message Boards to alert motorists of "Road Work Ahead" and Alternate Routes.
- Use of Construction Signage to alert motorists of construction activities in the "Work Zone."
- Use of One Lane Road (Bi-directional) traffic control with police details in the "Work Zone."
- Use of Detour plans around the "Work Zone" for short-duration road closures during daylight construction activities.
- Use of Traffic Control Devices such as traffic cones, reflectorized drums, and barricades for delineation of travel ways and walkways.
- Use of defined hours of operation.
- Reasonable limits on the length of trench the contractor may have open at any given time.
- Use of Road Plates to cover trench work in progress to restore two-way traffic during non-working hours or to allow access to local streets and driveways.
- Use of Designated Staging and Laydown Areas to minimize impacts to pedestrian and vehicular traffic.
- Use of public communications media to inform the public of current and future construction activities and how they may affect local traffic conditions.

The traffic mitigation measures will be in accordance with the *Manual of Uniform Traffic Control Devices* (2009 Edition) and the MassDOT *Work Zone Safety Guidelines*. These manuals and guidance documents provide detailed national and state standards for the application of traffic control devices for temporary roadway modifications that the Company will implement in the Project construction zone, including necessary lane widths, lane tapers, size, type and color of warning signs, and similar provisions that ensure safe travel through the construction zone. For additional detail on the TMP, please refer to Attachment B2.

In addition, the Company will work with community members, including local business owners and sensitive receptors to minimize construction period traffic-related impacts. Because the Project will maintain continuous access to businesses, the Company does not expect significant impacts on businesses. Furthermore, any in-road construction will occur outside the busy summer season, or as otherwise permitted by the Town or relevant agency. The Company believes the most effective approach to mitigation will be to communicate directly with each business that might be affected by the Project to determine if there are specific timing concerns such as hours of operation, deliveries, high-traffic periods, or other constraints. The Company will work with businesses located along the selected route to minimize any impacts to these businesses.

In terms of parking accommodations for construction workers, for similar types of construction past practice has been to utilize off-site commercial locations such as large existing parking lots or contractors' yards for satellite parking. Employees are then "shuttled" to the project site in company-supplied passenger vans. The Company will coordinate any required parking with the local police and town departments, as necessary. There are several areas near the Preferred and Noticed Alternative routes where off-site parking could potentially be utilized, and employees shuttled to the work sites. Installation of the in-road underground duct bank and onshore export cables within public roadway layouts will be performed during the off-season, or as otherwise permitted by the Town or relevant agency, to minimize traffic disruption.

5.3.10 Historic and Archaeological Resources

The Project is subject to review by the MHC in compliance with M.G.L. Chapter 9, Sections 26-27C as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00) known as "State Register Review", and Section 106 of the National Historic Preservation Act. The Project undertook surveys to identify historic resources, including above-ground historic resources and recorded archaeological sites, within and near the onshore routing alternatives. The term Historic Resources as used herein includes properties listed or eligible for listing on the National Register of Historic Places, properties on the Massachusetts State Register of Historic Places, and properties included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory). To be considered significant and eligible for listing on the State or National Registers of Historic Places, a resource must exhibit physical integrity and contribute to American history, architecture, archaeology, technology, or culture. Historic architectural resources located along the Preferred and Noticed Alternative onshore export cable routes and grid interconnection routes are shown on Figure 5-5. Locations of recorded archaeological sites have been included in the scoring analysis presented in Section 4, but the locations themselves are considered confidential by MHC and applicable federal agencies to protect the resources' integrity.

5.3.10.1 Preferred Route

The Preferred Route is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach and has a total length of approximately 6.7 miles. As depicted on Figure 5-5, the route passes through a portion of the Wianno Avenue Historic District, which includes seven National Register Properties directly adjacent to the route. Additionally, a large number of properties (buildings, burial grounds, structures, and/or objects such as statues, monuments, and walls along the northern half of Wianno Avenue and along Main Street up to the approximate intersection with Pond Street have been inventoried and are included in the MACRIS database. The Preferred Route passes through or is adjacent to a total of 304 inventoried properties, National Register Properties, and areas or districts, with each directly abutting parcel within an area or district included in this count.

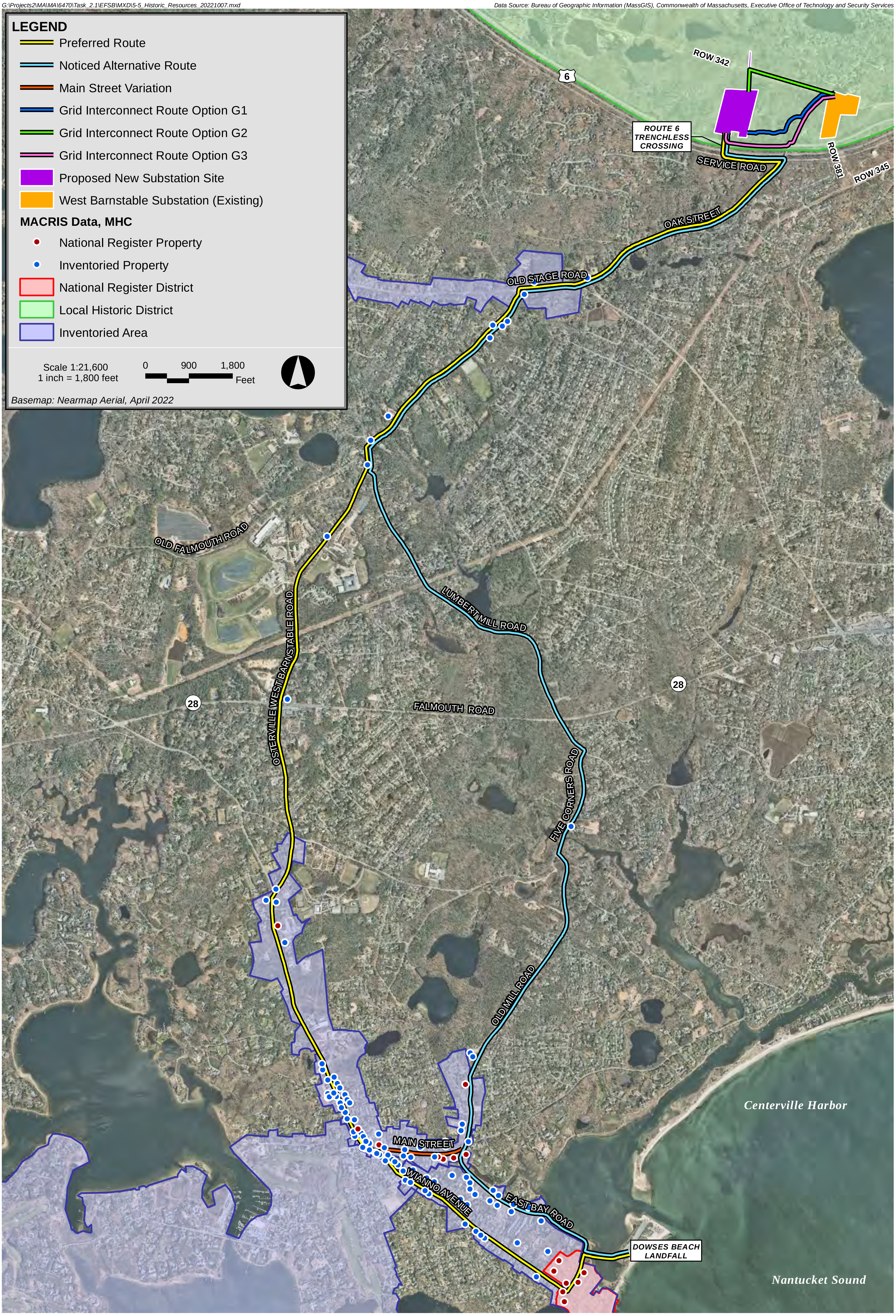

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Figure 5-5
Historic Resources (MACRIS Data, MHC)

5.3.10.2 Noticed Alternative

The Noticed Alternative is located entirely within public roadway layouts or within the existing parking lot area at Dowses Beach and has a total length of approximately 6.6 miles. The Noticed Alternative passes through or is adjacent to a total of 126 inventoried properties, National Register Properties, and areas or districts, with each directly abutting parcel within an area or district included in this count.

5.3.10.3 Comparison of Impacts

The Preferred Route passes through or is directly adjacent to more historic districts, areas, inventoried properties, and National Register Properties and as such, has a greater number (178) of historic resources associated with it than the Noticed Alternative Route (see Table 5-8). North of the intersection of Wianno Avenue and Main Street, the Preferred Route passes through an inventoried area of approximately 1.3 miles in length, with the number of inventoried properties along the southern section of Main Street being quite dense, whereas the Noticed Alternative only passes through an inventoried area of approximately 0.3 miles in length north of the intersection of Main Street and Old Mill Road, with a total of six inventoried properties (Inventoried and National Register Properties) directly abutting the roadway layout.

Both routes pass through almost the same length of areas identified as having moderate or high sensitivity for archaeological resources (see Table 5-8).

Table 5-8 Historic and Archaeological Resources Located Along the Preferred Route and Noticed Alternative Route

Route	*# of Historic Resources*	*Archaeological Sensitive Areas (length)*
Preferred Route	304	5.8
Noticed Alternative	126	5.7

As noted above, both the Preferred Route and Noticed Alternative Route will largely be constructed in previously disturbed areas (i.e., within public roadways or existing parking areas). These previously disturbed areas have been modified by construction of the road or parking areas and contain above- and below-grade utilities, and it is unlikely that natural/undisturbed soils or potentially significant unrecorded intact archaeological deposits would be located below or immediately adjacent to them. Based on a preliminary assessment performed by the Company's archaeology consultant (i.e., PAL), the general area surrounding the Project routes has been assigned moderate to high sensitivity for unrecorded archaeological resources. In general, it would be expected that unrecorded archaeological resources would not be found in previously disturbed roadway layouts where the duct banks will be placed. No impacts are anticipated to above-ground historic resources, as the proposed export cables will be underground. Excavation for the proposed onshore duct bank will comply will all pertinent codes and regulations for such work to ensure no damage occurs to adjacent properties. As the Project involves construction of an underground duct bank in existing roadways and/or right-of-ways, temporary construction activities will temporarily affect the appearance of existing roads near historic properties. However, the effect will be limited to excavation, restoration, and resurfacing of existing roadway layouts. No adverse impacts to above-ground historic properties are anticipated.

Construction of the onshore duct bank will not affect any historic buildings or structures on either the Preferred Route or the Noticed Alternative. The Noticed Alternative passes through or along fewer known historic sites/districts/features. However, none of the identified buildings or structures will be altered by the proposed underground export cables or construction along either route.

Both routes have similar archaeological sensitivities based on the length of areas identified as having moderate or high sensitivity for archaeological resources. As a result, the impacts of the two routes on historic and archaeological resources are comparable.

5.3.10.4 Substation

The proposed onshore substation site does not include any structures, sites, or districts listed in the MHC Inventory of Historic and Archaeological Assets of the Commonwealth. The proposed onshore substation site is located within the Old King's Highway Regional Historic District (regional district established by Massachusetts Chapter 470 of the Acts of 1973, as amended). The proposed onshore substation site has been examined for archaeological impacts through archaeological reconnaissance surveys. The results of the archaeological reconnaissance surveys indicate moderate to high levels of archaeological sensitivity at the proposed onshore substation site.

The Company's Archaeological Consultant has obtained a permit to complete Intensive Field surveys related to archaeological resources on the proposed onshore substation site. The Company is also coordinating with the THPOs of involved federally recognized tribes for the Intensive Field survey program. The Company will continue to consult with the THPOs to avoid, minimize, and mitigate impacts to significant Native American archaeological resources, if identified in the Project's area of physical effect (i.e., construction footprint). The Company will also coordinate with MHC and complete further consultation with the MHC pursuant to M.G.L. Chapter 254 (State Register Review) to identify any avoidance and mitigation measures to be incorporated into the Project related to cultural resources. The Company filed a Project Notification Form (PNF) with the MHC on August 18, 2022. Additionally, the MEPA ENF was submitted to MHC on September 30, 2022. Potential effects, if any, to archaeological resources will be addressed with the MHC and the THPO(s) through the federal Section 106 and the State Register Review processes.

5.3.10.5 Mitigation

Review by the MHC has already commenced through the filing of a PNF and ENF. As presented herein, reconnaissance-level surveys have been completed to determine the presence of historic and archaeological resources along all of the onshore components of the Project. Further consultation will be undertaken with the MHC pursuant to Chapter 254 (State Register Review) and with Tribal THPO staff to identify the need for additional field surveys and to identify any avoidance and mitigation measures to be incorporated into the Project related to cultural resources. Potential effects, if any, to cultural resources will be addressed with the MHC and the THPO(s) through the federal Section 106 and the State Register Review processes.

5.3.11 Potential to Encounter Subsurface Contamination

The potential to encounter subsurface contamination was derived from the number of sites on or within 300 feet of the Preferred Route and Noticed Alternative where a documented release of oil and/or hazardous materials occurred, or where past land uses potentially resulting in contamination have been documented in the MassDEP BWSC online database, pursuant to the MCP (310 CMR 40.0000). This criterion was evaluated using the MassDEP BWSC online database. No documented BWSC sites were identified on or within 300 feet of any of the routes, and thus both routes are comparable for this factor.

5.3.12 Noise

Potential construction period noise impacts associated with the onshore components of the Project and proposed mitigation measures are described below. In addition, potential noise impacts from operation of the Project substation are discussed in Section 5.3.12.7.

5.3.12.1 Sound Level Considerations - Duct Bank and Cable Installation

Civil construction activities related to the Project will generally consist of the following five principal noise-producing phases:

- Trench excavation;
- Duct bank installation;
- Manhole installation;
- Backfill and Compaction; and
- Final pavement restoration.

Each of these phases will be conducted in sequence at each location; it is possible that several phases of construction will be ongoing simultaneously along various sections of the onshore export cable route.

The potential for noise impacts from Project construction is a function of the specific receptors along the route as well as the equipment used and proposed hours of operation. Construction is anticipated to occur during typical work hours (Monday to Friday, from 7:00 AM to 6:00 PM), though in specific instances at some locations, or at the request of the DPW, the Project may seek municipal approval to work at night or on weekends. Nighttime work will be minimized and performed only on an as-needed basis, such as when crossing a busy road, and will be coordinated with the Town.

Onshore export cable installation will generate noise levels that are periodically audible along the Project route, conductor-pulling sites, and staging and maintenance areas. Proposed construction equipment will be similar to that used during typical public works projects (e.g., roadway resurfacing, storm sewer installation, transmission line installation).

In general, sound levels from construction activities will be dominated by the loudest piece of equipment operating at the time. Therefore, at any given point along the work area, the loudest piece of equipment will be the most representative of the expected sound levels in that area. Maximum sound levels from typical equipment proposed during construction are listed in Table 5-9 at a reference distance of 50 feet.

Table 5-9 Reference Sound Levels of Construction Equipment at 50 feet

Equipment	Max. Sound Level (dBA) at 50 feet
Mobile Crane *(duct bank and manhole installation)*	85 (1)
Pavement Saw *(trench excavation)*	90 (1)
Asphalt Paver *(manhole installation, street restoration)*	85 (1)
Pneumatic Hammer *(trench excavation)*	85 (1)
Mounted Impact Hammer (Hoe Ram) *(trench excavation if ledge)*	90 (1)
Backhoe *(trench excavation)*	80 (1)
Dump Truck *(manhole installation, trench excavation)*	84 (1)
Generator (cable pulling and splicing)	82 (2)
Air Conditioning (cable splicing)	60 (at 3 feet) (2)

Source:

1. Thalheimer, E., "Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project," Noise Control Eng. Journal 48 (5), 2000 Sep-Oct.
2. US EPA, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," prepared by Bolt, Beranek and Newman, Report No. NTID300.1, December 31, 1971.

Construction equipment proximity to noise-sensitive land uses will vary along the proposed onshore export cable route. Because sound levels from a point source drop off due to geometric divergence (hemispherical spreading) at a rate of 6 dB per doubling of distance, the reference sound levels at 50 feet in Table 5-9 will decrease by 6 dBA for locations 100 feet back from the edge of construction. For example, maximum backhoe sound levels at 100 feet would be expected to be approximately 74 dBA. Similarly, if setbacks are less than 50 feet, sound levels will be higher. For example, if a setback is 25 feet from construction activity, sound levels from each piece of equipment would increase by 6 dBA. Therefore, the same backhoe at 25 feet would be expected to produce a maximum sound level of 86 dBA. To reiterate, the 80 dBA is the maximum expected backhoe sound level, while typical levels would be lower.

In addition, the modeled sound impacts conservatively assume that construction equipment is operated continuously at maximum load. In fact, construction equipment generally does not operate at maximum load with significant variation in power and usage. Actual received sound levels would fluctuate depending on the construction activity, equipment type, and separation distances between source and receiver. Other factors such as terrain and obstacles (e.g., buildings) will act to further limit the impact of construction-period noise levels.

Trench excavation and manhole installation are typically the loudest phases of construction. Under normal trenching conditions (i.e., no ledge, no excessive underground utilities), the construction crews involved in trench excavation are expected to progress at an average rate of approximately 80 to 200 feet per day for an average duration of approximately seven days at any one location. If rock is encountered during construction, equipment such as a hoe ram will be used, which would temporarily increase noise levels.

In general, cable pulling and splicing phases are not expected to generate significant noise. Once adjacent cable sections are installed, they will be spliced together inside the manholes. Splicing high-voltage solid-dielectric transmission cable is a complex operation; splicing activities will not be continuous, but will take place over four or five extended workdays at each manhole location. The splicing operation requires a splicing van and a generator, and an air conditioning unit may be used to control the moisture content in the manhole. A portable generator will provide electrical power for the splicing van and air conditioning unit, and will be muffled to minimize noise; this technique has been used successfully in locations with sensitive receptors. Typically, the splicing van will be located at one manhole access cover, while the air conditioner will be located near a second manhole access cover, and the generator will be located in a convenient area that does not restrict traffic movement around the work zone.

The electric generator and truck with ventilation fans will generate some noise when manholes are occupied; however, every practicable effort will be made to limit noise disturbance from this source. Mitigation measures will include use of a low noise/muffled generator, portable sound walls (temporary noise barriers) as needed, blocking the path of generators, and working with municipalities to coordinate work.

The Company has developed construction procedures and policies to govern the manner in which construction will occur within existing public roadway layouts, and construction management is described in Section 5.5.3. During construction, BMPs will be implemented to minimize and mitigate potential impacts to the surrounding area and sensitive resources, and the hours of construction will be coordinated with local authorities.

5.3.12.2 Comparison of Preferred Route and Noticed Alternative Route

Noise from construction of the Preferred Route and the Noticed Alternative Route will impact residences, commercial/industrial units, and sensitive receptors. There are 13 more residential units along the Preferred Route versus the Noticed Alternative Route. The potential for impacts to residential units is effectively the same for each route. There are 151 more commercial/industrial units along the Preferred Route versus the Noticed Alternative Route. The Preferred Route will impact more commercial/industrial units during construction. There are nine more sensitive receptors along the Preferred Route than along the Noticed Alternative Route. The Preferred Route will impact more sensitive receptors during the construction phase of the Project.

5.3.12.3 Sound Level Considerations – Trenchless Crossings

HDD will be used to accomplish the offshore-to-onshore transition at the landfall site, and a trenchless crossing of Route 6 is likely to be accomplished via pipe jacking.

5.3.12.4 Landfall Site HDD

HDD has three major processes: (1) conductor casing installation; (2) pilot hole drilling/alignment reaming, and (3) conduit pull-back. Conductor casing installation involves drilling or hammering the conductor sleeve using a pneumatic hammer powered by a compressor and suspended by an excavator. A drill then creates a pilot hole through the casing followed by multiple reaming passes to the HDD exit location. A conduit is subsequently pulled back through the drilled alignment for future installation of the subsea cable.

The conductor sleeve (casing) or conductor casing is an oversized steel casing relative to the HDD conduit. The casing is installed prior to beginning HDD pilot bore installation over the planned drill path such that the pilot bore, reamers, and pipe pullback are all performed through the center of the conductor casing. The depth of installation depends on ground conditions, particularly the transition from loose or soft overlying soils to denser or stiffer underlying soils. The casing can be installed with drilling methods wherein teeth are welded to the end of the casing and the casing is drilled into place using the HDD drill rig or other similar rig. Alternatively, the casing can be rammed into place using a similar rig utilizing a percussive hammer. The choice to use ramming or drilling methods depends on noise and vibration limitations and ground conditions.

There are typically two purposes for a conductor casing in HDD operations. The first purpose is to support unstable ground prior to starting pilot bore, reaming, and product pipe installation. HDD requires a larger overcut between the product pipe (conduit) and the borehole to facilitate installation relative to other trenchless methods. As such, there is an increased risk of hole collapse in unstable soils. The conductor casing holds the hole open in these soils until the drill path can reach deeper, more competent material. The second purpose is to mitigate inadvertent drilling fluid release, the risk of which is often higher in thin ground cover near HDD exits and entries. The conductor casing prevents drilling fluid from leaving the confines of the casing.

While there are multiple noise sources associated with the HDD process, the loudest activity is conductor sleeve installation, and to be conservative this analysis assumes the loudest installation technique (i.e., hammering). Reference sound level measurements of conductor sleeve drilling activity were performed by Epsilon Associates, Inc. for another project, and Table 5-10 provides a series of expected sound pressure levels at varying distances from HDD conductor sleeve drilling based on measured data. Section 5.5.2 provides a more detailed description of the HDD to be used to accomplish the offshore-to-onshore transition at the landfall site, and Section 5.5.3.4 provides a detailed description of the Route 6 trenchless crossing.

Table 5-10 Conductor Sleeve Drilling Sound Levels (part of HDD)

Distance (feet)	Sound Pressure Level (dBA)
50	102
100	96
250	88
500	82
1,000	76
1,500	72
2,000	70
3,000	66

Potential receptors in the vicinity of the HDD will be at a variety of setback distances from the actual activity. The closest residence to potential HDD activity at the Dowses Beach Landfall Site is located over 500 feet from where conductor sleeve drilling will take place. This corresponds to an outdoor estimated sound level of approximately 82 dBA (unmitigated and assuming direct, unobstructed line of sight). For a point of reference, a typical heavy truck is approximately 85 dBA at 50 feet. Installation at the landfall site will be performed in the off-season, and the Company will assess additional sound mitigation techniques and will work with homeowners who may be in the area during HDD operations.

Noise mitigation techniques are discussed in Section 5.3.12.6. The estimated noise level while installing the landfall HDD conductor sleeve using the vibratory hammering process is approximately 97 dBA (unmitigated) at a distance of 50 feet. The actual sound level will be predicated on the contractor’s specific means and methods. A temporary sound barrier can be installed to minimize sound propagation. If the casing is drilled into place, the estimated maximum unmitigated sound level during casing advancement as 87 dBA at 50 feet. The selected contractor will determine the appropriate installation method.

In addition to conductor sleeve drilling, other HDD activities that will produce sound include trucks for hauling/disposal of slurry, the HDD drill rig, mobile site equipment such as a crane, excavator, and/or front-end loader, generator, slurry plant, and pumps. The following sound level estimates for the equipment associated with HDD are estimated based on equipment noise ratings from recently completed projects and noise attenuation data presented in the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual, dated September 2018 and the Federal Highway Administration (FHWA) Construction Noise Handbook. Actual noise levels may vary. The estimated maximum unmitigated sounds levels at a distance of 50 feet associated with other activities for HDD are as follows:

- Trucks: 84 dBA
- Excavator: 80 dBA
- Front End Loader: 79 dBA
- Mobile Crane: 83 dBA
- HDD Rig: 81 dBA during drilling / 87dBA during casing advancement (if drilled)
- Generator: 81 dBA
- Slurry Plant: 83 dBA
- Pumps: 81 dBA

Extended work hours would only be required if an unexpected condition were encountered during construction. The HDPE pipe pullback process requires a continuous operation to maintain borehole stability. As such, 24-hour operations are anticipated to be required for that activity.

5.3.12.5 Route 6 Trenchless Crossing

Pipe jacking is likely to be utilized as the trenchless crossing technique for crossing Route 6, and no residences are located within approximately 400 feet. Hours for pipe jacking are anticipated to be consistent with onshore duct bank and cable installation or as otherwise agreed upon with the Town and/or MassDOT. The proximity of Route 6 means there are already significant ambient sound levels in the location of this crossing.

5.3.12.6 Construction Noise Mitigation

While intermittent increases in noise levels are expected during construction activities, the Company is committed to minimizing these impacts. The Company will mitigate noise from construction equipment along the selected route near sensitive locations such as residences. The distance between the construction equipment and the sensitive locations will vary along the selected route. Mitigation equipment may include temporary noise barriers.

The Company will require that construction equipment be operated such that construction-related noise levels will comply with applicable sections of the MassDEP Air Quality Regulations at 310 CMR 7.10, particularly subsections (1) and (2), which pertain to the use of sound-emitting equipment in a considerate manner as to reduce unnecessary noise. The Project will make every reasonable effort to minimize noise impacts from construction. The Town of Barnstable does not have a bylaw applicable to construction-related noise.

Noise mitigation measures expected to be incorporated into the Project include:

- Minimizing the amount of work conducted outside of typical construction hours;
- Ensuring that appropriate mufflers are installed and maintained on construction equipment;
- Ensuring appropriate maintenance and lubrication of construction equipment to provide the quietest performance;
- Requiring muffling enclosures on continuously operating equipment such as air compressors and welding generators;
- Turning off construction equipment when not in use and minimizing idling times; and
- Mitigating the impact of noisy equipment on sensitive locations by using shielding or buffering distance to the extent practical.

Blasting is not anticipated, nor is construction expected to result in noticeable vibrations.

Specific to the HDD operation at the Dowses Beach Landfall Site, a primary noise mitigation technique that could be implemented is installation of a temporary sound barrier between the HDD activity and residences. The sound barrier would be an acoustical (i.e., sound-absorbing or blocking) blanket installed on the construction fence or as a free-standing barrier that could function as a substitute to the construction fence. Conductor sleeve installation will be the loudest component of the HDD operation. Such a barrier would likely need to be approximately 16 feet high such that the line-of-sight is broken between the conductor sleeve installation and the second story of the nearest residences. This temporary barrier would be expected to reduce sound levels from conductor sleeve installation, and all subsequent construction activity, by about 5 to 10 dBA. The Company would determine whether to use an acoustical blanket based on whether its use would be expected to significantly reduce sound levels at occupied residences during the scheduled construction activity.

To further reduce potential impacts, conductor sleeve drilling will be consistent with the work hours described in Section 5.5.6 unless otherwise coordinated with the Town, and the HDD schedule will avoid the summer season.

5.3.12.7 Project Substation Operation

The Project substation will contain noise emitting equipment. The Company will conduct a sound level impact assessment for the operation of the Project substation. The assessment will include ambient baseline sound level data collected in the vicinity of the proposed onshore substation site, sound level modeling to predict the operational sound from the substation, an evaluation of modeled sound levels, and design considerations for mitigation to ensure that noise from the substation has been minimized. The noise assessment is anticipated to be complete by Q1 2023.

5.3.13 Visual Impact

Except for the Project substation, which will be utilized by both routes, all other Project components will be located underground and will not have any visual impact once installed. The only visible at-grade features will be manhole covers within the Dowses Beach parking lot and at vault locations along the onshore duct bank route for either route selected. Thus, the Preferred Route and the Noticed Alternative are comparable with respect to visual impact.

The proposed onshore substation site is an approximately 15.2-acre privately-owned site located west of Oak Street in West Barnstable. The site is just north of Route 6[7] and is located approximately 0.5 miles from the existing West Barnstable Substation. The site is comprised primarily of undeveloped wooded uplands and is located in a residentially zoned area as well as an Aquifer Protection Overlay District. To the west, the proposed onshore substation site is bordered by undeveloped land. To the north, the site, including a 40-foot-wide “panhandle” associated with the site that extends from the north of the property, is bordered by two protected parcels that are part of the Spruce Pond Conservation Area owned by the Town of Barnstable and managed by the Conservation Commission. The existing Eversource ROW #342 and Spruce Pond Road are located in the Spruce Pond Conservation Area. To the east, the site is bordered by a residential parcel developed with one single-family home (see Figures 1-7 and 5-2). Based on preliminary engineering design, of the approximate 15.2-acre site, approximately 12.4 acres will be cleared during build-out of the new onshore substation. Visual simulations of the proposed onshore substation are anticipated to be complete by Q1 2023. Based on existing topography and vegetation between the proposed onshore substation, existing topography and vegetation to the south is anticipated to provide visual screening to persons traveling along Route 6. Four existing residences are located east of the proposed onshore substation site and include the existing residential parcel developed with one single-family home abutting the substation site, two residences along the east side of Oak Street, north of the Oak Street bridge, and one residence southwest of Plum Street. Views of the Project substation from the two residences located east of Oak Street and the one residence southwest of Plum Street are expected to be limited as a result of a combinations of distance, topography, and dense vegetative cover. Eversource ROW

[7] Route 6, the Mid Cape Highway, is a four-lane divided, limited access highway.

#342 and land associated with the Spruce Pond Conservation Area are located north of the proposed onshore substation site and to the west is undeveloped land located in private ownership and undeveloped conservation land owned by the Town.

All three grid interconnection route options would be located entirely underground. However, all three grid interconnection route options would require tree removal and tree trimming as described in Section 5.3.5.4. Visual impacts associated with the grid interconnection route would therefore be a result of tree removal and tree trimming.

Lighting

Outdoor lighting is planned at the proposed onshore substation. Light fixtures are typically holophane type fixtures equipped with light shields to prevent light from encroaching into adjacent areas. Light shields may be rotated within fixtures to the most effective position to keep light overflow from leaving the Project substation site. The design will be sensitive to night sky lighting considerations. There are typically a few lights illuminated for security reasons on dusk-to-dawn sensors as well as a few on motion-sensing switches, depending on the application needed for the site. The majority of lights will be switched on for emergency situations and maintenance activities but would not be used on a regular basis. The Company will work with the Town of Barnstable to ensure the lighting scheme complies with applicable Town requirements.

5.3.14 Air Quality

No stationary source air permit is anticipated to be needed from MassDEP for either route. In addition, the Company shall require all construction to be performed in accordance with applicable sections of the MassDEP Air Pollution Control Regulations at 310 CMR 7.00. During Project construction, temporary impacts on air quality from construction vehicles and equipment exhaust, and dust generated by construction activities will be minimized and mitigated. Specific air quality mitigation measures expected to be required include:

- Use of track out pads to prevent off-site migration of soils as appropriate;
- Mechanical street sweeping of construction areas and surrounding streets and sidewalks as necessary;
- Removal of construction waste in covered or enclosed trailers;
- Wetting of exposed soils and stockpiles to prevent dust generation;
- Minimizing stockpiling of materials on-site;
- Turning off construction equipment when not in use and minimizing idling times;
- Minimizing the storage of construction waste on-site; and
- Minimizing the duration that soils are left exposed.

Although fugitive dust may be generated during construction activities, the relatively short duration of construction at any single location for this Project makes it unlikely that the migration of dust will cause off-site impacts. Furthermore, soil excavation does not typically generate dust due to the natural moisture content of subsurface soils. Nonetheless, the contractor will implement dust control measures as needed during active construction that will primarily consist of street sweeping and using wetting agents to control and suppress dust. Pavement will be cut with a pavement saw, which cuts a trench line in the pavement and across driveways and any intersecting roadways. Pavement will then be removed, trucked away, and disposed of in accordance with applicable regulations. No pavement crushing will occur on-site.

The Company will require contractors to use ultra-low sulfur diesel (ULSD) in off-road diesel vehicles, and the Company will comply with requirements of the MassDEP Diesel Retrofit Program. The Diesel Retrofit Program, formerly called the Clear Air Construction Initiative of the Clean Construction Equipment Initiative, originated as an air quality mitigation measure for the Central Artery/Tunnel Project. The program encourages users of diesel construction equipment to install exhaust emission controls such as oxidation catalysts or particulate filters on their diesel engines. MassDEP requires participation in the Diesel Retrofit Program by municipalities applying for funding under the State Revolving Fund for water and wastewater projects. There is no MassDEP requirement for participation by other project proponents, yet, here, the Company is voluntarily committing to comply with the Diesel Retrofit Program requirements.

All onshore diesel-powered non-road construction equipment with engine horsepower ratings of 50 and above to be used for 30 or more days over the course of Project construction will either be EPA Tier 4–compliant or will have EPA-verified (or equivalent) emissions control devices, such as oxidation catalysts or other comparable technologies (to the extent that they are commercially available) installed on the exhaust system side of the diesel combustion engine.

In addition, vehicle idling will be minimized in accordance with Massachusetts' anti-idling law, G.L. c. 90, § 16A, c. 111, §§ 142A–142M, and 310 C.M.R. 7.11. The Company will require the use of ULSD in diesel-powered construction equipment and will limit idling time to five minutes except when engine power is necessary for the delivery of materials or to operate accessories to the vehicle such as power lifts. The Company will require its contractors to follow these procedures.

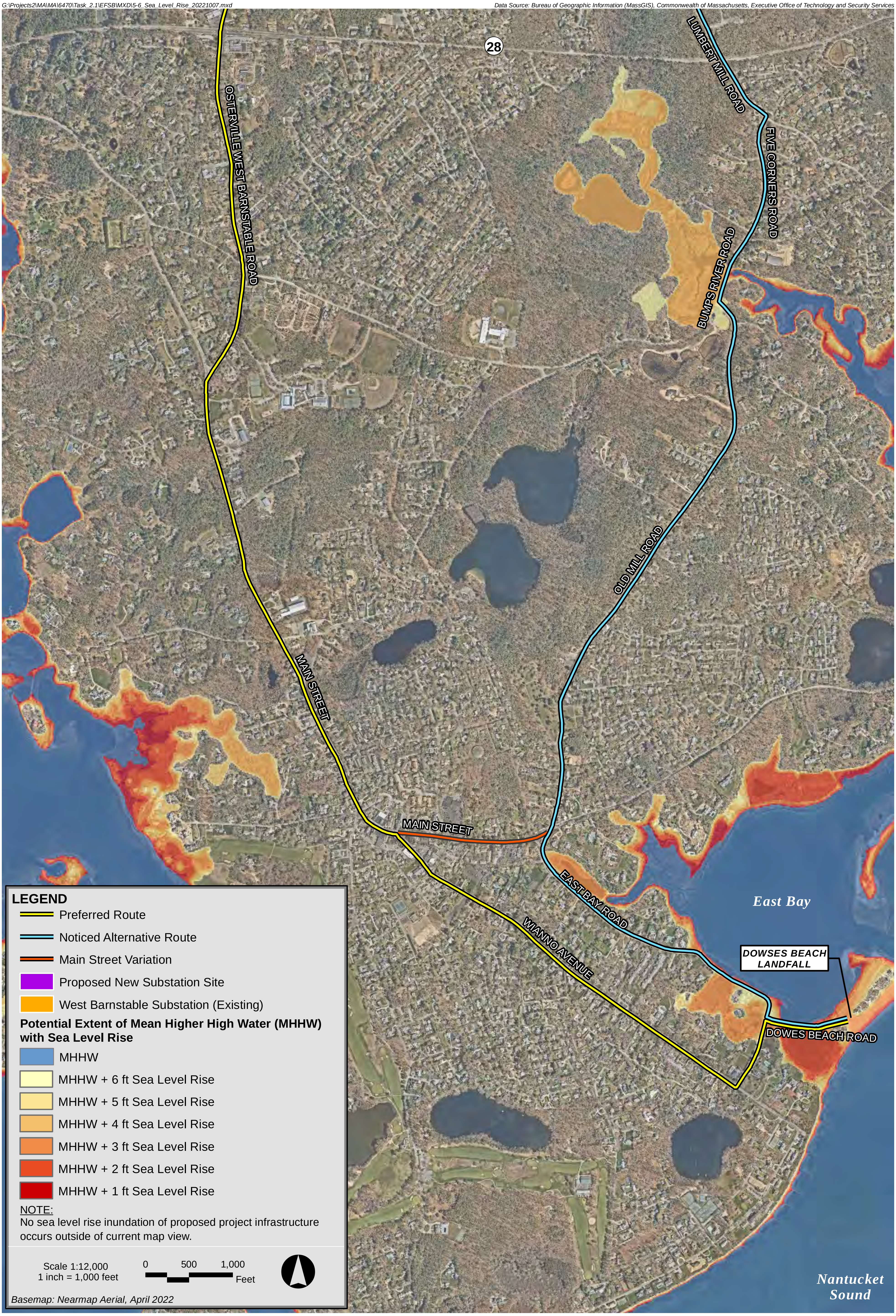
Both the Preferred Route and Noticed Alternative will result in temporary impacts on ambient air quality during construction including construction vehicles and equipment emissions and fugitive dust generated by construction activities. Air quality mitigation measures will be implemented regardless of the route selected. Thus, the Preferred Route and the Noticed Alternative are comparable with respect to air quality impacts.

5.3.15 Sea Level Rise, Storm Surge, and Shoreline Change/Coastal Erosion

While the proposed onshore substation is located inland and well outside of any areas that could experience sea level rise or be affected by coastal storm surges, the Project includes underground infrastructure including cables, duct bank, and transition vaults which are proximate to the shoreline and within the existing and future flood zone. Due to the nature of the Project, offshore-to-onshore cable transition must be located on the coastline and in areas that could be affected by climate change. There are no above ground facilities proposed for the Project in the coastal zone, including the existing and future flood zone. The existing flood zone is depicted in Figure 5-1. Potential for sea level rise inundation resulting from projected 1 to 10 feet rise in sea level above current Mean Higher High Water (MHHW) conditions as prepared by National Oceanic and Atmospheric Administration Office for Coastal Management is identified in Figure 5-6. The transition vaults within the Dowses Beach paved parking area will be installed to a maximum depth of approximately 8.5 feet and the top of the vaults will be approximately 2 feet below the parking lot surface. Within the parking lot, the only visible components of the cable system will be the manhole covers (two per vault) which will be used to access the transition vaults. The offshore cables will be installed at a depth of approximately 35 to 50 feet below the existing land surface and underneath the existing Coastal Dune and Coastal Beach. The onshore export cables will be installed within an underground duct bank and manhole system measuring approximately 8.17 feet wide and 4.5 feet tall, set at a depth of 8 feet for the majority of the onshore export cable route. In cases where the duct bank crosses under utilities or other obstructions, it will be approximately 11.5 feet wide and 4.5 feet tall, set at a depth of 11.5 feet. Attachments B1 and B2 provide specific details for the proposed activities at the Dowses Beach Landfall Site and for the onshore cable duct bank, respectively.

The RMAT Climate Resilience Design Standards Tool Report completed for the Project (RMAT Report), included as Attachment F, provides baseline data for the potential for sea level rise design criteria to be considered for each of the assets associated with the Project. As noted on the RMAT Report, tidal datum values provided are based on the Massachusetts Coast Flood Risk Model (MC-FRM), developed by Woods Hole Group in coordination with UMass Boston. However, as noted above, the nature of the Project requires installation of infrastructure below the existing surface. The underground cable systems are not anticipated to be negatively impacted by flooding and extreme weather events. The transition vaults, cables and all associated infrastructure will be designed to withstand regular inundation. Specifically, the cables and splices are designed to be sealed from water intrusion. The cables are designed to be able to function in inundated and submerged conditions. All structural supports will be fabricated with water/corrosion materials such as galvanized or stainless steel.

Figure 5-7 depicts the worst-case hurricane surge inundation for the area, as developed by the USACE. Dowses Beach is a Barrier Beach system and has Coastal Dunes and Coastal Bank associated with it. All of these features provide storm damage prevention and flood control functions by providing a buffer to storm waves and to sea levels elevated by storms. Under proposed conditions, these features are anticipated to continue to provide these functions. The Project will comply with all applicable performance standards for these coastal wetland resource areas required in the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00). As described above, underground cable systems are not anticipated to be negatively impacted by flooding and weather events.



New England Wind 2 Connector Project

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Figure 5-6

Sea Level Rise and Coastal Flooding (MassCZM)

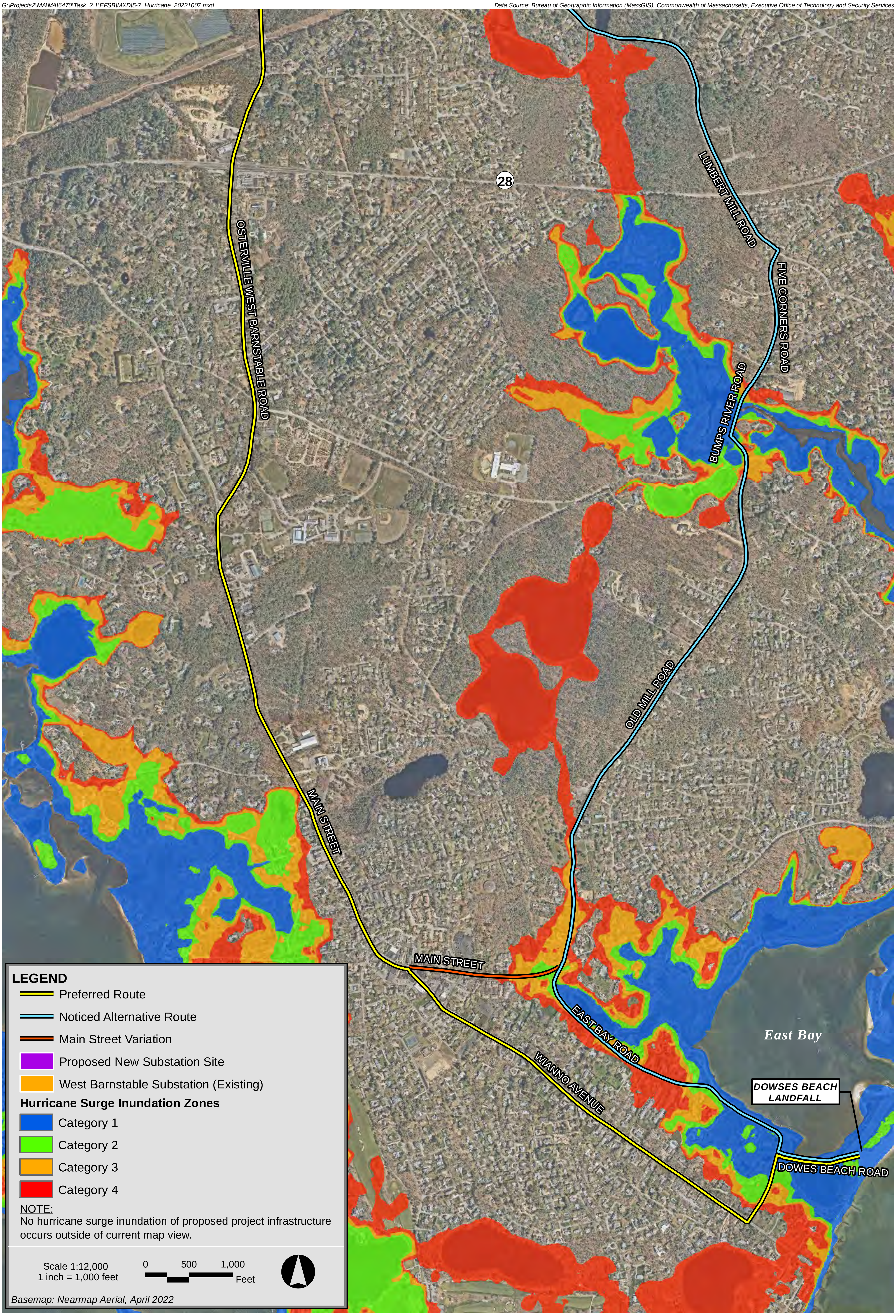

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Figure 5-7

Hurricane Surge Inundation (USACE SLOSH Data, Cape Cod Commission)

For comparison purposes, and as shown on Figure 5-6, approximately 0.24 miles of the Preferred Route versus 0.38 miles of the Noticed Alternative Route will be installed within public roadway layouts within areas identified as having the potential for effect from sea level rise. Similarly, and as shown on Figure 5-7, approximately 0.32 miles of the Preferred Route versus 1.2 miles of the Noticed Alternative Route will be installed within public roadway layouts within areas identified as having the potential for effect from storm surge impacts.

With regard to shoreline change/coastal erosion, according to CZM's Shoreline Change Project, Dowses Beach is relatively stable and the portion of the beach in the vicinity of the Project is accreting (see Figures 5-8 A, B, and C). As discussed above and as detailed in Section 5.5.2, the transition vaults will be installed within the paved parking lot area and the cables installed via HDD will be approximately 35 to 50 feet below the surface of the beach and under the adjacent dunes and coastal bank, decreasing the probability of exposure during a storm event. The offshore and onshore export cables will be made in underground concrete transition vaults and will not have any potential to cause erosion or to influence the existing coastal erosion patterns in this area. The Project will be installed under the existing landforms (beach, dunes, and bank) and will not impair their capacity to provide storm damage prevention and flood control functions. Lastly, the vaults and associated onshore export cable duct bank will be installed within existing paved surfaces that will be completely restored following installation of the Project.

5.4 Electric and Magnetic Fields (EMF)

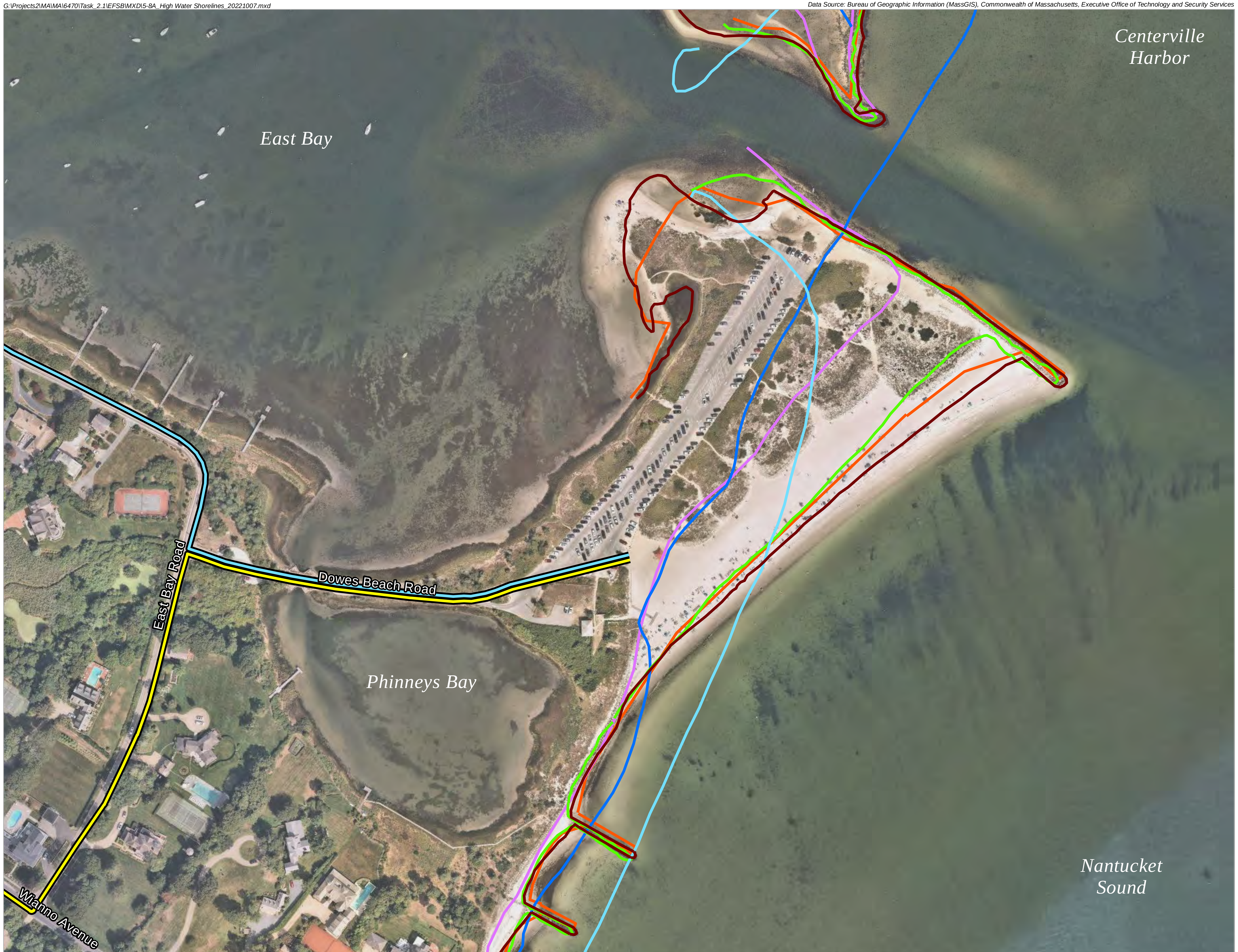
The following section outlines the magnetic field assessments that will be completed for the Project. Underground lines produce no aboveground electric fields, so the new 275-kV submarine and onshore export cables, and the 345-kV underground grid interconnection cables will not produce any aboveground electric fields. Accordingly, electric field modeling was not necessary for this Project. It is anticipated that the assessment will be provided by Q1 2023.

5.4.1 Offshore Export Cables

A detailed assessment of modeled magnetic field levels from the offshore export cables and at the Dowses Beach Landfall Site will be completed. Magnetic field modeling will include several conservative assumptions and inputs, including the assumption that the Commonwealth Wind Project is operating approximately 1,232 MW output, including charging currents, when in fact, the average annual capacity factor of Commonwealth Wind is expected to be approximately 50%. The assessment will compare modeled magnetic field levels to relevant public health guidelines for magnetic fields. Additionally, the assessment will identify design considerations for limiting magnetic field exposure.

G:\Projects2\MA\MA\6470\Task_2.1\EFSB\MXD\5-8A_High Water Shorelines_20221007.mxd

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



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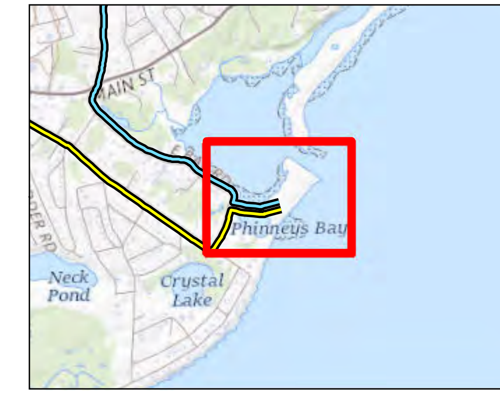

SCALE

1:2,400
1 inch = 200 feet

0 50 100 200 Feet

N

LEGEND

Preferred Route
Noticed Alternative Route

Historic High Water Shoreline

1846
1890
1938
1978
1994
2009

Figure 5-8A

Historic High Water Shorelines (1800s-2009, USGS, MassCZM) at Dowses Beach Landfall Site

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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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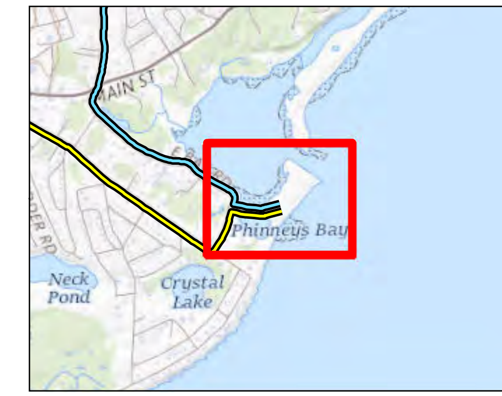

SCALE

1:2,400
1 inch = 200 feet

0 50 100 200
Feet

N

LEGEND

Preferred Route

Noticed Alternative Route

Short-Term Shoreline Change

Rate of Change Transect (meters/year)

-0.3 or more

-0.3 to -0.1

-0.1 to 0.1

0.1 - 0.3

0.3 or more

Figure 5-8B

Short-Term Shoreline Change Rate (1800s-2009, USGS, MassCZM) at Dowses Beach Landfall Site

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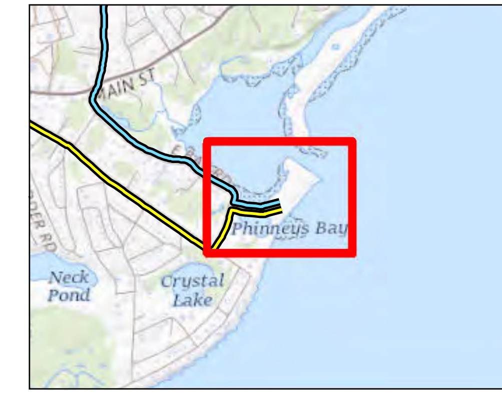
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

New England Wind 2 Connector Project

AVANGRID | Offshore Wind

LOCUS



SCALE

1:2,400
1 inch = 200 feet

0 50 100 200 Feet

N

LEGEND

- Preferred Route
- Noticed Alternative Route

Long-Term Shoreline Change

Rate of Change Transect (meters/year)

- -0.3 or more
- -0.3 to -0.1
- -0.1 to 0.1
- 0.1 - 0.3
- 0.3 or more

Figure 5-8C

Long-Term Shoreline Change Rate (1800s-2009, USGS, MassCZM) at Dowses Beach Landfall Site

5.4.2 *Onshore Export Cables*

A detailed assessment of modeled magnetic field levels from the onshore export cables will also be completed. Magnetic field modeling will include several conservative assumptions and inputs, including the assumption that the Commonwealth Wind Project is operating approximately 1,232 MW output, including charging currents, when in fact, the average annual capacity factor of Commonwealth Wind is expected to be approximately 50%. The assessment will compare modeled magnetic field levels to relevant guidelines for magnetic fields.

5.5 Construction Considerations and Methodologies

The Company will assemble a CMP that will be used by the Company and its contractors during Project construction. The CMP will be developed to guide contractors during construction, and the document will be an integral part of the Company's effort to ensure that environmental protection and sound construction practices are implemented throughout construction. The CMP will reflect permitting updates and include relevant commitments made during environmental reviews and permitting processes as well as a verbatim listing of formal permit conditions.

As summarized in this section, the Company has selected construction techniques to maximize efficiency, while minimizing potential impacts. The Company expects construction for the Project to begin with the new onshore substation civil works, followed by installation of substation equipment coincident with HDD proposed at the Dowses Beach Landfall Site as well as installation of the onshore duct bank. Installation of the offshore export cables will follow. The Company anticipates that construction of the Project including the duct bank and onshore substation will begin in 2025 and, under the current schedule, commercial operations are expected to commence in 2028.

5.5.1 *Offshore Cable Installation*

Each offshore export cable will be installed at a target burial depth of 5 to 8 feet (1.5 to 2.5 m) below the stable seabed, which the Company's engineers have determined is more than twice the burial depth required to protect the cables from fishing activities and potential anchor strikes. Offshore export cable installation is expected to be performed primarily via simultaneous lay and bury using jetting techniques (e.g., jet plow or jet trenching) or mechanical plow. Generally, jetting methods are better suited to sands or soft clays, whereas a mechanical plow or mechanical trenching tool is better suited to stiffer soil conditions (but is also effective in a wider range of soil conditions). While the actual offshore export cable installation method(s) will be determined by the cable installer based on site-specific environmental conditions and the goal of selecting the most appropriate tool for achieving adequate burial depth, the Company will prioritize the least environmentally impactful cable installation alternative(s) that is/are practicable for each segment of cable installation. The two most common methods are described below under "Typical Techniques."

While the Company anticipates primarily using jetting techniques or mechanical plowing for installing the offshore export cables, other specialty techniques may be used in a limited fashion in certain areas to maximize the likelihood of achieving sufficient burial depth (such as in areas of coarser or more consolidated sediment, rocky bottom, or other difficult conditions, where the typical techniques may not be feasible for achieving sufficient cable burial depth), while minimizing the need for possible cable protection and accommodating varying weather conditions. These additional techniques that may be used where necessary are described below under "Other Possible Specialty Techniques."

Typical Techniques

- **Jetting techniques (e.g., jet-plowing or jet-trenching):** Jetting tools may be deployed using a seabed tractor, a sled, or directly suspended from a vessel. Jetting tools typically have one or two arms that extend into the seabed (or alternatively a plow share that runs through the seabed) equipped with nozzles which direct pressurized seawater into the seafloor. As the tool moves along the installation route, the pressurized seawater fluidizes the sediment allowing the cable to sink under its own weight to the appropriate depth or be lowered to depth by the tool. Once the arm or plow share moves on, the fluidized sediment naturally settles out of suspension, backfilling the narrow trench. Depending on the actual jet-plow equipment used, the width of the fluidized trench could vary between 1.3 and 3.3 feet (0.4 – 1 m). While jet-plowing will fluidize a narrow swath of sediment, it is not expected to result in significant sidecast of materials from the trench. Offshore cable installation will therefore result in some temporary elevated turbidity, but sediment is expected to remain relatively close to the installation activities (see Section 5.2.2.1 for a discussion of sediment dispersion modeling).

- **Mechanical plowing:** A mechanical plow is pulled by a vessel or barge and uses cutting edge(s) and moldboard, possibly with water jet assistance, to penetrate the seabed, while feeding the cable into the trench created by the plow. While the plow share itself would likely only be approximately 1.6 feet (0.5 m) wide, a 3.3-foot (1 m) wide trench disturbance is also conservatively assumed for this tool. This narrow trench will infill behind the tool, either by slumping of the trench walls or by natural infill, usually over a relatively short period of time.

Other Possible Specialty Techniques

- **Mechanical trenching:** Mechanical trenching is typically only used in more resistant sediments. A rotating chain or wheel with cutting teeth/blades cuts a trench into the seabed. The cable is laid into the trench behind the trencher and the trench collapses and backfills naturally over time.

- **Shallow-water cable installation vehicle:** While any of the above "Typical Techniques" described above could be used in shallow water, the Project also includes specialty shallow-water tools if needed. In this scenario, either of the Typical Techniques described above would be deployed from a vehicle that operates in shallow water where larger cable-laying vessels cannot efficiently operate. The cable is first laid on the seabed, and then a vehicle drives over or alongside the cable while operating an appropriate burial tool to complete installation. The vehicle is controlled and powered from a shallower-draft vessel that holds equipment and operators above the waterline.

- **Pre-pass jetting:** Prior to cable installation, a pre-pass jetting run using a jet-plow or jet trencher may be conducted along targeted sections of the cable route with stiff or hard sediments. A pre-pass jetting run is an initial pass along the cable route by the cable installation tool to loosen sediments without installing the cable. A pre-pass jetting run maximizes the likelihood of achieving sufficient burial during the subsequent pass by the cable installation tool when the cable is installed. Impacts from the pre-pass jetting run are largely equivalent to cable installation impacts from jetting described under "Typical Techniques" above.

- **Pre-trenching:** Pre-trenching is typically used in areas of very stiff clays. A plow or other device is used to excavate a trench, the excavated sediment is placed next to the trench, and the cable is subsequently laid into the trench. Separately or simultaneously to laying the cable, the excavated sediment is returned to the trench to cover the cable. It is unlikely that the Company will use a pre-trench method because site conditions are generally not suitable (i.e., sandy sediments would simply fall back into the trench before the cable-laying could be completed); if needed, it would likely be necessary for only very limited areas.

- **Pre-lay plow:** In limited areas of resistant sediments or high concentrations of boulders, a larger tool may be necessary to achieve cable burial. One option is a robust mechanical plow that would push boulders aside, while cutting a trench into the seabed for subsequent cable burial and trench backfill. Similar to pre-trenching, if this tool is needed it would only be used in limited areas to achieve sufficient cable burial.

- **Precision installation:** In situations where a large tool is not able to operate, or where another specialized installation tool cannot complete installation, a diver, or Remotely Operated Vehicle (ROV) may be used to complete installation. The diver or ROV may use small jets and other small tools to complete installation.

- **Jetting by controlled flow excavation:** Jetting by controlled flow excavation uses a pressurized stream of water to push sediments to the side. The controlled flow excavation tool draws in seawater from the sides and then propels the water out from a vertical down pipe at a specified pressure and volume. The down pipe is positioned over the cable alignment, enabling the stream of water to fluidize the sediment around the cable, which allows the cable to settle into the trench. This process causes the top layer of sediments to be sidecast to either side of the trench. In this way, controlled flow excavation simultaneously removes the top of the sand wave and buries the cable. Typically, a number of passes are required to lower the cable to the minimum sufficient burial depth.

This method will not be used as the conventional burial method for the offshore export cables, but may be used in limited locations, such as to bury cable joints or bury the cable deeper and minimize the need for cable protection where initial burial of a section of cable does not achieve sufficient depth. Controlled flow may require several passes to lower the cable to a sufficient burial depth, resulting in a wider disturbance than use of a jet-plow or mechanical plow. Jetting by controlled flow excavation is not to be confused with jet-plowing or jet trenching (a typical cable installation method described above). Jetting by controlled flow excavation can also be used for dredging small sand waves.

Potential impacts from offshore export cable installation are described and quantified in Sections 5.2.1 and 5.2.2). The impact calculations shown in Table 5-1 conservatively assume a 3.3-foot (1-meter) wide direct trench disturbance throughout the entire installation corridor for the offshore export cable (*i.e.*, the widest expected trench width), though as mentioned, the Company expects the trench width to vary between 1.3 and 3.3 feet (0.4 and 1 m). In addition, as described above, each skid/track on the installation tool will have the potential to cause minor disturbance along an area approximately 5 feet (1.5 m) wide. The skids/tracks are not expected to dig into the seabed, and therefore the impact is expected to be minor.

The impact area identified in Table 5-1 reflects the temporary impact from two skids/tracks (one on either side of the installation tool), and therefore assumes a 10-foot-wide (3-meter-wide) disturbance zone. The trench is expected to naturally backfill as sediments settle out of suspension and no separate provisions to facilitate restoration of a coarse substrate are required.

Any boulders identified along the final offshore export cable alignments may need to be relocated prior to cable installation, facilitating installation without any obstructions to the burial tool and better ensuring sufficient burial depth. Boulder relocation is accomplished either by means of a grab tool suspended from a crane onboard a vessel that lifts individual boulders clear of the route, or by using a plow-like tool which is towed along the route to push boulders aside. Boulders will be shifted perpendicular to the cable route; no boulders will be removed from the site.

In accordance with normal industry practice, a pre-lay "grapnel run" will be completed. The pre-lay grapnel run will consist of a vessel towing equipment (*i.e.*, a grapnel train) that hooks and recovers obstructions such as fishing gear, ropes, and wires from the seafloor. Depending on the size and type of debris, the debris will be either removed from the route or recovered and brought aboard the vessel deck. Any abandoned fishing gear recovered will be disposed of or returned to its owner in accordance with requirements of DMF and other relevant Massachusetts regulations.

The proposed offshore cables will be deployed from a turntable mechanism aboard a cable ship or cable barge and installed along a surveyed installation corridor. This installation corridor will be within the surveyed OECC to enable the avoidance or minimization of impacts. Impacts will be avoided and minimized by allowing the contractor to micro-site the cable inside the installation corridor such that localized areas of hard bottom or boulders, for example, may be avoided. This installation corridor, rather than a specific cable alignment, allows for optimal routing of the cables.

Cable burial tools (e.g., jet-plow, mechanical plow) can be mounted on a sled pulled by the cable-laying vessel or can also be mounted on a self-propelled underwater tracked vehicle. The tracked vehicle would run along the seafloor using a power feed from the cable-laying vessel. This type of vehicle is routinely used for wind energy cable projects in Europe and has proven effective in dynamic marine environments like the proposed Project route. Typical cable installation speeds are expected to range from 230 to 656 feet (70 to 200 m) per hour, and it is expected that installation activities for the offshore export cables will occur 24 hours per day. For the integrity of the cable, this activity is ideally performed as a continuous action along the entire cable alignment up to splice joints.

Although the Company is considering the use of DP vessels, anchored cable laying vessels may be used along the entire length of the offshore export cables due to varying water depths throughout the OECC (see Section 5.2.1.2).

The Company's preferred installation approach is to install the offshore export cables sequentially. The three sets of cables within the OECC (Vineyard Wind Connector's two offshore export cables, NE Wind 1 Connector's two offshore export cables, and NE Wind 2 Connector's three offshore export cables) will typically be separated by a distance of 164 to 328 feet to provide appropriate flexibility for routing, installation, and maintenance or repairs. This separation distance could be further adjusted, pending ongoing routing evaluation, to account for local conditions, such as deeper waters, micro-siting for sensitive habitat areas, or other environmental or technical reasons.

5.5.1.1 Cable Jointing

Due to the length of the offshore export cables and other considerations, each offshore export cable will likely require two or three splices (i.e., joints), at least one of which is expected to be located in state waters. Upon reaching the jointing location, the end of the installed cable will be retrieved from the seabed and brought up to the surface and inside the cable-laying vessel or other specialized vessel (e.g., jack-up vessel). Inside a controlled environment (i.e., a jointing room) aboard the vessel, the two ends of the cable will be spliced together. Once cable jointing is completed, the offshore export cable will be lowered to the seafloor and buried (likely via controlled flow excavation). Depending on the design of the cable and joint, the jointing process may take several days, in part because the jointing process must be performed during good weather. Prior to retrieving the cable ends from the seabed for cable jointing, cable protection may be temporarily placed over the cable ends to protect them.

If a jack-up vessel is used for cable jointing operations, the vessel would impact approximately 0.15 acres (600 square meters) of seafloor each time the vessel jacks up. Any jacking-up will occur within surveyed areas of the OECC and SWDA.

5.5.1.2 Sand Waves and Potential Dredging

Multiple seasons of marine surveys have confirmed that segments of the OECC contain sand waves. Portions of these sand waves may be mobile over time; therefore, the upper portions of the sand waves may need to be removed (i.e., dredged) so the cable laying equipment can achieve sufficient burial depth below the sand waves into the stable seabed.

A TSHD is the anticipated methodology for dredging given the heights of sand waves in the OECC, although jetting by controlled flow excavation could be used for smaller sand waves. Where a TSHD is used, it is anticipated that the TSHD would dredge along the cable alignment until the hopper is filled to an appropriate capacity. Then, the TSHD would sail several hundred meters away and deposit the dredged material within an area of the surveyed corridor that also contains sand waves. Such depositing of dredged material would be prohibited within areas identified as hard bottom (see Attachment C1). Dredging will be limited to the extent required to achieve adequate cable burial depth during cable installation. If sufficient burial cannot be achieved, some bottom areas may require cable protection in the form of rock placement, gabion rock bags, concrete mattresses, or half-shell protection (see Section 5.2.1.3).

5.5.1.3 Cable Crossings

Depending on the timing of other offshore wind developments such as Mayflower Wind, cable crossings may be required. The Company would coordinate closely with other offshore wind developers. If required, a cable crossing would likely include the following steps:

1. Perform a full desktop study of any as-built and post-construction survey data for the previously installed cable.
2. Upon identification of a suitable crossing point that is agreed to by the cable owner, perform a full survey and inspection of the proposed crossing location and the existing cable using an ROV, diver-held instrument, or similar.
3. Carefully remove any existing debris surrounding the crossing point.
4. Depending on the depth of the existing cable and cable owner's requirements, there may be cable protection placed between the existing cable and NE Wind 2 Connector's proposed cable. Alternately, if there is sufficient vertical distance between the existing cable and NE Wind 2 Connector's proposed cable, there may be no manmade physical barrier between the cables.
5. During installation of an offshore export cable on approach to the crossing location, the cable will be graded out of burial with the cable installation tool. At this point, some form of cable protection (e.g., half-shell pipes or similar) will likely be applied to the cable when it is surface-laid on the seabed across the cable crossing. Once NE Wind 2 Connector's cable has been laid over the existing cable and clears the crossing location, no further protection will be applied to the cable and cable burial methods will resume using the cable installation tool.

6. Soon after installing the cable at the crossing, the surface-laid section of NE Wind 2 Connector’s cable would be protected with either additional concrete mattresses, controlled rock placement, or a similar physical barrier. Remedial post-lay burial of NE Wind 2 Connector’s cable on either side of the crossing may be performed to lower the cable into the seabed to ensure its protection.
7. If necessary, additional cable protection will be carefully placed on and around the crossing.
8. A final as-built survey of the completed crossing will be undertaken to confirm the exact location of NE Wind 2 Connector’s surface-laid cable and the cable protection laid over the crossing. As-built positions for the cable crossing will be shared with the existing cable’s owner and provided to the NOAA for charting purposes.

Cable protection measures will be designed to protect the offshore export cables against mechanical impact from above and respect the vertical distance and physical barrier (if any) to the existing cable. The cable crossing will also be designed to minimize the risk of fouling or snagging of fishing equipment. The design of the crossing structure, as well as any survey at the crossing, will be defined, planned, executed, evaluated, and documented in agreement with the cable’s owner. Cable protection is discussed in detail in Section 5.2.1.3.

5.5.1.4 Navigation and Vessel Traffic

This section describes the maritime navigation and vessel traffic characteristics of Project-related construction activities as they may impact navigation and vessels operating to and from ports along the south coast of Massachusetts, Cape Cod, and the Islands. The Company is not proposing any restrictions on navigation, fishing, or the placement of fixed or mobile fishing gear; however, construction and installation activities may temporarily affect navigation and/or fishing activities in the vicinity of construction and installation vessels. These impacts are temporary in nature and largely limited to the Project’s construction and installation period. Safety zones will be determined by the USCG and are anticipated to be activity-specific. Regarding cable installation, safety zones will be around the cable installation as it proceeds and will not preclude activity along the entire routes for the duration of construction. The Company, through its fisheries liaison, will coordinate with fishermen while discussions with the USCG are underway.

The Company is developing a detailed Navigational Risk Assessment for the Project that will conform to the USCG guidance for Offshore Renewable Energy Installations contained in Navigation Vessel Inspection Circular 02-07.

During construction and installation, the Company will employ a Marine Coordinator to manage all construction vessel logistics and act as a liaison with the USCG, port authorities, state and local law enforcement, marine patrol, and port operators. The Marine Coordinator will keep informed of all planned vessel deployments and will manage the Project’s marine logistics and vessel traffic coordination between the staging ports and offshore. The Company has also engaged with the

Northeast Marine Pilots Association to coordinate construction and installation of vessel approaches to the Project region, as required by state and federal law, and to minimize impacts to commercial vessel traffic and navigation.

The Company is actively engaged with fisheries stakeholders and will continue building on engagement undertaken for the past several years. The Company has developed a Fisheries Communication Plan, which will continue to be refined throughout permitting and development of the Project. As described in the Fisheries Communication Plan, both a Fisheries Liaison and Fisheries Representative will be employed by the Company to ensure effective communication and coordination between the Project and the fishermen. The most recent version of the Fisheries Communications Plan is provided in Attachment D.

During cable preparation/installation, vessels will be used for route clearance (e.g., dredging sand waves, removing boulders, pre-construction surveys, and grapnel runs), cable-laying and burial, cable jointing, and installation of remedial protection, if required. Approximately four vessels will be used for route clearance, one or two vessels will be used for cable laying and burial, and one vessel will be used for the installation of remedial protection. Onboard Fisheries Liaisons (OFLs) will be on vessels whenever possible. OFLs will be able to identify local active fishing gear and will be able to relay positions to the survey captains/crews. In addition, at any given time during cable construction, a guard vessel may be used to monitor vessel activity around the construction area and a crew transfer vessel may be used to transport crew and supplies between shore and the installation vessels. The Company will utilize local fishing vessels and their crews as guard vessels whenever possible.

The Company will distribute Notices to Mariners to notify recreational and commercial vessels of their intended offshore operations. Local port communities and media will be notified and kept informed as the construction and installation process progresses. Upon request, the Company will provide portable digital media with electronic charts depicting locations of Project-related work to provide fishermen with accurate and precise information on work within the offshore Project area. The Project's website will be updated regularly to provide information on the construction zone, scheduled activities, and specific Project information.

5.5.1.5 Time-of-Year Restrictions

The Company is engaged in ongoing consultations with state and federal agencies to address the timing of offshore export cable installation. The agencies involved in those discussions include BOEM, NMFS, Massachusetts CZM, DMF, MassDEP, and NHESP.

The NE Wind 2 Connector includes the offshore components located solely within state waters. The Company has consulted with NHESP to discuss survey and other technical evaluations relating to listed species in state waters and has included that information in both state and federal permit filings. For context, portions of the Commonwealth Wind Project located in federal waters, include areas that potentially serve as habitat for species listed in the federal Endangered Species Act. Potential impacts on those species will be reviewed through the BOEM federal permitting process. It is anticipated that state agencies and other interested parties will participate in this review, either directly or through the CZM consistency process. The Company will continue to communicate with NHESP throughout the permit review process.

5.5.1.6 Phases of Offshore Export Cable Installation

There are a number of components to the cable-laying process that will involve marine operations. These can be categorized as Route Clearance, Cable Lay/Burial and jointing, and Remedial Protection:

- Route Clearance: this activity is required to prepare the cable alignment for the subsequent installation, and it involves dredging sand waves, relocating boulders, grapnel runs for debris, and survey work. The extent of the need for route clearance activities will be further refined as Project design advances and when a contractor is selected. An exclusion zone to be set by the USCG will be established around major cable installation vessels.
- Cable Laying: The cable laying itself is expected to proceed at a rate of approximately 230 to 656 feet (70 to 200 m) per hour. During the lay process, an exclusion zone to be defined by the USCG will be established around cable-laying vessels.
- Cable Jointing: Given the length of the OECC, each offshore export cable could require up to three joints (at least one of which is anticipated to be located in state waters). Depending on the design of the cable and joint, the jointing process may take several days, in part because the jointing process must be performed during good weather (see Section 5.2.1.1).
- Remedial Protection: Any area of the cable that cannot be buried to adequate depth will be protected by the placement of rock, gabion rock bags, concrete mattresses, or half-shell protection (see Section 5.2.1.3). During the remedial protection process, an exclusion zone to be set by the USCG will be established around cable-laying vessels.

5.5.1.7 Post-Installation Surveys

The Company is assembling a Benthic Habitat Monitoring Plan intended to document habitat and benthic community disturbance and recovery as a result of construction and cable installation in the Primary OECC. Offshore and nearshore geophysical surveys will also be conducted post-construction during the operations and maintenance phase of the Project to inspect cable depth of burial and conduct as-built cable surveys. In addition, it is anticipated that short ad-hoc, supplemental geophysical or geotechnical surveys may be required during construction to provide final verification of site conditions. Geotechnical work would only be conducted in areas already cleared for archaeological resources. Any unanticipated discoveries of cultural resources will be reported and avoided during further on-site work, with review and recommendations by a qualified marine archaeologist and as agreed upon during the Section 106 consultation.

All surveys will use BMPs and industry-standard equipment that has been approved for use previously for offshore renewable energy work. Most of the surveys will entail use of geophysical systems 200 kHz or higher in frequency that do not require any special mitigation (e.g., multi-beam echosounder, side scan sonar, and magnetometer) to avoid impacts to marine mammals. Standard operating conditions (e.g., vessel strike avoidance, separation distances from protected species, necessary notifications, marine trash, and debris prevention) for work will be observed.

For surveys using sonar equipment less than 200 kHz in frequency (sub-bottom profilers) and any bottom-disturbing investigations that have been previously cleared, in addition to the standard operating procedures identified above, the following mitigation measures will be employed to maintain a level of consistency with offshore project activities:

- ♦ Notifications when appropriate: national security and military organizations, USCG communication, tribal correspondence.
- ♦ Vessel strike avoidance measures, including speed restrictions in Dynamic Management Areas, Seasonal Management Areas, Slow Zones.
- ♦ Protected Species Observer (PSO) monitoring: PSOs will accompany survey vessels and follow standard monitoring protocols, actively observing an established exclusion zone around each vessel.
- ♦ Shut down and soft start procedures.

5.5.2 Transition from Offshore to Onshore at the Landfall Site

The proposed landfall site for the Project is at Dowses Beach, a residents-only beach that is owned and managed by the Town of Barnstable and has an approximately 2.5-acre paved parking lot. Dowses Beach is situated on a peninsula between East Bay and the Centerville Harbor away from nearby residences.

HDD is the primary means of minimizing Project-related impacts to the beach, intertidal zone, and nearshore areas, as well as ensuring that the cables remain sufficiently buried and permanently out of the human environment at the shoreline. HDD is a “trenchless” installation technique that will avoid disturbance to the shoreline by negating the need to open-excavate existing coastal wetland resource areas; it will also avoid disturbing recreational use of the beach. The average horizontal length of the three HDDs (one for each offshore export cable) will be approximately 2,250 feet long (see Attachment B1). Although the HDD trajectory is still undergoing engineering refinement, it is estimated that the trajectory will result in the HDD passing at a depth of approximately 50 feet below the ground surface at MHW. HDD activities at the Landfall Site will be performed in the off-season, or as otherwise permitted by the relevant agencies, to minimize any disturbance to area residents or visitors and the Company plans to maintain beach access as much as possible, while keeping the safety of both construction crews and residents the top priority.

The transition between the offshore and onshore export cables will be made in underground concrete transition vaults (three vaults total, one per cable) that will be installed within the paved parking lot of Dowses Beach (see Attachment B1 for a full plan set showing the offshore to onshore operation). Each HDD process begins with drilling a pilot hole between the onshore HDD staging area within the Dowses Beach parking lot and an offshore HDD exit point, which is approximately 0.5 miles from the shoreline. The hole diameter will be increased with progressively larger reaming passes until the required diameter is achieved. Once the bore hole is completed, a HDPE conduit will be inserted for installation of the offshore export cable. To facilitate cable pull-in and expose the casing end, a shallow “pit” will be excavated at the offshore HDD exit point using techniques such as controlled flow excavation. The subsea export cable is drawn from the vessel and is pulled through the conduits towards land. The seaward end of each conduit will then be reburied beneath the seafloor. If softer sediments are present, silt curtains will be employed in and around the area of hand-jetting to contain turbidity. Once the offshore export cables are pulled into the transition vaults, they will be spliced to the onshore export cables. Each underground transition vault is approximately 10.8 feet wide by 61.3 feet long and up to 8.5 feet tall, subject to further engineering refinement and will be approximately 2 feet beneath the surface of the parking lot. Each underground concrete transition vault will be accessed via two manholes. The manhole covers will be the only components of the cable system associated with the HDD visible at ground surface once construction is complete.

5.5.2.1 HDD Construction Sequence

The selected contractor will be responsible for the specific construction means and methods and will be responsible to submit detailed site logistics, dewatering, drill fluid management, and spill response plans and procedures for Company approval. The anticipated construction sequence for installation of the export cables from offshore-to-onshore via HDD will consist of the following methods:

- **Surface Casing:** Approximately 100 feet of surface steel casing will be installed in the ground underneath the parking lot and follow along the trajectory of the HDD to ensure a stable, watertight corridor for downhole tooling and drilling fluid, ensure stability in the shallow section of the borehole immediately in front of the HDD rig. The surface casing will be removed upon completion of the HDD work.
- **Approach Pit:** Land-based HDD rigs are typically staged behind an approach pit, that will provide the contractor with access to the proper trajectory for drilling and will also serve as a reservoir for drilling fluids (i.e., a slurry consisting predominantly of water and bentonite, a naturally occurring, inert and non-toxic clay) used to extract material from the drill head.
- **Pilot Hole:** A small pilot hole will be drilled from the approach pit to the pre-determined location offshore where typical offshore cable installation will terminate. The pilot hole will be drilled at an angle such that it arcs down beneath the nearshore coastal resources and extends to a depth of approximately 50 feet beneath the surface of the seafloor. The path of the pilot hole will then arc back up towards the desired point on the seafloor that

will be the transition point between typical offshore cable installation and the seaward end of the HDD. Drilling fluid (a bentonite slurry) will cool and lubricate the drill bit, stem, and other equipment, and will also serve to keep the hole stable and seal the bore's walls. The pilot bore's progress is continuously monitored via a steering system.

- **Surfacing of HDD Pilot Hole:** At the HDD exit point, a shallow "pit" will be excavated to expose the conduit end using techniques such as controlled flow excavation. If softer sediments are present, silt curtains will be employed in and around the area to contain turbidity.
- **Reaming and HDPE Conduit Insertion:** After the pilot hole has been established, divers will replace the drilling head on the end of the drill shaft with a reaming head and swivel connection. The reaming head will enlarge the pilot hole to the necessary diameter ahead of the pull-back of the HDPE conduit into the underground bore. The HDPE pipe segments will be thermally fused and staged offshore and pulled to the HDD rig located onshore. Cuttings from the reaming/pull-back effort will be pumped from the HDD drill pit back to HDD settling tanks, then passed to a reclaim/cuttings separation tank. Any excess fluids remaining at the completion of HDD activities will be trucked off-site to an appropriate disposal site. Similarly, any waste drill cutting solids will be properly and legally disposed of as solid waste or landfill material.
- **Cable Insertion and Transition:** Upon conclusion of the reaming and conduit pullback, the end of the conduit will remain exposed on the seafloor. The conduit will likely have a messenger wire passing through it with a cap on each end until the export cable is ready to be installed. The export cable is drawn from the vessel and is pulled through the conduit to the onshore transition vaults. The seaward end of the conduit would then be reburied beneath the seafloor. If softer sediments are present, silt curtains will be employed in and around the area of hand-jetting to contain turbidity.
- **Disposal of drill cuttings and drill fluids:** The HDD installation method will produce a slurry of two co-mingled byproducts: drill cuttings and excess drill fluids (water and bentonite clay). During drilling, this slurry will be collected from the reservoir pit and will be processed through a filter/recycling system where drill cuttings (solids) will be separated from reusable drill fluids. Non-reusable material consisting of drill cuttings and excess drill fluids will be trucked to an appropriate disposal site (see Section 5.5.2.2 for additional information).
- **Landward Manholes and Infrastructure:** Each offshore cable will be pulled back through the conduit installed via HDD, from which it will enter a proposed transition vault, where it will transition to onshore cabling.
- **Site Restoration:** The work area will be restored to pre-construction grades and stabilized (re-paved) to match pre-construction conditions.

Throughout HDD operations, the Company will prioritize shore-side site safety, security, and traffic control, which will be coordinated with Town officials.

A preliminary estimated timeline for the HDD activities, assuming use of a single drill rig to install the HDD alignments sequentially over a single construction season, is 30 weeks as detailed in Table 5-11. The Company is evaluating other sequencing options, including, but not limited to, use of a second drill rig to afford simultaneous drilling operations to shorten overall schedule, and/or performing HDD operations over several construction seasons. The Company will optimize the HDD operations schedule, including sequencing, number of seasons, series versus parallel construction operations and matters of logistics, with the selected HDD contractor.

Table 5-11 Estimated HDD Construction Timeline Using a Single Drill Rig

	Time (in weeks)
Weeks per Drill Path (assume 12 hours per shift, 6 shifts per week)	6
Expected Number of Drill Paths	3
Construction Equipment Re-staging Between Drill Paths	2
Total Weeks on site Drilling Activity	**20**
Mobilization/Demobilization/Staging	4
Winter weather delays	6
Total Estimated Time at HDD site	**30**

Likely during separate work season, additional construction work will be required in the vicinity of Dowses Beach. This includes:

- Installation of offshore export cable through the HDD HDPE conduit into the transition vaults (no excavation required).
- Installation of the onshore export cables through duct bank/East Bay/Phinney's Bay Culvert Crossing (no excavation required).

Apart from the HDD installation, likely during a separate work season, additional construction work will be required in the vicinity of Dowses Beach. This includes:

- Installation of the underground duct bank along the Dowses Beach Road causeway, from the transition vaults to East Bay Road, including the East Bay/Phinney's Bay Culvert crossing (see Section 5.5.3). This will require closure of the Dowses Beach Road causeway for approximately six weeks, as well as partial parking lot closure.

5.5.2.2 Management of Drilling Fluids

HDD is a well-known and commonly utilized installation technique for this type of project, and with proper construction management, the risk of drilling fluid release is very low. The Project will use a drilling fluid composed of bentonite clay or mud. This benign, naturally occurring material will pose no significant threat to water quality or ecological resources in the rare instance of seepage around the HDD operations.

The HDD installation method will produce a slurry of two co-mingled byproducts: drill cuttings and excess drill fluids (bentonite clay or mud). During drilling, this slurry will be collected from the reservoir pit and will be processed through a recycling system where drill cuttings (solids) will be separated from reusable drill fluids. Once the drilling fluid cannot be recycled any further, the non-reusable material consisting of drill cuttings and excess drill fluids will be trucked to an appropriate disposal site. This material is typically classified as clean fill, and it is anticipated that will be the case for this Project. The material may have an elevated water content, which could require transport to occur in sealed trucks. Typical disposal sites for this type of material include gravel pits or land farmed as upland field or pasture.

Effective construction management contingency plan procedures during HDD operations will minimize construction period disturbances for nearby land uses and will also minimize the already remote potential for seafloor disturbance through drilling fluid seepage (i.e., frac-out). Drilling fluid seepage can be caused by pressurization of the drill hole beyond the containment capacity of the overburden soil material. Providing adequate depth of cover for the HDD installation can substantially reduce this potential impact and the Project will use a drilling fluid composed of bentonite clay or mud that will pose little to no threat to water quality or ecological resources should seepage occur. Nonetheless, the Company will adhere to operational standards to minimize the chances of drilling fluid seepage.

The trajectory of the HDD installation has been a primary consideration for contingency planning and prevention of drilling fluid seepage. The HDD drill hole will descend from the HDD pit location to a depth of approximately 50 feet below the seafloor before rising toward the exit hole on the seafloor where installation will transition to cable burial. The geometry of the drill hole profile can also affect the potential for drilling fluid seepage. In a profile that makes compound or tight-radii turns, down-hole pressures can build, thus increasing the potential for drilling fluid seepage. The proposed drilling profile, with its smooth and gradual vertical curves, will avoid this potential effect.

The drilling crew will be responsible for executing the HDD operation, including actions for detecting and controlling drilling fluid seepage. The drilling contractor will also be required to have proper monitoring and response action plans in place. The process and actions of the drilling crew will be closely supervised. HDD is a technically advanced process, and the Company will ensure that the drill crews have the proper training and oversight to minimize the potential for drilling fluid seepage and to respond to seepage promptly and competently should it occur.

Detecting a potential seep prior to it actually occurring is dependent upon the skill and experience of the drilling crew. For this reason, the Project will utilize a specially assigned drill crew. The drilling crew will monitor certain aspects of the drilling operation to detect fluid loss, including but not necessarily limited to the following:

- ♦ Drilling pit returns, where a sudden loss of drilling fluid would indicate that fluid may be lost to geological materials or a release at the seafloor surface;

- Down-hole pressure, which will be compared to the calculated confining pressure during pilot hole drilling;
- Returning drilling fluid volumes and rates, which will be compared to the volumes and rates of drilling fluid pumped down-hole; and
- Pump pressures and flow rates.

The drill crew will be responsible for immediately notifying the Health, Safety, and Environmental (HSE) Manager and Site Manager if seepage occurs. The HSE Manager and Site Management Team will immediately assess the situation and estimate the quantity of drilling fluid lost and the square footage of area potentially affected. If drilling fluid seepage is detected, the drilling crew will take immediate corrective action and implement the project mitigation plan as appropriate. The primary factor causing seepage would be pressure from the drilling fluid pumps, so the most direct corrective action will be to stop the rig pumps. By stopping the pumps, pressure in the drill hole will quickly dissipate, and with no pressure in the hole seepage will cease. Pumps will be stopped as soon as seepage is suspected or detected. In the event of seepage, the Company will notify the client and appropriate regulatory agencies.

Corrective actions for conditioning the drill hole should seepage occur differ with specific issues encountered during a particular HDD operation. Common corrective actions include, but are not limited to:

- Transitioning the down-hole tooling in a drill hole closer to the entry or exit location to reestablish drilling fluid returns, and “swabbing” out the drill hole;
- Modifying drilling pressures and/or pumping rates to account for an unanticipated or changing soil formation;
- Pumping drilling fluid admixtures into the drill hole at the location of seepage to solidify or gel the soil; and
- Suspending drilling operations for a period of time to allow the drill hole to set up.

5.5.2.3 HDD Construction Schedule Considerations

HDD would be performed in the off-season, or as otherwise permitted by the Town and relevant agencies, as may be necessary. The Company plans to maintain beach access to at least a portion of the beach in which the HDD work is not occurring, while keeping the safety of both construction crews and residents the top priority. HDD construction layouts are shown in Attachment B1.

As discussed in Section 5.3.2.3, the NE Wind 2 Connector is located within rare species habitat for the Piping Plover and Least Tern. Based upon MESA consultation completed for the Vineyard Wind Connector 1 and NE Wind 1 Connector, the Company anticipates the need to repeat similar protective measures for the Piping Plover at the NE Wind 2 Connector Landfall Site at Dowses Beach. Specifically, NHESP’s MESA Determination (NHESP File No.: 17-37398; 4/1/2022) for the NE Wind 1 Connector and Vineyard Wind Connector 1 (NHESP File No.: 17-37398; 5/14/2019) stated that, to avoid impacts to Piping Plovers and their habitats during the nesting season, all work and activities associated with the Project shall follow the protection measures and procedures outlined in the Draft Piping Plover Protection Plan, including, that all work associated with HDD cable installation shall not commence during April 1 — August 31, and that HDD work initiated in advance of April 1 may continue past April 1, provided the Piping Plover Protection Plan is fully implemented. Additional measures for Least Tern will be implemented in consultation with NHESP, as appropriate.

5.5.3 Onshore Trenching and Duct Bank Installation

Installation of the onshore export cables will occur in two stages. The first stage will consist of installing the concrete duct bank and splice vaults that will house the onshore export cables and associated infrastructure. The second stage will consist of pulling/installing the cables through the duct bank conduits and completing splices and terminations.

Construction of the onshore export cable duct bank system will be performed via open trenching with equipment such as excavators and backhoes. The open trench will be supported by temporary trench boxes or other shoring as appropriate. Proposed trenching will occur within existing roadway layouts. All work will be performed in accordance with local, state, and federal safety standards, as well as any Project-specific local requirements.

The 275-kV single-core onshore export cables will consist of a copper or aluminum conductor covered by XLPE solid insulation and wrapped in a metallic sheath with non-metallic outer jacket. The cables will not contain any fluids. All three circuits will be installed in a single, common underground concrete duct bank along the entire length of the onshore export cable route, which will include separate conduit for each onshore export cable and fiber optic cable. The conduit within the duct bank will be constructed of PVC or HDPE and encased in concrete. Spare conduits and grounding will also be accommodated within the duct bank. Final layout and configuration of the conduits within the duct bank will vary somewhat along the cable route, and the final layout and configuration is subject to final design and survey, including survey of existing utilities. The Company anticipates that the three-circuit duct bank will be arranged three conduits wide by four conduits deep for the majority of the onshore export cable route, with the total duct bank measuring approximately 8.17 feet wide and 4.5 feet tall, set at a depth of 8 feet. In cases where the duct bank crosses under utilities or other obstructions, it will be approximately 11.5 feet wide and 4.5 feet tall, set at a depth of 11.5 feet (see Attachment B2). Fluidized thermal backfill will likely be placed over the duct bank for both scenarios. The duct bank will have a typical depth of cover of 3.5 feet; however, if required due to existing conditions (e.g., at certain utility crossings), the depth of cover will be 7 feet (see Attachment B2). The circuits will be arranged in a twelve conduit wide by one conduit deep configuration, in a duct bank approximately 9.75 feet wide by 1.2 feet tall, when crossing the box culvert in Dowses Beach Road.

Once the duct bank is in place and backfilled, the cables are pulled through the conduit via underground splice vaults and associated manholes, which are placed in groups every 1,500–3,000 feet or more along the duct bank. The splice vaults are typically two-piece (top and bottom) pre-formed concrete chambers with openings at both ends to connect with the duct bank conduits and admit the cables. Each splice vault is typically 6 feet wide by 26 feet long and up to 8 feet deep (interior dimensions), subject to further engineering (see Attachment B2).

The onshore construction sequence includes survey/marking underground utilities, installation of erosion controls and traffic management signage/controls, pavement marking, saw cutting of pavement, pavement excavation/removal, trench excavation and removal of excess excavate, trench shoring, placement of ducts and spacers, placement of concrete around the ducts, backfill, temporary repaving, and cleanup. Open-trench work areas will be kept to a minimum, and any open trench will be covered with heavy steel plates at the end of each day.

Installation of the in-road underground duct bank and onshore export cables within public roadway layouts will be performed during the off-season, or as otherwise permitted by the Town and/or MassDOT, to minimize traffic disruption. Upon Project completion, the affected roads will be restored in accordance with the DPU's "Standards to be Employed by Public Utility Operators When Restoring and of the Streets, Lanes and Highways in Municipalities" (D.T.E. 98-22) ("Repaving Standards") and municipal standards. Off-road areas will be restored to pre-construction conditions or better, in compliance with applicable state and local standards, permit requirements, and/or landowner agreements.

During construction, traffic will be managed in accordance with Traffic Management Plans (TMPs). Draft TMPs for the onshore export cable route are included in Attachment B2. The Company will work closely with the Town of Barnstable on the TMP for construction including submittal of the TMPs for review and approval by appropriate municipal authorities (typically DPW/Town Engineer and Police). A TMP will also be prepared and submitted to MassDOT. In addition, the Company will work with community members, including local business owners to minimize construction period traffic related impacts.

5.5.3.1 Duct Bank Sequence and Timing

The typical duct bank construction sequence will include the following steps:

- Survey and mark splice vault and duct bank locations.
- Set up erosion and siltation controls, including silt sacks or similar protection for existing storm drains.
- Set up traffic management measures in coordination with local police and public works officials.
- Pipe will be delivered on flatbed trucks, stockpiled in a local staging area or within the roadway layout if space is available, and advanced ahead of the trench.
- Trench excavation and removal of excess material for recycling or disposal in accordance with state regulations.

- Fusing or joining of continuous PVC or HDPE pipe is planned to be completed in advance of the trench excavation and will be waiting for assembly into a duct bank array (above ground).
- Duct pipe is proposed to be assembled into the duct bank array in advance, with required spacers (above ground) then lowered into the trench with slings via heavy equipment.
- After the duct bank array is secure, concrete trucks will backfill the array in place.
- Trench areas that are not backfilled by day's end will be secured with steel plates set in place to cover and protect the trench overnight. Openings in the shoulder will be protected and barricaded to ensure traffic and pedestrian safety.
- While new trench excavation advances, backfill will be placed above new concrete-encased sections from the prior day's work. Backfill will be brought to required grade, and the trench will be secured with steel plates again overnight.
- Subject to local permit conditions, temporary pavement will be placed at completed trench sections as soon as there is enough work to occupy a paving crew for a full day's work.
- Final roadway restoration will be performed in accordance with the DPU's "Repaving Standards" and municipal standards. Off-road areas will be restored to pre-construction conditions or better, in compliance with applicable state and local standards, permit requirements, and/or landowner agreements.
- Clean up work area and remove erosion controls.

All work will conform to MassDOT and Town specifications for new road construction. The construction crews involved in trench excavation are expected to progress at an average rate of approximately 80 to 200 feet.

This cycle of trench work will proceed up to any given vault, and vaults will have been installed prior to duct bank trench work, in most cases staggered to minimize roadway impacts. For vault installations, a separate, but similar, sequence or work will be performed by a separate crew, while trench work advances:

- Vault locations will be excavated to required grade, and a base of leveling stone will be set in place.
- The vault (pre-delivered sections) waiting nearby will be set in place by a crane and fully assembled, including required manway risers.
- Conduit connections to the vault will then be made from trench ducts in place on each side of the vault.
- When all exterior connections are complete, the vault area will be fully backfilled and compacted to grade.

- Temporary pavement will be placed when vault work is complete, as described under the duct bank construction sequence above.
- If dewatering is required for vault installation, then procedures as described in Section 5.5.3.2 will be employed.

5.5.3.2 Dewatering

Dewatering of the duct bank trench may be necessary in areas where groundwater is encountered, where soils are saturated, or at times when the trench is affected by stormwater. Dewatering will likely be necessary in areas where the onshore export cable route is adjacent to wetlands, streams, or other bodies of water. Standard erosion control practices will be employed as necessary to minimize erosion during trenching operations and construction activities in general. Areas where groundwater may be encountered will be identified as part of the pre-construction environmental investigation of soils.

Trench dewatering is the process of removing excess runoff and groundwater that has accumulated and is occupying the trench line to allow for the installation of the duct bank and dry backfilling of the trench. Trench dewatering management will be accomplished using a combination of BMPs that will be tailored to the site-specific conditions for each dewatering operation. Water found in all excavations must be assessed for obvious signs of contamination (e.g., discoloration, odor, signs of oil) prior to discharge. Water exhibiting signs of contamination cannot be pumped to the ground, catch basin, storm drains, sewer system, or surface water; such water will typically need to be pumped by a waste management contractor for proper off-site disposal. If the assessment shows no evidence of contamination, BMPs must be followed to avoid pumping sediment-laden water from the excavation.

If high groundwater conditions are encountered, then groundwater will be pumped from a series of sumps within the trench or vault excavation. Each sump will have a submersible pump surrounded by clean crushed stone, and will discharge groundwater to filter bags for further filtration prior to release. Water released from the filter bags will flow through a series of floc-log check dams to an appropriate nearby Town catch basin or drainage way.

5.5.3.3 Soil Management

The proposed trench will be excavated using a "clean trench" technique, where soil will be loaded directly into a dump truck for temporary off-site stockpiling or hauling to an off-site facility for recycling, re-use, or disposal should it not be required for backfilling the trench. The soil will not be stockpiled along the edge of the roadway, thus reducing the size of the required work area, and reducing the potential for sedimentation and nuisance dust.

The Company's objective is to minimize the potential for erosion and sedimentation impacts during construction, and to restore any disturbed areas. The Company will meet these objectives by implementing the erosion and sediment control measures described in Section 5.5.5.2.

When considering the onshore export cable routes from the Dowses Beach Landfall Site to the proposed onshore substation site, no Tier-Classified Chapter 21E or MassDEP Tier Classified oil and/or hazardous material disposal sites or AUL sites were identified within 300 feet of any of the Candidate Routes. If there are suspected contaminated soil, contaminated groundwater, or other regulated materials encountered along the route, soils/groundwater will be managed under the Utility-Related Abatement Measure (URAM) provisions of the MCP. The Company will contract with a third-party Licensed Site Professional (LSP) as necessitated by conditions encountered along the route, consistent with the requirements of the MCP at 310 CMR 40.0460 et seq.

Off-site stockpile locations have not yet been identified. It is anticipated that two or more locations may be required for temporary storage of soils. Appropriate locations will be determined based on final design documents and will comply with all local and state requirements. To avoid unnecessary stockpiling and/or transport of soils, efforts will be made to re-use soil as trench backfill, if deemed appropriate by the LSP based on testing results and based on the requirements of the MCP (310 CMR 40.000).

5.5.3.4 Trenchless Crossing Techniques

Trenchless crossing techniques (e.g., HDD, micro tunnel, direct pipe, pipe jacking) are typically used where either: (1) open trenching is not feasible from a construction perspective due to subsurface infrastructure, bridges, culverts, or railroad tracks; or (2) open trench construction is not practical due to traffic conditions. For crossings of busy roads, nighttime work may allow for open trench construction. Trenchless techniques proposed to be employed for Project construction are described briefly below.

Landfall Site HDD

As described in detail in Section 5.5.2, the transition from offshore-to-onshore will be accomplished by approximately 2,250-foot-long HDD operation, which will minimize Project-related impacts to the beach, intertidal zone, and nearshore areas, as well as ensuring that the cables remain sufficiently buried and permanently out of the human environment at the shoreline. The drill entry pits will be located in the Town-owned parking lot at the Dowses Beach Landfall Site.

Route 6 Crossing

Pipe jacking methodologies, another set of trenchless crossing techniques, are proposed for the Route 6 crossing. The onshore export cable route is required to cross Route 6 to reach the proposed onshore substation site. Because both the Preferred and Noticed Alternative Onshore Export Cable Routes follow Oak Street to Route 6 before crossing to the proposed onshore substation site, the Company engaged in an engineering review to determine whether it was feasible to run the cables along the existing Oak Street Bridge over Route 6 or to install a separate utility bridge over Route 6 to accomplish the crossing. Following this engineering review, it was determined that it would not be feasible to either attach an electrical conduit to the Oak Street

Bridge or install an independent utility bridge parallel to the existing bridge. Instead, it was determined that a trenchless crossing of Route 6 is the preferred approach for this segment of the onshore export cable route.

The trenchless crossing of Route 6 will be accomplished via pipe jacking methodologies. Pipe jacking methodologies include micro tunnel, earth pressure balance machines, conventional non-pressurized tunnel-boring machines, and open shield machines. Among these pipe jacking methodologies, the Company selected micro tunnel as the preferred method for the Route 6 crossing. Two micro tunnel crossings are proposed as a single micro tunnel cannot accommodate all three cables due to cable ampacity/temperature limitations (see Attachment B3). Micro tunnel is a pipe jacking operation that utilizes an MTBM pushed into the earth by hydraulic jacks mounted and aligned in a jacking shaft. A concrete casing pipe is lowered into the shaft and inserted between the jacking frame and the MTBM or previously jacked pipe. Slurry lines and power and control cable connections are made, and the pipe and MTBM are advanced along the planned alignment. This process is repeated until the MTBM reaches the receiving shaft. Upon completion of the tunnel, the equipment is removed, the power/fiber optic conduits are pulled through the concrete casing pipe utilizing rollers or an alternative method, and the annular space is grouted. Each micro tunnel will have a dedicated jacking shaft and dedicated receiving shaft; however, future engineering analysis may evaluate the viability of common jacking and common receiving shafts. The jacking shafts and staging area for the two micro tunnels will be located in the proposed onshore substation site. Each circular jacking shaft has an outside diameter of approximately 41 feet (12.5 m). The receiving shafts will be located on the north side of Service Road / south side of Route 6 in a common 75 feet by 170 feet (22.9 m by 51.8 m) staging area. Each rectangular receiving shaft is approximately 29 feet by 20 feet (8.8 m by 6.1 m) in outside dimensions (see Attachment B3).

5.5.3.5 Onshore Cable Installation and Testing

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

To install each cable section, a cable reel will be set up at the "pull-in" manhole and a cable puller will be set up at the "pull-out" manhole. Following the initial pulling of the mandrel and pulling line through each conduit, a hydraulic cable-pulling winch and tensioner will be used to individually pull cable from the pull-in to the pull-out manhole. This process will be repeated until all cables have been installed.

Once adjacent cable sections are installed, they will be spliced together inside the manholes. Splices will be performed for straight joints, whereby two cable ends will be joined and then encapsulated with a heat-shrinking material to protect the splice. Cable sheath grounding will be either single- or cross-bonded. The splicing operation requires a splicing van and a generator. The splicing van contains all of the equipment and material needed to make a complete splice. An air conditioning unit may be used at times to control the moisture content in the manhole. A portable generator will provide the electrical power for the splicing van and air conditioning unit, and the generator will be muffled to minimize noise. Typically, the splicing van will be located at one manhole access cover, the air conditioner will be located near the second manhole access cover, and the generator will be located in a convenient area that does not restrict traffic movement around the work zone.

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

During Project operation, the Company will conduct routine maintenance per a preventative maintenance schedule based on the cable manufacturer's recommended maintenance schedules and best industry management practice. This will include visual inspection of the manhole and associated cabling, splice joints, grounding cable connections, and link boxes. The fiber optic splice boxes will also be visually inspected for signs of moisture and corrosion. Inspection of and access to manholes within roadways will be scheduled with Town departments for permission and implementation of any required traffic management mitigation measures. Entering a manhole will be in full compliance with the Project's safety management system and work permit practices.

5.5.3.6 Restoration

Where the trench location requires cutting of pavement, pavement restoration will be carried out in compliance with Section 9.0 of the DPU Street Restoration Standards (D.T.E. 98-22). Generally, all pavement excavations will be repaired with same-day permanent patches unless specifically agreed to by the Town. Typically, temporary patches are only permitted for work between December 1 and March 31, when bituminous concrete is not available, or if the excavation must be reopened within five working days (e.g., to continue work after a weekend). In general, the length of new excavation completed each day will equal the length of duct bank installed, backfilled, and compacted.

If, at the end of the day, construction is not complete along an active section, any street openings will be covered with steel plates and marked with drums and yellow flashers until pavement patching is accomplished. Openings in the shoulder will be protected and barricaded to ensure traffic and pedestrian safety.

The final backfill in roadway areas will be town- and/or state-required road sub-base graded material upon which base course and finish course pavements are placed. All affected public roadways will be repaved to as-new condition after construction is complete. In landscaped areas, the final backfill above the fluidized thermal backfill (FTB) will typically be a sandy loam which can be seeded. The shoulder will be graded to its pre-existing contours, with slight mounding to allow for settlement. Any disturbed vegetated areas will be loamed and seeded to match pre-existing vegetation. Any lawn-edge that has been affected by construction activities will be hand-dressed, seeded, and mulched.

Depending on final duct bank design, some vegetation clearing as well as selective tree removal and/or trimming may be required along the onshore export cable route. Vegetation clearing, tree trimming, and selective tree removal will be minimized to the extent feasible. Any disturbed vegetated areas will be loamed and seeded to match pre-existing vegetation and the vegetation would be allowed to grow back. Any vegetation removal would be completed in accordance with all applicable state and local laws and regulations.

5.5.4 Substation Civil Works and Construction

The new onshore substation is located approximately 0.5 miles from the West Barnstable Substation point of interconnection on an approximately 15.2-acre privately-owned site located west of Oak Street in West Barnstable (see Figure 1-7). The proposed onshore substation site is comprised primarily of undeveloped wooded uplands. There are no wetland resource areas on or adjacent to the site, and the site is not within any areas mapped for state-listed species habitat.

This site is located in a residentially zoned area as well as an Aquifer Protection Overlay District. To the west, the proposed onshore substation site is bordered by undeveloped land. To the north, the site, including a 40-foot-wide "panhandle" that extends from the north of the property, is bordered by two protected parcels that are part of the Spruce Pond Conservation Area owned by the Town of Barnstable and managed by the Conservation Commission. The existing Eversource ROW #342 and Spruce Pond Road are located in the Spruce Pond Conservation Area. To the east, the site is bordered by a residential parcel developed with one single family home. To the south is the Route 6 layout managed by MassDOT.

As depicted on the Project Plan Set in Attachment B4, the Project substation will include three 275/345-kV "step-up" transformers, gas-insulated switchgear and a control room inside a building, and other necessary equipment likely including shunt reactors, Static Synchronous Compensators (STATCOMs), and harmonic filters along with associated bus work and support structures, overhead and underground wiring and conduits, protective systems, electrical service equipment, grounding protection, and lightning protection masts. A general arrangement for the new onshore substation is provided in Attachment B4.

Project substation equipment and enclosures are expected to be 40 feet or less in height. The Project substation will also be equipped with lightning protection masts that will be approximately 80 feet in height, though the height and number of lightning masts is subject to further refinement in the Engineering, Procurement and Construction (EPC) phase of Project development.

The Project substation yard area will be finished in crushed stone, and perimeter security fencing and/or retaining wall will be installed (see Attachment B4). The substation design also includes an internal gravel access road. The proposed onshore substation will be equipped with an integrated fluid containment system described in Section 5.5.4.1.

Construction of the substation will include the following steps over an approximately 24-month construction period:

- Install perimeter construction fencing and security gate, install initial erosion controls;
- Prepare the site for construction, which entails clearing and grading the site (installing additional erosion controls where needed), installing retaining walls (if needed), and excavating required drainage swales and basins required for site drainage;
- Excavate areas required for major component foundations and full volume containment sumps;
- Form and pour major foundations/containment sumps;
- Excavate areas required for spread footings, form, and pour footings;
- Deliver and place major equipment (e.g., transformers, reactors) using appropriate heavy load vehicles and equipment (transformers are filled with dielectric fluid later in the construction sequence);
- Trench areas for underground cabling, install duct bank, and backfill;
- Install ground grid and place crushed stone in yard area;
- Construct Gas Insulated Switchgear (GIS) buildings
- Deliver and place GIS and other equipment in the GIS Buildings. Complete buswork, begin cabling, including bringing 275-kV transmission into the site and 345-kV cabling to the West Barnstable Substation;
- Complete cabling, control wiring, and installation of protection systems;
- Test and commission;
- Install permanent perimeter security fencing and screening;
- Restore site; and
- Remove construction stage erosion controls.

5.5.4.1 Substation Containment Systems

The proposed onshore substation site is located within a Potential Public Water Supply Area mapped by the CCC. None of the substation equipment will contain PCBs. The Company will provide full-volume (110%) containment systems for major Substation components using dielectric fluid (i.e., the main transformers, iron core reactors, and equipment containing dielectric fluid associated with the STATCOMS, as applicable). While sumps for transformers are standard practice, they are not normally used for other lower-volume fluid-filled equipment given the low probability of any leakage. However, the Company will commit to this additional containment above and beyond standard practices given the sensitive nature of the Cape Cod watershed. The containment sumps will be designed to fully contain the dielectric fluid in the very unlikely event of a complete, catastrophic failure of the transformer or other equipment.

In addition, as the developers of the Vineyard Wind Connector 1 and NE Wind 1 Connector have committed to doing pursuant to their HCAs with the Town of Barnstable, the Company expects to commit as part of an HCA agreement to adding additional containment volume as follows. For Substation components identified above (i.e., the main transformers, iron core reactors, and equipment containing dielectric fluid associated with the STATCOMS), in anticipation of an extreme rain event, the Company will increase the 110% containment volume to account for the simultaneous PMP event in a 24-hour period, which will be determined for the Project substation site in consultation with the Town of Barnstable.

Also included in the design as additional mitigation is a common drain system that routes each individual containment area through an oil-absorbing inhibition device to an oil/water separator before draining to the infiltration basin.

In addition, a SPCC Plan will be included in the Project's CMP. The Company will also include spill response in its emergency response plan as part of the Project's overall safety management system. Appropriate spill containment kits and spill control accessories will be strategically situated at the Project substation and may include absorbent pads, temporary berms, absorbent socks, drip pans, drain covers/plugs, appropriate neutralizers, over pack containers all for immediate use in the event of any inadvertent spills or leaks. All operators will be trained in the use and deployment of such spill prevention equipment. The Company will also have a third-party licensed spill response contractor on call.

5.5.4.2 Substation Stormwater Management

The proposed onshore substation site has no existing impervious areas. Building the Project substation will create 1.2 acres of impervious surfaces associated with the proposed buildings and paved surfaces. The proposed stormwater management system incorporates LID strategies, which are designed to capture, treat, and recharge stormwater runoff. These measures provide a treatment train to improve the quality of stormwater runoff, reduce the quantity of stormwater runoff, and provide infiltration and recharge to groundwater. These are considered BMPs by MassDEP. A summary of the LID measures to be incorporated is provided below:

- ♦ Perforated under-drains will be installed throughout the site, which will collect stormwater that has percolated through the crushed rock surfaces and direct it through a series of water quality measures, then towards the attenuation and infiltration swales and stormwater basin. In addition to the proposed water quality measures, the stormwater that percolates through the crushed rock will receive a degree of filtration, removing some suspended solid pollutants
- ♦ Some stormwater will flow overland into a riprap lined swale along the eastern side of the site, which also provides opportunity for settlement and filtration of pollutants.
- ♦ A hydrodynamic vortex separator device will be installed upstream of the proposed infiltration basin.

- The subsurface drainage collection system includes a number of structures which include sediment sumps, which will assist in removing a significant amount of the suspended solids.
- There is one attenuation/detention basin proposed: the existing localized depression located in the north-eastern corner of the proposed onshore substation site, outside of the Project substation facility fenceline/wall, will function as an infiltration basin (see Attachment B4). As noted above, the localized depression, which will collect and infiltrate the remaining runoff from the substation site.
- A berm/dam structure will be installed within the existing localized depression area such that no outflow from the proposed substation will leave the site during storms up to and including the 50-year 24-hr design rainfall event.

The stormwater management design will meet or exceed the Massachusetts Stormwater Policy recommendations, and the Project will comply with MassDEP Stormwater Standards. In addition, the stormwater management system has been designed in consideration of the RMAT Design Standards and Guidelines. The stormwater management system has been designed to accommodate the 24-hour storm event (2-year, 10-year, 50-year [RMAT], and 100-year) using Extreme Precipitation Estimates from the Northeast Regional Climate Center.

5.5.5 General Construction Best Management Practices for the Project

The following construction best management practices apply to all of the onshore components of the Project.

5.5.5.1 Laydown and Staging

The contractor will identify laydown/staging areas necessary to complete construction. These locations will be located more than 100 feet from any wetland resource areas, more than 200 feet from perennial waterways, and outside the Zone I area of any public water supply wells.

5.5.5.2 Erosion and Sediment Control

The Company's objective is to minimize the potential for erosion and sedimentation impact during Project construction, and to effectively restore any disturbed areas. The Company will meet these objectives by implementing the erosion and sediment control measures described in this section. In general, the measures are designed to minimize erosion and sedimentation by:

- Minimizing the quantity and duration of soil exposure;
- Protecting areas of critical concern during construction by redirecting and reducing the velocity of runoff;
- Installing and maintaining erosion and sediment control measures during construction;
- Establishing vegetation where required as soon as possible following final grading; and

- Inspecting construction work areas and maintaining erosion and sediment controls as necessary until final stabilization is achieved and final inspections completed.

A Stormwater Pollution Prevention Plan (SWPPP) will be developed and maintained for the Project that will identify controls to be implemented to mitigate the potential for erosion and sedimentation from soil disturbance during construction. The SWPPP will be adhered to by the contractor(s) during all phases of Project construction in accordance with the conditions prescribed in the EPA National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) for Stormwater Discharges from Construction Activities. It will be the responsibility of the contractor to implement and maintain erosion and sediment control measures during construction, and such measures will be overseen by the contractor's environmental compliance manager.

The sections below include erosion and sediment control techniques that apply to all areas of onshore construction. Erosion and sedimentation controls will be maintained until disturbed areas are stabilized. The Company anticipates that all upland areas affected by construction will be fully restored within two growing seasons.

As to offshore construction, the OECC is located in high-energy, coarse-grained areas such that turbidity generation is expected to be minor and short-term.

5.5.5.2.1 Temporary Erosion Control Barriers

Hay/straw bales and silt fences are interchangeable, except where noted below. Temporary erosion control barriers will be installed prior to initial disturbance of soil and maintained as described below:

- At the outlet of a slope break when existing vegetation is not adequate to control erosion;
- Down slope of any stockpiled soil in the vicinity of waterbodies and vegetated wetlands;
- At sideslope and downslope boundaries of the construction area where run-off is not otherwise directed by a slope break;
- Maintained throughout construction and remain in place until permanent revegetation has been judged successful, upon which they will be removed;
- At boundaries between wetlands and adjacent disturbed onshore areas;
- As necessary to prevent siltation of ponds, wetlands, or other waterbodies adjacent to/downslope of the Project;
- At the edge of the construction area as needed to contain soil and sediment; and
- Catch basins along the work area will be protected using "silt sacks" and perimeter hay bales. The silt sacks and hay bales will be installed before pavement removal and trench excavation begins and will remain in place until the area is repaired and the shoulder repaved and revegetated.

Temporary erosion control barriers will be inspected on a daily basis in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of a storm event that is 0.5 inches or greater.

In addition, the following provisions will be made as part of erosion control:

- A water truck will be present on-site and used as necessary to minimize fugitive dust during demolition of existing pavement, or during excavation for trenches, vaults, foundations, and general construction processes.
- Although stockpiling of soils will be discouraged, any stockpiled soils located in staging areas (topsoil, special structural fill, etc.) are to be covered to minimize fugitive dust and erosion.
- All exposed slopes are to be stabilized with erosion control netting and/or temporary plantings.
- A covered dumpster will be maintained on or near the active construction site to minimize windblown debris from littering neighborhood and resource areas.

5.5.5.2.2 Silt Fence Installation and Maintenance

Any silt fence used as a construction-period control will be installed as directed by the manufacturer and applicable permit conditions. Accumulated sediment will be removed and the fence inspected to ensure it remains embedded in the soil as directed. Sufficient silt fence will be stockpiled on-site for emergency use and maintenance.

5.5.5.2.3 Hay/Straw Bale Installation and Maintenance

Hay/straw bale installation and maintenance will be performed as follows:

- Hay/straw bales will be anchored in place with at least two properly sized wooden stakes;
- Bindings on bales will be horizontal;
- Bales shall be replaced if damaged or allowing water to flow underneath;
- Damaged bales will be replaced with new bales as deemed necessary by the environmental compliance manager;
- A sufficient supply of bales will be maintained on-site for emergency use;
- Bales bound with wire or plastic will not be used; and
- Properly placed and staked straw wattles or fiber rolls may be used in lieu of hay bales in certain circumstances. Such substitutions will be approved by the environmental compliance manager in advance.

5.5.5.3 Construction Equipment and Refueling

Procedures for refueling construction equipment will be finalized during consultations with the CCC to ensure safety and spill prevention. Nearly all vehicle fueling and all major equipment maintenance will be performed off-site at commercial service stations or a contractor’s yard. A few pieces of large, less mobile equipment (e.g., excavators, paving equipment) will be refueled as necessary on-site. Any such field refueling will not be performed within 100 feet of wetlands or waterways, or within 100 feet of known private or community potable wells, or within any Town water supply Zone I area. The fuel transfer operation will be conducted by a competent person knowledgeable about the equipment, the location, and with the use of the work zone spill kit. Proper spill containment gear and absorption materials will be maintained for immediate use in the event of any inadvertent spills or leaks. All operators will be trained in the use and deployment of such spill prevention equipment. During construction, equipment will be inspected for incidental leaks (e.g., hydraulic fluid, diesel fuel, gasoline, anti-freeze) prior to site access and on a daily basis at the commencement of each work shift. The Company will require its contractor to document the daily inspections as part of the approved means and methods. Small pieces of powered equipment such as generators and pavement saws will be placed in containment bins or on absorbent blankets or pads to contain any accidental fuel spills or leaks. In addition, under no circumstances shall fuel or oils of any kind be stored or brought into any duct bank vault, nor shall there be any re-fueling of equipment either inside a vault or within 100 feet of any vault.

Further, the contractor will ensure that all refueling is performed consistent with the requirements described above, and that impact minimization measures and equipment will be sufficient to prevent discharged fluids from leaving the construction zone or reaching wetlands or waterbodies, and be readily available for use. Minimization measures and equipment will include some combination of the following:

(a) dikes, berms or retaining walls sufficiently impervious to contain spilled oil;

(b) sorbent and barrier materials in quantities determined by the contractor to be sufficient to capture the largest reasonably foreseeable spill;

(c) drums or containers suitable for holding and transporting contaminated materials;

(d) curbing;

(e) culverts, gutters, or other drainage systems;

(f) weirs, booms, or other barriers;

(g) spill diversion or retention ponds;

(h) sumps and collection systems;

(i) secondary containment of non-mobile pumps;

(j) The contractor will prepare a list of the type, quantity, and storage location of containment and clean up equipment to be used during construction, and the Company will review this list prior to construction;

(k) All spills will be cleaned up immediately. Containment equipment will not be used for storing contaminated material; and

(l) Date and location of refueling activities will be documented and maintained by the contractor and made available to the Company for review.

The Company will prohibit its contractors from refueling machinery or storing oil and/or hazardous materials within Zone I areas, and will require its contractors to regularly inspect construction equipment for leaks. Construction equipment not in use will not be stored within Zone I areas. Spill containment equipment will be immediately available throughout construction in the unlikely event of a leak. In addition, under no circumstances will fuel or oils of any kind be stored or brought into in any duct bank vault, nor will there be any re-fueling of equipment either inside a vault or within 100 feet of any vault.

During operations and maintenance, there will be no on-site refueling of vehicles within Zone I areas or within 100 feet of vaults.

5.5.5.4 Safety and Protection of Existing Utilities

During construction and installation of the proposed duct bank, the work area will be cordoned off to prevent unauthorized or accidental access. At the end of the day, if construction is not complete along an active section of trenching, any street openings will be covered with steel plates and marked with drums and yellow flashers until pavement patching is accomplished. Openings in the shoulder will be protected and barricaded to ensure traffic and pedestrian safety.

Construction at the proposed onshore substation will be contained within a secured fence line.

Final engineered drawings will be based on the most recent underground utility location information available. The contractor will comply with all Dig-safe regulations and protocols. The Company will also ensure their contractors are in strict compliance with the local town road opening requirements and work closely with the applicable department of public works and local utilities. Some existing utilities (storm drain, water etc.,) may need to be relocated in accordance with utility company requirements. Other existing utilities may need to be "supported" (often times use of nylon straps attached to fix points such as jersey barriers to hang pipes) during excavations in accordance with utility company requirements. The work will be performed in a cautious manner, physical barriers, protection devices and hand digging may be required when in close proximity to anticipated utilities.

5.5.5.5 Environmental Inspections

The Company will require the contractor to have a qualified environmental compliance manager who will manage an environmental inspection program to ensure that construction activities will comply with requirements of applicable federal, state, and local environmental permits and approvals. The environmental compliance manager will have immediate access to a Company contact and will have “stop work” authority relative to environmental non-compliance.

5.5.6 Construction Hours and Schedule

For the installation of the onshore duct bank and cables, construction is anticipated to occur during typical work hours (7:00 AM to 6:00 PM) on Monday through Friday, though in specific instances at some locations, or at the request of the Barnstable DPW or MassDOT, the Company may seek municipal approval to work at night or on weekends. Nighttime work will be minimized and performed only on an as-needed basis, such as when crossing a busy road, and will be coordinated with the Town.

For work at the landfall site, the Company's proposed HDD construction schedule is from 7:00 AM to 7:00 PM on Monday through Saturday, though during conduit pull-in the contractor will likely need to work around the clock since once that process is started it cannot be stopped. Should the Company need to extend construction work beyond those hours and/or days (i.e., on Sunday), with the exception of emergency circumstances on a given day that necessitate extended hours, the Company will seek prior permission from the Town of Barnstable.

The Company will be adhering to the general summer limitations on construction activities on Cape Cod, which the Company has reflected in the Project schedule for construction at the landfall site and along the onshore export cable route, where the route follows public roadway layouts. Activities at the landfall site, where the cables will transition from offshore-to-onshore, are not expected to be performed during the summer unless authorized by the Town. Activities along the onshore export cable route (particularly where the route follows public roadway layouts) will also likely be subject to significant construction limitations from Memorial Day through Labor Day unless authorized by the Town, but could extend through June 15 subject to consent from the Town. The Company will consult with the Town of Barnstable and MassDOT regarding the construction schedule.

With respect to work at the new onshore substation site, construction is anticipated to occur during typical construction work hours (7:00 AM to 7:00 PM) on Monday through Saturday.

BOEM as the lead federal agency for the Project is consulting with USFWS relative to potential offshore and onshore impacts to federally listed species and their habitats. A review of known northern long-eared bat maternity roost trees and winter hibernacula near the proposed onshore substation site where tree removal will occur was performed (NHESP map of regulated sites, Northern Long-eared Bat Locations, last updated June 12, 2019 [current as of January 2021])[8]. There are no known, mapped winter hibernacula on Cape Cod and the nearest known maternity roost trees are approximately 7.5 miles northwest of the proposed onshore substation site. Tree clearing (greater than 3 inches diameter at breast height) at the proposed onshore substation site will not be conducted between June 1 and July 31 of any year.

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8 https://www.mass.gov/service-details/the-northern-long-eared-bat

5.6 Conclusion

As demonstrated herein, potential impacts from construction and operation of the Project have been considered, avoided, and minimized to the extent practicable. With regard to the onshore export cable route, both the Preferred Route and the Noticed Alternative Route are of similar length and will be constructed entirely within existing roadway layouts. As identified in Section 4.0 and in more detail in Section 5.3, there are some differences in potential impacts to various natural and developed environmental features along each of the routes, but those differences are limited in scope. The Preferred Route will be within public roadway layouts that pass a greater number of businesses, residences, and above ground historic features than the Noticed Alternative Route. The Noticed Alternative Route is located for a greater distance within public roadways closer to the coastline, wetland resources (East Bay Road), and mapped rare species habitat. Nonetheless, construction-period impacts along the onshore route are largely expected to be minor, with access maintained to residences, businesses, and sensitive receptors, and therefore the differences in potential impacts along the routes is minimal.

While the Company acknowledges that there are more businesses located along the Preferred Route, the traffic impact analysis performed to date indicates that the detours associated with the Noticed Alternative Route will consist of longer distances compared to the Preferred Route. The Company anticipates working with the Town and community members, including residents and business owners to minimize construction-related impacts, including the potential for traffic congestion. Construction period traffic management will be carefully considered and will be coordinated with the Town of Barnstable to ensure any impacts are minimized to the extent practicable and that safe and efficient travel is maintained throughout the area.

The potential opportunity to maximize public benefits by accelerating water quality improvements with the Preferred Route provides a compelling public interest basis to support the selection of Candidate Route T6 (Wianno Avenue and Main Street) as the Preferred Route. As presented in Section 4.5.10, the Town of Barnstable's CWMP proposes to install a sewer line under Main Street, to address a significant degradation in water quality in Osterville estuaries, including Three Bays, which is among the most threatened water bodies in Cape Cod. As presented in Section 4.5.10, both the Vineyard Wind Connector 1 project and the New England Wind 1 Connector project proposed collaboration on the installation of onshore export cables with the installation of town sewer within overlapping project routes. This collaboration minimizes road closures, as they will not be opened and closed twice for two different projects. The Company believes that similar coordination for the NE Wind 2 Connector would result in similar benefits. Doing so would efficiently accomplish several important objectives at one time: minimize the overall disturbance to residents and businesses along the route, expedite improvements in water quality in Osterville; and save taxpayers significant costs. It is the Company's understanding that Main Street will be excavated for the installation of a gravity sewer main regardless of whether the NE Wind 2 Connector duct bank is installed within Main Street. The Noticed Alternative Route would not provide these important public and environmental benefits.

The Company will continue to assess the potential for environmental impact at the proposed onshore substation site and will develop a final design that minimizes visual and noise impacts. The Company also anticipates making the EMF, visual, and noise analyses as described above available once complete.

Section 6.0

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

6.0 CONSISTENCY WITH THE CURRENT HEALTH, ENVIRONMENTAL PROTECTION, AND RESOURCE USE AND DEVELOPMENT POLICIES OF THE COMMONWEALTH

This section describes the NE Wind 2 Connector's consistency with current applicable health, environmental protection, and resource use and development policies of the Commonwealth. The Project is consistent with these policies as described herein.

6.1 Introduction

G.L. c. 164, § 69J states, inter alia, that the Siting Board shall approve a petition to construct a facility if it determines that "plans for expansion and construction of the applicant's new facilities are consistent with current health, environmental protection, and resource use and development policies as adopted by the Commonwealth." As discussed below and in more detail throughout the Analysis, the Project not only satisfies the requirements of G.L. c. 164, § 69J, but, moreover, is consistent with other important state energy policies such as those articulated in An Act to Promote Energy Diversity (c. 188 of the Acts of 2016), the Green Communities Act (c. 169 of the Acts of 2008), the Global Warming Solutions Act (c. 298 of the Acts of 2008), the Electric Utility Restructuring Act of 1997 (Restructuring Act, c. 164 of the Acts of 1997) and amendments thereto.

6.2 Safety, Health, and Welfare Policies

The Restructuring Act provides that reliable electric service is of "utmost importance to the safety, health and welfare of the Commonwealth's citizens and economy…" (See Restructuring Act, St. 1997, c. 164, § 1(h)). Thus, the Legislature has expressly determined that an adequate and reliable supply of energy is critical to the state's citizens and economy. The Project will be fully consistent with this policy. The Project will deliver over 1,200 MW of zero-carbon renewable energy to the ISO-NE electrical grid, helping to ensure the availability of clean and reliable electric service to the citizens and businesses of the Commonwealth and the region. It will also enhance winter reliability and will diversify the fuel mix away from natural gas. Thus, because the Project is consistent with and will promote the Commonwealth's energy policies as outlined in the Restructuring Act, it is also consistent with its safety, health, and welfare policies.

All design, construction, and operation activities will be in accordance with applicable governmental and industry standards such as the National Electrical Safety Code (NESC) and Occupational Safety and Health Administration (OSHA) regulations such that the health and safety of the public are protected. As discussed in Section 5.0, the Project is being designed in a manner to avoid and minimize potential impacts related to traffic, noise, air and water quality, and EMF. For example, the Company will comply with requirements of the MassDEP Diesel Retrofit Program (see Section 5.3.14).

6.3 Green Communities Act, as amended

The Project is consistent with, and directly advances, the Commonwealth's policies for the development of offshore wind energy resources. In 2016, the Commonwealth enacted legislation specifically intended to bring about development of offshore wind energy generation projects such as those that would be enabled by the NE Wind 2 Connector. Section 83C of the *Green Communities Act* (Chapter 169 of the Acts of 2008), as amended by Chapter 188 of the Acts of 2016, *An Act to Promote Energy Diversity*, Chapters 8 and 24 of the Acts of 2021, and Chapter 179 of Acts of 2022, aims to establish a commercial-scale offshore wind industry in Massachusetts. Among other things, Section 83C requires the procurement of 5,600 MW of offshore wind energy generation by June 30, 2027. It represents a significant, long-term commitment to offshore wind energy by the Commonwealth. It also sets forth a specific process for soliciting and selecting project proposals and for approving the resulting contracts. The Commonwealth Wind Project was selected in the third solicitation conducted pursuant to Section 83C in December 2021, which allowed the advancement of the Commonwealth Wind/NE Wind 2 Connector projects. The associated PPAs have been executed and are currently before the DPU for approval pursuant to Section 83C. The NE Wind 2 Connector and the associated Commonwealth Wind project will be another significant step forward in meeting Massachusetts' growing demand for clean energy and in implementing Section 83C.

In addition, and as recognized by Section 83C, offshore wind has the potential to more broadly support other renewable energy goals in the Commonwealth, including by contributing to the greenhouse gas emission reduction targets set forth in G.L. c. 21N. Those contributions will be direct reductions in emissions associated with generating an energy supply for the region, and indirect benefits. For example, Massachusetts has the most solar energy generation in New England, and the daily and seasonal production profiles for solar generation pair nicely with those of offshore wind (e.g., more solar energy generation in the summer, with more offshore wind energy generation in the winter).

As described in Section 2.0, without new transmission facilities such as the NE Wind 2 Connector, the offshore wind energy sought by the Act would not be able to deliver power to the New England electrical grid.

6.4 Environmental Protection Policies

The Project is consistent with, and advances, the Commonwealth's environmental protection policies. Among other things, by displacing fossil-fueled electric generation, the Project will cause a reduction of 2.35 million tons per year of greenhouse gas emissions (as carbon dioxide equivalent [CO_2e]), the equivalent of removing 505,000 cars per year from the road[1]. The Project will also reduce NOx by 1,255 tons per year and SOx by 666 tons per year. The avoided emissions analysis conservatively assumes an annual capacity factor of 50% with a capacity of 1,200 MW.

6.4.1 State and Local Environmental Policies

The Project will obtain all environmental approvals, licenses, and permits required by federal, state, regional, and local agencies and will be constructed and operated in compliance with applicable federal, state, regional, and local environmental policies. Thus, the Project will contribute to a reliable, diverse, and low-carbon energy supply for the Commonwealth and region with minimal environmental impact. With respect to state permitting and in addition to the Siting Board's review, the Project will undergo MEPA review and federal consistency review by CZM and will secure state permits from MassDEP and MassDOT and potentially NHESP.

Following completion of the MEPA review process, the Project will be reviewed at the regional level as a Development of Regional Impact (DRI) by the Cape Cod Commission (CCC) and the Martha's Vineyard Commission (MVC). On the local level, the Project will secure the appropriate wetlands approvals from local conservation commissions, as well as other necessary approvals from local authorities. Moreover, as explained in more detail in sections 1.6.3.2 and 4.5.10, the Project has the potential to accelerate water quality improvements in Barnstable, and in particular the Three Bays Area, a currently impaired waterway. This is because the Project has identified as its preferred route a roadway system that the Town intends to sewer. The opening of the road for cable installation may expedite the installation of a sewer line, as has been the case for the Vineyard Wind 1 Connector and will be the case for the NE Wind 1 Connector. This expediting of sewering is also consistent with a recent action by MassDEP to promulgate regulations to limit septic system loadings in nitrogen sensitive areas within Cape Cod.

Table 6-1 identifies the anticipated principal environmental reviews, permits, and approvals required for the NE Wind 2 Connector; federal permits required for the Commonwealth Wind project are included for background. By meeting the requirements for each of these review programs, permits, and approvals, the Project will demonstrate compliance with applicable state, regional, and local environmental policies.

[1] USEPA, Greenhouse Gas Equivalencies Calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results).

Table 6-1 Environmental Permits, Reviews, and Approvals for the NE Wind 2 Connector and Commonwealth Wind

Agency/Regulatory Authority	Permit/Approval	Status
Federal (for Commonwealth Wind)		
US Bureau of Ocean Energy Management (BOEM)[1]	Site Assessment Plan (SAP) approval	Completed[2]
	Construction and Operations Plan (COP) approval/Record of Decision (ROD)	COP filed with BOEM July 2, 2020
	National Environmental Policy Act (NEPA) Environmental Review	Initiated by BOEM June 30, 2021
	Facilities Design Report (FDR) and Fabrication & Installation Report (FIR)	To be filed (TBF)
US Environmental Protection Agency (EPA)	EPA Permits under Section 316(b) of the Clean Water Act (CWA), including National Pollutant Discharge Elimination System (NPDES) Permit(s)	TBF
	Outer Continental Shelf (OCS) Air Permit	Application filed October 7, 2022
US Army Corps of Engineers (USACE)	Clean Water Act (CWA) Section 404 Rivers and Harbors Act of 1899 Section 10 Individual Permit	Application filed August 1, 2022
US National Marine Fisheries Service (NMFS)	Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA)	Application considered adequate and complete July 20, 2022
US Coast Guard (USCG)	Private Aids to Navigation (PATON) authorization	TBF
Federal Aviation Administration (FAA)	No Hazard Determination (for activities at construction staging areas and vessel transits, if required)	TBF
State/Massachusetts (for the NE Wind 2 Connector)		
Massachusetts Environmental Policy Act Office (MEPA)	Certificate of Secretary of Energy and Environmental Affairs (EEA) on Final Environmental Impact Report	Environmental Notification Form (ENF) filed September 30, 2022
Energy Facilities Siting Board (EFSB)	G.L. c. 164, § 69J Approval	Accompanies this Analysis
Massachusetts Department of Public Utilities (DPU)	G.L. c. 164, § 72, Approval to Construct G.L. c. 40A, § 3 Zoning Exemption	Filed with or shortly after the Petition under G.L. c. 164 Sec. 69J
Massachusetts Department of Environmental Protection (MassDEP)	Chapter 91 Waterways License and Dredge Permit Water Quality Certification (Section 401 of the CWA)	TBF
Massachusetts Department of Transportation (MassDOT)	Access Permit(s)	TBF
Natural Heritage and Endangered Species Program (NHESP)	Conservation and Management Permit (if required)	TBF (if required)
State/Massachusetts (for the NE Wind 2 Connector)		
Massachusetts Office of Coastal Zone Management (CZM)	Federal Consistency Determination (15 CFR 930.57)	Filed with MA CZM on September 14, 2022
Massachusetts State Legislature	Article 97 Authorization(s)	TBF

Table 6-1 Environmental Permits, Reviews, and Approvals for the NE Wind 2 Connector and Commonwealth Wind (Continued)

Agency/Regulatory Authority	*Permit/Approval*	*Status*
Regional (for portions of the NE Wind 2 Connector within regional jurisdiction)		
Cape Cod Commission (CCC)	Development of Regional Impact (DRI) Review	TBF
Martha's Vineyard Commission (MVC)	DRI Review	TBF
Town of Barnstable Old King's Highway Historic District Committee	Certificate of Appropriateness (if required)	TBF
Local (for portions of the NE Wind 2 Connector within local jurisdiction)		
Barnstable Conservation Commission	Order of Conditions (Massachusetts Wetlands Protection Act and municipal wetland non zoning bylaws)	TBF
Barnstable Department of Public Works (DPW) and/or Town Council	Street Opening Permits/Grants of Location (if required)	TBF
Barnstable Planning/Zoning	Zoning approvals (if required)	TBF
Barnstable Tree Warden	Tree Work Permit (Massachusetts Public Shade Tree Statute, G.L. c. 87, and Chapter 221-4 of Barnstable's general bylaws)	TBF
Barnstable Tree Warden/Planning Board	Scenic Road Permit (Chapter 180 of Barnstable's General Ordinances) (if required)	TBF (if required)
Edgartown Conservation Commission	Order of Conditions (Massachusetts Wetlands Protection Act and municipal wetland non-zoning bylaw) for Offshore Export Cable Corridor (OECC) within Edgartown waters	TBF
Mashpee Conservation Commission	Order of Conditions (Massachusetts Wetlands Protection Act and municipal wetland non zoning bylaws) for OECC within Mashpee waters (if required)	TBF (if required)
Nantucket Conservation Commission	Order of Conditions (Massachusetts Wetlands Protection Act and municipal wetland non zoning bylaws) for OECC within Nantucket waters	TBF

(1) In its review of the COP, BOEM must comply with its obligations under the NEPA, the National Historic Preservation Act (NHPA), the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the Migratory Bird Treaty Act (MBTA), the Clean Air Act (CAA), and the Endangered Species Act (ESA). Thus, BOEM coordinates and consults with numerous other federal agencies including the National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), the United States Environmental Protection Agency (EPA), and the United States Coast Guard (USGC) during the review process. BOEM also coordinates with the state under the Coastal Zone Management Act (CZMA) to ensure that the project is consistent with the state's coastal zone management program.

(2) A meteorological-oceanographic buoy (metocean buoy) was installed in Lease Area OCS-A 0501 (prior to its segregation into Lease Areas OCS-A 0501 and OCS-A 0534) under an approved Site Assessment Plan (SAP) in May 2018.

6.4.2 Global Warming Solutions Act and An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy

Enacted in 2008, the GWSA established ambitious GHG emissions reduction targets mandating that the Commonwealth reduce its GHG emissions by 10 to 25% from 1990 levels by 2020 and by at least 80% from 1990 levels by 2050 (St. 2008, c. 298). Pursuant to the GWSA, the Secretary of the EEA issued the Clean Energy and Climate Plan for 2020 in December 2010 and updated that plan in December 2015. In June of 2022, the Secretary issued the Clean Energy and Climate Plan for 2025 and 2030.[2] Among other provisions, the GWSA obligates administrative agencies such as the Siting Board to consider reasonably foreseeable climate change impacts (e.g., additional GHG emissions) and related effects (e.g., sea level rise) in evaluating and issuing permits.

The 2021 law "An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy" set GHG reduction goals at 50% from 1990 levels by 2030, 75% from 1990 levels by 2040, and net zero emissions by 2050 (see M.G.L. chapter 21N, sections 3(b) and 4). As one of the major renewable energy sources in New England, offshore wind energy is critical to meeting these targets, and is a cornerstone of the Commonwealth's Clean Energy and Climate Plan for 2025 and 2030 (*see, e.g.*, pages iv, xi, xiv, 4-5, 62-65, 69-70).

By enabling the interconnection of large-scale offshore wind energy generation to the regional electric grid, the NE Wind 2 Connector directly and substantially advances the Commonwealth's GHG reduction goals. As discussed in Section 1.6.3.1, the Commonwealth Wind project enabled by the NE Wind 2 Connector, will displace fossil-fueled generation, and thereby reduce CO_{2e} emissions by approximately 2.35 million tons per year across the ISO-NE electrical grid, the equivalent of taking 505,000 cars off the road per year. The Project will deliver over 1,200 MW of renewable energy to the ISO-NE electrical grid. The Project is therefore consistent with the GWSA and An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy.

6.4.3 The Restructuring Act

The Project is consistent with the environmental policies of the Restructuring Act as more thoroughly addressed in Sections 3.0 through 5.0. The Restructuring Act provides that the Company must demonstrate that the Project minimizes environmental impacts consistent with the minimization of costs associated with mitigation, control, and reduction of the environmental impacts of the Project. Accordingly, an assessment of all effects of a proposed facility is necessary to determine whether an appropriate balance is achieved both among potentially competing environmental impacts and benefits, as well as among environmental impacts, cost, and reliability.

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[2] The Clean Energy and Climate Plan for 2025 and 2030 is available at https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2025-and-2030.

A facility that achieves the appropriate balance thereby meets the Chapter 164 requirement to minimize environmental impacts at the lowest possible cost. To determine if a petitioner has achieved the proper balance among environmental impacts, cost, and reliability, the Siting Board first determines if the petitioner has provided sufficient information regarding environmental impacts and potential mitigation measures in order to make such a determination. The Siting Board then determines whether environmental impacts are minimized. Similarly, the Siting Board evaluates whether the petitioner has provided sufficient cost information to determine if the appropriate balance among environmental impacts, cost, and reliability has been achieved.

Sections 3.0 through 5.0 of this Analysis demonstrate that the Company has compared a range of alternatives and has proposed specific plans to mitigate potential environmental impacts associated with construction, operation, and maintenance of the proposed Project, consistent with cost minimization. As such, the Project is consistent with the environmental policies of the Commonwealth as set forth in Chapter 164 of the General Laws.

6.4.4 Environmental Justice Policy

The Project is consistent with EEA's EJ Policy, which was originally promulgated in 2002. On November 25, 2014, the EJ Policy was updated by then-Governor Patrick through Executive Order #552. The EJ Policy was adopted and updated by then-Secretary Beaton on January 31, 2017. Most recently, on March 26, 2021, Governor Baker signed bill S.9., "An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy" (the "Climate Act"). The Climate Act defines environmental justice principles and populations, environmental burdens, and environmental benefits, and directs Commonwealth agencies to develop processes and standards to enhance opportunities for meaningful involvement by members of EJ communities and to ensure agency consideration of concerns related to EJ communities. The EJ policy was updated on June 24, 2021, consistent with the new statute. Subsequently, the MEPA Office developed the MEPA Public Involvement Protocol for Environmental Justice Populations and the Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations which became effective on January 1, 2022.

Enhanced Public Participation requirements under MEPA are identified in Section 16 of the EJ Policy and are the basis of MEPA's Public Involvement Protocol for EJ Populations. The Enhanced Public Participation requirements apply to projects that meet two criteria:

1. The project exceeds an ENF threshold for air, solid and hazardous waste (other than remediation projects), or wastewater and sewage sludge treatment and disposal; **and**

2. The project site is located within one mile of an EJ population (or in the case of projects exceeding an ENF threshold for air, within 5 miles of an EJ population).

The criteria for Enhanced Analysis of Impacts and Mitigation under MEPA are identified in Section 17 of the EEA's EJ Policy and are the basis of the MEPA Office's Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations and apply to projects that meet two criteria:

1. The project exceeds a mandatory Environmental Impact Report (EIR) threshold for air, solid and hazardous waste (other than remediation projects), or wastewater and sewage sludge treatment and disposal; **and**

2. The project site is located within one mile of an EJ population (or in the case of projects exceeding a mandatory EIR threshold for air, within 5 miles of an EJ population). The project proponent may submit actual air modeling data on the project's area of potential air impacts in its EIR scope to modify the presumed five-mile impact area referred to in this condition.

Specific criteria for Enhanced Public Participation and Enhanced Analysis of Impacts and Mitigation in Siting Board proceedings are in Section 20. Those criteria incorporate the MEPA parameters from section 16 and section 17. Siting Board-specific aspects of the EJ policy address the Siting Board's notice and translation requirements and the Siting Board's consideration of "cumulative health impacts."

As described in the EJ Policy, "Environmental Justice (EJ) Population" means

(A) a neighborhood that meets 1 or more of the following criteria:

(i) the annual median household income is not more than 65 per cent of the statewide annual median household income;

(ii) minorities comprise 40 percent or more of the population;

(iii) 25 percent or more of households lack English language proficiency; or

(iv) minorities comprise 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 per cent of the statewide annual median household income; or

(B) a geographic portion of a neighborhood designated by the Secretary as an environmental justice population in accordance with law.

The term English Isolation "refers to households that are English Language Isolated according to federal census forms, or do not have an adult over the age of 14 that speaks only English or English very well" (EJ Policy, Section 4). The EJ Policy relies on the full count Census (currently 2020), not estimates extended to larger populations from small sample sizes.

Figure 6-1 shows that no EJ Populations are located within a one-mile radius of the Project. However, as described above, one census tract located within one mile of the Project is a Linguistic Isolation Area based on languages other than English being spoken by more than 5% of the population who otherwise do not have proficiency in English.

The Project does not exceed any ENF thresholds for air, solid and hazardous waste, or wastewater and sewage sludge treatment and disposal and there are no EJ Populations, as defined under Massachusetts law, within one mile of the proposed Project. Thus, neither the Enhanced Public Participation requirements nor the Enhanced Analysis of Impacts and Mitigation under MEPA apply, and the corresponding provisions for Siting Board proceedings are similarly inapplicable.

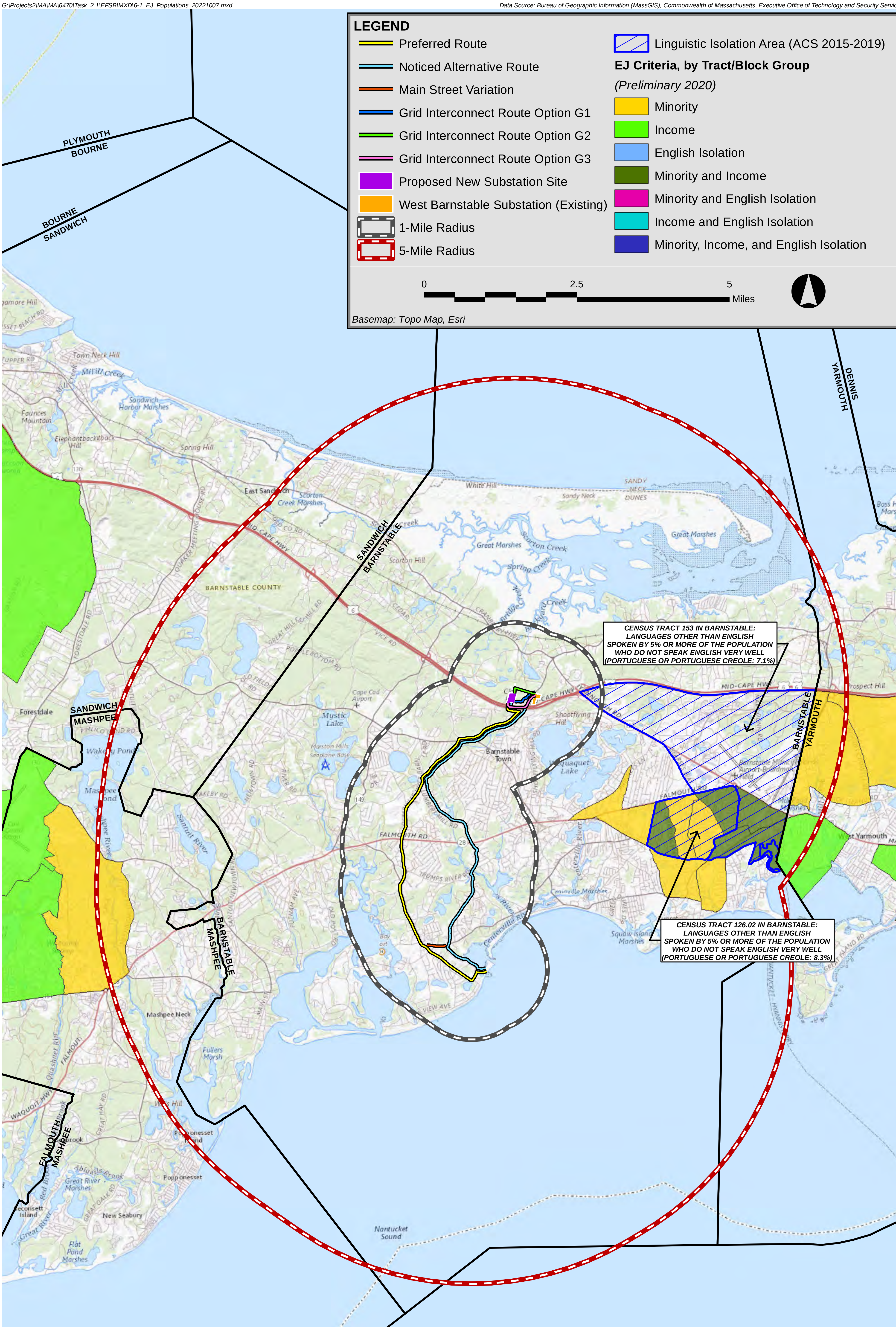
Nonetheless, the Company voluntarily distributed an advance notice of the Company's intention to file an ENF for the Project to support the MEPA Office's initiative to enhance public participation opportunities for members of the public, including those with limited English proficiency. The proposed project is located within a one-mile radius of one census tract where Portuguese or Portuguese Creole is spoken by 5% or more of the population who otherwise have limited English proficiency. Therefore, the Company voluntarily circulated a Project fact sheet (Advance Notice of ENF Filing) to a distribution list provided by the MEPA Office as well as to CBOs in English, Brazilian Portuguese, and Spanish based on review of the Barnstable school district website and consultation with Barnstable school district staff. The Advance Notice was circulated approximately one month before the ENF was published in the Environmental Monitor which began the public comment period. In addition, the Company extended the ENF comment period by 30 days to allow for more public review and input. The Company will work with the Siting Board to develop appropriate notices for the Project consistent with Siting Board precedent.

Moreover, the Company's environmental analysis is intended to minimize the Project's potential impacts to all populations, including EJ populations. Clean energy generated by Commonwealth Wind and delivered by the NE Wind 2 Connector will help displace electricity generated by fossil fuel power plants that have operated near neighborhoods for over a century, affecting air, water, soil, and human health, prompting attention to EJ. The Company's outreach to and interaction with neighborhoods and local industries will meet or exceed the intent of EJ policies to involve the public in decision-making about development. Regardless of any legal obligation, and consistent with the Commonwealth's EJ Policy, the Company undertook diligent efforts to identify EJ communities in the vicinity of the Project and has undertaken and will continue to undertake extensive community outreach efforts to facilitate meaningful opportunities for all potentially affected parties to participate.

In summary, the NE Wind 2 Connector is consistent with the Commonwealth's EJ Policy and applicable MEPA Protocols in that its impacts to all populations, including EJ populations, will be minimized and public participation will meet or exceed the requirements of the EJ Policy. Although the Project does not exceed any ENF thresholds for air, solid and hazardous waste, or wastewater and sewage sludge treatment and disposal, the Project has made a diligent effort to

G:\Projects2\MA\MA\6470\Task_2.1\EFSB\MXD\6-1_EJ_Populations_20221007.mxd

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



New England Wind 2 Connector Project

AVANGRID Offshore Wind

Figure 6-1

Environmental Justice Populations and English Isolation Areas conduct an inclusive community outreach program. Furthermore, potential impacts from construction will be temporary and carefully mitigated. Long-term impacts will be minimal and minimized, as described in Section 5.0.

Finally, one purpose of the EJ Policy is to promote climate change resiliency and minimize potential effects from climate change (pages 4-5 of the Policy). The Project will bring over 1,200 MW of renewable, emissions-free energy into the ISO-NE electrical grid, advancing greenhouse gas reduction goals and improving air quality.

6.4.5 Massachusetts Ocean Management Plan

This section describes how the Project is consistent with the Massachusetts OMP. Initially released in 2009 and subsequently revised in 2015 and again in 2021, the Massachusetts OMP creates a framework for managing uses and activities within the state's ocean waters. As such, its geographic scope is broad and includes the ocean waters, seafloor, and subsurface. Jurisdiction covers the area from the seaward limit of state waters (generally three miles offshore) to a nearshore boundary that lies approximately 0.3 miles seaward from Mean High Water. Figure 1-4 illustrates the OECC and shows the limits of Massachusetts waters. As stipulated in the Oceans Act of 2008, and described in Chapter 1 of the OMP, implementation is achieved through existing state review procedures, whereby all licenses, permits, and leases are required to be consistent to the maximum extent practicable with the OMP. Since the OMP is incorporated into the Massachusetts Coastal Zone Management Plan, all federal actions must also be consistent with the OMP, to the maximum extent practicable. Any project that requires an EIR pursuant to MEPA is subject to the OMP. The Plan's mapped resources, as describe further below, guide the scope of relevant aspects of the MEPA review.

The Project is located in the "Multi-Use Area" of the OMP, which covers the majority of the jurisdictional planning area. In Multi-Use Areas, proposed projects are subject to the siting and performance standards associated with allowable uses; those uses are governed by the Ocean Sanctuaries Act, as modified by the Oceans Act, and include power and communications cables. Cables are allowed in the OMP Multi-Use Area, subject to these siting and performance standards as well as other applicable laws.

A large part of the planning process for the OMP was devoted to mapping and evaluating natural resources and existing water-dependent uses (e.g., navigation and fishing). This resulted in a series of maps identifying SSU resources and existing water-dependent uses that are relevant for particular types of projects. The OMP's general siting and performance standards are directly tied to these SSUs and uses and are discussed below in specific reference to cable projects.

6.4.5.1 Special, Sensitive, or Unique Estuarine and Marine Life and Habitats

The OMP and relevant OMP Regulations, found at 301 CMR 28.00, include management standards for SSU Resources. Specific to cable projects, the OMP identifies the following SSUs: (1) core habitat of the North Atlantic right whale, fin, and humpback whales; (2) hard/complex seafloor; (3) eelgrass; and (4) intertidal flats. Mapping of these SSUs based on marine surveys within the

OECC are depicted on the plan set in Attachment C. Activities in SSU areas are permitted if the maps delineating the SSU resources do not accurately characterize the resource based on substantial site-specific information (301 CMR 28.04(2)(b)(1)) or there is no less damaging practicable alternative taking into consideration cost, existing technology, and logistics, all practicable measures have been taken to avoid damage to SSUs (including mitigation measures and time of year controls), and the public benefits outweigh the public detriments (see 301 CMR 28.04(2)(b)(2-4)).

6.4.5.1.1 Core Habitat of the North Atlantic Right Whale

The North Atlantic right whale (*Eubalaena glacialis*) is both a state and federally listed endangered species that regularly uses Massachusetts waters for feeding. The OMP established the North Atlantic right whale core habitat SSU resource based on data that identified statistically significant use of certain areas of the Massachusetts coast by right whales (Massachusetts Geographic Information System [MassGIS], 2020). The Project avoids OMP-mapped core habitat for whales, including the North Atlantic Right Whale. The Project will not place any structures within or conduct any work within the area of core habitat for the North Atlantic Right Whale mapped as an SSU area in the OMP.

6.4.5.1.2 Hard and Complex Bottom

Hard seafloor is seabed characterized by exposed bedrock or concentrations of boulder, cobble, or other similar hard bottom distinguished from surrounding unconsolidated sediments. Complex seafloor is a morphologically rugged seafloor characterized by high variability in bathymetric aspect and gradient. Biogenic reefs and man-made structures, such as artificial reefs, shipwrecks, or other functionally equivalent structures, may provide additional suitable substrate for the development of hard bottom biological communities. Hard/complex seafloor is seabed characterized singly or by the combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or shipwrecks and obstructions to navigation.

Cable projects are considered an allowed use under the OMP for certain SSU resources, including hard/complex seafloor. However, the guidelines outlined in the OMP call for the avoidance of hard/complex seafloor to the extent practicable (MassGIS, 2020). The Company has conducted geological and geotechnical surveys of the OECC to identify locations of hard/complex seafloor, and extensive benthic sampling and imaging to characterize habitat, to inform the final placement of the offshore export cables to avoid or mitigate the potential effects to this SSU resource.

As a component of evaluating and minimizing potential impacts related to the Project, the Company has conducted extensive surveys of the OECC and has mapped hard bottom and complex bottom (bedform fields). Hard and complex bottom delineated from survey results is depicted on the plan set in Attachment C. Based on marine survey data, it is not feasible for cable installation activities to completely avoid hard or complex bottom.

6.4.5.1.3 Eelgrass

Eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*) are both species of submerged aquatic vegetation (SAV) and are important protected resources that represent critical habitat in nearshore coastal ecosystems. These resources are important components of coastal ecosystems and provide food and shelter to numerous aquatic species, cycle nutrients from the water column, and stabilize marine sediments.

Evaluations of SAV within the OECC and Western Muskeget Variant have included a desktop study making use of data from MassDEP's *Eelgrass Mapping Project*, which, over multiple years, mapped eelgrass beds in state waters using high-resolution digital imagery and extensive fieldwork supported by high-accuracy GPS, high-resolution sonar, and underwater video cameras. Nearshore surveys have not identified any eelgrass in the Primary OECC or Western Muskeget Variant.[3]

6.4.5.1.4 Intertidal Flats

Based on marine survey results to date, there are no intertidal flats in the vicinity of the Project within OMP jurisdiction.

6.4.5.2 Conformance with the OMP Management Standards for SSUs

The Company has completed detailed marine surveys within the OECC proposed for the Project and have refined the SSU areas using data that comply with the data standards requirements in the OMP Regulations at 301 CMR 28.08(1). Specifically, the Company met on multiple occasions with representatives of the Secretary of the EEA, CZM, and other relevant agencies before, during, and after marine surveys specifically to discuss refinement of the SSU areas. Data collected as a result of those surveys are based on contemporary and accepted standards, as informed by the multiple consultations described above and therefore is appropriate to use under 301 CMR 28.08(1)(b).

It is expected that isolated areas of hard/complex bottom will be avoided; however, in areas such as Muskeget Channel where hard or complex bottom extends across the majority or entire corridor, it will not be possible to avoid these seafloor habitats (see Attachment C).

[3] In 2018, a single area of eelgrass was found within the installation corridor for the New England Wind 1 Connector around Spindle Rock in Centerville Harbor. This area is not within the portion of the OECC that would be used for the NE Wind 2 Connector because the NE Wind 2 Connector will approach shore in a different location to achieve its proposed landfall site.

Given the need to bring the offshore export cables to shore, although the Company has taken all practicable measures to avoid SSU areas (hard bottom, complex bottom, intertidal flats, and eelgrass), including extensive evaluation of potential cable routes in the offshore project area, a commercially viable route that completely avoids hard bottom and complex bottom is not available.

Using the refined SSU delineations generated as a result of marine surveys, the Company has determined it is not possible to completely avoid SSUs. Specifically, it is not possible to completely avoid hard/complex seafloor; no other SSUs will be impacted. Numerous technical and environmental considerations and constraints have factored into the routing of the OECC and Western Muskeget Variant, including avoidance of SSUs. However, the OECC and Western Muskeget Variant are consistent with OMP Regulations because no less environmentally damaging practicable alternative exists, all practicable measures have been or will be taken to avoid damage to SSU areas, and the public benefits outweigh the public costs. Compliance with this aspect of the OMP is also discussed below.

As a component of evaluating and minimizing potential impacts related to the Project, the Company has conducted extensive surveys of the OECC and Western Muskeget Variant and has mapped hard bottom, complex bottom (bedform fields), and eelgrass along the corridors (see Section 4.1.2). Based on these surveys and evaluations, the proposed route options are the least environmentally damaging practicable alternatives and result in a Project with public benefits that outweigh any detriments to SSU and other resources; the Project's public benefits are summarized in Section 1.6.

Offshore survey results and considerations related to installation of the offshore cables together demonstrate that the proposed OECC and Western Muskeget Channel options for the Project will unavoidably traverse some areas mapped as hard/complex bottom; these are shown on the plan set in Attachment C. The area between Martha's Vineyard and Nantucket, in the vicinity of Muskeget Channel, has shoals and strong tidal currents. The feasible routes through the Muskeget Channel area would all affect some areas mapped in the OMP and confirmed through marine surveys as hard/complex bottom.

In addition to the OMP-mapped hard/complex bottom, the marine surveys have identified additional areas where greater than 50% of the seafloor is characterized by higher concentrations of boulders, bathymetric relief, and coverage by coarse material. The Company, in identifying the OECC and Western Muskeget Variant, has sought to avoid and/or minimize passage through areas of hard/complex bottom, both due to their value as a resource and for potential installation challenges related to achieving the target cable burial depth. However, some of these areas are unavoidable given other physical constraints related to water depth and currents. Where possible, Project engineers have sought to maintain water depths of approximately 20 feet (6 m).

While the OMP identifies some preliminary corridors for offshore wind transmission cables that are in presumptive compliance with the siting standards of the Plan, those corridors are not suitable to the Project. The Project team considered these corridors while assessing offshore routing alternatives, but they were unsuitable for the Project given that water depths within the mapped preliminary corridors are frequently too shallow, and the mapped corridors do not accommodate a landfall site in Barnstable (the Company determined such a landfall was needed to minimize onshore and overall routing distances).

The Project is consistent with the OMP because:

- The Project is consistent with the siting and performance standards for cables, as the proposed OECC and Western Muskeget Variant will avoid impacts to North Atlantic Right Whale core habitat, mapped eelgrass beds, and mapped intertidal flats;

- The proposed OECC and Western Muskeget Variant scenarios are the least environmentally damaging practicable alternatives for the Project, as described in Section 4.0;

- All practicable measures to avoid damage to SSU resources and minimize impacts to those resources will be taken, and installation methodologies have been selected to minimize impacts where avoidance is not possible. The proposed OECC and Western Muskeget Variant avoid to the maximum extent practicable areas of hard/complex bottom, only passing through these areas where there is no less damaging practicable alternative (see Section 4.1), and, where passage through hard/complex bottom is necessary, all practicable measures to avoid damage to SSU resources and minimize impacts to those resources will be taken (see Sections 5.2.4 and 4.1); and

- The public benefits analysis described in the context of the public benefit determination demonstrates that the Project's public benefits outweigh any detriments (see Sections 6.4.6 and 1.6).

6.4.5.3 OMP Concentrations of Water-Dependent Uses (Commercial and Recreational Fishing, Navigation)

The Ocean Management Plan Regulations at 301 CMR 28.02 defines areas in the OMP where the intensity of marine-based commercial and recreational fishing, commercial shipping and navigation, and recreational boating uses are significant as “Concentrations of Water-Dependent Uses”. Specifically, the OMP includes mapped areas of commercial and recreational fishing and navigation in Nantucket Sound and commercial and recreational fishing take place in state waters off the south coast of Massachusetts, Cape Cod, and the Islands. Where mapped as such in the OMP, those activities constitute “Concentrations of Water-dependent Uses” under 301 C.M.R. § 28.02, and proponents of projects that are required to develop an EIR under MEPA must, “to the maximum extent practicable, . . . avoid, minimize, and mitigate impacts to [such areas]” (301

C.M.R. § 28.04(3)). Although the cable corridor options mostly avoid areas mapped by the OMP as "high commercial fishing effort and value," the Company recognizes that commercial fishing activities will occur, and construction and installation activities associated with the Project could temporarily affect these concentrated areas of water-dependent uses.

To the maximum extent practicable, the Project avoids, minimizes, and will mitigate impacts to areas of commercial fishing effort and value, areas of concentrated recreational fishing, and other water-dependent uses as they may occur in proximity to the Project.

As an initial matter, impacts to finfish and invertebrates targeted by commercial and recreational fishermen within state waters are expected to be short-term and localized during construction and installation phases. Construction and installation activities will occur within very limited and well-defined areas, and vessel restrictions are not proposed other than those imposed by the USCG in the immediate vicinity of the construction and installation activity. The majority of the cable corridor will remain accessible to commercial and recreational fishing vessel operations throughout the construction and installation process. During the entire anticipated lifespan of the Project, the cable corridor(s) will remain accessible to commercial and recreational fishing vessel operations.

The NE Wind 2 Connector is designed to avoid and minimize impacts, including impacts to fish and fisheries resources. The alignments of the OECC and Western Muskeget Variant are intended to minimize impacts to fish and fishing while enabling the delivery of clean renewable energy to the electrical grid. Measures that have been taken to site the Project while minimizing impacts include, but are not limited to:

- Routing of offshore export cables to avoid sensitive habitats used by fish to the greatest degree possible, including routing of the cable to avoid all eelgrass;
- Consultation with commercial and recreational fisherman on the location of the cables;
- Prioritization of cable burial to reduce impacts to fishing during Project operations; and
- Implementation of a Fisheries Communications Plan, including the use of Fisheries Liaisons and multiple Fisheries Representatives, before, during, and after cable installation.

The Company or its affiliates and predecessors have been cultivating relationships and consulting with fishermen and the broader fishing community since 2010. The Company has had direct outreach with scores of individual fishermen in the region to understand, as fully as possible, historic, current, and potential fisheries within the affected area (see Section 1.10 Agency and Community Outreach). The Company or its affiliates and predecessors have been actively consulting with the Massachusetts Fishery Working Group, NE Fishery Management Council Habitat Committee, various local Massachusetts fishing alliances and partnerships, various regional fisheries working groups, and has hired several fishery representatives, including a representative fisherman on Martha's Vineyard, who serves the fisheries' interest and serves as a liaison between the Company and the local fishing community.

The Company or its affiliates and predecessors' fisheries science program is currently one of the largest offshore wind-supported programs in the country. The Company worked closely with the University of Massachusetts Dartmouth School for Marine Science and Technology (UMass SMAST), federal and state agencies, and the fishing community to develop robust pre/mid/post construction survey methods that will be used to measure potential impacts of windfarm development on fisheries. The Company also provides financial and technical support for the other fisheries science efforts, including collaboration with several Regional Regulatory and Science Organizations or Entities for long-term fisheries monitoring and research. For example, the Company is currently funding a channeled whelk age at maturity study by SMAST, in collaboration with the Commercial Fisheries Research Foundation's (CFRF) whelk study fleet, the quahog fishery, the Massachusetts Conch Association, and the Massachusetts Lobstermen's Association, to acquire seasonal samples and analysis (multiple size ranges) from three locations in state waters: Buzzards Bay, Nantucket Sound, and Vineyard Sound. The Company is also supporting the New England Aquarium's regional study of highly migratory fish species, through deployment of acoustic receivers and fish tagging.

The Company will coordinate with fixed-gear fisheries prior to construction to minimize the potential for fishermen to place gear along the cable alignments at the time construction activities begin in a particular section of the route. During cable installation, fishing vessels will not be precluded from operating within the corridor except where temporary safety buffer zones are established around where construction and installation vessels are operating. It is expected that the USCG may define a safety buffer as a 1-km (0.62-mile) diameter around installation vessels.

It is currently expected that installation of the three offshore export cables for NE Wind 2 Connector/Commonwealth Wind will take place over approximately 13.5 months. Although bottom trawl gear typically interacts with the seafloor, the target burial depth for the cables will allow for safe deployment of such gear immediately after cable installation. Should the Project not be able to achieve target burial depth in certain areas, cable protection may be required (see Sections 4.1.3 and 5.2.1.3). In such cases, it will be designed to minimize impacts to fishing gear, when possible, and fishermen will be informed of the areas where protection is used.

To further avoid and minimize impacts to commercial fishing activities, the Company will implement a comprehensive communications plan with the various port authorities, federal, state, and local authorities, and other key stakeholders, including recreational fishermen and boaters, commercial fishermen, harbormasters, the Northeast Marine Pilots Association, and other port operators. The Company's Fisheries Communication Plan (FCP) is a living document first drafted in 2011 to develop strategies to improve communication with fishermen potentially affected by the development of offshore wind projects (the most recent version is included as Attachment D). The FCP will continue to be refined throughout the Project. As described in the document, both a Fisheries Liaison and Fisheries Representatives will continue to be employed by the Company to ensure effective communication and coordination between the Project and the fishermen.

The Company is not proposing any restrictions on navigation, fishing, or the placement of fixed or mobile fishing gear during the operation and maintenance period; however, construction and installation activities may temporarily affect navigation and/or fishing activities in the vicinity of construction and installation vessels. These impacts are temporary in nature and largely limited to the Project's construction and installation period. Safety zones will be determined in coordination with the USCG, and as per industry standards are anticipated to be activity-specific. Regarding cable installation, safety zones will be required around the cable installation as it proceeds and will not preclude activity along the entire routes for the duration of construction. Through its fisheries liaison, the Company will coordinate with fishermen while these discussions with the USCG are underway.

The target burial depth of the cables is sufficient to allow continued use of mobile fishing gear, and anchors from vessels operating at the water depths in the cable area would not penetrate to the planned burial depth even in storm situations.

During construction and installation, the Company will employ a Marine Coordinator to manage all construction vessel logistics and act as a liaison with the USCG, port authorities, state and local law enforcement, marine patrol, and port operators. The Marine Coordinator will keep informed of all planned vessel deployments and will manage the Project's marine logistics and vessel traffic coordination between the staging ports and the wind energy development area in federal waters.

The Company has also engaged with the Northeast Marine Pilots Association to coordinate construction and installation vessel approaches to the Project region, as required by state and federal law, and to minimize impacts to commercial vessel traffic and navigation.

There will be a maximum of approximately six vessels used during installation of the offshore export cables on any given day. On average, there will be approximately four vessels associated with installation of the offshore export cables. During cable construction, vessels will be used for route clearance (e.g., dredging sand waves, removing boulders, pre-construction surveys, and grapnel runs), cable-laying and burial, and installation of remedial protection. Approximately four or fewer vessels will be used for route clearance, one or two vessels will be used for cable laying and burial, and one vessel will be used for the installation of remedial protection, as required. In addition, at any given time during cable construction, a guard vessel may be used to monitor vessel activity around the construction area and a crew transfer vessel may be used to transport crew and supplies between shore and the installation vessels.

6.4.6 Chapter 91 and Public Benefit Determination

The NE Wind 2 Connector is presumptively water-dependent: the Massachusetts regulations at 310 CMR 9.12(2)(e), provide that "in the case of a facility generating electricity from wind power (wind turbine facility) or any ancillary facility therefore, for which an EIR is submitted, the Department shall presume such facility to be water dependent if the Secretary has determined that such facility requires direct access to or location in tidal waters."[4] The Secretary and MassDEP determined that the NE Wind 1 Connector was water-dependent, and the Company anticipates the same determination for the NE Wind 2 Connector.

In November 2007, the Massachusetts House and Senate passed An Act Relative to the Licensing Requirements for Certain Tidelands (House Bill 4324), which was signed by Governor Patrick on November 15, 2007 (Chapter 168 of the Acts of 2007) and is known as the "Landlocked Tidelands Legislation." The legislation, among other things, names the Secretary of EEA as the "administrator of tidelands," and requires the Secretary to conduct a "public benefit review" for projects located on tidelands and to issue a written determination (the Public Benefit Determination, or PBD). Pursuant to 301 CMR 13.02(1), the Secretary is required to conduct a public benefit determination for any project that (a) files an ENF after November 15, 2007, (b) is required to file an EIR, and (c) is completely or partially located in tidelands or landlocked tidelands. Pursuant to 301 CMR 13.02(2), the Secretary may conduct a discretionary public benefit review for any project that (a) files an ENF after November 15, 2007, (b) is not required to file an EIR, and (c) is completely or partially located in tidelands or landlocked tidelands.

The proposed offshore export cable route options cross through jurisdictional flowed tidelands for the extent of their length within Massachusetts' waters. Additionally, portions of Dowses Beach Landfall Site and the onshore export cable route along Dowses Beach Road are located within Chapter 91 jurisdiction. The Project is not located on landlocked tidelands. The legislation outlined above requires analysis of a Project's impacts on the public's rights to access, use, and enjoy tidelands that are protected by Chapter 91 as well as the identification of measures to avoid, minimize, and mitigate any adverse impacts on such rights.

The standards that guide the Secretary in making the PBD are related to the water dependency of the project under review. Under 301 CMR 13.04, water-dependent projects are presumed to meet the criteria in 301 CMR 13.04 and provide adequate public benefit.

4 For nonwater-dependent projects, the Secretary is required to consider the following criteria: the purpose and effect of the project; the impact on abutters and the surrounding community; enhancement to the property; benefits to the public trust rights in tidelands or other associated rights, including but not limited to benefits provided through previously obtained municipal permits; community activities on the site; environmental protection and preservation; and public health and safety, and the general welfare.

6.4.7 Massachusetts Coastal Zone Management Federal Consistency Statement

The NE Wind 2 Connector complies with the enforceable policies of Massachusetts' approved Coastal Zone Management Plan and will be conducted in a manner consistent with such policies. The Company filed a CZMA Consistency Statement as Appendix III-S of the COP, and it is provided as Attachment G of this Petition. *See* 26 U.S.C. 1451 et seq. (CZMA); 15 CFR Part 930 (implementing regulations); 301 CMR 20.00 (Massachusetts regulations). The Consistency Statement addresses New England Wind in its entirety, and therefore pertains to Park City Wind/NE Wind 1 Connector as well as Commonwealth Wind/NE Wind 2 Connector. CZM will complete a formal review of the Consistency Statement, and it may be updated during that review. The Project's compliance with the Coastal Zone Management Plan is set forth in the Consistency Statement, Attachment G.

6.5 Resource Use and Development Policies

The Project, which will supply the New England electrical grid with over 1,200 MW of clean, renewable energy, will be constructed and operated in compliance with Massachusetts' policies regarding resource use and development.

As embodied in Section 83C of *Green Communities Act* (Chapter 169 of the Acts of 2008), as amended, the Commonwealth has adopted a policy favoring the development of offshore wind generation. That policy has been recently reinforced by *An Act Driving Clean Energy and Offshore Wind*, St. 2022, c. 179, which took multiple steps to support the development of offshore wind offshore from Massachusetts. The Commonwealth's most recent Clean Energy and Climate Plan for 2025 and 2030 (June 30, 2022) also includes development of offshore wind energy generation a cornerstone policy objective. The Project is consistent with these policies.

The Project is also consistent with EEA's climate resilience and adaptation policies. The Project will assist the Commonwealth in its efforts to improve climate resilience and the ability of the State to support the needs of the population in the face of the growing impacts of climate change. Not only will the Project itself be designed to be climate resilient, but the increased reliance on renewable clean energy will substantially reduce GHG emissions in the region and help to mitigate the impacts of climate change. The Project, therefore, is in compliance with, and furthers, the Commonwealth's policies regarding resource use and development.