MAYFLOWER WIND

Appendix H. Water Quality Report

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MAYFLOWER WIND

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Final Water Quality Report

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Quality Information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	2/8/21	Submittal of COP	Yes	Nancy Palmstrom	Project Manager
1	8/27/21	Revised to include Brayton Point Onshore Project Area and ECC and updated Falmouth Project Design Envelope	Yes	Kristen Durocher	Deputy Project Manager

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Abbreviations and Acronyms

Abbreviation or Acronym	Definition
ºC	degrees Celsius
µm	micromole
µg/L	micrograms per liter
%	percent
AIS	Air-Insulated Substation
BMP	Best Management Practice
BOEM	Bureau of Ocean Energy Management
CCS	Center for Coastal Studies
CFR	Code of Federal Regulations
cm	centimeter
CMR	Code of Massachusetts Regulations
COP	Construction and Operations Plan
CWA	Clean Water Act
ECC	Export Cable Corridor
EDR	Environmental Data Resources
ERM-Q	Effects Range-Median quotient
FRWA	Freshwater Recharge Area
ft	feet
GIS	Gas-Insulated Substation
Ha	hectare
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IAC	Inter-array Cable
in	inch
IISD	International Institute for Sustainable Development
IPF	Impact-Producing Factor
JBCC	Joint Base Cape Cod
km	kilometer
kV	kilovolt
LRM	logistic regression models
m	meter
mi	mile
km	kilometer
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Geographic Information System
Mayflower Wind	Mayflower Wind Energy LLC
MEPA	Massachusetts Environmental Policy Act

M.G.L.	Massachusetts General Law
mg/L	milligrams per liter
NBFSMN	Narragansett Bay Fixed-Site Monitoring Network
NCCA	National Coastal Condition Assessment
NDBC	National Data Buoy Center
NEPA	National Environmental Policy Act of 1969
NEFSC	Northeast Fisheries Science Center
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
OCS	Outer Continental Shelf
O&M	Operations and Maintenance
OSP	Offshore Substation Platform
OSRP	Oil Spill Response Plan
OST	Onshore Transmission
Pmax	maximum probability
POI	Point of Interconnection
psu	Practical Salinity Units
RFU	Relative Fluorescence Units
RICR	Rhode Island Code of Regulations
RIDEM	Rhode Island Department of Environmental Management
RIDEM GIS	Rhode Island Department of Environmental Management Geographic Information System
ROW	Right of Way
SESCP	Soil Erosion and Sediment Control Plan
SPCC	Spill Prevention, Control, and Countermeasure
SQI	Sediment Quality Index
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USC	United States Code
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VGP	Vessel General Permit
WQI	Water Quality Index
WTG	Wind Turbine Generator

1.0 Introduction

Mayflower Wind Energy LLC (Mayflower Wind) proposes an offshore wind renewable energy generation project (the Project) located in federal waters off the southern coast of Massachusetts in the Outer Continental Shelf (OCS) Lease Area OCS-A 0521 (Lease Area). The Project will deliver electricity to the regionally administered transmission system via export cables with sea-to-shore transitions in Falmouth and Somerset, Massachusetts and Portsmouth, RI (intermediate landfall) and onshore transmission system extending to the respective points of interconnection (POIs) in Massachusetts.

1.1 Goals and Objectives

The objective of this Water Quality Report (Report) is to summarize the existing water quality conditions based on available data and to identify the potential effects on water quality that may occur as a result of Project construction, operation, or decommissioning activities. This Report addresses potential water quality effects within onshore water (surface and groundwater), coastal water, Nantucket Sound, Rhode Island Sound, Mount Hope Bay, Sakonnet River, and offshore waters associated with Project activities.

This Report identifies potential impact-producing factors (IPFs) and discusses the water quality characteristics, resource sensitivity to effect, and key factors that may influence the type and intensity of effects posed by those IPFs. A qualitative characterization of IPF intensity and resource sensitivity provide the basis for characterizing the potential risk of effects anticipated as a result of Project development, operations, and decommissioning. Mitigation measures that may reduce the likelihood or severity of potential effects on water quality are also identified, where appropriate.

1.2 Report Organization

This report includes a general Project description (Section 2.0), description of the Report approach (Section 3.0), a description of existing water quality conditions (Section 4.0), and the effect characterization which describes the potential effects and presents avoidance, minimization, and mitigation measures (Section 5.0). Conclusions are provided in Section 6.0 and references are listed in Section 7.0.

2.0 Project Overview

The Mayflower Wind Project includes a Lease Area located in federal waters south of Martha's Vineyard and Nantucket (Figure 2-1). Wind turbine generators (WTGs) constructed within the Lease Area will deliver power via inter-array cables to the offshore substation platforms (OSPs). Submarine offshore export cables will be installed within offshore export cable corridors (ECCs) to carry the electricity from the OSPs within the Lease Area to the onshore transmission systems via two different ECCs. One ECC will make landfall in Falmouth, Massachusetts and the other will make landfall at Brayton Point, in Somerset, Massachusetts. The offshore export cables will make landfall via horizontal directional drilling (HDD). The proposed Falmouth ECC will extend from the Lease Area through Muskeget Channel into Nantucket Sound to three potential landing location(s) in Falmouth including Shore Street, Central Park, or Worcester Avenue. The proposed Brayton Point ECC will run north and west from the Lease Area through Rhode Island Sound to the Sakonnet River. It will then run north up the Sakonnet River, cross land at Aquidneck Island to Mount Hope Bay, and then north into Massachusetts state waters to Brayton Point. Landfall will be made via HDD at one of two potential landing locations in Somerset on the western side of Brayton Point from the Lee River (preferred) or the eastern side via the Taunton River (alternate).

In Falmouth, the underground onshore export cables will extend from the landfall location(s) to an onshore substation and will be installed within existing paved roadways and shoulder and within a municipal grassy median strip for the Worcester Avenue HDD transition vault (Figure 2-2). The new Falmouth onshore substation will step up the voltage to 345 kilovolts (kV) to enable connection to either an overhead transmission line (preferred) or an underground transmission route (alternate). The selected landfall location will determine the route of the underground onshore export cables between the landfall and the new onshore substation. The proposed Falmouth point of interconnection (POI) to the regional transmission system is an existing switching station (Falmouth Tap). Mayflower Wind anticipates that upgrades to Falmouth Tap will be undertaken by Eversource, as part of a larger reliability project, which is independent of the Mayflower Wind Project. The overhead transmission line will be designed, permitted, and built by Eversource to provide interconnection at Falmouth Tap. The alternate underground transmission route would be constructed within local roadway and/or shoulder extending from the onshore substation to the POI at Falmouth Tap.

As stated above, the Brayton Point ECC includes an overland portion where underground onshore export cables will be installed to cross the northern portion of Aquidneck Island (Figure 2-3). Three route options for the crossing of the island are under consideration, all route options include HDD for entry and exit on/off the island. At Brayton Point, the onshore underground export cables will traverse the site from the landing to the location of a new high voltage direct current (HVDC) converter station (converter station). Underground transmission cable(s) will be constructed from the converter station to the Brayton Point POI, the adjacent existing National Grid substation.

The Falmouth Onshore Project Area includes the landing(s), underground onshore export cables, onshore substation, alternate underground transmission route, and POI at the Falmouth Tap switching station. The Brayton Point Onshore Project Area includes the onshore export cable route options over Aquidneck Island, landing(s) at Aquidneck Island and Brayton Point, the underground onshore export cables, converter station, underground transmission route, and the POI at the National Grid substation. See Figure 2-2 and Figure 2-3 for the Falmouth Onshore Project Area and the Brayton Point Onshore Project Area respectively.

2.1 Specific Project Details

Each primary Project component is briefly described below in Table 2-1. Additional details may be found in the Construction and Operations Plan (COP) Section 3 –Description of Proposed Activities.

Table 2-1. Key Project Details

Project Attribute	Description
Landfall Location(s)	Falmouth, MA Three locations under consideration: Worcester Avenue (preferred), Shore Street, and Central Park Brayton Point, Somerset, MA Two locations under consideration: the western (preferred) and eastern (alternate) shorelines of Brayton Point Aquidneck Island, RI Several locations under consideration for intermediate landfall across the island
Onshore Export Cables	Falmouth, MA Anticipated High voltage alternating current (HVAC); Nominal underground onshore export cable voltage: 200 – 345 kV Up to 12 onshore export power cables and up to five communications cables Length: Up to 6.4 statute miles (mi) (10.3 kilometers [km]) Brayton Point, Somerset, MA HVDC; Nominal underground onshore export cable voltage: ±320 kV Up to 4 export power cables and up to 2 communication cables Length: Up to 3,940 feet (ft) (1,200 m) on Brayton Point Aquidneck Island, RI HVDC; Nominal underground onshore export cable voltage: ±320 kV Up to 4 onshore export power cables and up to 2 communication cables Up to 3 mi (4.8 km) across Aquidneck Island
Offshore Export Cables	Falmouth ECC Cable Type: HVAC (anticipated) Number of export cables: up to 5 Nominal export cable voltage: 200 – 345 kV Length per export cable beneath seabed: 51.6 – 87.0 mi (83 – 140 km) Cable crossings: up to 9 Target burial depth (below level seabed): 3.2 – 13.1 ft (1 – 4 m) Brayton Point ECC Cable Type: high voltage direct current (HVDC) Number of export cables: up to 6 Up to 4 export power cables and up to 2 communication cables Nominal export cable voltage: ±320 kV Length per export cable beneath seabed: 97 – 124 mi (156 – 200 km) Cable/pipeline crossings: up to 16 (total) Target burial depth (below level seabed): 3.2 – 13.1 ft (1 – 4 m)
Onshore Substation/HVDC Converter Station	Falmouth, MA Type: Step up 275-kV to 345-kV; Air-insulated substation (AIS) or gas-insulated substation (GIS) Location: Two locations under consideration: Lawrence Lynch (preferred), and Cape Cod Aggregates (alternate) Area: Up to 26 acres (10.5 hectares [ha]) Brayton Point, Somerset, MA Type: HVDC Converter Station Location: On the Brayton Point property area under consideration Area: Up to 7.5 acres (3.0 ha)

Project Attribute	Description
Transmission from Onshore Substation/Converter Station to POI	Falmouth, MA New, 345-kV overhead transmission line along existing utility right of way (ROW) (preferred) (to be designed, permitted, and built by Eversource) Up to 5.1 mi (8.2 km) in length New, 345-kV underground transmission route (alternate) Up to 2.1 mi (3.4 km) in length Brayton Point, Somerset, MA New 345-kV underground transmission route to National Grid substation HVAC; nominal underground transmission cable voltage: up to 345 kV Up to 2,788 ft (850 m) on Brayton Point property
Point of Interconnection	Falmouth, MA Falmouth Tap (new or upgraded switching station to be designed, permitted, and built by Eversource) Brayton Point, Somerset, MA Existing National Grid substation

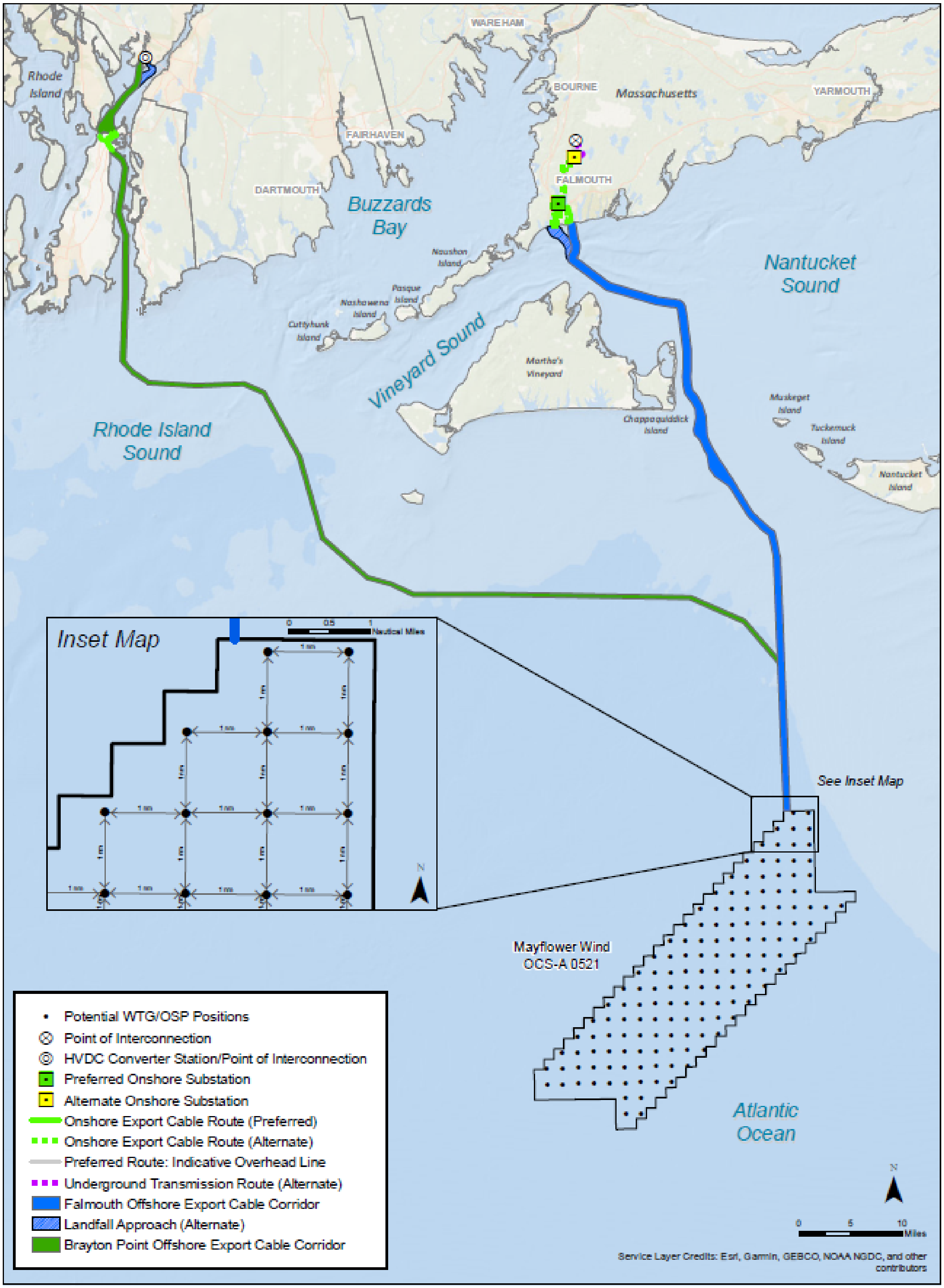


Figure 2-1. Location of Mayflower Wind Offshore Wind Renewable Energy Generation Project

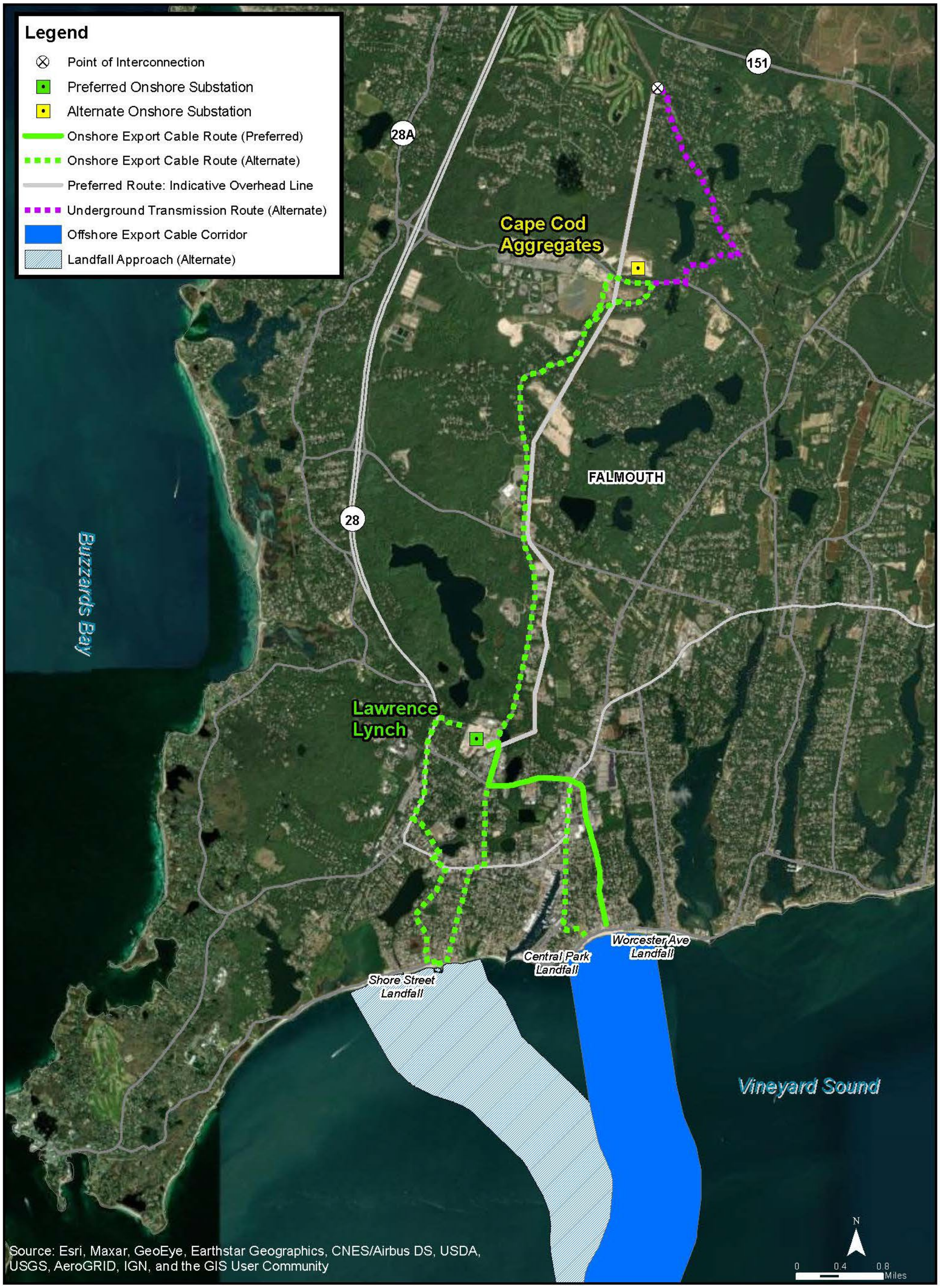


Figure 2-2. Location of Mayflower Wind Onshore Project Elements - Falmouth

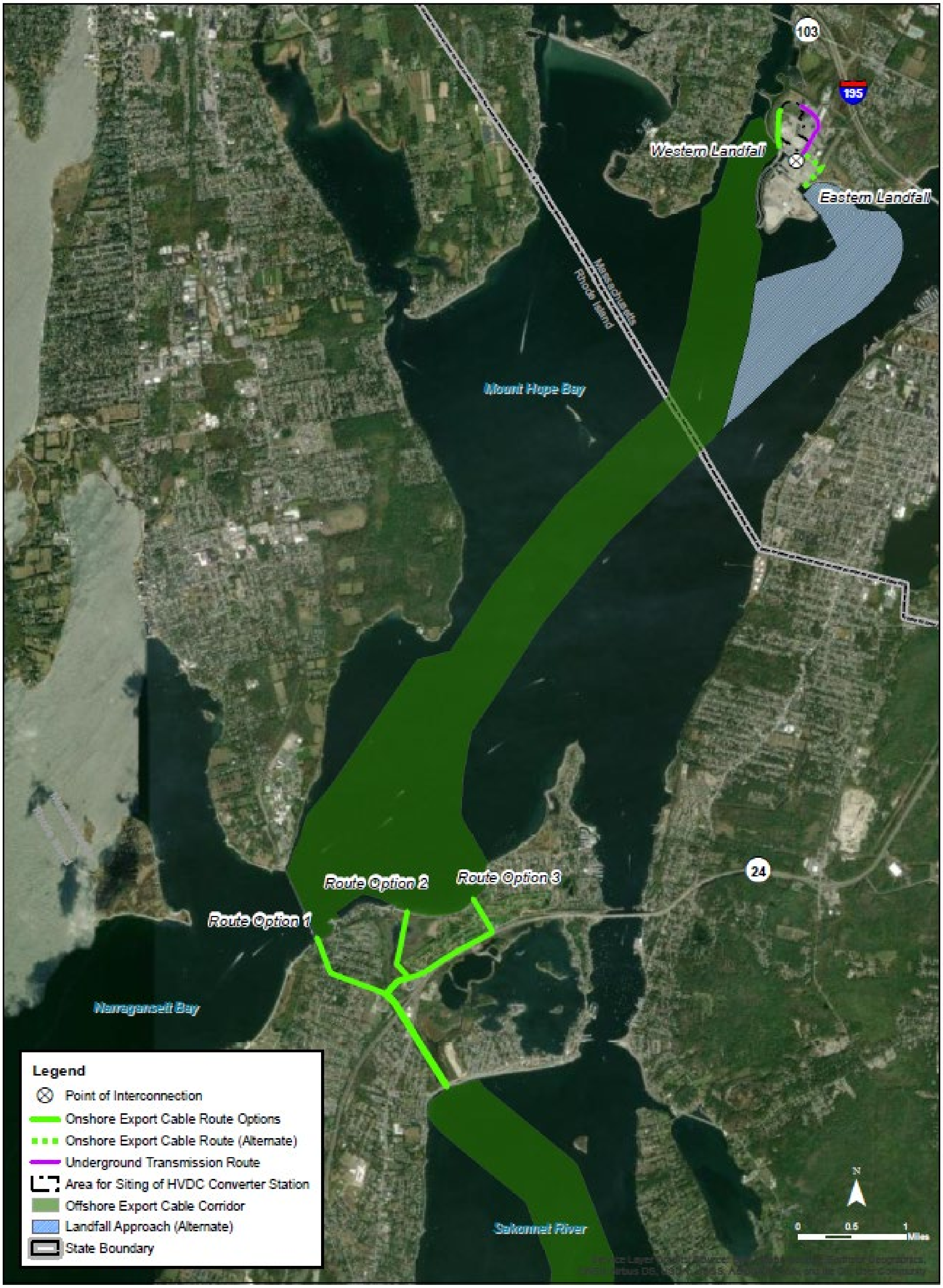


Figure 2-3. Location of Mayflower Wind Onshore Project Elements - Brayton Point

3.0 Assessment Approach

This section discusses the approach for water quality characterization for potentially affected water resources, identification of IPFs, and characterization of the potential risk of effect to those water resources.

Potentially affected water resources include coastal and offshore marine waters, onshore surface waters, and groundwater resources. Each of these water resources and the corresponding available water quality data are described in Section 3.2. Information sources consulted on existing water quality include publicly available resources for the marine waters. Publicly available water quality data for groundwater and surface water in the onshore area are limited.

The term “water quality” refers to the physical, chemical, and biological characteristics of water. Within coastal areas, water quality is primarily influenced by anthropogenic input from overland runoff, point source discharges, and atmospheric deposition. Further from shore, ocean currents and circulation patterns tend to disperse and dilute anthropogenic contaminants. Natural sources of pollutants may be delivered into water systems via atmospheric deposition, freshwater drainage, and suspension of sediments into the water column.

3.1 Applicable Regulations

Potential effects to water quality associated with the Project development and operation are regulated under a number of federal and state regulations. As such, the Project will be subject to agency reviews, and will comply with the regulatory requirement of the regulations and statutes listed below.

- Contents of the Construction and Operations Plan (30 Code of Federal Regulations [CFR] 585.627[a][3]) – requires a description of existing water quality conditions and potential Project impacts on water quality that must be included in the COP to support Bureau of Ocean Energy Management (BOEM) obligations under the National Environmental Policy Act of 1969 (NEPA) and the Outer Continental Shelf Lands Act of 1953. It also requires that the BOEM consider the environmental impacts of federal actions that may significantly affect the environment.
- Massachusetts Environmental Policy Act (MEPA; Massachusetts General Law [M.G.L.] c. 30, 61 through 62I) – a state law that is similar to the federal NEPA and requires state agencies to study the environmental consequences of their actions (e.g., issuance of permits or financial assistance), and take measures to avoid, minimize, and mitigate environmental impacts.
- Massachusetts Waterways Regulations (310 Code of Massachusetts Regulations [CMR] 9.00; M.G.L. c. 91, 1 through 63; M.G.L. c. 21A, 2, 4, 8 and 14) - requires all projects to “comply with applicable environmental regulatory programs of the Commonwealth.”
- Standards for Dredging and Dredged Material Disposal (310 CMR 9.40) – requires dredging or dredged material disposal to comply with the published standards for dredging and dredge material placement.
- Clean Water Act (CWA) Section 401 Water Quality Certification (33 United States Code [USC] 1344) as implemented via 314 CMR 9.06(1) through (8) – requires conformance with Water Quality Certification criteria for discharge of dredged or fill material.
- CWA Section 404 (33 USC 1344) – requires permits for the discharge of dredged or fill material into waters of the United States, including wetlands.
- Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403; 33 CFR 322) – requires a permit for construction or alterations in or over navigable waters, including installation of subaqueous cables.
- Rhode Island Water Quality Regulations (250-Rhode Island Code of Regulations [RICR]-150-05-1 *et seq.*) - establish water quality standards for the State's surface waters with the purpose to restore, preserve and enhance the physical, chemical and biological integrity of state water,

maintain existing water uses and adhere to the Clean Water Act and R.I. Gen. Laws Chapter 46-12 (RIDEM 2018).

- Rhode Island Rules and Regulations for Dredging and the Management of Dredged Materials (250-RICR-150-05-2)- *et seq.*)- ensure dredging is done in a protective manner and encourage the beneficial use of dredged materials (RIDEM 2018).
- Coastal Zone Management Act of 1972 (16 USC 1456) – requires review of the Project by the Massachusetts Office of Coastal Zone Management to ensure that the Project is consistent with the Commonwealth's coastal zone management policies.
- National Pollutant Discharge Elimination System (NPDES) (40 CFR 122) – requires a permit for stormwater discharges associated with construction activities and facility operations.

3.2 Water Quality Data Sources

Water quality data were divided into two groups, coastal and offshore marine waters, and onshore surface waters and groundwater. Water quality data from within coastal and offshore marine waters in the vicinity of the Project have been collected by multiple government and private entities. These sources were all publicly accessible, sampling locations in the vicinity of the Project were identified, and individual data were available for download. These water quality data are discussed in Section 3.3. Water quality information for onshore sources are discussed in Section 3.4. Water quality data include temperature expressed in degrees Celsius (ºC), salinity expressed in practical salinity units (psu), chlorophyll a expressed as micrograms per liter (µg/L), nutrients expressed in micromoles (µm), dissolved oxygen and dissolved inorganic nutrients expressed as milligram per liter (mg/L), turbidity expressed as Nephelometric Turbidity Units (NTU), and light transmissivity expressed as percent (%) transmitted at 1 m depth.

3.3 Coastal and Offshore Marine Waters Data

In the sections below, general data are presented for federal waters, mostly associated with the Lease Area, and offshore waters for the ECCs. The Report presents data for shallower waters of the Falmouth and Brayton Point ECCs. A brief description of these routes are as follows:

- Federal Waters – mostly associated with the Lease Area (Figure 2-1).
- Falmouth ECC State Waters - Nantucket Sound, which is located between the south coast of Massachusetts and the Islands of Martha's Vineyard and Nantucket, falls within the Project's area of influence, specifically within the area of the Falmouth ECC. The OCS is located south of both islands. The offshore structures (WTGs and OSPs) and a portion of the export cables will be located within the Lease Area (Figure 2-1).
- Brayton Point ECC State Waters - The Sakonnet River, located east of Narragansett Bay in Rhode Island connects Mount Hope Bay to the Rhode Island Sound, falling within the Project's area of influence, specifically the area of the Brayton Point ECC. Mount Hope Bay is located between both Massachusetts and Rhode Island and is in the vicinity of the proposed export cable landfall locations at Brayton Point, in Somerset, Massachusetts (Figure 2-1).

3.3.1 Federal Waters

3.3.1.1 Northeast Fisheries Science Center Multispecies Bottom Trawl Surveys

Water quality data are collected by the Northeast Fisheries Science Center (NEFSC) during seasonal multispecies bottom trawl surveys. While these surveys primary focus on fisheries, temperature and salinity profiles collected during the surveys help link fish distribution to physical oceanographic conditions. This program includes sampling locations from the Gulf of Maine to Cape Hatteras, so only a sub-set of the locations are in the vicinity of the Project.

Water quality data collected between 1963 and 2019 are available for multiple offshore bottom trawl transects located in the general vicinity of the Lease Area and the offshore portion of the export cable corridors (NEFSC, 2020). Salinity and temperature were measured at the bottom and surface of the water column during surveys conducted in the spring, fall, and winter.

Seasonal values for temperature and salinity are summarized in Table 3-1, and Figure 3-1 shows the sub-set of trawls conducted in the vicinity of the Project.

Table 3-1. Mean and Standard Deviation for Seasonal Water Temperature and Salinity Data from the NEFSC Multispecies Bottom Trawl Surveys (1963-2019)

Season	Average Water Depth (m)	Layer	Water Temperature (°C)	Salinity (psu)
Spring (n=1621)	84.8	Surface	5.7 ± 1.8	32.7 ± 0.6
		Bottom	6.7 ± 3.2	33.3 ± 1.2
Fall (n=1704)	86.9	Surface	16.5 ± 3.6	32.9 ± 1.3
		Bottom	12.7 ± 2.4	33.4 ± 1.4
Winter (n=355)	89.2	Surface	5.2 ± 1.7	32.7 ± 0.5
		Bottom	6.9 ± 3.5	33.5 ± 1.2

Results show mean ± 1 standard deviation.
n= number of samples (not all samples were analyzed for all parameters).
Seasons are defined by trawl, not specific month. For example, March was included in the 1992, 2002. 2003, 2006, and 2007 Winter surveys, but was included in Spring surveys during other years.

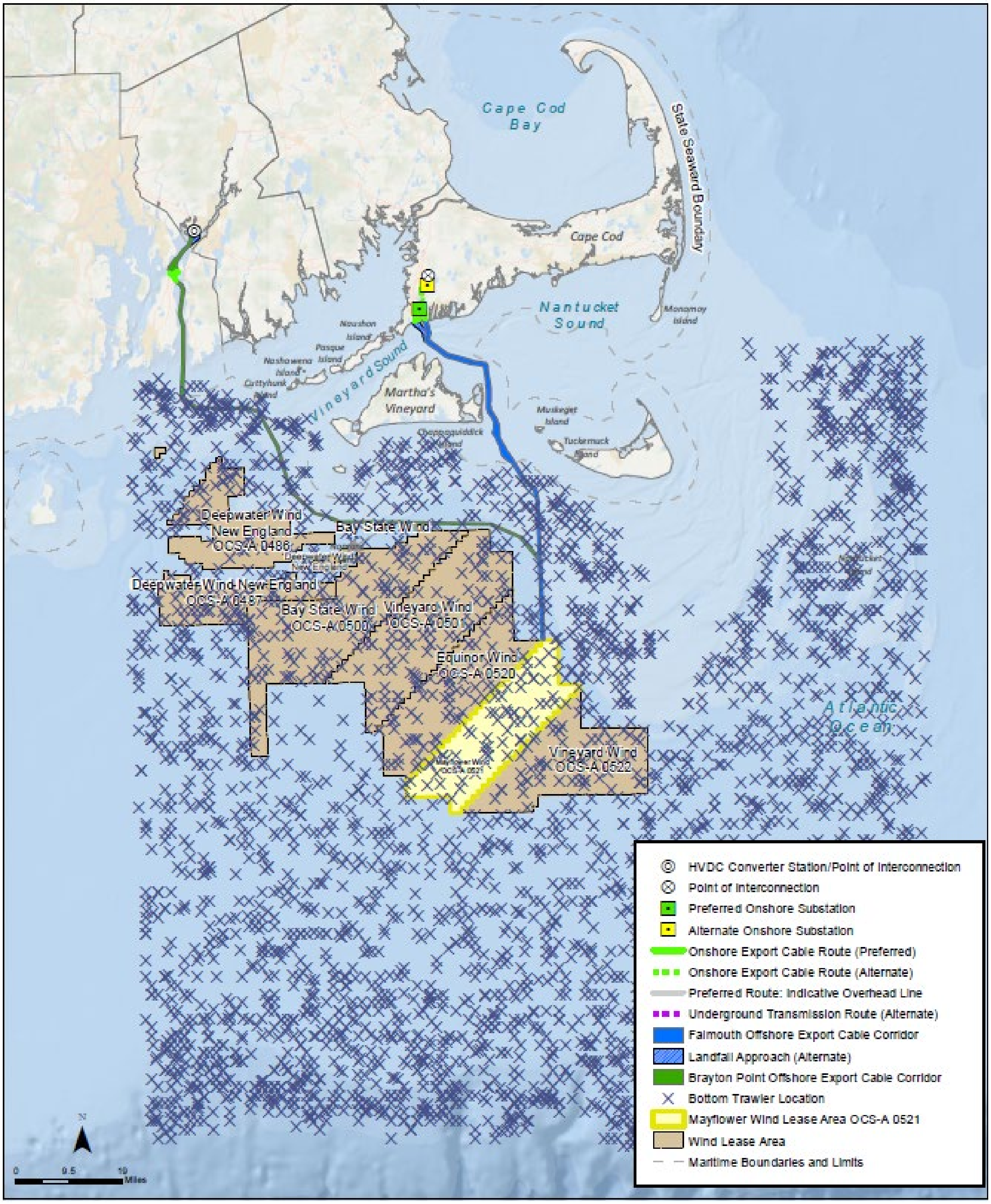
3.3.1.2 National Oceanic and Atmospheric Administration National Data Buoy Center

Long-term water temperature data are available from the National Oceanic and Atmospheric Administration (NOAA) National Data Buoy Center (NDBC) for two buoys located in Federal Waters in the general vicinity of the Offshore Project Area. Station 44020 is located in Nantucket Sound at a water depth of 46.9 ft (14.3 m) near the Falmouth ECC. Station 44097 is located near Block Island at a water depth of 158 ft (48.2 m) near the Brayton Point ECC and the Lease Area. Water temperature data were downloaded from the NDBC website (NOAA NDBC, 2020) for the period from 2009 through 2019 with seasonal values summarized in Table 3-2. Figure 3-2 shows the locations of the NOAA NDBC buoys.

Table 3-2. Mean and Standard Deviation for Seasonal Water Temperature Data from NOAA NDBC For Nantucket Sound and Block Island (2009-2019)

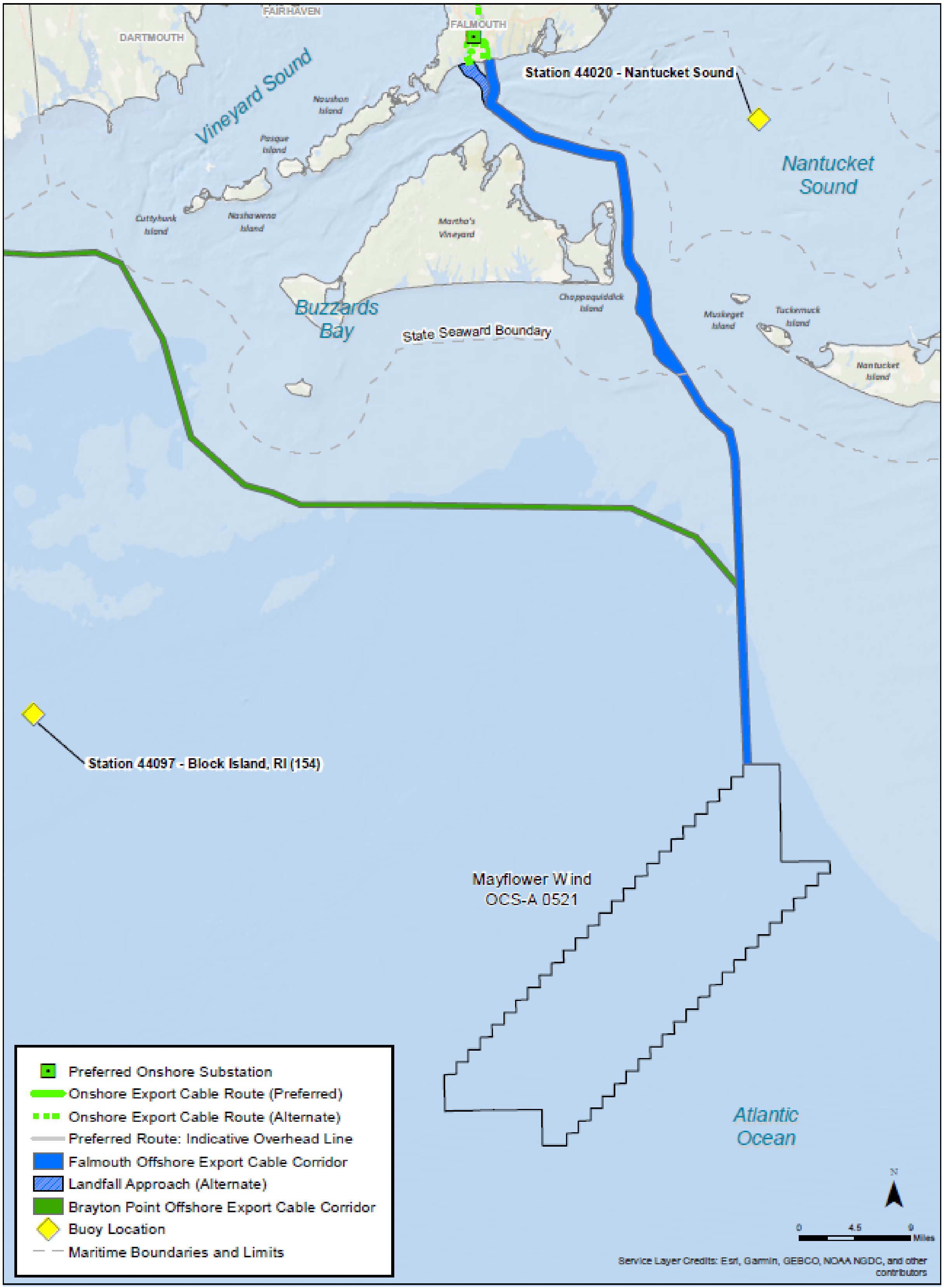
	Buoy 44020 (Nantucket Sound)		Buoy 44097 (near Block Island)	
Season	Number of Samples	Water Temperature (°C)	Number of Samples	Water Temperature (°C)
Spring	35,207	7.9 ± 3.9	39,154	7.6 ± 3.3
Summer	45,520	20.9 ± 3.2	39,122	19.6 ± 3.3
Fall	45,395	15.7 ± 4.8	32,521	17.0 ± 2.9
Winter	33,529	3.9 ± 2.3	34,735	8.2 ± 2.8

Results show mean ± 1 standard deviation.
Spring = March to May; Summer = June to August; Fall = September to November.



Source: CCS, 2020.

Figure 3-1. Bottom Trawl Survey - Water Quality Sample Locations



Source: NOAA NDBC, 2020.

Figure 3-2. Location of NOAA Monitoring Buoys in Federal Waters

3.3.2 Falmouth ECC State Waters

3.3.2.1 Center for Coastal Studies

The Center for Coastal Studies (CCS) began monitoring the water quality of the coastal waters of Cape Cod in 2006 and its program includes the only water quality monitoring that is regularly conducted in Nantucket Sound. Sampling is a collaborative effort done by staff at the CCS, volunteer citizen scientists, and partnering organizations with sample analysis conducted at the CCS state-certified laboratory.

Four sampling locations within Nantucket Sound are located in the general vicinity of the Falmouth ECC. These include NTKS-1, NTKS-6, NTKS-8, and NTKS-10 as shown in Figure 3-3. Data collected from these stations are available from 2010 to 2016 (CCS, 2020).

Three sampling stations are in coastal areas in the vicinity of the preferred export cable landfall location in Falmouth. These locations include Falmouth-Inner Harbor, LP-2, and Great Pond as shown in Figure 3-3. Data collected from these stations are available from 2014 to 2016 (CCS, 2020). A sampling station at Oyster Pond-Falmouth (Figure 3-3) is located near the alternate landfall locations.

Table 3-3 and Table 3-4 present the seasonal results for the Nantucket Sound and coastal sampling stations, respectively. Winter sampling data were not available. Average seasonal results are summarized for water temperature, salinity, dissolved oxygen, chlorophyll a, turbidity, total nitrogen, and total phosphorus.

Table 3-3. Mean and Standard Deviation for Water Quality Parameters Measured in Nantucket Sound by CCS (2010-2016)

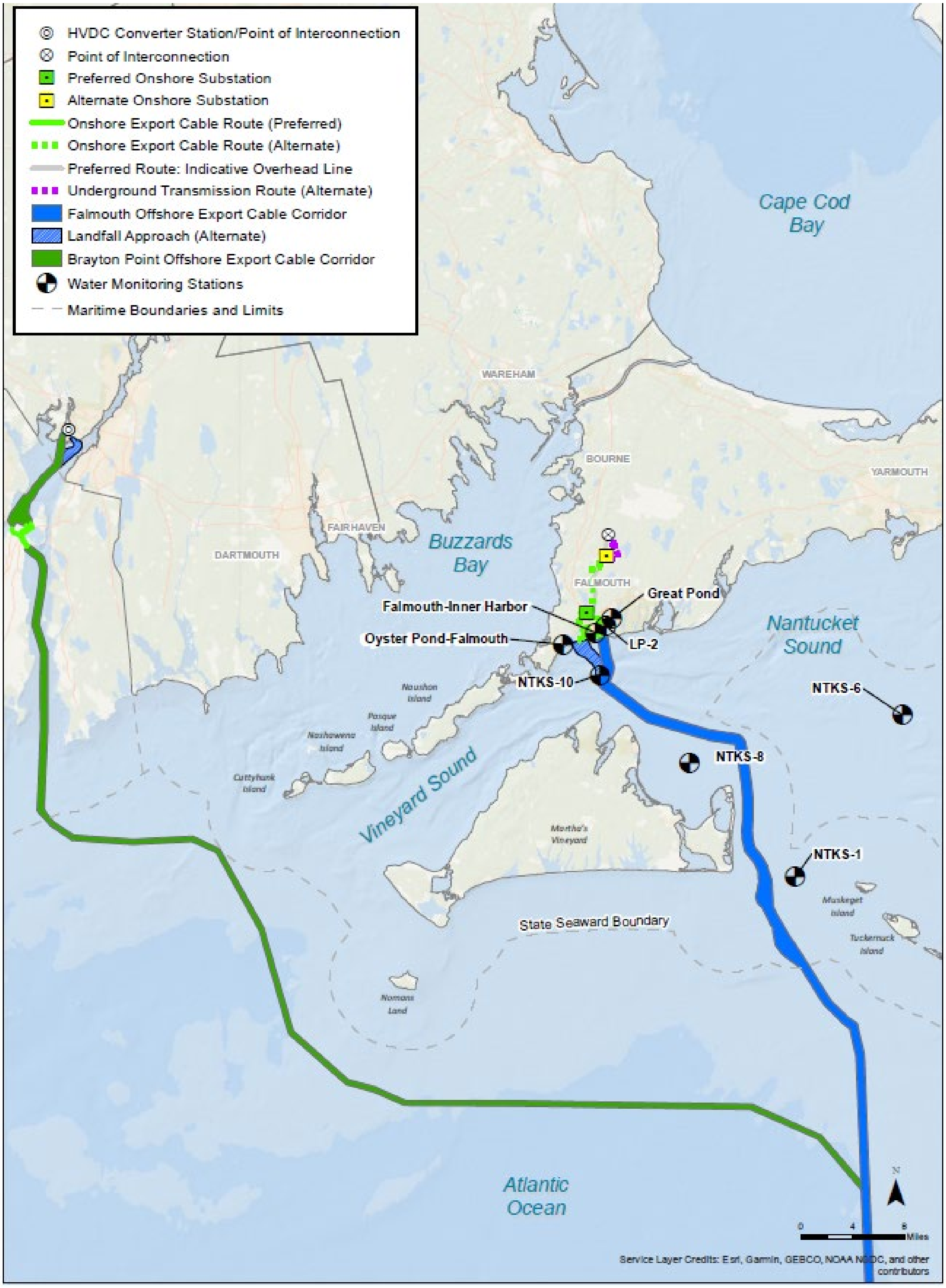
Season	Water Temp. (°C)	Salinity (psu)	Dissolved Oxygen (mg/L)	Chlorophyll a (µg/L)	Turbidity (NTU)	Total Nitrogen (µm)	Total Phosphorus (µm)
Spring (n=27)	12.9 ± 2.3	32.1 ± 0.25	9.8 ± 1.1	1.2 ± 0.53	0.47 ± 0.31	10.1 ± 3.5	0.61 ± 0.27
Summer (n=142)	20.5 ± 2.4	31.5 ± 1.4	7.6 ± 0.75	1.9 ± 0.83	0.59 ± 0.46	11.7 ± 4.8	0.71 ± 0.31
Fall (n=83)	18.2 ± 3.0	31.9 ± 0.25	7.7 ± 0.58	2.2 ± 1.1	0.51 ± 0.37	10.4 ± 3.1	0.76 ± 0.22

Results show mean ± 1 standard deviation.
n= number of samples (not all samples were analyzed for all parameters).
Nantucket Sound samples include NTKS-1, NTKS-6, NTKS-8, and NTKS-10.
Spring = March to May; Summer = June to August; Fall = September to November.

Table 3-4. Mean and Standard Deviation for Water Quality Parameters Measured in Coastal Locations Near Falmouth Export Cable Landfall(s) by CCS (2014-2016)

Season	Water Temp. (°C)	Salinity (psu)	Dissolved Oxygen (mg/L)	Chlorophyll a (µg/L)	Turbidity (NTU)	Total Nitrogen (µm)	Total Phosphorus (µm)
Spring (n=10)	18.4 ± 1.3	21.1 ± 13.3	7.0 ± 1.3	5.4 ± 2.2	2.2 ± 1.1	not sampled	not sampled
Summer (n=62)	24.1 ± 2.5	21.2 ± 12.6	6.7 ± 1.8	10.0 ± 6.3	2.3 ± 1.5	35.0 ± 12.5	1.4 ± 0.58
Fall (n=33)	19.2 ± 4.1	21.8 ± 12.6	7.2 ± 2.0	13.0 ± 12.8	2.8 ± 3.0	42.3 ± 21.5	1.4 ± 0.82

Results show mean ± 1 standard deviation.
n= number of samples (not all samples were analyzed for all parameters).
Coastal samples include Oyster Pond-Falmouth, Falmouth Inner Harbor, LP-2, and Great Pond.
Spring = March to May; Summer = June to August; Fall = September to November.



Source: CCS, 2020.

Figure 3-3. CCS Water Quality Monitoring Stations

3.3.2.2 National Coastal Condition Assessment – Nantucket Sound

The condition of coastal water was assessed by the United States Environmental Protection Agency (USEPA) in the 2010 National Coastal Condition Assessment (NCCA) (USEPA, 2015). Water quality data from the 2010 NCCA are available for eight stations within Nantucket Sound with sample locations shown in Figure 3-4.

Analytes measured in this assessment included chlorophyll a, dissolved inorganic nitrogen, dissolved inorganic phosphorus, dissolved oxygen at the bottom of the water column, and light transmissivity. Water quality results for the Nantucket Sound data set are summarized in Table 3-5.

These water quality parameters were used to determine a Water Quality Index (WQI) for each sample characterized as Good, Fair, or Poor. As summarized in Table 3-6, in Nantucket Sound, 88 percent of the samples (seven of eight) received a WQI of Good and the remaining sample was Fair.

Table 3-5. Mean and Standard Deviation for Water Quality Parameters Measured in the 2010 NCCA

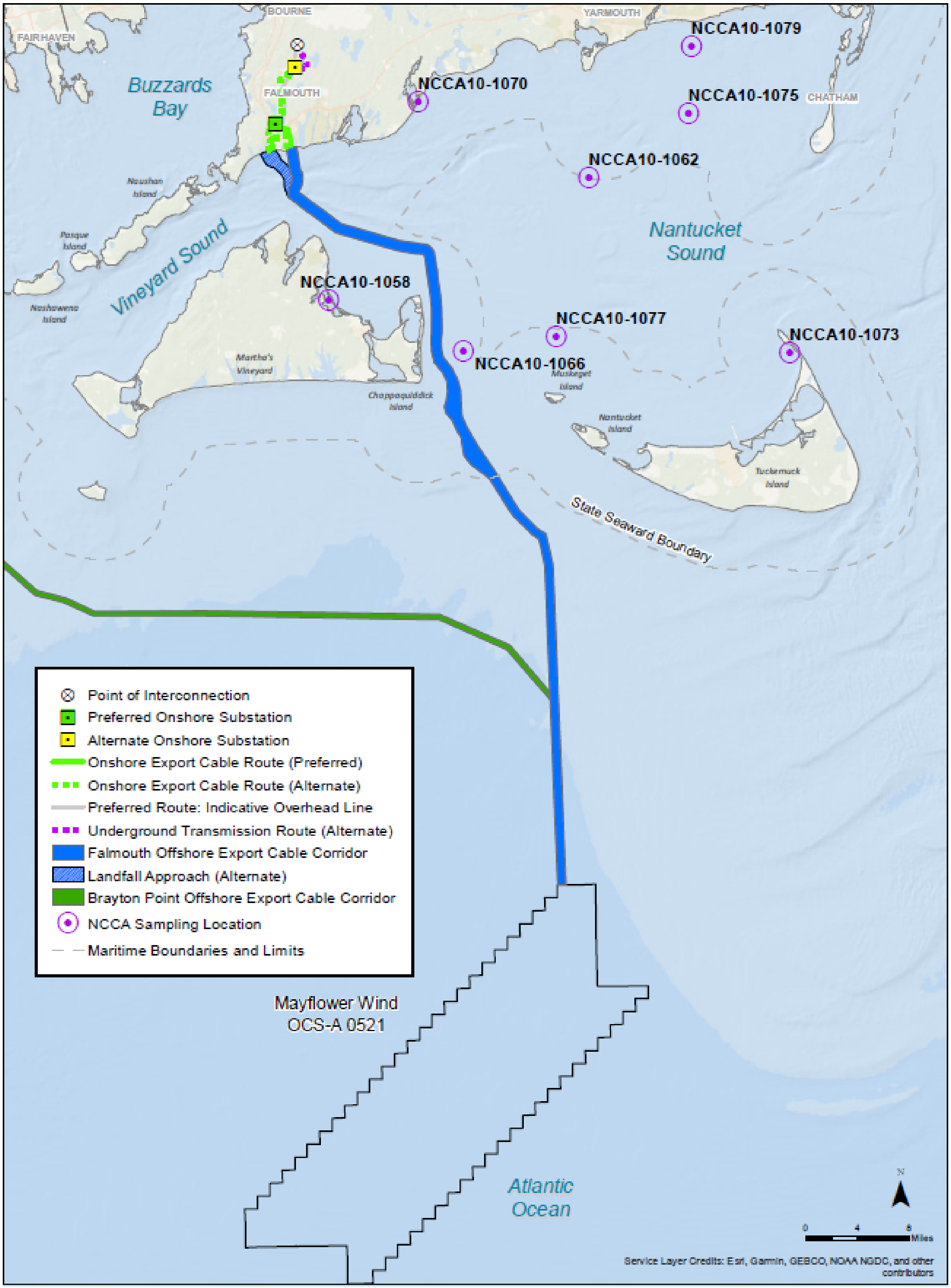
Area	Chlorophyll a (µg/L)	Dissolved Inorganic Nitrogen (mg/L)	Dissolved Inorganic Phosphorus (mg/L)	Dissolved Oxygen (mg/L)	Light Transmissivity (% at 1 m depth)
Nantucket Sound (n=8)	3.9 ± 1.1	0.019 ± 0.002	0.017 ± 0.003	6.5 ± 1.3	63.1 ± 5.1

Results show mean ± 1 standard deviation.
n= number of samples (not all samples were analyzed for all parameters).

Table 3-6. Summary of Surface Water Parameter Scores and WQI for the Nantucket Sound

	Nantucket Sound (n=8)			
Parameter	Good	Fair	Poor	No Data
Chlorophyll a	88%	12%	0%	0%
Dissolved Inorganic Nitrogen	100%	0%	0%	0%
Dissolved Inorganic Phosphorus	0%	100%	0%	0%
Dissolved Oxygen	88%	12%	0%	0%
Light Transmissivity	75%	0%	0%	25%
Overall WQI	88%	12%	0%	0%

Results show percent of samples within each category for individual parameters and overall WQI.
n= number of samples (not all samples were analyzed for all parameters.



Source: USEPA, 2015.

Figure 3-4. Location of NCCA Sampling Stations in Nantucket Sound

3.3.3 Brayton Point ECC State Waters

3.3.3.1 USGS National Water Information System

Sakonnet River

The Sakonnet River is a tidal straight flowing from Mt. Hope Bay to Rhode Island Sound and located east of Narragansett Bay in Rhode Island. Physical and chemical data were collected from the Sakonnet River to characterize its water quality conditions in 2018 and 2019. The data was collected by United States Geological Survey (USGS) at Buoy monitoring station 413642071125701 located in the Sakonnet River near Gould Island, RI (USGS Sakonnet River Station Buoy) (Figure 3-5.). The Sakonnet River remains saline throughout the year due to tidal influence (Table 3-7). Reaching peak temperatures in the summer months, the river also reaches its lowest dissolved oxygen levels (Table 3-7). Seasonal algal growth, seen as increased Chlorophyll a, as well as low dissolved oxygen levels have raised concern for the ecological health of the river (USGS, 2019). The primary causes of the observed water-quality impairments are the inputs of nutrients from wastewater management and stormwater runoff from the surrounding developed area (USGS, 2019).

The Sakonnet River is listed in the State of Rhode Island 2018-2020 Impaired Waters Report (RIDEM, 2021). The waterbody is identified as Category 4A – Waterbodies for which a Total Maximum Daily Load (TMDL) has been developed. The TMDL for fecal coliform was published April 7, 2005 (RIDEM, 2005). The TMDL indicates the impaired reach of the Sakonnet River includes "waters north of a line extending from the southwestern-most corner of the stone bridge in Tiverton to the eastern-most extension of Morningside Lane in Portsmouth." The landfall for the offshore export cable on Aquidneck Island is within this reach. The 180-acre (73-ha) area is closed to shellfishing due to the presence of fecal coliform.

Table 3-7. Mean and Standard Deviation for Water Quality Parameters Measured from the USGS Sakonnet River Station Buoy near Gould Island (2018-2019)

Season	Water Temp. (°C)	Salinity (psu)	Dissolved Oxygen (mg/L)	Chlorophyll a (µg/L)	Turbidity (NTU)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
Spring (n=2)	12.6 ± 0.2	28 ± 0.0	7.3 ± 0.4	-	1.2 ± 0.0	0.21 ± 0.03	0.04 ± 0.01
Summer (n=28)	22.3 ± 2.7	30.3 ±0.8	6.1 ± 0.9	6.3 ± 4.6	2.4 ± 0.8	0.28 ± 0.07	0.07 ±0.02
Fall (n=20)	17.7 ± 4.7	29.8 ± 1.2	7.0 ± 1.0	3.0 ± 1.4	2.5 ± 0.6	0.33 ± 0.08	0.08 ± 0.01

Results show mean ± 1 standard deviation.
n= number of samples (not all samples were analyzed for all parameters).
Values for turbidity and salinity were only measured in 2018
Spring = March to May; Summer = June to August; Fall = September to November.
Source: USGS, 2019

Mount Hope Bay

Brayton Point is located at the confluence of the Taunton River and the Lee River, where they empty into Mount Hope Bay. The Cole and Kickamuit Rivers also empty into Mount Hope Bay west and southwest of Brayton Point (See Figure 3-5.). The Mount Hope Bay area, and especially Fall River, have a long industrial history, including discharges from the Brayton Point Power Station that may affect water quality.

The Massachusetts Department of Environmental Protection (MassDEP) operates two fixed-location buoys at the mouths of the Cole (MassDEP Station 1565 – Cole, the Cole buoy) and Taunton Rivers (MassDEP Station 2204 – Taunton, the Taunton buoy) to monitor water quality in Mount Hope Bay seasonally from May to November (Figure 3-5.). The monitoring is part of the Narragansett Bay Fixed-Site Monitoring Network (NBFSMN) and provides data in the Massachusetts portion of Mount Hope Bay (NBFSMN, 2018, MassDEP, 2020). Data collected from these stations are available for the 2017 and 2018 seasons as shown in Table 3-8.

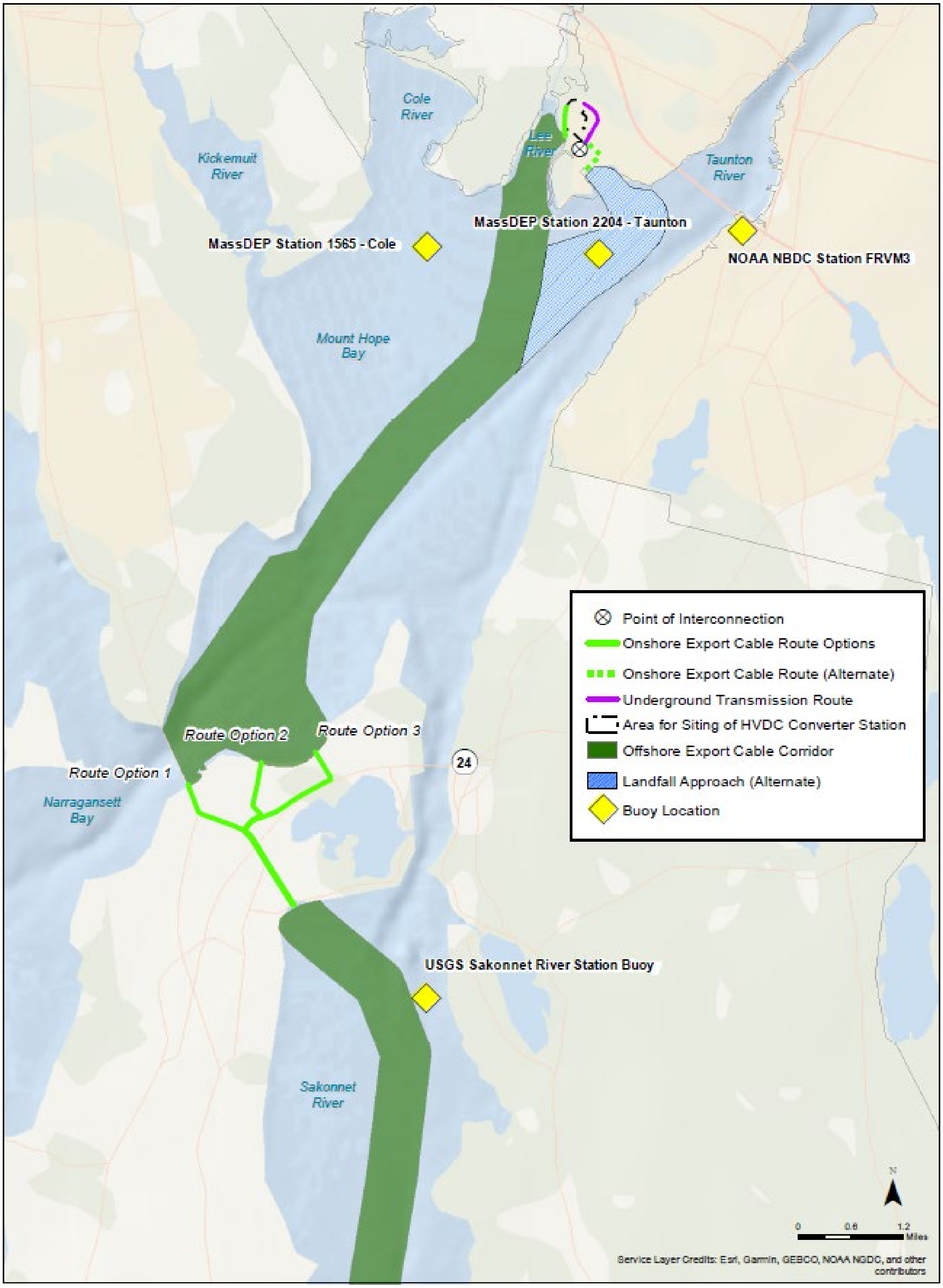


Figure 3-5. Location of Buoy Monitoring Stations in Brayton Point ECC State Waters

Table 3-8. Mean and Standard Deviation for Water Quality Parameters Measured in Mount Hope Bay by NBFSMN (2017-2018)

Year	Site	Water Temp. (°C)	Salinity (psu)	Dissolved Oxygen (mg/L)	Chlorophyll (RFU)	Nitrate-N (mg/L)
2017	Taunton Buoy	20.3 ± 3.2	27.4 ± 1.2	7.4 ± 1.3	2.5 ± 2.2	0.12 ± 0.06
	Cole Buoy	20.5 ± 3.3	27.9 ± 1.9	7.9 ± 1.3	4.3 ± 3.7	0.13 ± 0.06
2018	Taunton Buoy	21.3 ± 4.3	27.2 ± 2.6	7.1 ± 1.2	2.7 ± 2.2	0.18 ± 0.08
	Cole Buoy	21.4 ± 4.4	27.5 ± 2.1	7.5 ±1.2	2.7 ± 2.0	0.16 ± 0.06

3.3.3.2 NOAA National Data Buoy Center

A buoy located near the proposed Brayton Point landfall site(s) and the Brayton Point ECC (NOAA NBDC Station FRVM3) is located in Mount Hope Bay. Table 3-9 summarizes the temperature data between 2011 and 2020 (NOAA NBDC, 2021).

Table 3-9. Mean and Standard Deviation for Seasonal Water Temperature Data from NOAA NDBC for Mount Hope Bay (2011-2020)

Season	NOAA NBDC Station FRVM3 (Mount Hope Bay)	
	Number of Samples	Water Temperature (°C)
Spring	210,308	9.4 ± 4.2
Summer	207,469	22.7 ± 2.8
Fall	207,819	16.5 ± 4.8
Winter	209,750	4.5 ± 2.5

Results show mean ± 1 standard deviation.
Spring = March to May; Summer = June to August; Fall = September to November, Winter = December to February.

3.4 Onshore Surface Waters and Groundwater Data

The underground onshore export cables and underground transmission routes pass near several coastal and freshwater ponds, wetlands, and streams among both the Falmouth Onshore Project Area and the Brayton Point Onshore Project Area. The section below presents both groundwater and surface water resources for each Onshore Project Area.

3.4.1 Falmouth Onshore Project Area

3.4.1.1 Groundwater

Figure 3-6 identifies several drinking water protection areas in the vicinity of the transmission line and underground cable routes. These include multiple Zone I and Zone II Wellhead Protection areas, as well as surface water supply protection areas primarily surrounding Long Pond. Zone II Wellhead Protection areas are considered primary recharge areas.

The USGS has investigated groundwater and surface water resources on Cape Cod for over 50 years. Groundwater is the sole source of drinking water and a major source of freshwater for domestic, industrial, and agricultural uses on the Cape. Groundwater discharged from aquifers also supports freshwater pond and stream ecosystems and coastal wetlands. In most areas, groundwater in the sand and gravel aquifers is shallow and susceptible to contamination from anthropogenic sources and saltwater intrusion (Barbaro, et al., 2014).

USGS activities include long-term monitoring of groundwater and pond levels and field research on groundwater contamination and plumes associated with Joint Base Cape Cod (JBCC), located north of the Falmouth Onshore Project Area.

Groundwater quality data in the vicinity of the Falmouth Onshore Project Area were not identified.

3.4.1.2 Surface Water

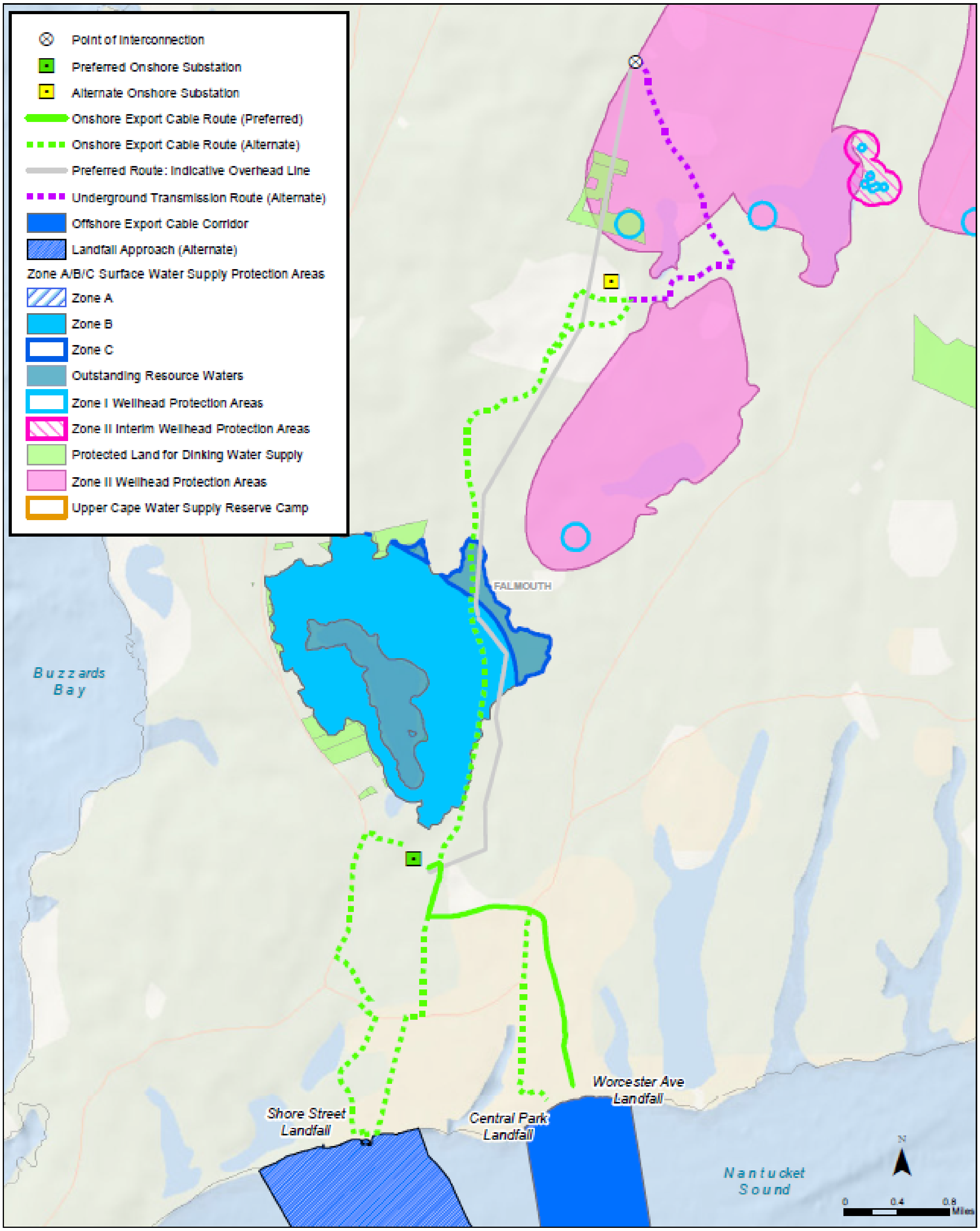
The preferred route and the alternate routes for the underground cables in Falmouth pass through residential areas and past several small coastal ponds (Figure 3-7). The onshore export cable route (alternate) (to be constructed in roadway or road shoulder) follows Route 28 and does not cross any mapped rivers, streams, vernal pools, or waterbodies, but does pass near certain waterbodies. The alternate onshore export cable route passes within 0.6 mi (1 km) of Grews Pond, Jones Pond, Mares Pond, Morse Pond, Jones Pond, Palmers, Shivericks Pond, Siders Pond, and Sols Pond.

Between the onshore substation and the Falmouth POI, the alternate onshore export cable route passes near Spectacle Pond, Mares Pond, Deer Pond, Long Pond, and Grews Pond – all located a minimum of 0.6 mi (1 km) from the alternate underground onshore export cable route; Long Pond is located approximately 1.2 mi (2 km) from the onshore export cable route (Figure 3-7).

Between the preferred and alternate export cable landfall locations and the onshore substation, the preferred route and the alternate routes for the underground cables pass through residential areas and past several small coastal ponds including Sols Pond, Jones Pond, Grews Pond, Siders Pond, Shivericks Pond, an unnamed pond north of Shivericks Pond, Nyes Pond, and Morse Pond (Figure 3-7.). No recent publicly available water quality data were available for these areas.

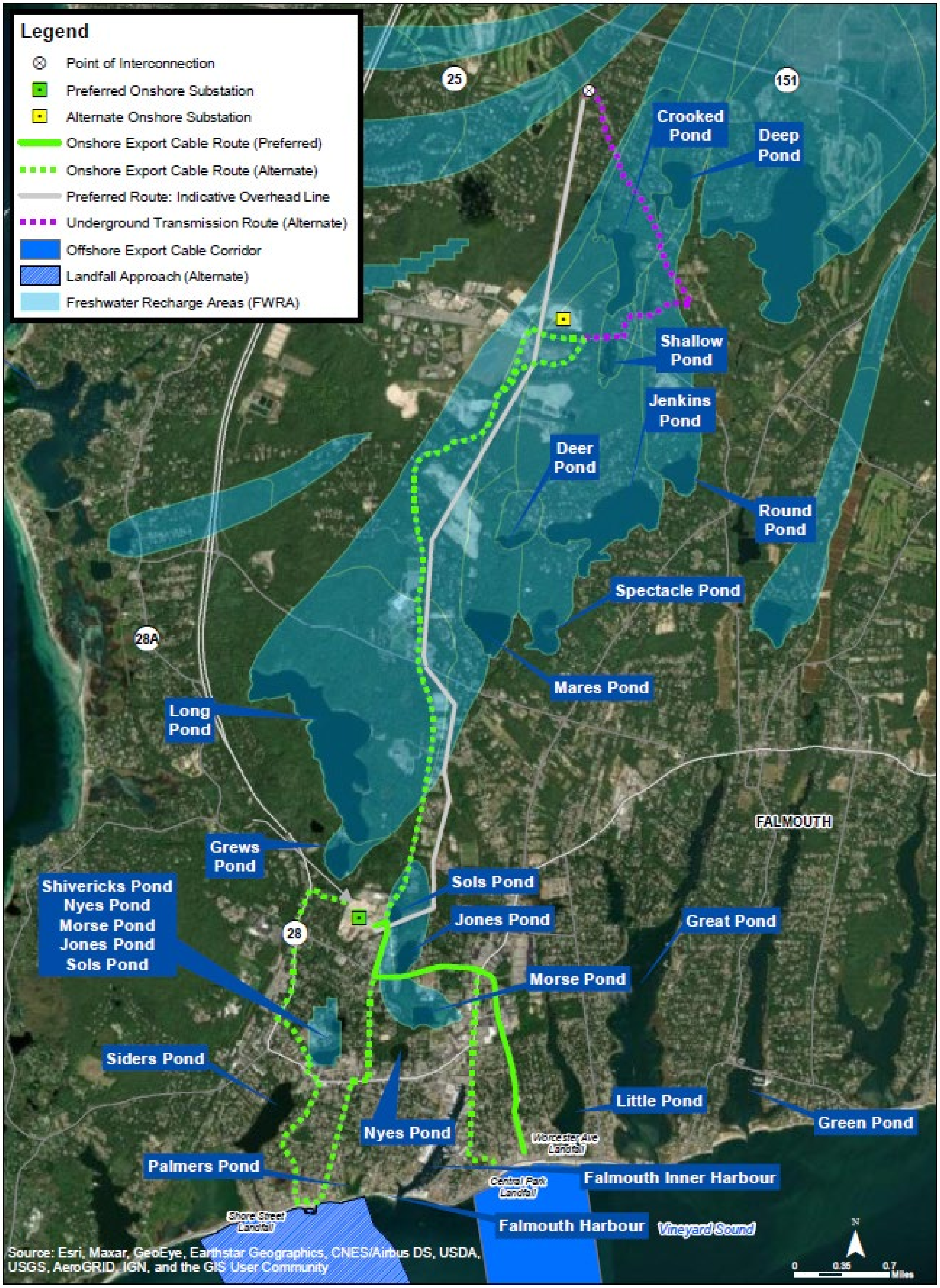
Freshwater Recharge Areas (FWRA) are regulated by the Cape Cod Commission and represent watershed areas where fresh surface water or groundwater discharge to various Cape Cod Ponds. Some of the onshore export cable routes traverse FWRAs (Figure 3-7). A very small portion (< 1 acre [0.25 ha] on the northeastern boundary of the Lawrence Lynch site falls within a FWRA. The Cape Cod Aggregates site falls fully within mapped FWRAs.

As described in Section 3.3.2, water quality data are available from four coastal waterbodies connected to Nantucket Sound (Oyster Pond, Falmouth-Inner Harbor, Little Pond, and Great Pond). These coastal waterbodies are in the vicinity of potential export cable landfall locations.



Source: MassGIS, 2020a,b,c.

Figure 3-6. Drinking Water Protection Areas - Falmouth



Source: MassGIS, 2019; FWRA Cape Cod Commission, 2018

Figure 3-7. Onshore Surface Water Features - Falmouth

3.4.2 Brayton Point Onshore Project Area

3.4.2.1 Groundwater

The Brayton Point ECC contains an overland portion on Aquidneck Island. Rhode Island Department of Environmental Management (RIDEM) classifies the groundwater quality of the area surrounding the onshore export cable route options over Aquidneck Island as Class GA, which includes groundwater resources that are known or presumed to be suitable for drinking water use without treatment. However, the Aquidneck Island area is not considered a priority area (which are classified as GAA) and approximately 70 percent of the state of Rhode Island overlies groundwater classified as GA (RIDEM Geographic Information System (RIDEM GIS), 2021, RIDEM, 2009). There are no drinking water protection areas (e.g., public wells, well head protection areas, drinking water reservoir watersheds, etc.) along the Brayton Point ECC, including the overland portion on Aquidneck Island (Figure 3-8).

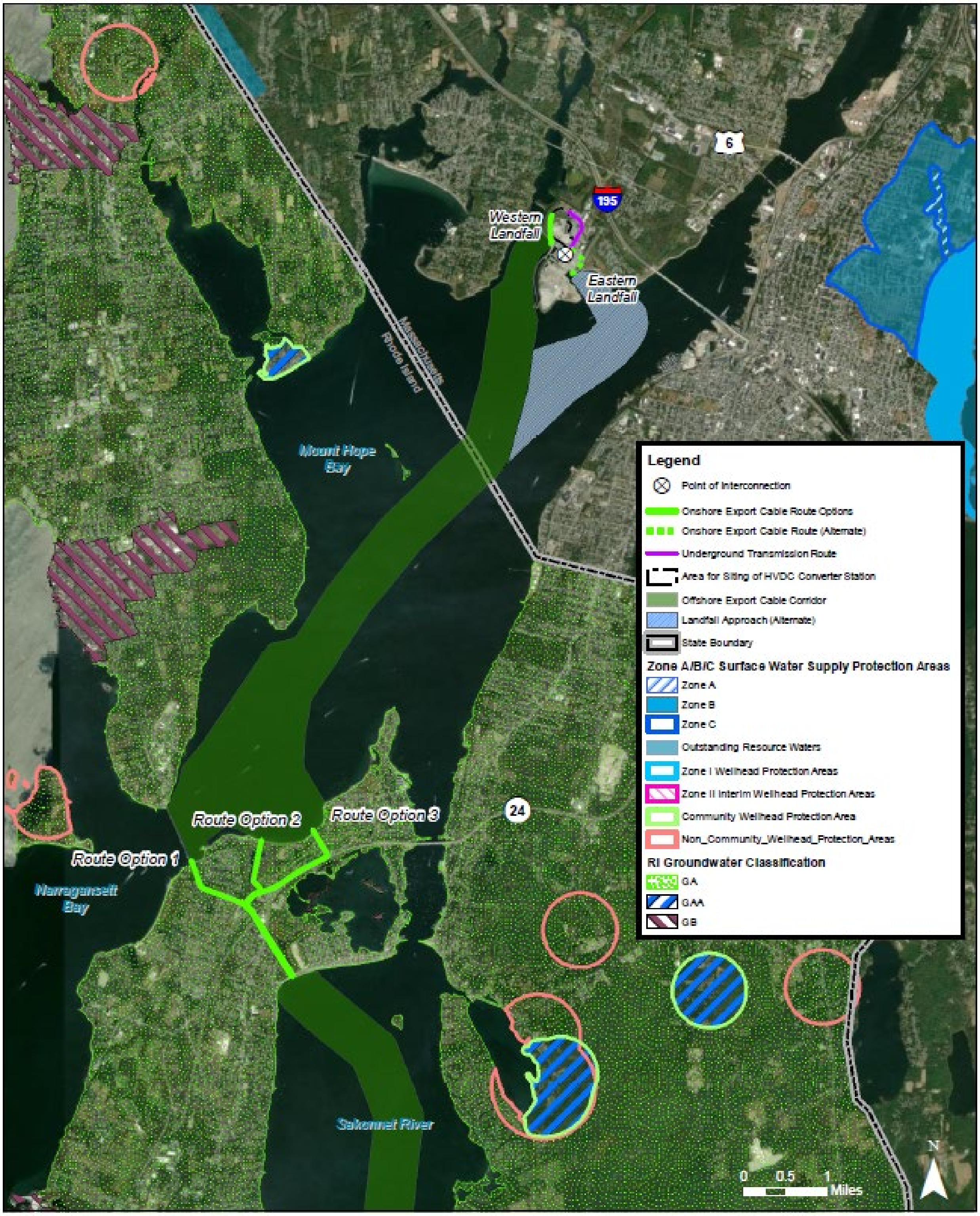
Brayton Point is a small peninsula in Mount Hope Bay. Review of the USGS maps show that the larger geographic peninsula Brayton Point encompasses has a central area between 50-100 ft (15-30 m) in elevation that slopes downward east and west to the Taunton and Lee River, respectively. As such groundwater from Brayton Point is anticipated to flow towards both bodies of water.

Review of *2019 Annual Groundwater Monitoring and Corrective Action Report and Final Closure Report – Brayton Point CCR Basins A, B, and C* identified groundwater elevations and groundwater elevation contours, in the southern tip of the point (south of the proposed landfalls). Although the data are limited, the data suggest that groundwater flows from higher to lower elevations.

Brayton Point is home to considerable past and former industrial use and there has been past contamination identified in the groundwater. As identified in the previous paragraph there are no drinking water aquifers identified at the landing sites; however, data provided in the GEI 2019 report would suggest groundwater will be less than six ft (1.8 m) below ground surface at the landing sites (GEI Consultants, 2019).

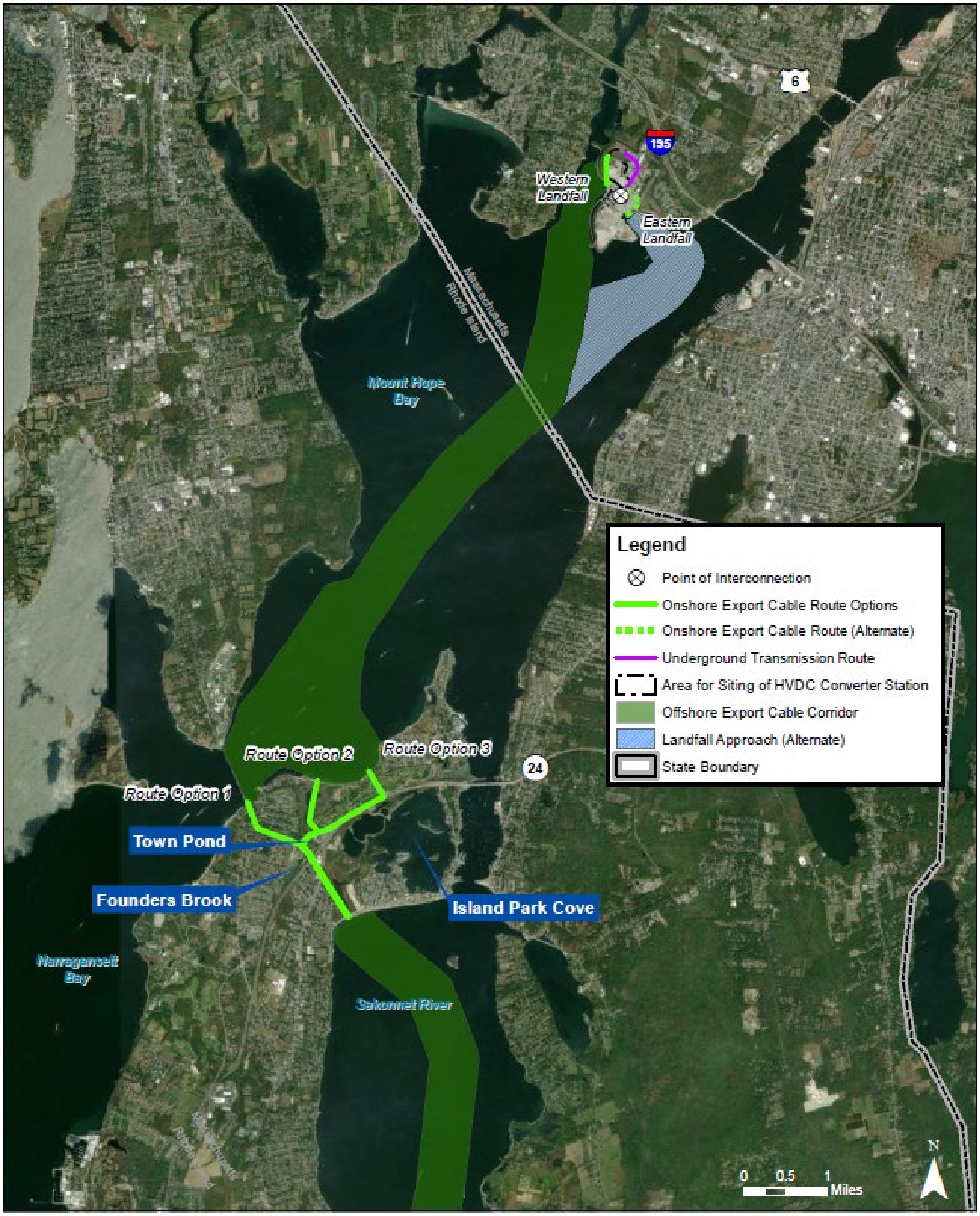
3.4.2.2 Surface Water

There are no mapped drinking water protection areas along the Brayton Point ECC (Figure 3-9). As the export cable crosses over Aquidneck Island it passes through residential and recreational areas. There are several freshwater streams and ponds present in the vicinity of the onshore export cable route options. The three proposed route options over Aquidneck Island pass near Founders Brook (Figure 3-9), a 1.2-mile (1.9-km)-long stream. It is categorized as Water Quality Standard A (designated for primary and secondary contact recreational activities and for fish and wildlife habitat, suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses, excellent aesthetic value) (RIDEM GIS, 2021, RIDEM 2009). The ponds located along the three route options are small, unnamed and do not have water quality data available. Along the shoreline, closest to Route Option 3 across Aquidneck Island, there are some shallow coastal bays in the vicinity of the export cable route that make up Island Park Cove (Figure 3-9). There are no FWRAs located within the Brayton Point onshore export cable route options.



Source: RIDEM GIS, 2021.

Figure 3-8. Drinking Water Protection Areas - Brayton Point



Source: RIDEM GIS, 2021

Figure 3-9. Onshore Surface Water Features - Brayton Point

3.5 Sediment Chemistry

Sediment contamination may have a bearing on the potential risk for water quality effects during construction, associated with sediment disturbing activities that would result in the resuspension of sediments.

3.5.1 Federal Waters

No relevant sediment chemistry data were located within and/or adjacent to the footprints of the export cable corridors or WTGs/OSPs.

3.5.2 Falmouth ECC State Waters

Contaminant data for sediment within the vicinity of the Falmouth ECC were not identified. The 2010 NCCA (USEPA, 2015) included an assessment of sediment chemistry (metals and polycyclic aromatic hydrocarbons) and sediment toxicity information for the eight Nantucket Sound locations identified in Figure 3-4.

As summarized in Table 3-10, for sediment contaminants, 100 percent of the Nantucket Sound sediments were in Good condition (the mean Effects Range-Median quotient [mERM-Q] < 0.1 and logistic regression models (LRM) maximum probability (Pmax) ≤ 0.5)). Sediment toxicity indicates that 38 percent of the Nantucket Sound sediments were rated in Good condition (test results not significantly different from control [p > 0.05] and ≥ 80 percent control-corrected survival), 25 percent were in Fair condition (test results significantly different from control [p ≤ 0.05] and ≥ 80 percent control-corrected survival or test results not significantly different from control [p > 0.05] and < 80 percent control-corrected survival), and 25 percent were in Poor condition (test results significantly different from control [p < 0.05] and < 80 percent control-corrected survival; note: toxicity results were missing for one station). In Nantucket Sound, 50 percent of the samples received a Sediment Quality Index (SQI) of Good (both sediment chemistry index and toxicity target are rated Good), 25 percent were classified as Fair (neither sediment chemistry index nor sediment toxicity index are rated Poor and at least one index is rated Fair), and 25 percent were classified as Poor (either sediment chemistry index or sediment toxicity index are rated Poor).

Table 3-10. Summary of Sediment Parameter Scores and SQI for the Nantucket Sound

	Nantucket Sound (n=8)		
Parameter	Good	Fair	Poor
Sediment Contaminants	100%	0%	0%
Sediment Toxicity	38%	25%	25%
Overall SQI	50%	25%	25%

Results show percent of samples within each category for individual parameters and overall SQI.
Percentages for a parameter do not add up to 100% in cases where results were missing.
n= number of samples (not all samples were analyzed for all parameters).

3.5.3 Brayton Point ECC State Waters

The benthic sediments of estuaries and coastal marine waters serve as major repositories for chemical contaminants derived from land-based and marine sources, both point and non-point sources (Kennish, 2002). The benthic sediments of many estuaries have varying levels of contaminants that exceed regulatory standards. These exceedances can be the result of natural processes or are the result of anthropogenic activities, industrialization, etc.; moreover, due to the location of the source pollution, depositional rates, tides and currents, and other factors, the levels of sediment contaminants in one location of an estuary, may not be representative of sediments throughout the estuary.

Review of available reports presented limited data on sediment chemistry in Mount Hope Bay. The only study that presented data were from sediments were collected and analyzed during a 2008 benthic study of the larger Narragansett Bay area (Calabretta and Oviatt, 2008). During that study, one sample location, located approximately 0.62 mi (1 km) southwest of Brayton Point, collected from the top 0.8 inches (in) (2 centimeters, cm) of sediment from multiple 0.04 m^2 van Veen grabs. These Mount Hope Bay sediments showed evidence of contamination by heavy metal and organic pollutants as described in Table 3-11 below. But it must be noted that a high concentration of heavy metals does not always indicate anthropogenic contamination and the natural variability of these metals should be considered. Grain size can be another factor in heavy metal presence in sediment, small grain size is often correlated with metal concentration and Mount Hope Bay is 71.8 percent silt (Table 3-11) (Calabretta and Oviatt, 2008). Finally, the study is now over 13 years old and it is unknown what concentrations of contaminants were present, if any, below 0.8 in (2 cm) in depth in 2008.

Sediment chemistry data for the Sakonnet River was not available.

Table 3-11. Sediment Characteristics and Contaminant Concentrations for Mount Hope Bay

Sediment Characteristics and Contaminant concentrations	Mount Hope Bay
Sediment description	
Sand (%)	25.5
Silt (%)	71.8
Clay (%)	0.7
Sediment TOC %	2.91
Heavy metals (mg/kg)	
Arsenic	9.07
Cadmium	0.81
Chromium	111.7
Copper	55.2
Iron	34,500
Lead	86.3
Mercury	0.93
Nickle	23.5
Silver	1.77
Zinc	151.3
Organic Contaminants (µg/kg)	
Total PAH	1593
Low MW PAH	258
High MW PAH	1336
Total DDT	1.36
Total PCB	14.40

Source: Calabretta and Oviatt, 2008

4.0 Existing Conditions

This section provides a discussion of the water quality data available from the sources identified in Section 3.2. Coastal and offshore marine resources are described in Section 4.1, and onshore surface water and groundwater resources are described in Section 4.2.

4.1 Coastal and Offshore Marine Resources

The water quality parameters discussed in this section include water temperature, salinity, chlorophyll a, nutrients, dissolved oxygen, and turbidity in the coastal and offshore locations and the coastal ponds. Each of the water quality parameters are described below.

Offshore water temperatures are influenced by seasonal mixing of water masses, estuarine outflows, and air-sea interactions. Water temperatures vary on a seasonal basis, warming in the spring, peaking in late summer, and cooling in the fall and into the winter. These trends are reflected in the seasonal water temperature data presented in Table 3-1 through Table 3-4 and Table 3-7 through Table 3-9. These results show the highest temperatures in the summer.

Like temperature, salinity may vary based on seasonal changes and currents, but the salinity changes are smaller than those exhibited for temperature.

Chlorophyll a is a photosynthetic green pigment found in most phytoplankton and plant cells. Measuring chlorophyll a in the surface water is an indication of how much primary production is occurring in the surface of the ocean. Chlorophyll a levels will increase with increased phytoplankton production, which may be related to increased nutrient inputs.

Nitrogen and phosphorus are two of the primary nutrients measured in coastal and marine waters. These nutrients are required for the growth of algae and phytoplankton, but excessive levels of these nutrients can lead to eutrophication, reduced water clarity, and lower levels of dissolved oxygen. Depending on the season, levels of stratification, surrounding land uses, and other inputs the level of nitrogen and phosphorus in coastal bays and waters in the Northeast United States can vary substantially. Nitrogen and phosphorus may be assigned site specific permit limits to control local eutrophication (RIDEM).

Dissolved oxygen is essential for all aquatic life. Concentrations less than 2 mg/L can lead to hypoxia, which is detrimental to most organisms. Dissolved oxygen levels can be influenced by physical factors (e.g., water temperature) and biological factors (e.g., respiration, photosynthesis, and bacterial decomposition).

Turbidity is a measure of water clarity or how much the material suspended in the water column decreases light penetration. Excessively turbid water can be detrimental to water quality if suspended sediments settle out and bury benthic communities, adversely affect filter feeders, or block sunlight needed by submerged vegetation. Turbidity can vary within a water body depending on water depth, currents, storm events, tidal action and seabed grain size.

The sections below summarize the available water quality data for Federal Waters, Falmouth ECC State Waters, and Brayton Point ECC State Waters.

4.1.1 Federal Waters

The NEFSC bottom trawl survey data (Figure 3-1) provides both surface and bottom water temperatures. These results show that average temperatures at the surface and bottom are similar in spring and winter, with warmer temperatures in the surface horizon in the fall. This suggests that there is some thermal stratification within the water column in the fall. Stratification likely also occurs in the summer, given the warmer water temperatures recorded by CCS and the NOAA NDBC for the summer months, but bottom temperature data were not available. Average bottom temperatures are substantially colder in the winter and spring than in the fall. Surface temperatures recorded by the NEFSC were highest and most variable in the fall (summer sampling is not conducted by the NEFSC). In the fall, upwelling bottom waters and storm activity mixes the stratified water column that typically occurs by late summer.

The NOAA NDBC data (Table 3-2) provide seasonal surface water temperature data over a period of 11 years (2009 through 2019). The two buoys in the vicinity of the Project (Buoys 44020 and 44097; Figure 3-2) show generally similar patterns with the highest temperatures in the summer and the lowest in the winter and spring. The lowest average temperatures were recorded in the winter for Buoy 44020 located in Nantucket Sound. The average winter water temperature for Buoy 44097, located in the open ocean off of Block Island, was warmer than that of Buoy 44020. The other seasonal averages were generally similar between the two buoys.

The NEFSC multispecies bottom trawl survey data (Table 3-1) showed minimal variation in salinity by season or depth. The seasonal average surface salinities were essentially the same in spring, fall, and winter. The bottom salinities averaged marginally higher than the surface salinities, but the differences were less than 1 psu between the surface and bottom.

Data for chlorophyll a, nutrients, dissolved oxygen, and turbidity were not identified for Federal Waters.

4.1.2 Falmouth ECC State Waters

Temperature and Salinity

In the CCS data, higher temperatures are consistently recorded in the coastal data set (Table 3-4) when compared to the Nantucket Sound data set (Table 3-3). This is not surprising since the coastal samples are collected in smaller, shallower locations and from waterbodies that are not subject to the same current seen in the Nantucket Sound. Temperatures in the open ocean, represented by the NEFSC bottom trawl data (Table 3-1) and the NOAA NDBC data (Table 3-2), are typically lower than those observed by CCS in the coastal areas or the Sound, particularly in the spring and fall (CCS data are not collected in winter months).

In the CCS data, mean salinity in the Nantucket Sound data set (Table 3-3) was approximately 32 psu in spring, summer, and fall. The mean salinity in the coastal data set (Table 3-4), which is more influenced by freshwater flow and surface runoff, was approximately 21 psu throughout the seasons.

Chlorophyll a

In the CCS data, the highest and most variable chlorophyll a levels were recorded in fall samples collected from the coastal sampling locations (average of 13 µg/L; Table 3-4) with lower levels recorded in the spring. The levels in the fall reflect nutrient inputs from nearshore sources and the maximum primary production toward the end of the growing season. Chlorophyll a levels in Nantucket Sound are lower (seasonal averages ranged from 1.2 to 2.2 µg/L (Table 3-3) and show less seasonal variability.

Chlorophyll a levels measured in Nantucket Sound as part of the NCCA (USEPA, 2015; Table 3-5) averaged 3.9 µg/L, higher than the levels recorded by CCS. As indicated in Figure 3-4, the NCCA locations evaluated in in this report included only the coastal locations in Nantucket Sound. Seven of the eight Nantucket Sound locations had chlorophyll a levels that were rated as Good condition and one was rated as Fair (Location 1058 from Sengekontacket Pond) based on the USEPA WQI (Table 3-6).

Nutrients

Nutrient information is available from the data reported by CCS and in the NCCA (USEPA, 2015). Although these two studies report nutrient data differently, they provide useful information relative to nutrient trends in the water.

In the CCS data, the highest total nitrogen levels were recorded in fall samples collected from the coastal sampling locations (average of 42.3 µm; Table 3-4). Total nitrogen levels in the Nantucket Sound locations (Table 3-3) were lower and less variable than the coastal samples. Total phosphorus levels were lower and showed less variability than the nitrogen levels with higher levels recorded for coastal samples than for Sound samples. These trends track closely with the chlorophyll a levels described above which likely reflects the available nutrient content of the water.

Of the eight Nantucket Sound locations considered in the NCCA (USEPA, 2015; Table 3-5) nitrogen levels in all samples were rated in Good condition and phosphorus was rated as Fair in all locations based on the USEPA WQI (Table 3-6).

Dissolved Oxygen

In the CCS data, dissolved oxygen levels were lowest in the summer months for both the Nantucket Sound (Table 3-3) and coastal locations (Table 3-4). However, average dissolved oxygen levels measured by CCS were representative of reasonably well-oxygenated conditions.

Dissolved oxygen levels in the eight Nantucket Sound locations considered in the NCCA (USEPA, 2015; Table 3-5) averaged 6.5 mg/L with seven of the eight samples rated as Good and one rated as Fair (Location 1058 from Sengekontacket Pond) based on the USEPA WQI (Table 3-6).

Turbidity

In the CCS data, turbidity levels were highest and most variable in the summer months for the Nantucket Sound locations (Table 3-3). Turbidity levels were relatively low and similar through the spring, summer, and fall. In the coastal locations, turbidity levels were higher than in the Sound with the highest average recorded in the fall (Table 3-3). These coastal turbidity levels are higher than those recorded in the Sound due to inputs from onshore sources, such as sediments being washed down in rivers.

Water clarity was measured as light transmissivity using photosynthetically active radiation meters, rather than turbidity, in the NCCA (USEPA, 2015). Light transmissivity data were not available for two of the Sound locations, but the remaining six stations were rated as Good based on the USEPA WQI (Table 3-6).

4.1.3 Brayton Point ECC State Waters

Temperature and Salinity

Surface temperature data from the USGS (Table 3-7) shows peak temperature in the Sakonnet River in the summer months at a mean of 22 ºC (USGS, 2019).

NBFSMN buoy data from the MassDEP Cole and Taunton buoys show mean temperatures from May to November of 2017 and 2018 (Table 3-8). Temperatures at each location were relatively the same each year during the monitoring season, averaging between 20-21 ºC (NBFSM, 2018).

NOAA NDBC (2020) provides the annual sea temperature data for Station FRVM3, located in Mount Hope Bay (Figure 3-5, Table 3-9). Annual sea temperature data from the buoy collected between 2011 and 2020 are summarized. Mount Hope Bay reaches its lowest temperatures in the winter (December through February) and highest temperatures in the summer (June through August).

The USGS data for Sakonnet River (Table 3-7) shows a mean salinity of approximately 30 psu in the spring, summer, and fall. The Sakonnet River is a tidal straight with most influence coming from the Rhode Island Sound and Atlantic Ocean (USGS, 2019).

As for Mount Hope Bay, data collected by the University of Rhode Island Graduate School of Oceanography, under the direction of the MassDEP, following NBFSMN protocols (Table 3-8) showed mean salinity at approximately 27 psu. The bay receives more freshwater influence from the Taunton and Cole rivers as well as the surrounding Narragansett watershed (NBFSM, 2018, MassDEP, 2020).

Chlorophyll a

Chlorophyll a data for the Sakonnet River and Chlorophyll data for Mount Hope Bay are presented in Table 3-7 and Table 3-8, as µg/L and Relative Florescence Units (RFU), respectively. The Chlorophyll a in the Sakonnet River 2018-2019 (Table 3-7) observed that the summer season had a mean concentration of Chlorophyll a value of 6.3 µg/L in the summer and a concentration of Chlorophyll a in the fall of 3.0 µg/L. Near Brayton Point, two MassDEP buoys Cole and Taunton, located west and south/southeast of Brayton Point, respectfully. recorded Chlorophyll mean concentrations of 4.3 and 2.5 RFU, respectively in 2017. In 2018, the

Cole and Taunton buoys recorded mean Chlorophyll a concentrations of 2.7 RFU in each waterbody. Review of the data showed no proximal cause as to why the Cole buoy recorded higher Chlorophyll RFUs in 2017. One reason could be variations in sensor measurements not related to chlorophyll concentrations such as changing light and temperature conditions, which affect the fluorescence response of algal cells.

Nutrients

Nutrient Information for the Sakonnet River is available from the USGS (Table 3-7). The river experienced its highest amount of nutrients, both nitrogen and phosphorus, in the fall season. This did not correlate with Chlorophyll a level as above. Mean Total nitrogen and total phosphorous concentrations varied throughout the year from 0.21-0.33 and 0.04 and 0.08 mg/L, respectively.

Only Nitrate-N (mg/L) Levels were available from NBFSMN for the Cole and Taunton Buoys and showed slightly higher Nitrate-N levels in 2018 than in 2017 but levels were relatively constant between the two sites (Table 3-8).

Nutrient inputs are expected to come from the surrounding Narragansett Bay watershed, consisting of mostly developed land. Review of the Rhode Island water quality standards (250-RICR-150-05-1. Water Quality Regulations) in effect for the Clean Water Act does not assign specific criteria to nitrogen and phosphorus. The regulations state that “Total phosphorus, nitrates and ammonia may be assigned site-specific permit limits based on reasonable Best Available Technologies. Where waters have low tidal flushing rates, applicable treatment to prevent or minimize accelerated or cultural eutrophication may be required for regulated nonpoint source activities” (RIDEM 2018).

Dissolved Oxygen

In the USGS data, the Sakonnet River dissolved oxygen levels were lowest in the summer months. During the summer the mean DO is about 5.9 mg/L which could be considered low (below 6.5 mg/L). This is due to an increase in temperature and possibly an increase in pollutants. The low DO levels correlate to increased chlorophyll a levels in the summer. Sakonnet River DO conditions return to healthy levels in the spring and fall seasons (Table 3-7).

MassDEP Buoys Cole and Taunton report healthy mean dissolved oxygen levels for Mount Hope Bay (Table 3-8).

Turbidity

Turbidity in the Sakonnet River as reported by USGS (Table 3-7) was highest in the summer and fall seasons but overall are relatively low (<10 NTU).

Turbidity was not reported by the NBFSMN for Mount Hope Bay.

4.2 Onshore Surface Water and Groundwater Resources

4.2.1 Falmouth Onshore Project Area

As described in Section 3.4, several coastal and freshwater ponds, wetlands, streams, and groundwater resources are located in the vicinity of the onshore export cable routes and the underground transmission route (Figure 3-7 and Figure 3-8). The Lawrence Lynch site is located in proximity to Sols Pond. Specific recent onshore surface water and groundwater quality data were not identified.

Surface water data collected from coastal ponds in the vicinity of the potential export cable landfall locations were presented in Section 3.4.1 and the existing conditions for these ponds were discussed with the available offshore water quality data in Section 4.1.2.

Groundwater in the vicinity of the onshore export cable routes include drinking water protection areas and portions of groundwater contamination plumes located to the west of the JBCC, located north of the Falmouth Onshore Project Area.

A review of potential environmentally impacted sites along the route was conducted and included a search of various governmental databases by Environmental Data Resources, Inc. (EDR, 2020). This review indicated that all but one reported release had been closed out by the Commonwealth. One Massachusetts hazardous waste site associated with a petroleum release at the Falmouth High School remains open. Although most of these sites are closed, there may be institutional controls associated with the properties and residual impacted soil and/or groundwater may still be present at concentrations less than regulatory standards at closed sites. In addition, incidental spills and/or releases resulting in less than reportable quantities may have occurred and have not been reported.

4.2.2 Brayton Point Onshore Project Area

Several small freshwater ponds are present in the vicinity of the onshore export cable route options on Aquidneck Island as well as a stream, Founders Brook (Figure 3-9). No data are available for the quality of the ponds, but the stream water is currently safe for primary contact recreation, wildlife habitat and industrial use. Fresh surface water sources are not present at Brayton Point (RIDEM GIS, 2021).

Groundwater in the vicinity of the onshore export cable route options on Aquidneck Island is classified as GA, safe for drinking without treatment (Figure 3-9). But groundwater at Brayton Point has a higher level of TDS and is not recommended for drinking (RIDEM GIS, 2021). Project-related construction activities will be designed to avoid potential effects to local groundwater and surface water resources that may occur due to soil erosion or stormwater discharge into waterbodies or contact with groundwater resources. All requirements of NPDES construction permits and best management practices will be implemented to protect water resources.

5.0 Effect Characterization

This section includes a discussion of potential effects of various aspects of the Project on water quality, primarily in the Federal Waters in the vicinity of the Lease Area, Falmouth ECC State waters, and Brayton Point ECC State Waters. This section also considers potential effects of onshore activities associated with landfall of the export cables, underground routing of the cables, and construction of the onshore substation and HVDC converter station on localized inland water quality. All phases of the Project, including construction, operations and maintenance (O&M), and decommissioning are considered in this characterization.

5.1 Characterization Approach

The following provides a description of the approach used to characterize effects of the Project on resources (receptors) within or in the vicinity of the Project. This approach used in this Report includes three primary steps:

1. Identification and characterization of IPFs
2. Identification of potentially affected resources
3. Effect characterization

5.1.1 Impact-Producing Factors

BOEM (2020), in its Information Guidelines for a Renewable Energy Construction and Operations Plan (COP) identified primary potential IPFs potentially affecting water quality. These were adapted to address the IPFs associated with the Project for this assessment. COP Section 3.4 summarizes IPFs for water quality resources, the Project phases where IPFs would be of concern, and specific Project activities related to them. Based on an assessment of the Project activities described in Section 2.0 (and detailed in Section 3.4 of the COP), each anticipated IPF is assigned an intensity ranking based on a qualitative assessment of the criteria.

Table 5-1 below provides definitions of the criteria used to qualitatively assess the anticipated effect intensity with the effect being any change to resource brought about by the presence of a Project component or by the execution of a Project activity.

Table 5-1. Effect Criteria Qualitative Definitions

Effect Criteria	Definitions
Nature	• **Positive** – An effect that is considered to represent an improvement to the baseline or to introduce a new desirable factor. • **Negative** – An effect that is considered to represent an adverse change from the baseline, or to introduce a new undesirable factor.
Type	• **Direct** – An effect created as a direct result of the Project. • **Indirect** – An effect which may be caused by the Project but will occur in the future or outside the area of influence.
Reversibility	• **Temporary** – Effects are predicted to be of short duration and intermittent/occasional in nature and/or largely reversible. • **Permanent** – Effects that occur during the development of the Project and cause a permanent change in the affected indicator or resource that endures substantially beyond the Project lifetime (irreversible).

Effect Criteria	Definitions
Duration	• **Short-Term** – Effect that are predicted to last only for a limited period (less than four years) but will cease on completion of an activity, or as a result of mitigation measures and natural recovery. • **Medium-Term** – Effects that will occur over a period of four to 10 years. This will include effects that may be intermittent or repeated rather than continuous if they occur over an extended time period. • **Long-Term** – Effects that will occur over an extended period (more than 10 years). This will include effects that may be intermittent or repeated rather than continuous if they occur over an extended time period.
Geographical Extent (Area)	• **Local** – Effects that affect locally important resources or are restricted to a single (local) administrative area or local community (not widespread). • **Regional** – Effects that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries (widespread). • **National** – Effects that affect nationally important resources, affect an area that is national important/protected or macro-economic consequences (widespread). • **International** – Effects that affect internationally important resources such as areas protected by International Conventions and Impacts that are experienced in one country as a result of activities in another (widespread).
Cumulative	• **Cumulative** – Direct or indirect effects that could have a greater effect due to the proximity and timing of other activities in the Project Area. • **Synergistic** – Direct or indirect effects that could have a greater effect due to the additive or interactive nature of the effect in a place and time.

Note:
Effect criteria and definitions adapted from International Institute for Sustainable Development (IISD, 2016)

Based on that qualitative assessment and the application of professional judgment, each anticipated effect is assigned one of the intensity levels defined in Table 5-2.

Table 5-2. IPF Intensity Levels and Defining Characteristics

IPF Intensity Level	Defining Characteristics
High	• Effect is irreversible or permanent. • Long-term effect (more than 10 years) that are widespread. • Effects that affect nationally important resources. • Numerous non-conformities with respect to federal, state and/or local regulation. • Significant release or discharge of untreated waste (emissions, effluents, spills, solids) or hazardous materials.
Medium	• Medium-term effects (five to 10 years) that are widespread (national or regional) and reversible. • Water contamination or coastal pollution by slightly biodegradable products and/or hazardous substances having a chronic effect on human health after long-term exposure or aquatic life. • Several non-conformities with federal, state or local regulations • Small scale release of untreated waste; not immediately contained.
Low	• Shorter-term effect (one to five years), local and reversible. • Level of water and coastal pollution detectable, but below thresholds known to influence human health or aquatic life. • Small scale release of untreated waste; promptly contained and controlled.
Very Low	• Short-term effect (less than one year), local and reversible. • Waste effluents released into water at near-natural concentrations. • Little to no change or rapidly dissipating.
None	• Intensity is so immaterial that any resulting effect is scoped out of the effect assessment process.

5.1.1.1 Resource Sensitivity

Based on an assessment of the environment described in Section 4.0, the subject resource is assigned a **sensitivity** "ranking" based on a qualitative assessment of the criteria presented in Table 5-3, whereby sensitivity is ranked as follows: Very Low, Low, Medium and High. The degree of sensitivity of resource is, in part, based on resource's resilience, its ability to naturally adapt to changes or recover from effect.

Table 5-3. Resource Sensitivity Ranking

Ranking	Definitions
High	• An already vulnerable resource with very little capacity and means to adapt to or tolerate the changed conditions.
Medium	• A resource with limited capacity and means to adapt to change and tolerate changed conditions. Adaptation may take an extended period (years) and / or may only be partial.
Low	• A resource with some capacity and means to adapt to change and maintain/improve current conditions. Adaptation may take time (weeks/months) and / or may only be partial.
Very Low	• A resource with the capacity and means to adapt to change and tolerate the changed conditions.

5.1.2 Potentially Affected Resources

Onshore and offshore construction activities may affect the following water resources described in Section 4.0.

- Coastal and marine waters;
- Onshore streams, rivers and ponds; and
- Onshore groundwater.

5.2 Identification and Characterization of Effects

The following describes the potential effects associated with planned Project activities and unplanned events. Relevant potential effects are described in the sections that follow.

Potential IPFs that may affect these water resources are described in the sections that follow.

Construction activities associated with the offshore and onshore portions of the Project may have the potential to affect water quality. IPFs associated with construction activities and relevant avoidance, minimization and mitigation measures are described below and the IPF intensity as well as resource sensitivity with and without mitigation are provided in Table 5-4.

Operation and maintenance activities associated with the offshore and onshore portions of the Project may have the potential to affect water quality. IPFs associated with these activities and relevant avoidance, minimization and mitigation measures are described below and the IPF intensity as well as resource sensitivity with and without mitigation are provided in Table 5-4.

Removal of offshore facilities during decommissioning at the end of the Project may affect water quality. The decommissioning of Project facilities would likely include removal of WTGs and associated support structures above the mudline. Offshore cables, including export cables and inter-array cables, and scour protection may be removed or retired in-place as described in Sections 3.3.5 and 3.3.4 of the COP, respectively. Removal of these materials would result in short-term and localized generation of suspended sediments.

Removal of cables from onshore areas could result in erosion into local waterways that may affect inland water quality. Similar to the construction activities, sedimentation and erosion during decommissioning will be controlled with appropriate best management practices (BMPs).

5.2.1 Sea Bottom Disturbance

5.2.1.1 Construction and Decommissioning

Construction activities with the potential to disturb bottom sediments include vessel anchoring, installation of foundations, installation of export and inter-array cables, preparation for scour protection, and placement of scour protection.

The potential effects to water quality via sediment resuspension from repeated hammer blows during pile driving for the installation of WTG/OSP foundations would likely be localized to the work area described in Section 3.3 of the COP. Similarly, installation of rocks or stones for scour protection would likely be localized to the area described in COP Appendix F2, Scour Potential Impacts from Operational Phase and Post-Construction Infrastructure. Placement of the materials for scour protection may result in a temporary increase in suspended sediments due to resuspension of bottom sediments as the rock is placed; however, these effects are expected to be short-term in duration.

The installation of the cables and the repositioning of sediment within the offshore export cable corridors will result in dredged material being side cast, backfilled, or temporarily disturbed and suspended if plowing or jet plowing installation methods are used. To assess the potential effects, a sediment plume model was conducted for the Project (COP Appendix F1 - Sediment Plume Impacts from Construction Activities). The modeling showed that the installation activities may cause a temporary increase in suspended solids in the water column due to sediment remobilization. The volume of suspended solids (TSS) released will vary based on the speed and type of equipment used.

Figure 5-1 shows an example of the plume modeling from the southern Falmouth ECC. Section 6 of COP Appendix F1 provides results of all modeling. As depicted in the figure, the max TSS of 650 milligrams per liter (mg/L) is located in the area of the cables; however, within a few meters, the TSS begins to reduce rapidly. Sediment plume dispersion was found to reach the max TSS of 650 mg/L along the KP0 to KP20 (Nantucket Sound) Falmouth ECC at 14 meters and reduces rapidly past that point. KP20 to KP45 along the Muskeget Channel portion of the offshore Falmouth ECC was found to reach the max TSS of 650 mg/L at 22 meters, then begins to decrease rapidly. KP45 to KP88 along the offshore Falmouth ECC was found to reach the max TSS of 650 mg/L at 21 meters then reduces rapidly. Within the Lease Area, the inter-array cables were found to reach the max TSS of 650 mg/L at 56 meters, then decreases rapidly. At the landfall locations, the HDD exit pit dredging was found to reach the max TSS of 650 mg/L at 65 ft (20 m) and then reduces rapidly. As noted previously this spike in TSS is a one-time temporary event that would quickly dissipate to imperceptible levels in a short time period after the cables are installed at a particular location.

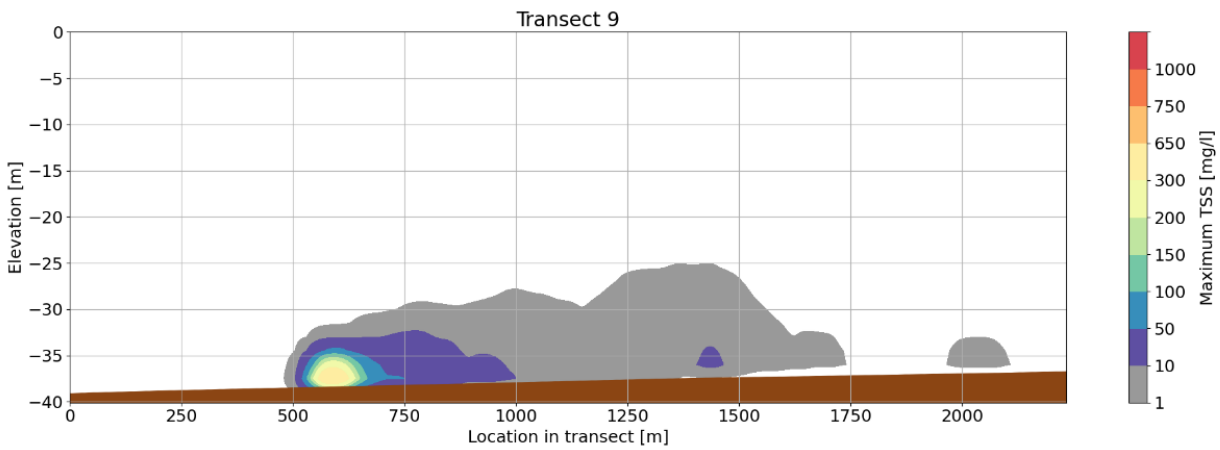


Figure 5-1. Example Sediment Plume Modeling on Southern Falmouth Export Cable Corridor

The TSS is expected to drop below 10 mg/L within an hour along the northern portions of Falmouth ECC in Nantucket Sound and the Muskeget Channel, in less than a minute at the HDD exit pit, and within two hours in the southern portion of the Falmouth ECC and the Lease Area during installation of inter-array cables. TSS will drop below 1 mg/L within 10 minutes at the HDD exit pit, and within approximately two hours along the export cable corridor. In the Lease Area, TSS will drop below 1 mg/L in approximately three and one-half hours.

Vessel anchoring may likewise result in temporary disturbance of bottom sediments during foundation installation, the construction of WTGs, and installation of the inter-array and export cables.

For construction activities that disrupt the seafloor, the amount of suspended sediment and the area affected by redeposition is greatest in areas with fine-grained materials and decreases as grain size increases. USGS surficial sediment texture data provided in the Marine Cadastre web viewer shows that sediments in the vicinity of the Lease Area and the Falmouth ECC through Muskeget Channel are primarily sand (BOEM-NOAA, 2019). Some more fine-grained silty sand is found in the southwestern portion of the Lease Area. Sediments along the Falmouth ECC within Nantucket Sound are composed primarily of sand, rock, mud, and gravel. In general, coarser materials are found around shoals and in high current areas with finer grained materials found in deeper water and areas with less current and flow. Ongoing geophysical and benthic habitat surveys will provide specific characterization data for sediments within the Lease Area and export cable corridors, including the Brayton Point ECC. These preliminary data are provided in COP Appendix E (Marine Site Investigation Report) and COP Appendix M (Benthic and Shellfish Resources Characterization Report). In addition, sediment transport modeling that will provide additional information on the potential extent of sediment transport is provided in COP Appendix F1 (Sediment Plume Impacts from Construction Activities).

Where possible, installation methods which minimize sediment resuspension will be used, particularly in the vicinity of sensitive habitats. As stated in Section 3 of the COP, Mayflower Wind anticipates use of HDD for the installation of the export cables at all landfall locations. TSS will only be generated at the exit pit of the

HDD. This approach will avoid most sediment disturbances that could affect water quality affecting aquatic life and/or recreational uses of the waters. Offshore export cable and inter-array cable installation methods are discussed in COP Section 3.3.4.1. The effect on water quality from construction is expected to be indirect, short-term, temporary and local, at a **Very Low** intensity level.

Decommissioning of offshore facilities at the end of the Project may affect water quality. The decommissioning would likely include removal of WTGs/OSPs and associated support structures above the mudline. Offshore cables, including inter-array cables and export cables , and scour protection may be removed or retired in-place as described in Sections 3.3.4 and 3.3.5 of the COP, respectively. Removal of these materials would result in short-term and localized generation of suspended sediments. If left in place, these components would not generate any increased sedimentation. The effect on water quality from deconstruction is expected to be indirect, short-term, temporary and local, at a **Very Low** intensity level.

5.2.1.2 Operation & Maintenance

In some cases, repair of subsurface cables may be required that would result in sediment disturbances similar to those during construction. As with construction any such disturbances would be short-term, temporary, and localized. The effect on water quality from operations and maintenance is expected to be indirect, short-term, temporary and local, at a **Very Low** intensity level.

5.2.2 Ground Disturbance

5.2.2.1 Construction and Decommissioning

Onshore construction and installation of the export cable landfalls, onshore export cables, underground transmission routes, onshore substation, and HVDC converter station could result in soil erosion and/or stormwater discharge into adjacent waterbodies along the selected routes that could affect local inland water quality. Such activities will be temporary, and the potential for effect would cease on stabilization of disturbed areas.

The planned areas of construction do not cross any major waterbodies and is not located immediately adjacent to onshore surface water resources. This greatly reduces the likelihood of potential effect. A detailed assessment of soil and groundwater contamination within the onshore construction route is planned and will be used to avoid and minimize locations and construction activities that could affect surface water and groundwater.

Land disturbing activities are subject to the NPDES regulations of stormwater discharges associated with construction activities. One requirement of the construction general permit is the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP will be generated prior to onshore construction activities. The provisions included in the SWPPP will conform to applicable regulatory requirements including measures that are intended avoid, minimize or mitigate for potential construction impacts on water quality.

The SWPPP will identify specific erosion and sedimentation controls to be used during the construction phase to control and manage any stormwater runoff originating from the Project site. The SWPPP will also include measures to control fugitive dust that may be generated as a result of soil disturbance and construction vehicle traffic. The effect on water quality from construction on land is expected to be indirect, short-term, temporary and local, at a **Very Low** intensity level.

Decommissioning (i.e., removal of cables from onshore areas) could result in erosion into local waterways that may affect inland water quality. Similar to the construction activities, sedimentation and erosion during decommissioning will be controlled with appropriate BMPs. The effect on water quality from decommissioning on land is expected to be indirect, short-term, temporary and local, at a **Very Low** intensity level.

5.2.2.2 Operation & Maintenance

Repair or replacement of the onshore export cables and underground transmission infrastructure, if required, may involve land disturbance. Land disturbances greater than one acre would be executed under a NPDES

Construction General Permit, or for smaller disturbances under an approved Soil Erosion and Sediment Control Plan (SESCP). As with construction any such disturbances would be direct, short-term, temporary, and localized, at a **Very Low** intensity level.

5.2.3 Planned Discharges

5.2.3.1 Construction and Decommissioning

Vessels used during offshore construction activities may routinely release bilge water, engine cooling water, deck drainage and/or ballast water. Nearshore discharges and discharges in port are regulated and No Discharge Zones regulated by the Massachusetts Office of Coastal Zone Management and RIDEM are in effect in all Massachusetts and Rhode Island coastal waters. Discharge of boat sewage is prohibited in these zones. Where discharges are allowed (e.g., under the NPDES 2013 Vessel General Permit [VGP]), such releases would quickly be dispersed and diluted and would cease when construction is complete.

Onshore construction activities may require dewatering during construction. Such dewatering activities may result in a discharge of groundwater to nearby surface waters or in some cases may be discharged to the ground and re-infiltrated in an upland vegetated area near the construction activities. Groundwater contamination, if it occurs within the area of construction, may reduce the allowable options for discharges to surface water. The effect on water quality from planned discharges during construction is expected to be direct, short-term, temporary and local, at a **Very Low** intensity level.

5.2.3.2 Operation & Maintenance

Vessels used during offshore construction activities may routinely release bilge water, engine cooling water, deck drainage and/or ballast water. Nearshore discharges and discharges in port are regulated and No Discharge Zones regulated by the Massachusetts Office of Coastal Zone Management and RIDEM are in effect in all Massachusetts and Rhode Island coastal waters. Discharge of boat sewage is prohibited in these zones. Where discharges are allowed (e.g., under the NPDES 2013 VGP), such releases would quickly be dispersed and diluted and would cease when construction is complete. The effect on water quality from planned discharged during operations and maintenance is expected to be direct, short-term, temporary and local, at a **Very Low** intensity level.

5.2.4 Accidental Events

5.2.4.1 Construction and Decommissioning

Vessels could also experience unplanned releases of oil, solid waste or other materials. During the construction period, increased vessel traffic in the area of construction and at nearby ports may increase the likelihood of unplanned releases.

Offshore structures also contain small quantities of coolants, oil, and other lubricants; as such the potential exists for the unplanned release of such material during construction and commissioning of the structures.

Vessels and the construction activities offshore will comply with the regulatory requirements related to the prevention and control of discharges and the prevention and control of accidental spills as documented in the Project’s Oil Spill Response Plan (OSRP) included as COP Appendix AA.

In addition, a component of the SWPPP for onshore construction will be a Project-specific Spill Prevention, Control, and Countermeasure (SPCC) Plan to prevent inadvertent releases, to the extent practicable, to the environment of oils and other hazardous materials incidental to the use of heavy construction equipment and vehicles. The SWPPP will also include provisions for stabilization of disturbed soils, equipment refueling, proper handling, storage, and off-site disposal of all solid and/or hazardous wastes generated during construction.

The effect on water quality from unplanned releases is expected to be direct, short-term, temporary and local, at a **Low** intensity level.

5.2.4.2 Operation & Maintenance

Unplanned events associated with O&M will be subject to the OSRP for offshore facilities and a SPCC Plan for the onshore substation and HVDC converter station. The effect on water quality from unplanned releases during operations and maintenance activities is expected to have a **Low** intensity level.

5.2.5 Natural Hazards

5.2.5.1 Construction and Decommissioning

Natural hazards may create physical hazards to structures and infrastructure or environmental hazards, such as unplanned releases. Accidental releases of non-hazardous or hazardous materials and wastes may affect water quality, may occur as a result of natural hazards such as meteorological events (including increased intensity and/or frequency associated with climate change), seismic and other events causing increased scouring, wave strikes and overtopping, and slope instability. As discussed in Section 5.2.4.1, the measures in place for accidental events would mitigate potential effects of these hazards. In extreme weather conditions, construction would be temporarily halted to minimize risks. Potential effects from natural hazards on water quality are indirect and short -term, temporary and local. The intensity of natural hazards may range from **Very Low** to **Low**, depending on the magnitude of the hazardous event.

5.2.5.2 Operation & Maintenance

Similar to the potential effects during construction and decommissioning, natural hazards may result in indirect effects to water resources by increasing the potential for accidental releases. Due to greater variability in climate conditions, the potential for natural hazards may change during the O&M period of the Project. As noted in Section 5.2.4.2, the prevention, control and cleanup measures in place for accidental events (e.g., OSRP, SPCC) would be used mitigate potential effects of these hazards. Periodic reviews of the OSRP and SPCC plan are expected to material changes in conditions that would warrant and adjustment to measures included in these plans.

5.3 Potential Risks of Effects

The effects on water quality associated with construction and operation of the Offshore and Onshore Project Areas are expected to be of short duration, occasional in nature, and localized in geographic extent. Potential effects of the Project construction, operation, and decommissioning were evaluated according to the methods described in Section 5.1 (Table 5-4).

5.3.1 Pre-Mitigation Potential Risk of Effect

The potential for effect was scored initially without consideration of potential measures to avoid, minimize or mitigate potential effects (Table 5-4). The IPF intensity levels are expected to be **Very Low** to **Low** and in general the resource sensitivity (e.g., Nantucket Sound, open ocean, inland surface waterbodies, groundwater) is expected to be **Very Low**. The overall IPF intensity on water quality associated with construction and O&M are expected to be **Very Low** to **Low**.

5.3.2 Mitigation and Residual Effects

Measures to avoid, minimize and mitigate potential effect were considered (Table 5-4). Such measures may fall into several categories including:

- Regulatory compliance – compliance with applicable federal, state and local regulations that will mitigate the potential for adverse effect.
- Construction methods – selection of construction methods that avoid or minimize or mitigate effects.
- Control plans – establishing plans that will be implemented to avoid, minimize, and mitigate the potential effect of planned or unplanned discharges

- Treatment – treatment of planned discharges prior to release to the receiving water resources will avoid, minimize, and mitigate potential effects.

The Project will require all vessels used during construction, operations, maintenance, and decommissioning to comply with regulatory requirements related to the prevention and control of discharges and the prevention and control of accidental spills. These may include, for example, United States Coast Guard (USCG) requirements at 33 CFR Part 151 and 46 CFR Part 162 regarding bilge and ballast water and USEPA requirements under its USEPA 2013 VGP, as well as state and local government requirements, each as may be updated and in effect at the time of the relevant activities. Project operations also will be guided by an approved OSRP.

To the extent feasible and appropriate, the avoidance, minimization and mitigation measures implemented during construction and operation of the Project components will be followed for the decommissioning of the Project. Due to the long lifespan of the Project, it is also expected that technology will be improved by the time decommissioning occurs and effects on water quality will be reduced.

5.3.3 Post-Mitigation Potential for Effect

With the application of avoidance, minimization and mitigation measures, the IPF intensities are rated as **None** to **Very Low** (Table 5-4). Short term declines in water quality will be localized and temporary.

Table 5-4. Characterization of Potential Project Effects

IPF	Related Activities	Key Intensity Criteria [a]	Pre-Mitigation Intensity Level [b]	Receptor Sensitivity Rank [c]	Mitigation Type	Post-Mitigation IPF Intensity Level [d]
Sea bottom disturbance	EC, IAC, WTG installation, including vessel anchoring	Indirect Short-term Temporary Local	Very Low	Very Low	Construction methods to minimize sediment mobilization	None
	EC, IAC, WTG scour protection placement		Very Low	Very Low	Placement of scour protection	Very Low
Ground disturbance	OST construction	Indirect Short-term Temporary Local	Very Low	Very Low	Erosion controls Regulatory compliance	None
Discharges	Vessel discharges	Direct Short-term Temporary Local	Very Low	Very Low	Regulatory compliance	None
	OST construction dewatering		Very Low	Very Low	Regulatory compliance	None
Unplanned release	WTG foundation installation Vessels Onshore and offshore operations	Direct Short-term Temporary Local	Low	Very Low	OSRP, SWPPP and SPCC Plan	None
Natural hazards	Construction, decommissioning and O&M of project components in the Offshore and Onshore Project Areas	Indirect Short-term Temporary Local	Very Low to Low	Very Low	OSRP, SWPPP, and SPCC Plan	None to Very Low

Notes:
WTG – wind turbine generators (including foundations and scour protection)
EC – export cable(s)
IAC – inter-array cable(s)
HDD – horizontal directional drilling
OSRP – Oil Spill Response Plan
O&M – operations and maintenance
OST – onshore transmission system includes underground transmission and substation/HVDC converter station.
(a) See Table 5-1
(b) Pre-Mitigation – IPF intensity level is characterized assuming no additional efforts to avoid, minimize and mitigate effects
(c) See Table 5-2
(d) Post-Mitigation – IPF intensity level represents residual level assuming implementation of mitigation measures including avoidance, minimizing, restoration, and offsetting.

6.0 Conclusions

The characterization of effects suggests there is little risk for adverse effects to water quality associated with the Project, even without additional avoidance, minimization, and mitigation measures. Mayflower Wind will conform to applicable federal, state and local regulatory requirements for Project activities that may affect water quality. In addition, Mayflower Wind will select construction measures and routes for the export cables and transmission infrastructure that avoid and minimize the potential for effects to water quality.

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