Beacon Wind LLC

Beacon Wind 1
Article VII Application

Exhibit 4
Environmental Impact

May 2022

Exhibit 4 Environmental Impact

TABLE OF CONTENTS

Exhibit 4 Environmental Impact 4-1
4.1 Introduction 4-1
4.1.1 Assessment of Impacts and Areas of Disturbance 4-4
4.1.2 Summary of Construction Methods 4-6
4.1.3 Summary of Operations and Maintenance 4-14
4.2 Physical Oceanographic Conditions 4-16
4.2.1 Existing Conditions 4-16
4.2.2 Potential Impacts 4-30
4.2.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-34
4.3 Water and Sediment Quality 4-35
4.3.1 Existing Conditions 4-35
4.3.2 Potential Impacts 4-45
4.3.3 Summary of Avoidance, Minimization and Mitigation Measures 4-48
4.4 Air Quality 4-50
4.4.1 Regulatory Standards for Air Emissions 4-50
4.4.2 Existing Conditions 4-54
4.4.3 Potential Impacts 4-56
4.4.4 Summary of Avoidance, Minimization, and Mitigation Measures 4-57
4.5 Acoustics 4-59
4.5.1 Applicable Noise Standards and Guidelines 4-59
4.5.2 Existing Conditions 4-61
4.5.3 Potential Impacts 4-65
4.5.4 Summary of Avoidance, Minimization, and Mitigation Measures 4-75
4.6 EMF 4-77
4.6.1 Electric and Magnetic Field Assessment and Criteria 4-77
4.6.2 Existing Conditions 4-78
4.6.3 Potential Impacts 4-78
4.6.4 Summary of Avoidance, Minimization, and Mitigation Measures 4-80
4.7 Onshore Topography, Geology, Soils, Groundwater 4-81
4.7.1 Existing Conditions 4-81
4.7.2 Potential Impacts 4-84
4.7.3 Summary of Avoidance, Minimization and Mitigation Measures 4-87
4.8 Terrestrial Vegetation and Wildlife 4-89
4.8.1 Existing Conditions 4-89
4.8.2 Potential Impacts 4-95
4.8.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-96
4.9 Wetlands and Waterbodies 4-98
4.9.1 Existing Conditions 4-98
4.9.2 Potential Impacts 4-104
4.9.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-106
4.10 Avian Species 4-108
4.10.1 Existing Conditions 4-108
4.10.2 Potential Impacts 4-120
4.10.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-123
4.11 Bat Species 4-125
4.11.1 Existing Conditions 4-125
4.11.2 Potential Impacts and Proposed Mitigation 4-126
4.11.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-127

4.12 Benthic, Finfish, Invertebrates, and Essential Fish Habitat 4-128
4.12.1 Existing Conditions 4-128
4.12.2 Potential Impacts 4-142
4.12.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-151
4.13 Marine Mammals 4-152
4.13.1 Existing Conditions 4-152
4.13.2 Potential Impacts 4-169
4.13.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-174
4.14 Sea Turtles 4-176
4.14.1 Existing Conditions 4-176
4.14.2 Potential Impacts 4-180
4.14.3 Summary of Avoidance, Minimization, and Mitigation Measures 4-184
4.15 Important Habitat Areas and Protected Species 4-185
4.15.1 Important Habitat Areas 4-185
4.15.2 Protected Species 4-190
4.16 Cultural Resources 4-192
4.16.1 Marine Archaeological Resources 4-193
4.16.2 Terrestrial Archaeological Resources 4-197
4.16.3 Above Ground Historic Properties 4-204
4.17 Visual and Aesthetic Resources 4-210
4.17.1 Existing Conditions 4-210
4.17.2 Potential Impacts 4-223
4.17.3 Summary of Avoidance, Minimization and Mitigation Measures 4-229
4.18 Land Use 4-231
4.18.1 Existing Conditions 4-231
4.18.2 Potential Impacts 4-239
4.18.3 Summary of Avoidance, Minimization and Mitigation Measures 4-241
4.19 References 4-243

LIST OF FIGURES

Figure 4.2-1. Surficial Sediments Along the Submarine Export Cable Route 4-18
Figure 4.2-2. Bathymetry along the Submarine Export Cable Route 4-21
Figure 4.2-3. Seabed Formations 4-22
Figure 4.2-4. Metocean Stations 4-24
Figure 4.2-5. Depth-Averaged Current Roses 4-27
Figure 4.2-6. Bed Mobility Percentage 4-31
Figure 4.2-7. Bed Mobility Recurrence 4-32
Figure 4.3-1. NYS Water Quality Classifications 4-37
Figure 4.3-2. 2010 NCCA Sampling Stations in Long Island Sound and Block Island Sound 4-42
Figure 4.3-3. NYCDEP Harbor Water Quality Monitoring Locations in UER - WLIS 4-43
Figure 4.5-1. Noise Monitoring Location 4-63
Figure 4.5-2. Ambient Noise Modeling Results 4-64
Figure 4.5-3. Anticipated Noise Levels from HDD Activities 4-68
Figure 4.5-4 Predicted Noise Levels from Construction of the Onshore Substation Facility 4-71

Figure 4.5-5. Predicted Noise Levels from Operation of the Onshore Substation Facility 4-74
Figure 4.7-1. Onshore Study Area Soils 4-83
Figure 4.8-1. Onshore Components Over Aerial Imagery 4-91
Figure 4.8-2. Regional Land Cover Mapping 4-92
Figure 4.9-1. Mapped Wetlands and Waterbodies 4-100
Figure 4.9-2. FEMA Mapped Special Flood Hazard Areas 4-103
Figure 4.10-1. Important Bird Habitat 4-113
Figure 4.12-1. Benthic and Fish Habitat Features 4-131
Figure 4.13-1. Seasonal Marine Mammal Sightings in the Study Area 4-156
Figure 4.13-2. North Atlantic Right Whale Seasonal Management Area 4-159
Figure 4.13-3. Seal Haul-Out Sites in and Near the Study Area 4-168
Figure 4.14-1. Seasonal Sea Turtle Occurrences in the Vicinity of the Project 4-178
Figure 4.15-1. Important Habitat Areas 4-189
Figure 4.16-1. Study Area for Marine Archaeological and Cultural Resources 4-195
Figure 4.16-2. Study Area for Terrestrial Archaeological Resources 4-199
Figure 4.16-3. PAPE for Terrestrial Archaeological Resources 4-203
Figure 4.16-4. Onshore PAPE for Above Ground Historic Properties 4-205
Figure 4.16-5. Above Ground Historic Properties within the Onshore PAPE 4-208
Figure 4.18-1. NYC Land Use in the Vicinity of the Onshore Project Area 4-234
Figure 4.18-2. NYC Zoning Districts in the Vicinity of the Onshore Project Area 4-236
Figure 4.18-3. Parks and Recreational Resources in the Vicinity of the Onshore Project Area 4-238

LIST OF TABLES

Table 4.1-1. Location of 16 NYCRR § 86.5 Requirements 4-2
Table 4.1-2. Summary of the Article VII Project Area and Potential Disturbance Areas 4-6
Table 4.2-1. Tidal Ranges Along Submarine Export Cable Route 4-23
Table 4.2-2. Long Island Sound 2010 Current Survey Results 4-25
Table 4.2-3. Mean Current Speed 4-26
Table 4.2-4. Monthly Average Significant Wave Height at Buoys 4-28
Table 4.2-5. Average Sea Temperature in Central Long Island Sound 4-29
Table 4.3-1. Summary of Marine Waterbody Classes Crossed by the Submarine Export Cable Route 4-36
Table 4.4-1. National Ambient Air Quality Standards 4-50
Table 4.4-2. Applicability of State Air Quality Regulations to the NY Project Under Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR) 4-53

Table 4.4-3. New York State Ambient Air Quality Standards 4-54
Table 4.4-5. NY Project-Related Nonattainment or Maintenance Counties – New York 4-55
Table 4.4-6. Estimated Emissions from Operation of Onshore Substation (Tons per Year) 4-57
Table 4.4-7. Avoided Emissions from Operation of the BW1 Project 4-57
Table 4.5-1 NYSDEC Guidelines for Impacts to Sensitive Receptors 4-59
Table 4.5-2. HDD Equipment noise Level Pressure Source Levels, dBA at 3 ft 4-67
Table 4.5-3. Noise Levels (dBA) during HDD Activities 4-67
Table 4.5-4. HDD Candidate Noise Control Strategies 4-69
Table 4.5-5. Primary Noise Sources and Reference Levels for Onshore Substation Facility Construction Activities 4-70
Table 4.5-6. Predicted Substation Construction Noise Levels (dBA) 4-70
Table 4.5-7. Primary Noise Sources and Reference Levels for Onshore Substation Facility Sites 4-72
Table 4.5-8. Comparison of Predicted Operational OBCF Noise Levels with NYCAC §24-232 4-73
Table 4.7-1. Astoria Power Complex Soils 4-82
Table 4.8-1. National Land Cover Data Within 1 Mile of the Onshore Project area 4-90
Table 4.8-2. Invasive Plant Species Observed within the Astoria Power Complex 4-93
Table 4.8-3. USFWS IPaC Official Species List in the Vicinity of the NY Project 4-94
Table 4.8-4. NYNHP Terrestrial Rare Species Identified In the Vicinity of the NY Project 4-95
Table 4.9-1. FEMA-Mapped SFHAs at the Onshore Project Area 4-102
Table 4.10-1. Commonly Observed Avian Species in the Vicinity of Long Island Sound 4-109
Table 4.10-2. Listed Species with Potential Presence in the NY Project Area 4-115
Table 4.12-1. Invertebrate Species Collected in Long Island Sound Trawl Survey in the Spring and Fall of 2019, Ordered by Weight of Catch (Largest to Smallest) 4-134
Table 4.12-2. Demersal Finfish Species Collected in Long Island Sound Trawl Survey in the Spring and Fall of 2019, Ordered by Total Count Number (Largest to Smallest) 4-135
Table 4.12-3. Pelagic Finfish Species Collected in Long Island Sound Trawl Survey in the Spring and Fall of 2019, Ordered by Total Count Number (Largest to Smallest) 4-137
Table 4.12-4. Designated EFH by Species and Life Stage within the Submarine Export Cable Corridor 4-139
Table 4.12-5. Relative Sensitivity of Fish and Invertebrates 4-147
Table 4.13-1. Protected Species Observer (PSO) Report Sightings Summary 4-155
Table 4.13-2. Major harbor and gray seal haul-out locations in the Study Area 4-167
Table 4.15-1. Important Habitat Areas within 1 Mile of the NY Project Area 4-186
Table 4.15-2. State and Federally Listed Species with Potential Presence in the NY Project Area ... 4-190

Table 4.16-1. Maximum Disturbance Within the Marine Archaeological PAPE....4-196
Table 4.16-2. Previously Recorded Sites within 1.5 mile of the Terrestrial Archaeological Study Area 4-198
Table 4.16-3. Maximum Disturbance within the Terrestrial Archaeological PAPE 4-202
Table 4.16-4. Above Ground Historic Properties within the Onshore PAPE....4-207
Table 4.17-1. Onshore KOPs....4-222
Table 4.17-2. Summary of Seascape and Landscape Context and Visual Resource Contrast Rating for Visual Simulations from Onshore KOPs....4-229
Table 4.18-1. Summary of Land Use Plans and Policies....4-231

LIST OF ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
µg/m^3	micrograms per standard cubic meter
ac	acre(s)
amsl	above mean sea level
ANSI	American National Standards Institute
APE	Area of Potential Effects
AVEHP	Analysis of Visual Effects to Historic Properties
BBA	Breeding Bird Atlas
Beacon Wind LLC	Beacon Wind or the Applicant
BOEM	Bureau of Ocean Energy Management
BW1	Beacon Wind 1 project
CAA	Clean Air Act
CBC	Christmas Bird Count
CBRA	cable burial risk assessment
cm/s	centimeter per second
CMP	Coastal Management Program
CO	carbon monoxide
CO_2	carbon dioxide
Commission	New York State Public Service Commission
ConEdison	Consolidated Edison Company of New York, Inc.
CRIS	Cultural Resources Information System
CWA	Clean Water Act
dBA	A-weighted decibel
DDT	dichlorodiphenyltrichloroethane
DEEP	Department of Energy and Environmental Protection
DIN	dissolved inorganic nitrogen
DIP	dissolved inorganic phosphorus
DO	dissolved oxygen
DPS	distinct population segments
DSM	digital surface model
ECL	Environmental Conservation Law
EFH	Essential Fish Habitat
EM&CP	Environmental Management and Construction Plan
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FOTF	Fuel Oil Tank Farm
ft	foot/feet
ft/s	feet per second
GHG	greenhouse gas
H_2S	hydrogen sulfide
ha	hectare(s)
HAP	hazardous air pollutant

HAPC	habitats of particular concern
HDD	horizontal directional drilling
HRG	high-resolution geophysical
HTL	High Tide Line
HVAC	high-voltage alternating current
HVDC	high-voltage direct current
Hz	hertz
IBA	important bird area
IMO	International Maritime Organization
IPaC	Information for Planning and Consultation
ISCMP	invasive species control and management plan
IUCN	International Union for Conservation of Nature
kHz	kilohertz
km	kilometer(s)
KOP	Key Observation Point
kV	kilovolt(s)
L_{90}	sound pressure level exceeded 90 percent of the time
Lease Area	Lease Area OCS-A 0520
L_{eq}	equivalent sound level
LISICOS	Long Island Sound Integrated Coastal Observing System
LISS	Long Island Sound Study
L_wA	sound power levels in dBA
LWRP	local waterfront revitalization program
m	meter(s)
m^3	cubic meter(s)
mi	mile
MARA	Marine Archaeological Resources Assessment
MDAT	Marine-life Data and Analysis Team
MEC	munitions and explosives of concern
mG	milliGuass
mg/L	milligrams per liter
MMPA	Marine Mammal Protection Act
MVA	megavolt ampere
NAAQS	National Ambient Air Quality Standards
NCCA	National Coastal Condition Assessment
NHPA	National Historic Preservation Act
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NSA	noise-sensitive area
NSPS	New Source Performance Standards
NSR	new source review

NY Project	portions of the BW1 transmission system to be located within the State of New York
NYCAC	New York City Administrative Code
NYCDEP	New York City Department of Environmental Protection
NYCRR	New York Codes, Rules, and Regulations
NYNHP	New York Natural Heritage Program
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSDPS	New York State Department of Public Service
NYSHPO	New York State Historic Preservation Office
NYISO	New York Independent System Operator
O&M	operations and maintenance
OBCF	octave band center frequency
OCS	Outer Continental Shelf
OPRHP	Office of Parks, Recreation and Historic Preservation
OSAMP	Ocean Special Area Management Plan
OSRP	Oil Spill Response Plan
PAPE	Preliminary Area of Potential Effects
Pb	lead
PCBs	polychlorinated biphenyls
PM_{10}	particulate matter with aerodynamic diameter 10 micrometers or less
$PM_{2.5}$	particulate matter with aerodynamic diameter 2.5 micrometers or less
POI	point of interconnection
ppb	parts per billion
ppm	parts per million
PSL	Public Service Law
PSO	Protected Species Observer
QMA	Qualified Marine Archaeologist
SF6	sulfur hexafluoride
S/NHRP	State or National Register of Historic Places
SAV	submerged aquatic vegetation
SCFWH	Significant Coastal Fish and Wildlife Habitat
SFHA	Special Flood Hazard Area
SLCU	Seascape and Landscape Character Unit
SMA	Seasonal Management Area
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control and Countermeasures
SPL	sound pressure level
SQI	Sediment Quality Index
SSC	species of special concern
SWPPP	Stormwater Pollution Prevention Plan
TARA	Terrestrial Archaeological Resources Assessment
tpy	tons per year
TSS	total suspended solids
UDP	Unanticipated Discoveries Plan

UER-WLIS	Upper East River–Western Long Island Sound
ULSD	ultra-low sulfur diesel
USACE	United States Army Corps of Engineers
USCG	United Sates Coast Guard
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance
VIA	Visual Impact Assessment
VOC	volatile organic compound
WI/PWL	Water Inventory/Priority Waterbodies List
yd^3	cubic yard(s)
ZOLA	Zoning and Land Use
µmol/L	micromole per liter

Exhibit 4 Environmental Impact

4.1 Introduction

Beacon Wind LLC (Beacon Wind or the Applicant) proposes to construct and operate the Beacon Wind 1 project (BW1) as one of two separate offshore wind projects to be located within the Bureau of Ocean Energy Management (BOEM)-designated Renewable Energy Lease Area OCS-A 0520 (Lease Area). The proposed transmission system for BW1 will connect the offshore wind farm to the point of interconnection (POI) at the Astoria power complex in Queens, New York, and will include one 320-kilovolt (kV) high-voltage direct current (HVDC) submarine export cable circuit approximately 115 nautical miles (nm) (213 kilometers [km]) in length in New York State waters, one 320-kV HVDC onshore export cable circuit approximately 600 feet (ft) (183 meters [m]) in length, and three 138-kV high-voltage alternating current (HVAC) interconnection cable circuits approximately 1,400 ft (427 m) in length. An electric transmission line with a design capacity of 125-kV or more, extending a distance of 1 mile (mi) (1.6 km) or more, is subject to review and approval by the New York State Public Service Commission (Commission) as a major electric transmission facility. This application is being submitted to the Commission pursuant to Article VII of the New York Public Service Law (PSL) for the portions of the BW1 transmission system to be located within the State of New York (collectively, the NY Project).

The NY Project's POI to the New York State Transmission System operated by the New York Independent System Operator (NYISO) will be at the existing Astoria West 138-kV Substation in Queens, New York. The Astoria West Substation is owned by the Consolidated Edison Company of New York, Inc. (ConEdison). The following Article VII components of BW1 constitute the NY Project:

- One 320-kV HVDC submarine export cable circuit (two cables) located within an approximately 115 nm (213 km)-long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall at Lawrence Point at the Astoria power complex in Queens, New York;
- A 2,000 ft (610 m) long onshore cable route and substation facility within the Astoria power complex including:
    - One 320-kV HVDC onshore export cable circuit (two cables) installed underground from the landfall to the onshore substation facility within the Astoria power complex (approximately 600 ft [183 m]);
    - One onshore substation facility (inclusive of an onshore converter station and onshore substation) to convert HVDC power to HVAC power and step the voltage down from 320-kV to 138-kV; and
    - Three 138-kV cable circuits, each with nine HVAC onshore interconnection cables, buried underground from the onshore substation facility to the Astoria West POI (approximately 1,400 ft [427 m]).

This Exhibit addresses the requirements of 16 New York Codes, Rules and Regulations (NYCRR) § 86.5 and describes the studies that have been conducted to assess the potential impacts of the NY Project on the environment. This Exhibit also describes the methodologies used to investigate existing environmental conditions, as well as the potential impacts that the NY Project's construction and

operation could have on physical or biological resources and processes, and cultural and societal resources. The Applicant's efforts to avoid, minimize, and mitigate potential impacts to environmental resources are also described. The existing conditions and potential impacts to these environmental resources are described in greater detail throughout **Exhibit 4: Environmental Impact**, based on the results of desktop assessment work, field surveys and studies, and agency and stakeholder engagement.

Table 4.1-1 summarizes the specific requirements of 16 NYCRR § 86.5 and where they are addressed within this Exhibit.

TABLE 4.1-1. LOCATION OF 16 NYCRR § 86.5 REQUIREMENTS

16 NYCRR § 86.5 Requirement	Exhibit 4 Section(s)
(a) The applicant shall submit a statement describing any study which has been made of the impact of the proposed facility on the environment. That statement shall include a description of the methods employed in making that study and a summary of its findings.	All sections within Exhibit 4
(b) The applicant shall state: (1) what changes, if any, the construction and operation of the proposed facility might induce in the physical or biological processes of plant life or wildlife through any permanent or significant temporary change in the hydrology, topography or soil of the area;	Section 4.2 Physical Oceanography and Meteorology Section 4.3 Water and Sediment Quality Section 4.7 Onshore Topography, Geology, Soils, and Groundwater Section 4.8 Terrestrial Vegetation and Wildlife Section 4.9 Wetlands and Waterbodies Section 4.10 Avian Species Section 4.11 Bat Species Section 4.12 Benthic Resources and Finfish, Invertebrates, and Essential Fish Habitat Section 4.13 Marine Mammals Section 4.14 Sea Turtles
(2) what efforts, if any have been made to assure: (i) that any right-of-way avoids scenic, recreational and historic areas;	Section 4.16 Cultural Resources Section 4.17 Visual and Aesthetic Resources Section 4.18 Land Use
(ii) that any right-of-way will be routed to minimize its visibility from areas of public view;	Section 4.16 Cultural Resources Section 4.17 Visual and Aesthetic Resources
(iii) that any right-of-way has been planned to avoid heavily timbered areas, high points, ridge lines and steep slopes; and	Section 4.7 Onshore Topography, Geology, Soils, and Groundwater Section 4.8 Terrestrial Vegetation and Wildlife
(iv) that the selection of any proposed right-of-way preserves the natural landscape and minimizes conflict with any present or future planned land use;	Section 4.17 Visual and Aesthetic Resources Section 4.18 Land Use

16 NYCRR § 86.5 Requirement	Exhibit 4 Section(s)
(3) what, if any, plans have been formulated to keep any right-of-way clearing to the minimum width necessary to prevent interference of vegetation with the proposed facility;	Section 4.8 Terrestrial Vegetation and Wildlife
(4) what, if any, schedule or method of clearing the right-of-way has been formulated to take into account soil stability, protection of natural vegetation, and the protection of adjacent resources (including the protection of any natural habitat for wildlife);	Section 4.7 Onshore Topography, Geology, Soils, and Groundwater Section 4.8 Terrestrial Vegetation and Wildlife Section 4.9 Wetlands and Waterbodies
(5) what, if any, plans have been made to protect vegetation and topsoil not cleared, from damage from construction and operation of the facility;	Section 4.7 Onshore Topography, Geology, Soils, and Groundwater Section 4.8 Terrestrial Vegetation and Wildlife
(6) what, if any, provision has been made to protect fish and other aquatic life from harm from the use of explosives or pollutants in or near streams and other bodies of water;	Section 4.9 Wetlands and Waterbodies Section 4.12 Benthic Resources and Finfish, Invertebrates, and Essential Fish Habitat
(7) what, if any, pesticide or herbicide will be used in construction or maintenance of the proposed facility (including the volumes and manner of use);	Section 4.8 Terrestrial Vegetation and Wildlife
(8) what, if any, plans have been made to locate and design appurtenant structures to minimize the environmental impact of the structures (including visual and noise disturbance); and	Section 4.5. Acoustics Section 4.17 Visual and Aesthetic Resources Section 4.18 Land Use
(9) what, if any, provisions have been made for cleanup and restoration of the project area after construction.	Section 4.7 Onshore Topography, Geology, Soils, and Groundwater Section 4.8 Terrestrial Vegetation and Wildlife Section 4.9 Wetlands and Waterbodies
(c)(1) If any portion of the proposed facility is to be constructed underground, the applicant shall state what, if any, provisions have been made to avoid clearance of the entire right-of-way. If the clearance proposed will go to the mineral soil, the applicant shall state:	Section 4.1 Introduction Section 4.7 Onshore Topography, Geology, Soils, and Groundwater
(i) the width of the clearance;	Section 4.1 Introduction

16 NYCRR § 86.5 Requirement	Exhibit 4 Section(s)
(ii) what, if any, provisions have been made for the replacement of topsoil removal during construction;	Section 4.7 Onshore Topography, Geology, Soils, and Groundwater
(iii) what, if any, provisions have been made for removing excess soil excavated during construction; and	Section 4.7 Onshore Topography, Geology, Soils, and Groundwater
(iv) what, if any, plans have been made for stabilizing the cleared area with vegetation and erosion control devices.	Section 4.7 Onshore Topography, Geology, Soils, and Groundwater Section 4.8 Terrestrial Vegetation and Wildlife
(2) If any underground portion of the proposed facility will be constructed in or adjacent to a stream or other body of water, the applicant shall state: (i) what, if any, plans have been made to prevent erosion of the banks;	Section 4.3 Water and Sediment Quality Section 4.9 Wetlands and Waterbodies
(ii) what, if any, techniques (such as cofferdams) will be used; and	Section 4.1 Introduction
(iii) what, if any, plans have been made to use the water from such streams or other bodies of water for pipe-testing or other purposes (including volumes of water involved and methods for release of water once used).	Not applicable

4.1.1 Assessment of Impacts and Areas of Disturbance

In accordance with 16 NYCRR § 86.5, the Applicant has assessed the potential impacts of the construction and operations and maintenance (O&M) of NY Project facilities on the environment and has described methods to avoid, minimize, and mitigate potential impacts to environmental resources.

The NY Project Area assessed in Exhibit 4 includes the areas that may be used for the build-out of the NY Project (e.g., the submarine export cable corridor within New York State waters, the onshore cable construction corridors, the onshore substation facility, and any areas to be temporarily used for onshore construction). The submarine export cable circuit in New York State waters will be installed in an approximately 115 nm (213 km)-long corridor that extends from the federal/New York State water boundary to the cable landfall. The submarine export cable corridor in New York State waters is approximately 1,640 ft (500 m) wide to allow the Applicant flexibility to micro-site the cables based on environmental and seabed conditions identified prior to installation (see figures provided in **Exhibit 2: Location of Facilities**). The two 320-kV HVDC submarine export cables comprising the circuit will be bundled and installed in a single trench from the New York State jurisdictional water boundary to approximately 6.4 nm (12 km) from the landfall. Direct disturbance for bundled cable installation will be up to approximately 13 ft (4 m) wide including the width of the burial tool penetrating the seafloor, plus the additional width of seafloor contact and sediment sidecast based on the use of a jet trencher which is the primary tool planned for the majority of the route. A jet plow may be required for harder seabed conditions and can generate disturbance as wide as approximately 33 ft (10m). The cables

will proceed the remaining 6.4 nm (12 km) to the landfall unbundled and installed in two separate trenches spaced approximately 33 ft (10 m) apart. Direct disturbance for unbundled cables installed by jet trencher or vertical injector should the cable cross into a federally maintained channel will be approximately 13 ft (4 m) wide per trench.

In addition, a width of up to 1,500 ft (457 m) on either side of the submarine export cable corridor may be used for anchoring of the submarine export cable installation vessel(s) in support of installation activities. This anchoring corridor width may vary where site constraints exist.

Since the submarine export cables will be buried under the seafloor, the area of operational impact for the submarine cables is considered to be limited to the footprint of the cable protection measures and any long-term bathymetry changes to facilitate installation of the cables (e.g., dredging). Cable protection, where insufficient burial occurs, would conservatively occupy a total width of up to 36 ft (11 m) over the submarine export cables. Cable protection may also be necessary in areas of existing cable crossings (e.g., cables, pipelines) where cable protection would conservatively occupy a total width of up to 118 ft (36 m). It is estimated that up to 10 percent of the length of the submarine export cables in New York State waters will require remedial surface cable protection.

The Onshore Project Area includes approximately 11.4 acres (ac) (4.6 hectares [ha]) in the Astoria power complex for cable landfall, the onshore substation facility (6.1 ac [2.5 ha]), interconnection cable corridor (3.5 ac [1.4 ha]), and the temporary construction staging area (1.9 ac [0.8 ha]) required for onshore construction of the facility. The onshore substation facility will include monitoring equipment and will be regularly inspected during O&M. Inspections may periodically result in routine maintenance activities, such as replacement of and/or updates to electrical components/equipment.

The specifications of the onshore export cables are not expected to differ from the submarine export cables and will be pulled into the horizontal directional drilling (HDD) exit and connected directly to the onshore substation facility, a distance of approximately 600 ft (183 m). The onshore substation workspace will include the workspace needed for trenching, equipment operation, and onshore export cable installation. The onshore interconnection cables will be installed utilizing open cut trench techniques (except where trenchless methodologies are necessary such as to cross major infrastructure). The interconnection cables will be installed underground in paved or otherwise previously disturbed areas from the onshore substation facility to the POI, within an approximately 1,400 ft (427 m)-long and 82 ft (25 m)-wide onshore construction corridor. Following construction, the Applicant will maintain a 75 ft (22.9 m)-wide operational corridor for the onshore interconnection cables.

The NY Project Area and areas of temporary construction and permanent operational disturbance used for the environmental assessment in Exhibit 4 are summarized in **Table 4.1-2**. For certain resources with potential indirect impacts beyond the direct NY Project Area, a resource-specific study area is described in the applicable resource sections.

TABLE 4.1-2. SUMMARY OF THE ARTICLE VII PROJECT AREA AND POTENTIAL DISTURBANCE AREAS

NY Project Component	Total NY Project Area (ac [ha])	Temporary Construction Disturbance Area (ac [ha])	Permanent Operational Disturbance Area (ac [ha])
Submarine Export Cable Corridor a/	27,711 ac (11214 ha) a/	241 ac (98 ha) per trench b/	57 ac (23 ha) per trench c/
Cable Landfall and Onshore Substation Facility (including temporary workspace and HDD pits….) d/	8.0 ac (3.2 ha)	8.0 ac (3.2 ha)	6.1 ac (2.5 ha)
Onshore Interconnection Cable Corridor	3.5 ac (1.4 ha) e/	3.5 ac (1.4 ha) e/	3.0 ac (1.2 ha) f/

a/ Based on the total area within the submarine export cable corridor (cable siting corridor) in New York State; this also includes the offshore workspace associated with the cable landfall activities.
b/ Based on an estimated 13 ft (4 m)-wide disturbance corridor per trench for 90% of the length of the submarine export cable route and an estimated 33 ft (10 m)-wide disturbance corridor per trench for 10% of the submarine export cable route.
c/ Based on the assumption that cable protection will be required along 10% of the 115 nm (213 km)- long cable route at a width up to 36 ft (11 m). This calculation does not include areas of cable crossings which require a cable protection width up to 118 ft (36 m).
d/ The work area associated with the horizontal directional drill (HDD) for the sea-to-shore transition is included within this temporary disturbance calculation.
e/ Based on the footprint of the 82 ft (25 m)-wide corridor during construction.
f/ Based on a 75 ft (22.9 m)-wide corridor along the interconnection cable route during operations.

4.1.2 Summary of Construction Methods

The NY Project will be constructed as reflected on the Preliminary Design Drawings (see **Exhibit 5: Project Design Drawings**). A detailed construction schedule will be finalized when federal and state authorizations to proceed with construction have been granted and final contracts have been awarded to all contractors.

4.1.2.1 Submarine Export Cable Installation

Offshore infrastructure within New York State waters will consist of the submarine export cables and cable protection (in areas where the target burial depth cannot be achieved due to existing seabed conditions or the presence of existing utilities [cables and/or pipeline] that must be crossed). The submarine export cables will be installed from specialized installation vessels/barges which will install the cable from a turntable on the lay vessel/barge. The number and type of vessels to be used for the installation of the cable will depend on factors such as seabed depth, depth of cable protection, distance to shore, installation methodology, and cable protection method to be used. The submarine export cable installation methodology selected will also depend upon a variety of factors, including seabed characteristics and target burial depth. Installation methods that may be used along different portions of the submarine export cable route are described in **Section 4.1.2.1.3**.

The submarine export cables will be buried to a target burial depth of 3 to 6 ft (0.9 to 1.8 m) below the seabed outside of federally maintained areas (e.g., anchorages and shipping channels). In locations where the cable must enter or cross federally maintained areas, the cable will be buried to a minimum target burial depth of 15 ft (4.7 m) below the current or future authorized depth or depth of existing seabed (whichever is deeper).[1] The burial depth may vary from the target depth due to a variety of factors including seafloor conditions, previously installed utilities, other existing uses, and planned and future uses. A conceptual submarine export cable plan and profile is provided in **Exhibit 5**.

Other factors that determine minimum target burial depth will be considered during a cable burial risk assessment (CBRA); those factors may include non-regulated anchoring activity, seabed mobility (e.g., sandwaves), and seabed impacting fishing (e.g., hydraulic clam dredging). For example, in areas of hydraulic clam dredging, a target burial depth of at least 6 ft (1.8 m) may be appropriate pending results of the CBRA. A complete CBRA will be conducted to inform the final design. Additional information on target burial depths will be provided with the Environmental Management and Construction Plan (EM&CP).

In areas where the target burial depth cannot be achieved due to existing seabed conditions or the presence of existing utilities (cables and/or pipeline) that must be crossed, cable protection measures may be required (see **Section 4.1.2.1.5** for additional information on rock installation protection and other protection measures).

The typical key stages of submarine cable installation are:

1. Munitions and explosives of concern/unexploded ordnance (MEC/UXO) clearance and pre-installation activities[2] ;
2. Pre-sweeping and pre-trenching activities (if needed);
3. Cable lay and burial, including cable and pipeline crossings;
4. Post-installation survey; and
5. Post-crossing or remedial cable protection (if needed).

Installation of the submarine export cable is expected to take approximately 23 weeks for the submarine export cable route in New York. The actual installation schedule will be subject to seabed characteristics, installation vessel availability, and weather.

4.1.2.1.1 MEC/UXO Clearance and Pre-Installation Activities

Prior to the installation of the submarine export cable, survey campaigns and route preparation may be completed including MEC/UXO clearance, pre-installation surveys, debris clearance, boulder clearance, and pre-lay grapnel run. This is to ensure that the submarine export cable and burial equipment will not be impacted by any debris or hazards, either natural or fabricated, during the burial process, which may cause equipment damage and/or delays. It also serves to ensure sufficient burial

[1] The Applicant is coordinating with the USACE as it relates to future plans associated with these USACE-managed areas, and the potential for an increase in the authorized depths. Final burial depth will be based upon a Cable Burial Risk Assessment and is subject to regulatory approval.
[2] Pre-installation activities may include a separate pre-survey and route clearance prior to the pre-installation grapnel run and survey if there are expected to be large quantities of debris along the route.

depth. Please note that clearance activities will be implemented should avoidance through micro-siting not be feasible.

In some areas, existing, out-of-service cables and pipelines may be cut away and removed in order to install the submarine export cables, in accordance with applicable industry practices in collaboration with asset owners. This removal will only be undertaken upon pre-determined cables and pipelines for which written agreement is received from the owners and/or appropriate agencies. Should such cutting or removal of existing infrastructure be required, removal will be consistent with sound engineering practices and relevant requirements. Additional details on crossing existing submarine assets are provided in **Section 4.1.2.1.3**.

It is anticipated that the submarine export cable route will be surveyed and cleared for MEC/UXO. Where clearing is not feasible, the cable will be re-routed slightly within the surveyed corridor to avoid any identified MEC/UXO, or those features will be managed in accordance with applicable regulations. A pre-lay grapnel run may be completed to clear the path of seabed debris (abandoned fishing gear, wires, ropes, etc.) from the installation corridor, where feasible. The grapnel run will be carried out by towing a grapnel train from a support vessel.

The cable lay and burial operations will attempt to avoid boulders; however, if this is not possible, typically a 65.6 ft (20 m)-wide corridor will be cleared of boulders. In the areas with low boulder density where mainly surface boulders are identified, a remotely operated vehicle-based boulder grab will typically be utilized. In areas with high density of boulders, sub-surface boulders are also likely to be present. A pre-lay plough will normally be mobilized, which could move surface boulders as well as create a pre-cut trench (see **Section 4.1.2.1.2** for more detail on pre-trenching activities).

4.1.2.1.2 Pre-Sweeping and Pre-Trenching Activities (if needed)

In certain limited areas of the submarine export cable corridor, pre-sweeping may be necessary prior to cable lay activities, where underwater mega ripples and sandwaves are present on the seafloor. Pre-sweeping involves smoothing the seafloor by removing any ridges or edges that may be present. The primary pre-sweeping method will involve using a Trailing Suction Hopper Dredger from a construction vessel to remove the excess sediment on the seafloor along the footprint of the cable lay; however, other types of dredging equipment may be used depending on environmental conditions and equipment availability. The Applicant anticipates that dredged material generated from the submarine export cable corridor may either be side casted near the site of installation or removed after project completion for beneficial reuse or proper disposal. The actual method of dredged material management will be based on sampling and consultation with regulatory agencies. Where required, pre-sweeping activities will occur in a corridor that is up to approximately 65.6 ft (20 m) in width along the length of the mega ripples and sandwaves; the amount of clearance will vary along the submarine export cable route. Mega ripple and sandwave height vary depending on localized seabed and current characteristics. Approximately 321,077 cubic yards (yd^3) (245,481 cubic meters [m^3]) of sediment in New York State waters are anticipated to be dredged as a result of these pre-sweeping activities.

Pre-cut trenching activities may also be required along the submarine export cable route where deeper burial may be required and/or where seabed conditions are not suitable for traditional cable burial methods without seabed preparation. Pre-cut trenching involves running the cable burial equipment over portions of the route in order to soften the seabed prior to cable burial and/or the use of a suction

hopper dredge to excavate additional sediment. The impacts associated with this pre-trenching method are anticipated to be the same as those described in **Section 4.1.2.1.3**.

Local dredging or pre-sweeping at the locations where the submarine export cable crosses other assets may also be needed in order to reduce the shoaling of the crossing design. The final depth of the dredged area will be governed by the vertical distance between the natural seabed and the assets to be crossed and will be resolved by agreement with the asset owners through a crossing agreement or by PSC approval of the segment EM&CP. In typical scenarios, the crossing design will consist of the removal of approximately 8 ft (2.4 m) of sediment within a 52 ft by 85.3 ft (16 m by 26 m) area at each crossing. Approximately 679 yd^3 (519 m^3) of material will be removed by suction hopper dredge and/or mass flow excavation at each crossing.

4.1.2.1.3 Cable Lay and Burial, including Cable and Pipeline Crossings

Cable Lay and Burial

Following the pre-installation grapnel run and route clearance, the submarine export cable will be brought to the appropriate section of the submarine export cable installation corridor on the cable-laying vessel. From there, the cable will be laid onto the seabed and then buried or simultaneously laid and buried. In shallow areas, specifically in the East River approaching the landfall at the Astoria power complex, the submarine export cable may need to be floated into place for burial, as water depths along this stretch are inadequate for the cable lay vessel. A cable burial machine may assist in lowering and burying the submarine export cable in place, as it moves along these shallower areas. The burial machine would be operated off a separate construction vessel that could access these shallow waters.

Two options are proposed for installing the submarine export cables in the seabed:

- Cable lay with simultaneous burial using jet plow, mechanical plowing, or trenching; and
- Post-lay cable burial with either a jet trencher and/or mechanical trencher.

Depending on seabed conditions, cable burial depth targets, and other design requirements, cable lay with simultaneous burial and post-lay cable burial will utilize one or more of the following methods:

- **Jetting.** Jetting will be the primary method for cable installation. Jetting may be conducted via a towed device that travels along the seafloor surface. Jetting may also be conducted with a vertical injector fixed to the side of a vessel or barge. These methods inject high pressure water into the sediment through a blade that is inserted into the seafloor to create a trench. Simultaneously, the cable is fed from the cable ship down through the device and laid into the trench. Post-lay burial with a jetting tool may also be utilized. With this method, the cable would first be laid along the seafloor, and then the post-lay jetting tool would follow and may attempt multiple passes of the area for burial.

  The high-pressure water from the jetting tool sufficiently softens the sediment such that the cable can be pushed down through the sediment to the desired burial depth. The adjacent sediment and displaced sediment then resettles into the trench. Jetting with simultaneous cable lay, using either a jet plow or vertical injector, is considered the most efficient method of

submarine cable installation in many soil types. It minimizes the extent and duration of bottom disturbance for the significant length and water depths along the submarine export cable route.

- **Mechanical Plowing.** Plowing is conducted with a "mechanical" (i.e., non-jetting) cable plow that is pulled along the seabed, creating a narrow trench. Simultaneously, the cable is fed from the cable ship down to the plow, with the cable laid into the trench by the plow device. Gravity causes the displaced sediment to return to the trench, covering the cable. In general, material backfills naturally under wave action and tidal currents, but if necessary, additional sediment is mechanically returned to the trench using a backfill plow. Similar to a jet plow, the cable is installed and buried in a single pass. Plowing is generally less efficient than jetting methods but may be used in limited site-specific conditions. Mechanical plowing may be used for harder soils, where jetting is determined to be problematic.
- **Trenching (cutting).** Trenching (cutting) is used on seabed containing hard materials not suitable for jetting or plowing. For those areas containing hard materials, the trenching machine mechanically cuts through the hard materials using a chain or wheel cutter fitted with picks or teeth. The cutter creates a trench that the submarine export cable is laid into, and backfill is mechanically returned to the trench using a backfill plow.

The two submarine export cables will be installed bundled together with a fiber optic cable or unbundled and installed separately, and would be selected based upon available technology. Bundled submarine export cables will be installed in a single trench from the New York State jurisdictional water boundary in Block Island Sound and continue through Long Island Sound until approximately 6.4 nm (12 km) from the landfall. At that point, the cables will be separated (unbundled) and installed in two separate trenches for the final 6.4 nm (12 km) through Long Island Sound and the East River to the landfall. **See Exhibit E-3: Underground Construction** for figures depicting the trench burial for the bundled and unbundled scenarios.

Due to the length of the submarine export cable, three or more spools of cable will be necessary to transport and install the cable. Therefore, the cable will be installed in three or more sections and will require three to six jointing campaigns, each with a duration of three to seven days, to join sections of cable together. The jointing will be performed with the cable installation vessels. During the jointing, the vessels will be on dynamic positioning, so no anchoring or other seabed intervention will be required. If there is time between the lay-down of one cable end and the jointing campaign, there may be a guard vessel patrolling the cable end area.

For all submarine export cable installation activities, additional support and guard vessels are required. Support vessels may be used for dive teams or other works crews that are deployed for specific tasks during cable installation. Environmental monitors may also be deployed on separate vessels, if necessary. Guard vessels would navigate along with construction vessels to monitor and maintain safety zones when installation activities take place.

Cable and Pipeline Crossings

Cables and pipelines, both in and out of service, are charted along the NY Project submarine export cable route. While the submarine export cable route has been sited to avoid cables and pipelines to the extent practicable, some crossings will still be required. Where cable and/or pipeline crossings along the submarine export cable route are necessary, specific crossing methodologies will be developed and engineered as the submarine export cable route is finalized. Cable crossing

methodologies will be based on the type of asset to be crossed (i.e., material), depth of the existing buried cable or pipeline, and whether the assets are in service or out of service. Crossing methods will be determined through asset owner crossing agreements or by PSC approval of the segment EM&CP. **See Exhibit E-3** for figures depicting examples of cable crossings.

A typical pre-lay and burial installation sequence for a submarine export cable crossing of other cable and pipeline assets is as follows:

- Once the precise crossing location and separation distance are determined, a layer of protection may be installed over the asset. Localized dredging using equipment described in **Section 4.1.2.1.2** may be used in order to minimize or eliminate shoaling on the seabed before cable protection is installed;
- The submarine export cable will be laid over the first layer of protection. The submarine export cable may have a casing installed prior to placement, as an additional layer of protection;
- At a pre-determined distance away from the crossing location, cable burial will be suspended in accordance with a crossing agreement or approved EM&CP, cable route, water depth, and seabed conditions.
- Burial of the cable will resume at a pre-determined distance after the crossing;
- A second layer of protection will be installed over the submarine export cable.
- Subject to burial depth, a final layer of protection will be installed over the crossing for stabilization and additional scour protection; any remaining voids in the seabed at the installation site will be allowed to backfill naturally.

4.1.2.1.4 Post-Installation Survey

After cable burial, a post-installation survey will be completed to determine the as-built conditions of the submarine export cable and the levels of burial achieved. The survey will also identify areas requiring remedial cable protection.

4.1.2.1.5 Post-Crossing or Remedial Cable Protection (if needed)

In areas where adequate burial of the cable is not possible, such as cable or pipeline crossings, or sufficient burial depth is not achieved, remedial cable protection may be installed as a secondary measure to protect the cables. The submarine export cable will be buried to the proposed burial depth wherever it is technically and commercially feasible to do so, with additional or alternative protection measures only applied if necessary and subject to outcomes of the CBRA and consultation with regulatory authorities and other users (e.g., commercial fishers). Remedial cable protection measures may include the following:

- Rock – the installation of crushed boulders over a cable;
- Rock bags – pre-filled bags containing crushed rock to be placed over a cable; and
- Concrete mattresses – concrete blocks, or mats, connected via rope or cable.

In addition, at cable and pipeline crossings (see **Section 4.1.2.1.3**), a primary protection layer of rock or concrete mattresses may be installed over the existing asset prior to installation of the submarine

export cable and placement of the previously described cable protection measures, dependent upon separation distance. Cable protection may also be placed around appropriate sections of exposed or at-risk cables, where the amount and type depend on the cable type/position and residual burial depth (if partially buried), and subject to the results of the geophysical and geotechnical surveys, hydrodynamic modeling and the CBRA. It is estimated that up to 10 percent of the length of the submarine export cables may require remedial surface cable protection.[3] **Exhibit E-3** provides more details on the parameters for the proposed cable protection measures.

4.1.2.2 Cable Landfall and Onshore Export Cable Installation

The submarine export cables will make landfall at the Astoria power complex at Lawrence Point in Queens, New York (see **Exhibit 2, Figure 2-7**). Once the submarine export cables reach the landfall, they are referred to as the onshore export cables. The onshore export cables will be brought directly into the onshore substation facility by trenchless (e.g., horizontal directional drilling, jack-and-bore, micro-tunneling) installation methods described in **Sections 4.1.2.2.1 and 4.1.2.2.2**. A representative example of submarine/onshore export cable transition components at the landfall is provided in **Exhibit 5**. If it is determined that trenchless techniques are not feasible, then an open cut trenching methodology at the landfall would be considered (see **Exhibit 3: Alternatives**).

4.1.2.2.1 HDD

Horizontal directional drilling (HDD) is used to install cables in ducts under sensitive coastal and nearshore habitats, such as shorelines as well as infrastructure such as bulkheads and roadway crossings. HDD can also be used to cross under major infrastructure, including railroads and highways. **Exhibit E-3, Table E-3-3** provides a summary of the HDD parameters proposed for the NY Project if HDD is the trenchless method used to install the onshore exports cables from the landfall to the onshore substation facility. A representative drawing of this installation methodology is provided in **Exhibit 5**.

Typically, HDD operations for a cable landfall originate from an onshore landfall location and exit a certain distance offshore. The total distance of the HDD is influenced by many factors including the water depth contour, geologic characteristics, and limitations of the HDD equipment. To support this installation, both onshore and offshore work areas are required. The onshore work areas are typically located within the landfall parcels. Work areas associated with the NY Project are shown in **Exhibit 2, Figure 2-7**.

Once the onshore work area is set up, the HDD activities commence using a rig which drills a borehole underneath the surface. Once the drill for the HDD exits onto the seafloor, the conduits in which the submarine/onshore export cables will be installed are floated out to the offshore exit location and then pulled back onshore within the drilled borehole. A single, larger HDD bore may be completed to install the entire cable bundle, or individual, smaller HDD bores may be conducted to accommodate unbundles cables, which will depend on engineering and constructability factors.

The offshore exit location requires some seafloor preparation and construction of a workspace where the HDD drill can target the appropriate depth and location for the submarine export cable to start its landing. Typical offshore HDD exit pit preparations include the installation of a cofferdam or excavation

[3] Actual extent of cable protection will be refined upon completion of the CBRA but shall not exceed 10 percent.

pit that is either open to the sea (wet) or pumped clear of water (dry). This space not only marks the location the HDD drill will complete the borehole, it may also be used to collect any drilling fluids that exit the borehole with the drill bit during HDD. Marine support is needed (e.g., vessels, barges, divers) to support HDD drilling operations.

4.1.2.2.2 Non-HDD Trenchless Methods

The submarine/onshore export cables may also transition from the landfall to the onshore substation using micro-tunneling, jack-and-bore, or other non-HDD trenchless technologies. While each method has its own characteristics, micro-tunneling and jack-and-bore are generally completed by installing a steel pipe or casing under surface impediments or constraints such as existing roads or other infrastructure. This is completed by excavating a bore (entry) pit and receiving (exit) pit on either side of the crossing. An auger boring machine or tunneling boring machine installs the casing pipe through the earth between each pit. A conduit bundle will be installed within the bore hole, grouted, and the onshore export or interconnection cable will then be pulled through the crossing. In general, the decision to use one method over the other will be a factor of the length and size of the pipe, but the construction layout, cable landing, and handling considerations will be similar. **Exhibit E-3** provides additional information on this technique.

4.1.2.3 Onshore Substation Facility Construction

For the onshore substation facility, the construction and installation methodology will comply with local and state regulations and guidelines, except where waivers are obtained from the Commission (see **Exhibit 7: Local Ordinances** for local compliance information and requested waivers). A typical construction and installation methodology is as follows:

- Establish site access;
- Perform site preparation, including clearing and/or filling (if necessary), excavation, and grading;
- Construct a stormwater management system;
- Install the foundation and/or piles to adhere to flood elevation requirements;
- Install the electrical infrastructure and other associated structures and services including connection to local utilities; and
- Perform land restoration and landscaping.

Site preparation activities within the onshore substation facility site will likely include the excavation and removal or relocation of existing utilities and/or infrastructure. The site will be surveyed and staked prior to the start of construction activities, and site controls, access, and security for construction will be installed. Construction will begin with the excavation and installation of stormwater management controls, followed by excavation for building foundations, columns, footings and slabs. Excess spoil and materials excavated for the facility foundations and infrastructure, including any potentially contaminated soils, will be properly managed and disposed off-site, unless suitable for reuse onsite. After pouring and setting foundations, electrical infrastructure, structures and buildings will be installed. Finally, site restoration (including any temporary staging or workspaces), painting, permanent fencing, and security controls will be completed at the site.

4.1.2.4 Onshore Interconnection Cable Installation

The interconnection between the onshore substation facility and the Astoria West POI will consist of three 138-kV circuits. Each circuit will consist of nine, HVAC, single-core, solid, dielectric cables with copper conductors enclosed in XLPE insulation. Three separate fiber optic cables will be used for communication and temperature measurements and will be installed alongside the interconnection cables. The onshore interconnection cables will be housed in three separate concrete duct banks, which will be buried to a target depth of between 3.0 ft and 16.4 ft (0.9 and 5 m) beneath the surface. Shallower burial may be required with the potential need for additional protection depending on subsurface obstructions encountered. Each of the concrete duct banks will be approximately 3 ft (1 m) high by 11 ft (3.4 m) wide, for a total width of 33 ft (10 m). Up to 4 joint pits (manholes) will be located along the interconnection cable corridor to provide access and the spacing between joint pits will vary due to site-specific and cable installation constraints. Final locations and design of the onshore interconnection cables will be provided in the Environmental Management and Construction Plan (EM&CP).

The onshore interconnection cables will be installed utilizing open cut trench (except where trenchless methodologies are necessary such as if existing infrastructure is present), and will typically include the following main activities:

- Prepare the construction corridor and excavate a trench;
- Establish jointing bays;
- Install ducting;
- Pull interconnection cables through the ducts;
- Join the cables; and
- Restore the construction corridor.

Open cut trenching consists of excavating a trench along the onshore interconnection cable route. During excavation, the material is stockpiled next to the trench or hauled offsite based on its suitability for reuse. The onshore civil components, including the conduits, conduit spacers, and concrete encasement are then installed within the trench. Once installation is complete, the trench is backfilled with thermally acceptable backfill, which can include a combination of excavated soil, borrow soil, or low-strength flowable fills. Excavated soils will be used following engineering analysis and as approved for reuse by permitting authorities. Unsuitable or contaminated soils will be disposed of offsite in an approved manner and location, and suitable and/or uncontaminated soil will be brought in and used as backfill. The area is then restored. See **Exhibit E-3** for more information on open cut trenching methods for the interconnection cables.

4.1.3 Summary of Operations and Maintenance

The NY Project will be designed to operate 24 hours a day with minimal day-to-day supervisory input, with key systems monitored remotely. During operations, the NY Project will require both planned and unplanned inspections and maintenance, which will be carried out by qualified engineers, technical specialists, and associated support staff. The Applicant will ensure that all NY Project components are maintained and operated in a safe and reliable manner, compliant with regulatory

requirements, and in accordance with commercial objectives. Remote monitoring and maintenance activities will be based out of the Applicant's O&M facility for the offshore wind farm, on the SBMT site.

An O&M Plan will be developed and finalized prior to the commencement of construction. Based on the Applicant's previous O&M experience in offshore wind, a brief summary of the anticipated offshore and onshore activities is provided below. An Oil Spill Response Plan (OSRP) (for offshore facilities); Spill Prevention, Control and Countermeasures (SPCC) Plan (for onshore facilities); and Safety Management System will also be developed and implemented during O&M activities.

4.1.3.1 Offshore O&M

O&M activities for the submarine export cables will include surveys of the submarine export cable route to confirm the cables have not become exposed and that the cable protection measures have not worn away. The frequency and schedule of these surveys will be determined based upon factors to be detailed with and agreed upon during discussions with the applicable agencies.

The submarine export cables will be monitored during O&M through Distributed Temperature and Distributed Vibration Sensing equipment. The Distributed Temperature Sensing system will be able to provide real time monitoring of temperature along the submarine export cable route, alerting the Applicant should the temperature change, which often is the result of scouring of material and cable exposure. The Distributed Vibration Sensing system will provide real time vibration monitoring close to the cables indicating potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant would investigate the cable condition and identify any needed corrective actions. Should one of the submarine export cables fault, the portion of the cable will be spliced and replaced with a new, working segment.

4.1.3.2 Onshore O&M

New onshore components include the onshore substation facility and onshore cables. The onshore substation facility will be equipped with remote monitoring and operational capability that will notify the Applicant of any equipment faults, unexpected shutdowns, and/or other issues, and will be regularly inspected during the O&M term.

Critical electrical equipment and infrastructure will be monitored and controlled through the Supervisory Control and Data Acquisition System with provisions for local management and control during both planned maintenance or inspection activities and unplanned events. In the event of a fault or failure of the onshore components, the Applicant will repair and replace the Project component in a timely manner. Any unplanned maintenance and repair of the onshore substation facility will be managed as part of overall operations of the Project.

4.2 Physical Oceanographic Conditions

This section addresses the requirements of 16 NYCRR § 86.5 and describes the physical oceanographic environment in the vicinity of the submarine export cable corridor. In addition, this section discusses the potential impacts to physical oceanographic conditions resulting from construction and O&M of the NY Project, as well as proposed measures the Applicant will implement to avoid, minimize, and/or mitigate those potential impacts. Impacts to marine water and sediment quality are discussed in **Section 4.3**. Onshore geology and soils are described in **Section 4.7**.

4.2.1 Existing Conditions

Marine physical conditions include characteristics of the seafloor, bathymetry, currents, tides, wave heights, sea level elevation, water temperature, and sediment transport. These physical characteristics can interact in complex ways throughout the NY Project Area. For the purposes of this section, physical and oceanographic conditions in the vicinity of the submarine export cable corridor that have the potential to directly or indirectly affect or be affected by the construction and operation of the NY Project were evaluated.

4.2.1.1 Physical Oceanographic Studies and Analyses

Marine physical and chemical conditions in the NY Project Area were assessed using a combination of desktop analysis of publicly available data and the Applicant's surveys. The following resources were reviewed as part of the desktop analysis:

- Marine Cadastre National Viewer (NOAA 2021b);
- Natural Resources Conservation Service (NRCS) soil data;
- NE-US hindcast model operated by Kjeller Vindteknikk (2020);
- GROW-FINE EC5km hindcast model operated by Oceanweather Inc. (2018);
- NOAA National Data Buoy Center assets (NOAA 2019; NOAA 2020a, b, c, d);
- NOAA National Oceanographic Data Center World Ocean Atlas 2013 (NOAA 2013);
- Integrated Ocean Observing System Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS) (NOAA 2021c); and
- United Kingdom Hydrographic Office's (UKHO's) "Admiralty Sailing Directions, East Coast of the United States Pilot" (2009).

In addition, the Applicant conducted several site-specific geophysical and geotechnical survey campaigns for BW1, including along the submarine export cable corridor. The completed surveys included the following:

- High resolution geophysical survey by MMT between August 2020 and August 2021;
- High resolution geophysical survey by MMT between December 2021 and February 2022;
- Geotechnical and benthic survey by MMT between July 2021 and January 2022 including samples collected at 0.53-nm [1-km] intervals alternating A, B stations;
    - "A" Stations (1.07 nm [2km] between stations):

- Geotechnical vibracores to a target depth of 19 ft (6 m) and geoenvironmental vibracores to a target depth of 6 ft (1.8 m); and
- Sediment profile images/imaging and plan view images/imaging (SPI/PV).

o "B" Stations (1.07 nm [2 km] between stations):

- Seabed cone penetration tests (CPT) to a target depth of 19 ft (6 m);
- Benthic grabs;
- Sediment profile images/imaging and plan view images/imaging (SPI/PV); and
- Towed seafloor video.

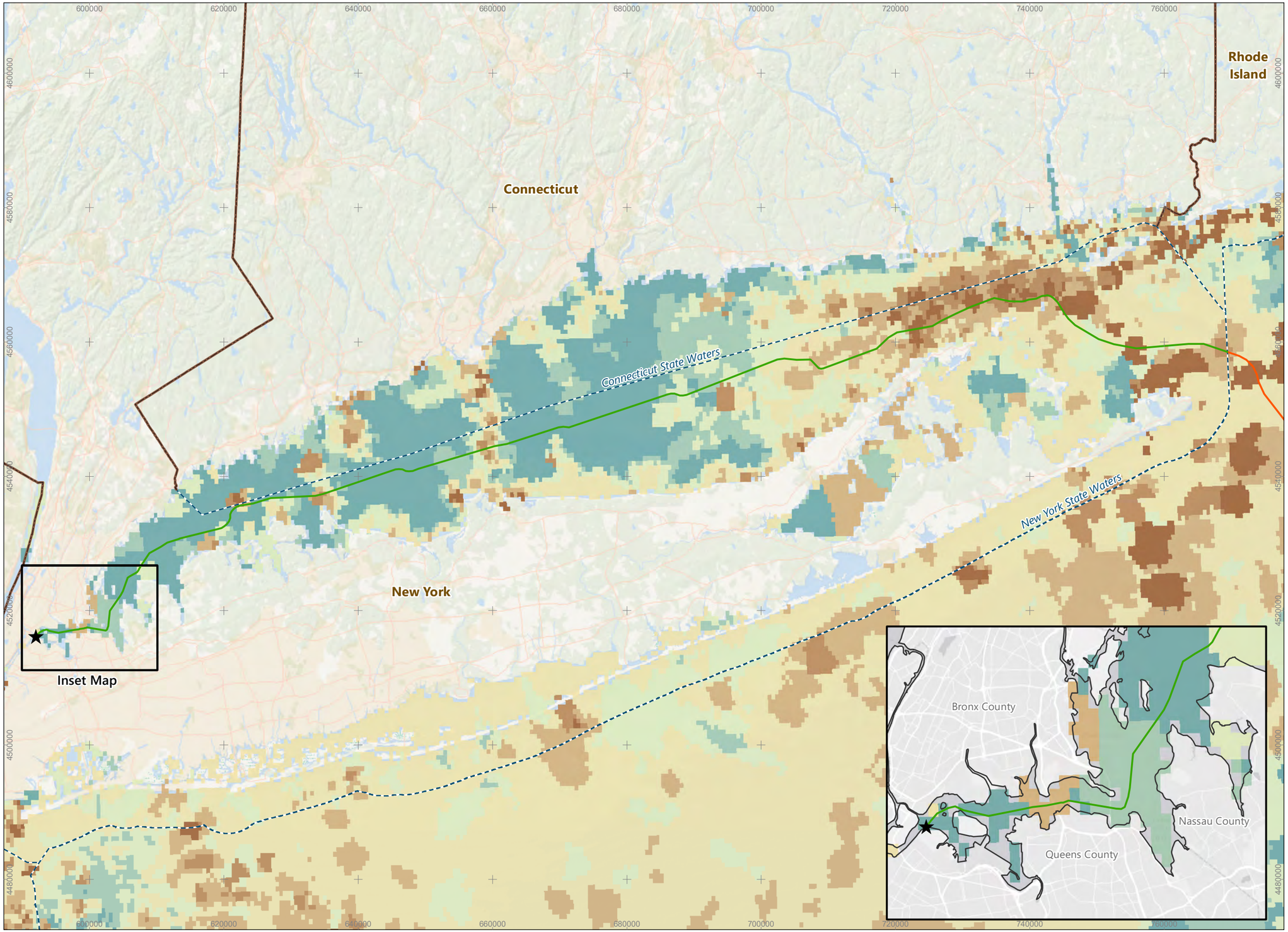
4.2.1.2 Surficial Geology

The submarine export cable corridor begins where the cable route crosses the state boundary 3 nm (5.6 km) offshore, which occurs in Block Island Sound approximately 8 nm (15 km) southwest of Block Island, Rhode Island, and 5 nm (9 km) northeast of Montauk, New York. From there, the submarine export cable route travels the length of Long Island Sound, remaining in New York State waters, to the landfall within the East River at the Astoria power complex in Queens, New York.

In the vicinity of the submarine export cable corridor, the underlying bedrock is primarily comprised of gneisses and granites of the Pre-Cambrian and Paleozoic ages and can be found at depths greater than 262 ft (80 m) below seabed level. The bedrock and overlying sediments in Block Island Sound were extensively eroded during the late Tertiary and early Pleistocene, carving valleys that coalesced and drained southward (McMaster and Ashraf 1973; Needell et al. 1983; Needell and Lewis 1984). Glacial drift sheets covered much of the region during the Quaternary period, and as the ice sheet retreated, meltwater was blocked behind end moraines forming pro-glacial lakes in the areas presently occupied by Block Island Sound and Long Island Sound. The submarine export cable corridor crosses areas of remnants of these moraines. A depression was cut into the moraine that formed an area at the eastern end of Long Island Sound called, "The Race" (i.e., the narrow straight where Long Island Sound meets Block Island Sound that is known for strong currents), which is believed to be the spillway for glacial Lake Connecticut. As sea levels rose and transgressed across the continental shelf, fluvial-estuarine deposits covered much of the outwash plain and infilled low-lying areas, gradually transitioning into a shallow marine environment with sandy sediments and fine-grained deposits in deeper water. Tidal forces dominate the present-day Long Island Sound, and areas of scouring and redistribution of glacial and younger sediments commonly occur as a result of the strong tidal currents (Poppe et al. 2006; Poppe et al. 2008).

The surficial sediment along most of the submarine export cable corridor is comprised of silts, clays, and fine sands, with some medium to coarse sandy areas within Long Island Sound and Block Island Sound. Toward the eastern end of Long Island Sound, sand and gravel are the main sediments with areas of cobbles and boulders found near The Race (**Figure 4.2-1**) (USGS via Marine Cadastre, Mar 2021).

Figure 4.2-1. Surficial Sediments along the Submarine Export Cable Route



Beacon Wind 1 Project

Long Island Sound, New York

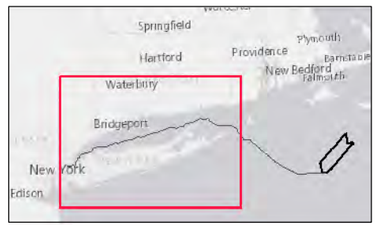
Article VII Application

Surficial Sediment (Grain Size)

- Clay (< 0.002 mm)
- Silt (0.002 - 0.06 mm)
- Very Fine Sand (0.06 - 0.125 mm)
- Fine Sand (0.125 - 0.25 mm)
- Medium Sand (0.25 - 0.5 mm)
- Coarse Sand (0.5 - 1 mm)
- Very Coarse Sand (1 - 2 mm)
- Gravel/Granule (> 2 mm)

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary



0 5 10 Miles

0 10 20 Kilometers

Prepared May 5, 2022

Data Sources: The Nature Conservancy, 2015.

Basemap: Esri ArcGIS Online "World Ocean Base" map service.

4.2.1.3 Bathymetry and Seabed Formations

Bathymetric conditions within the submarine export cable corridor were determined by a review of publicly available National Oceanic and Atmospheric Administration (NOAA) digital elevation models (DEM) derived from source hydrographic survey soundings as well as the NY Project's offshore geophysical and geotechnical survey campaign data. Water depths across the submarine export cable corridor are variable and generally range from 0 ft (0 m) at the landfall to 295 ft (90 m) North American Vertical Datum of 1988 (NAVD88) maximum depth towards eastern Long Island Sound and The Race (NOAA 2003). Several channels exist throughout the submarine export cable corridor, both natural and man-made. The nearshore portion of the submarine export cable corridor traverses an area where depth and bathymetry are heavily influenced by dredging. The Applicant also identified certain natural and anthropogenic seafloor features, such as channels and anchorage areas, that may occur along the submarine export cable corridor. An overall depiction of bathymetry in the vicinity of the submarine export cable corridor is provided in **Figure 4.2-2**.

Seabed formations and slopes are highly variable throughout the submarine export cable corridor (**Figure 4.2-3**), some of which are related to the Pleistocene glaciation processes and/or the presence of currents that move the loose and sandy sediments. Seabed slopes range from 0 degrees in relatively flat and featureless areas (e.g., Central Long Island Sound) to approximately 44.3 degrees at the crest of a sandwave feature near The Race. Seabed formations are most irregular within Long Island Sound and Block Island Sound, particularly in the eastern Long Island Sound near The Race.

There are three significant recessional end moraines located at the eastern end of Long Island Sound, within The Race, which have contributed to the existing seabed formations and bathymetry of the area. Great Gull Island, Fishers Island, and the submerged ridge between them were formed by the Harbor Hill-Roanoke Point-Charleston moraine, which trends in a southwest-northeast direction. Surface boulders and smaller ridges run parallel to the moraine. The following notable seabed features are found along the submarine export cable corridor:

- Kame and esker – A discontinuous, sinuous ridge approximately 197 ft (60 m) wide and extending approximately 10 ft (3 m) about the surrounding seafloor is located 0.67 to 1.2 mi (1 to 2 km) east of Great Gull Island and has been interpreted as an esker which represents glaciofluvial deposition beneath stagnant ice (Poppe et al. 2006).
- Rocky outcroppings – Rocky seabed or bedrock outcroppings have been described across the submarine export cable corridor, primarily in proximity to the Long Island shoreline. Additionally, outcroppings or shallow bedrock are expected in the eastern part of Long Island Sound and Block Island Sound due to the presence of end moraines.
- Boulders – Isolated boulders as well as boulder fields are expected to be present along the submarine export cable corridor due to the glacial influence of this region. Certain areas of boulder seafloor as seen from bathymetry data have also been depicted on admiralty charts (NOAA 2021).
- Bedforms within The Race – Many of these features exhibit the typical characteristics of bedforms within an area of sandy sediments subject to high on-bottom currents. Some features do not have the same, typical characteristics. These features are expressed as craters or scour pits and are typically very steep sided.

- Outcropping/sub-cropping hard ground – likely moraine/till.
- Residual scour depressions.

Upon entering New York State waters, the submarine export cable corridor crosses Block Island Channel, a deep channel with shallow flanks located between Long Island and Block Island with water depths between 164 and 269 ft (50 and 82 m) (AECOM 2020). Within Western Block Island Sound, six major depressions are characterized by shallow ridges and knolls with water depths ranging from 210 to 330 ft (64 to 100 m). Seabed conditions are comprised of upper flats, depressions, mid flats, low slopes, and upper slopes.

Long Island Sound is divided into five regions including the Eastern Basin, Central Basin, Western Basins, Eastern Narrows, and Western Narrows (**Figures 4.2-2** and **4.2-3**). The Eastern Basin is characterized by gentle slopes and deep water with depths ranging from 114 to 197 ft (35 to 60 m) in most areas. The deepest portion of the Eastern Basin occurs at The Race, which reaches water depths of approximately 300 ft (91m). Flow westward from the Eastern Basin to the Central Basin is attenuated by Mattituck Sill, a shallow submarine ridge, with depths averaging 69 ft (21 m) (Gottschall et al. 2000). Seabed formations in the Eastern Basin are predominantly comprised of depressions, with low slopes and upper slopes found near The Race, and upper flats, upper slopes, low slopes, and mid-flats along the Mattituck Sill.

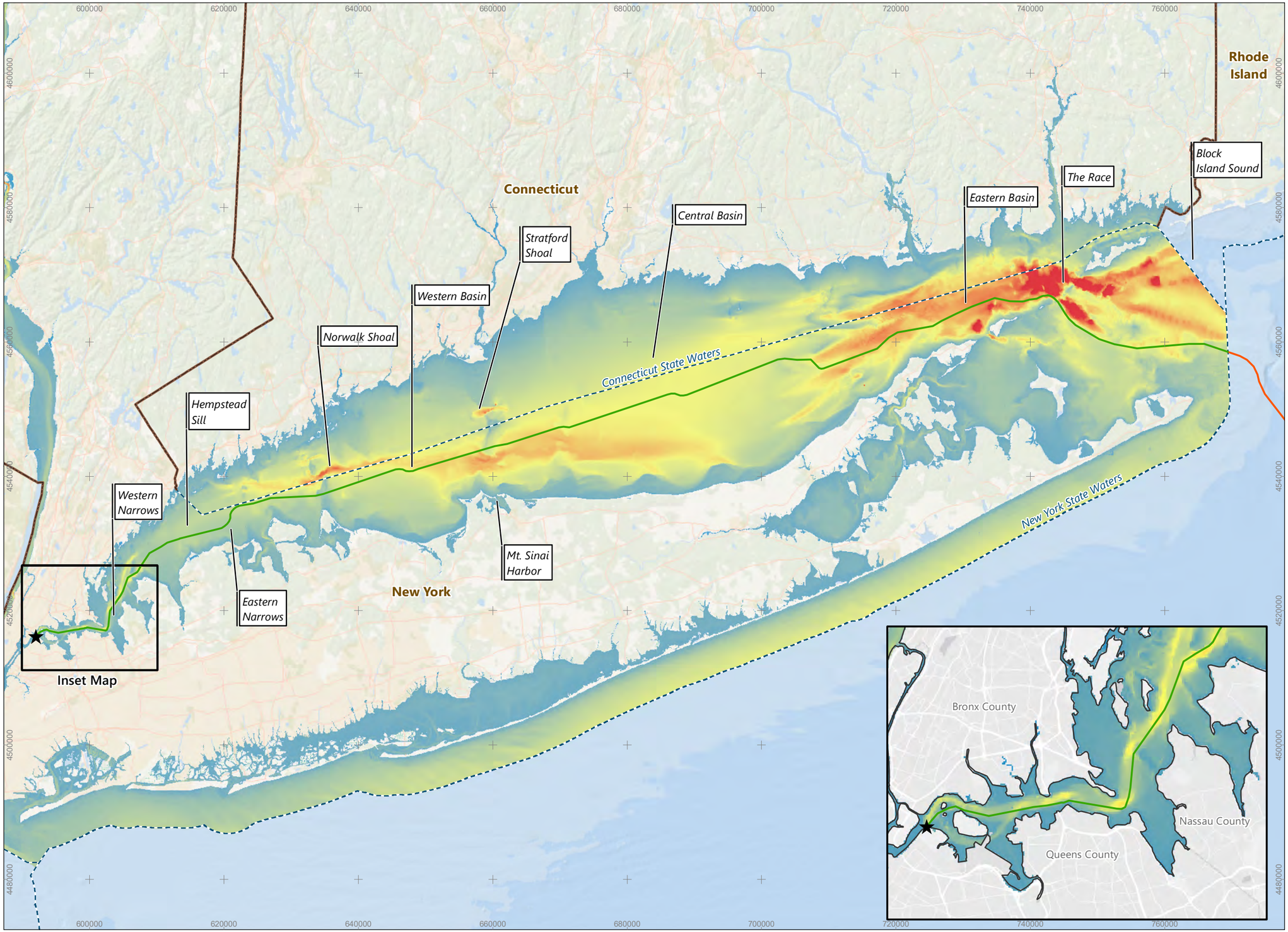
The Central Basin of Long Island Sound is the largest and widest portion of Long Island Sound, bound by the Mattituck Sill to the east and the Stratford Shoal to the west. The Central Basin is characterized by gentle slopes leading into a flatter bottom, generally 100 ft (30 m) in depth. Approximately 5.3 mi (4.6 nm, 8.5 km) north of Mt. Sinai Harbor, Long Island is the deepest area of the Central Basin, which reaches water depths of approximately 147 ft (45 m). Seabed forms in the Central Basin are predominantly depressions and mid-flats, with some areas of upper flats. Flow is restricted between the Central Basin and Western Basin by the shallow areas of the Stratford Shoal which extends from Stratford, Connecticut south to Port Jefferson on Long Island.

The Stratford Shoal is characterized by shallow areas separated by two deeper east-west channels: one located approximately 4 mi (3.5 nm, 6.4 km) south of Connecticut and one located approximately 2 mi (1.7 nm, 3 km) north of Long Island. Seabed forms in the Stratford Shoal are predominantly upper flats and upper slopes, with low slopes where channels cut through the shoal.

The Western Basin of Long Island Sound is characterized by gentle bathymetric slopes extending from the northern and southern shores toward the basin's center. A deeper natural channel runs east-west along the main axis of Long Island Sound with water depths ranging from approximately 115 ft (35 m) mid basin and increasing westward toward the Norwalk Shoal, up to maximum of approximately 200 ft (61 m) at the Norwalk Shoal southern channel. Seabed forms in the Western Basin are predominantly depressions and mid-flats.

The Norwalk Shoal extends from Norwalk, Connecticut southward to Eaton's Neck on Long Island and has two deeper areas that are separated by shallow shoals that restrict flow between the Western Basin and the Eastern Narrows. Seabed forms at the Norwalk Shoal include upper flats, upper slopes, and low slopes where the channels cut through the shoal.

Figure 4.2-2. Bathymetry along the Submarine Export Cable Route



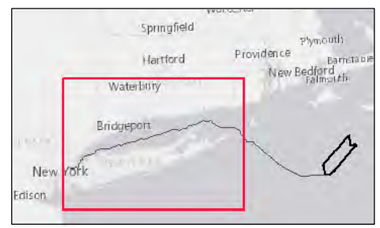
Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

Water Depth (Meters, NAVD88)
0 m
30.6 m
123.4 m

Project Components
- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

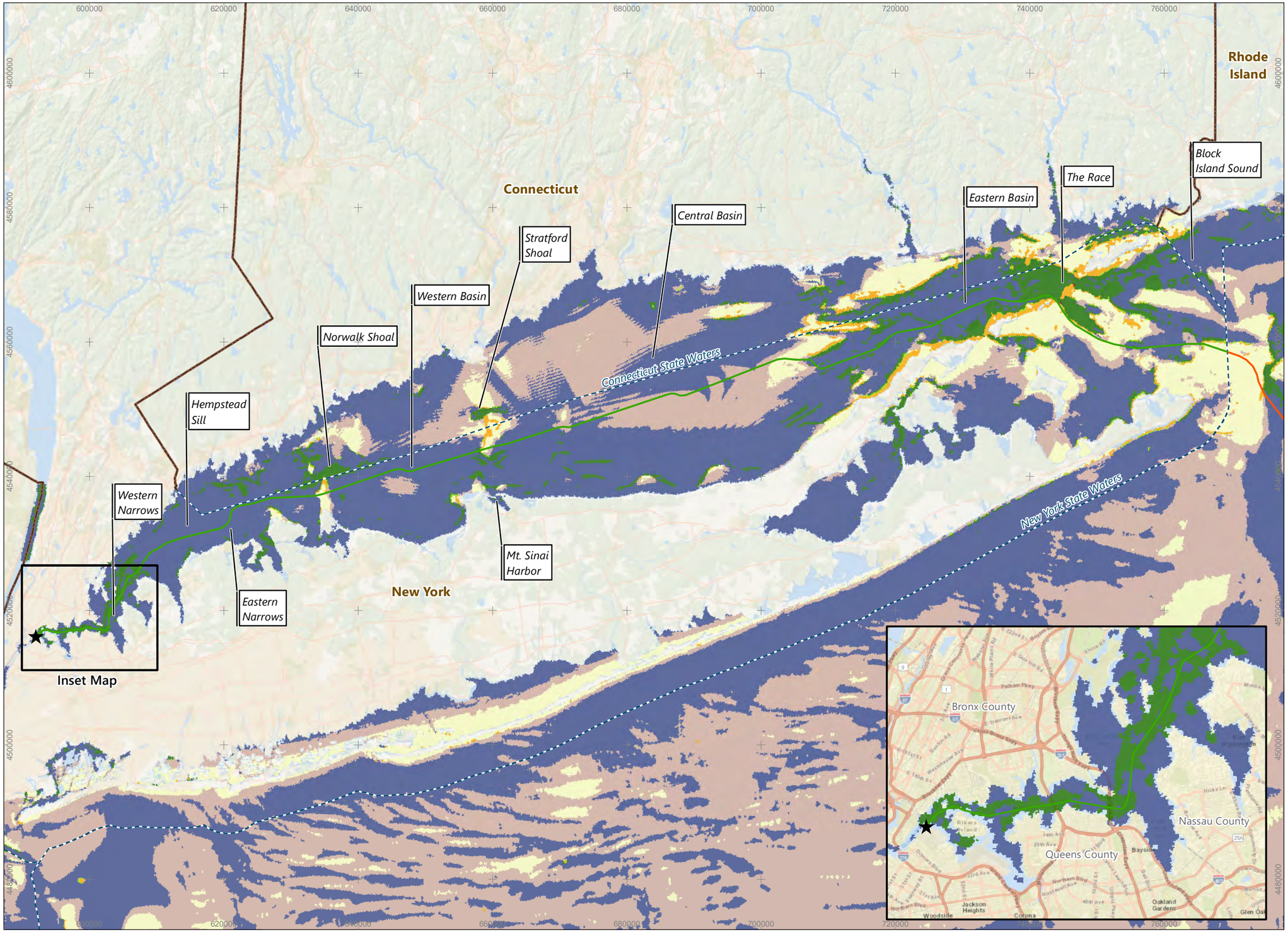


0 5 10 Miles

0 10 20 Kilometers

Prepared May 5, 2022
Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Figure 4.2-3. Seabed Formations



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

Seabed Forms (Legend)

- Depression
- Mid Flat
- Upper Flat
- Low Slope
- Side Slope
- Upper Slope

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022
Data Sources: USGS, usSEABED, 2010
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

The Narrows is the westernmost portion of Long Island Sound, extending between the Norwalk Shoal in the east to the mouth of the East River in the west. The Hempstead Sill, a shoal extending from Matinecock Point on Long Island to the New York/Connecticut boundary in the north, divides the Narrows into the Eastern Narrows and Western Narrows. The Eastern Narrows are nearly level with water depths ranging from 32 to 66 ft (10 to 20 m). Predominant seabed forms include depressions with some low slopes. The Western Narrows have more variable water depth (32 to 108 ft [10 to 33 m]) as reefs and islands are common features (Gottschall et al. 2000; NOAA 2021). Predominant seabed forms in the Western Narrows also include depressions with some low slopes.

Within the East River, seabed forms include depressions with low slopes, and water depths are generally level within the navigation channel, maintained at approximately 35 ft (10.6 m), and more variable outside of the navigation channel ranging from 2 to 108 ft (0.6 to 33 m) deep.

4.2.1.4 Tides, Currents, Waves

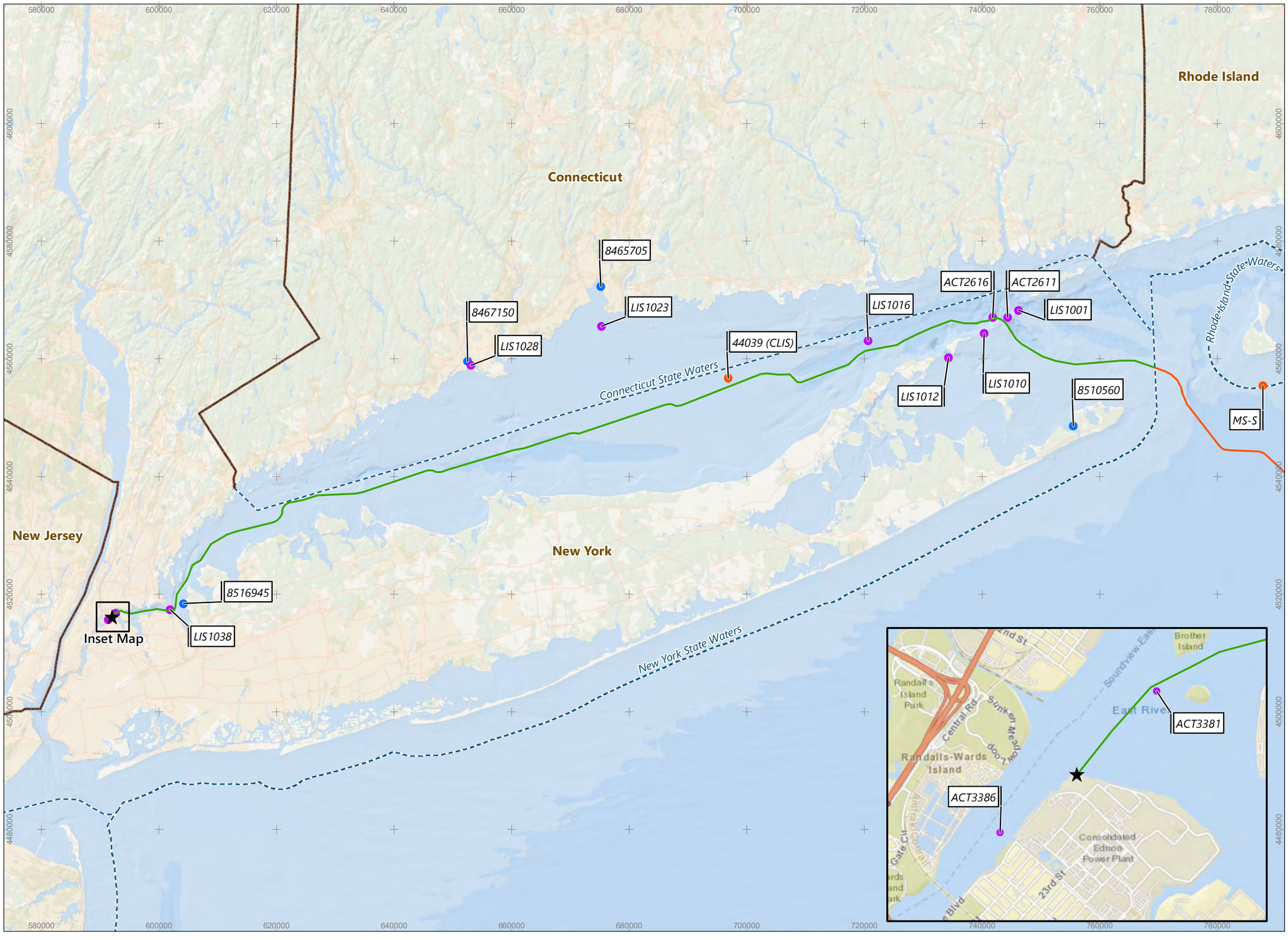
The East River, Long Island Sound, and Block Island Sound are tidal estuaries with semi-diurnal tides (four tides each day [two high, two low]). The NOAA Tides and Currents database provides tidal predictions and observations at stations throughout Long Island Sound and the East River (**Figure 4.2-4**). The closest station to the NY Project's cable landfall is located at Kings Point, New York (Station #8516945). This tide station indicated a mean diurnal range of 7.8 ft (2.38 m). **Table 4.2-1** summarizes tidal ranges calculated over several years at a selection of NOAA stations within Long Island Sound.

TABLE 4.2-1. TIDAL RANGES ALONG SUBMARINE EXPORT CABLE ROUTE

Station ID	Station Name	Data Period	Tidal Ranges			
			MHHW (ft [m])	MLLW (ft [m])	Mean Tidal Range (ft [m])	Diurnal Range (ft [m])
8516945	Kings Point, NY	Oct 27, 1998 - present	6.45 (1.97) on 10/30/12	-4.01 (1.22) on 1/6/18	7.16 (2.18)	7.8 (2.38)
8467150	Bridgeport, CT	Jun 10, 1932 - present	5.72 (1.74) on 10/30/12	-4.58 (-1.39) on 2/2/76	6.74 (2.05)	7.32 (2.23)
8465705	New Haven, CT	Aug 11, 1999 - present	5.52 (1.68) on 10/30/12	-3.24 (-0.99) on 1/6/18	6.16 (1.88)	6.73 (2.05)
8510560	Montauk, NY	Sep 05, 1947 - present	5.91 (1.80) on 8/31/54	-3.78(-1.15) on 2/2/76	2.07 (0.63)	2.53 (0.77)

Source: NOAA 2021

Figure 4.2-4. Metocean Stations



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

- NOAA Current Velocity Prediction Station
- NOAA NDBC Buoy
- NOAA Tidal Prediction Station

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022
Data Sources: NOAA
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Velocity and direction of Long Island Sound currents typically depends on wind, weather, chemical ocean conditions (temperature and salinity), and geomorphology (bathymetry and land masses). Northeast storms largely dictate the regional currents and sediment mobility during the winter months (Ashley et al. 1986). Within Long Island Sound and especially along the eastern part of Long Island Sound, current direction predominantly moves westward. Within Block Island Sound, a current moving to the east splits before encountering Block Island. One of its branches continues to flow eastward into Rhode Island Sound and forms an anticyclonic circulation around Block Island, while the other branch turns southward to flow out of Block Island Sound and then moves southwestward along the shore (Luo et al. 2013). The strongest currents in this area are of tidal origin and are sufficient to move fine sand and coarser sediments and to produce coarse lag deposits in areas of erosion (USGS 1997). Within the East River, eddies[4] of varying levels of turbulence occur in numerous locations but generally follow the channels (NOAA 2019). Mean tidal currents are over 2 meters per second (m/s; 3.9 knots) in The Race and decrease to less than 0.25 m/s (0.5 knots) in parts of the Western Narrows (NOAA 2003).

A United States Geological Survey (USGS) modeling study of the bottom tidal-, wave-, and wind-driven currents in Long Island Sound indicates that the strongest bottom currents (≥ 0.5 m/s [1 knot]) are located in the eastern part of Long Island Sound, where the width of the Sound is relatively narrow. As the width of Long Island Sound increases to the west, the peak speed of tidally driven bottom currents decreases. The central Long Island Sound has bottom current speeds of 0.2 to 0.3 m/s (0.4 to 0.6 knots), and the western Long Island Sound contains some areas where current speeds < 0.2 m/s (0.4 knots). The only areas in the western Long Island Sound where tidal currents > 0.2 m/s (0.4 knots) are near headlands (USGS 1997).

Publicly available current data along the submarine export cable corridor were reviewed to further understand water currents along the submarine export cable route. NOAA provides an annual prediction of current velocities at several stations within Long Island Sound, Block Island Sound, and the East River (**Figure 4.2-4)**. Current velocities were typically predicted to be highest toward the east end of Long Island Sound and within Block Island Sound with several predicted current velocities in excess of 1.5 m/s (3 knots). Annual maximum (flood) values of 1 m/s (2 knots) were reported at the South Brother Island station, the station closest to the landfall, with an annual average flood/ebb of 0.67 m/s (1.3 knots). Station ACT3386 (off Winthrop Avenue in Astoria, Queens, New York) reports maximum velocities of 2.37 m/s (4.6 knots) within the East River just west of the landfall location. The maximum, minimum and average current velocities at a selection of stations are presented in **Table 4.2-2**.

TABLE 4.2-2. LONG ISLAND SOUND 2010 CURRENT SURVEY RESULTS

Station ID	Station Name	Current Velocities		
		Maximum (m/s [knots])	Minimum (m/s [knots])	Average (m/s [knots])
ACT3386	Off Winthrop Ave, Astoria	2.37 (4.6)	0.87 (1.7)	1.49 (2.9)
ACT3381	South Brother Island,	1.03 (2.0)	0.41 (0.8)	0.67 (1.3)
LIS1038	Throgs Neck	1.3 (2.0)	1.36 (0.7)	2.53 (1.3)

[4] A circular movement of water, counter to the main current, causing small whirlpools.

Station ID	Station Name	Current Velocities		
		Maximum (m/s [knots])	Minimum (m/s [knots])	Average (m/s [knots])
LIS1023	New Haven, CT	0.51 (1.0)	0.58 (0.3)	1.17 (0.6)
LIS1028	Bridgeport, CT	0.15 (0.3)	0.19 (0.1)	0.39 (0.2)
LIS1016	Cornfield Point	1.54 (3.0)	2.33 (1.2)	4.08 (2.1)
LIS1012	Plum Gut	2.16 (4.2)	1.94 (1)	4.67 (2.4)
ACT2611	Little Gull Island	3.24 (6.3)	4.47 (2.3)	8.16 (4.2)
ACT2616	Little Gull Island	2.06 (4.0)	2.33 (1.2)	4.67 (2.4)
LIS1010	Great Gull Island	2.21 (4.3)	3.11 (1.6)	5.44 (2.8)
LIS1001	The Race	2.93 (5.7)	3.89 (2)	7.19 (3.7)

Source: NOAA 2021

As part of the University of Connecticut's Long Island Sound Integrated Coastal Observing System (LISICOS), a series of moorings have been deployed throughout Long Island Sound to collect a suite of measurements, including atmospheric, wave, current, and nutrient data. NOAA Buoy #44039 within Central Long Island Sound was utilized in the LISICOS mooring (referred to as "CLIS Buoy") and outfitted with a surface-mounted RDI 600 kHz Acoustic Doppler Current Profilers (ADCP) unit, which measures currents through the approximately 98 ft (30 m) water depth at the mooring's location. Observed current profile measurements collected at this mooring from December 2018 to February 2019 were provided by the principal investigator of the LISICOS project, Dr. James O'Donnell of the University of Connecticut (O'Donnell 2021). A similar dataset was collected from a mooring just south of Block Island as part of the Rhode Island Ocean Special Area Management Plan (OSAMP) initiative. As part of the data collection efforts in support of the OSAMP project, several moorings were deployed within Rhode Island State Territorial Waters between 2009 and 2010. These moorings were outfitted with ADCP sensors that collected depth-variable velocity profiles through the water column at the mooring location. While several buoys were deployed as part of this project, data from only one of the moorings (MD-S Buoy) are publicly available, with observed currents between October 2009 and October 2010 (OSAMP 2010).

Figure 4.2-5 shows depth-averaged current roses from moorings within Long Island Sound (CLIS Buoy) and just south of Block Island (MD-S Buoy). Currents generally flow along an east-west alignment and have a mean speed of less than 0.3 m/s (0.6 knots) (see **Table 4.2-3** for monthly mean speed).

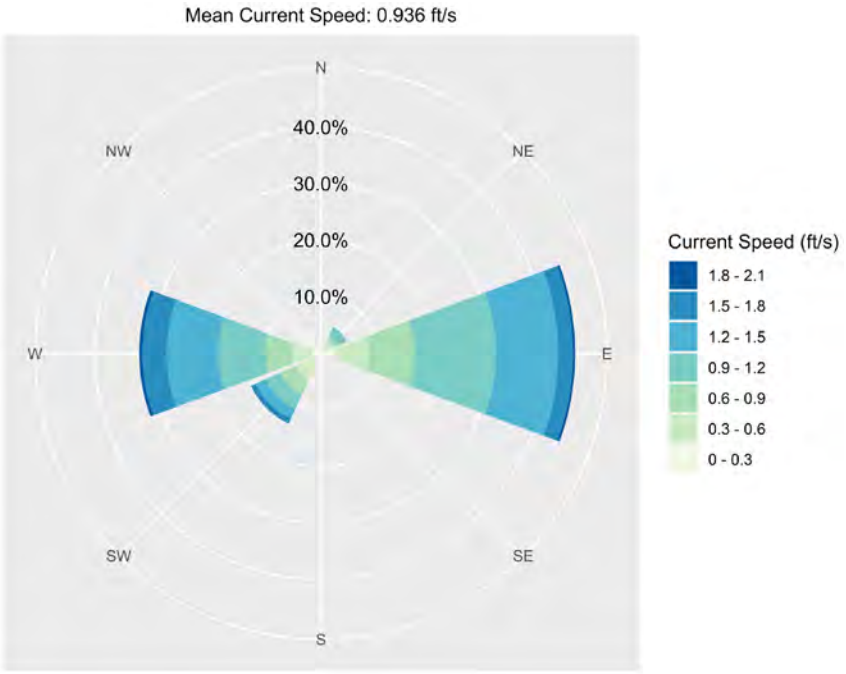
TABLE 4.2-3. MEAN CURRENT SPEED

Average Current (m/s [knots])													
Buoy ID	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
44039 (CLIS)	Dec 2018-Feb 2019	0.3 (0.6)	0.3 (0.6)	---	---	---	---	---	---	---	---	---	0.3 (0.6)
MD-S	Oct 2009-Oct 2010	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)	0.2 (0.4)

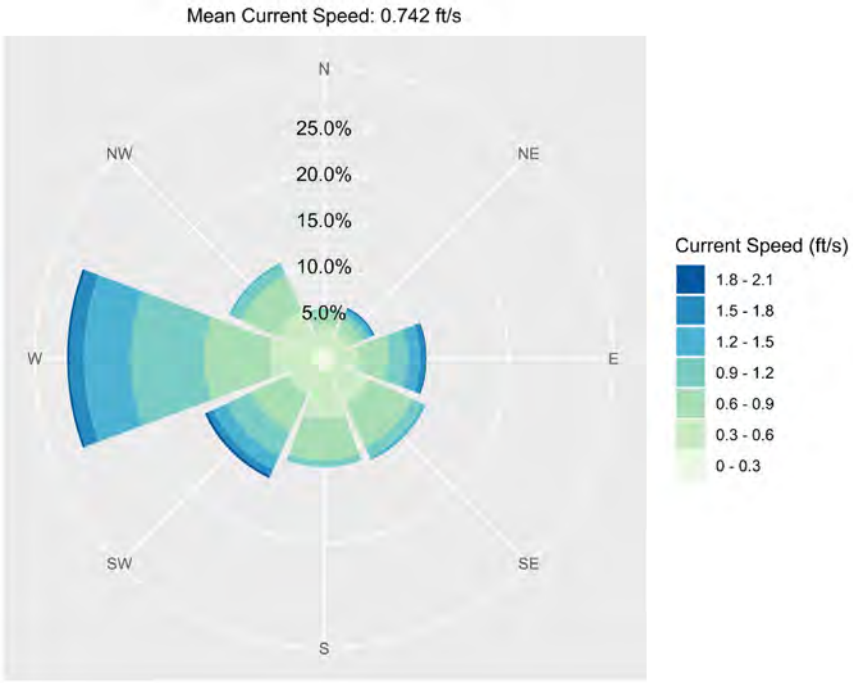
Note: --- Signifies months not part of timeframe evaluated.
Sources: O'Donnell 2021; OSAMP 2010

Figure 4.2-5. Depth-Averaged Current Roses

Central Long Island Sound (Buoy 44039)



South of Block Island (MS-S Buoy)



Wave height data were collected from the NOAA NDBC CLIS Buoy (Buoy #44039) from 2006 to 2017 (**Table 4.2.4** and **Figure 4.2-4**). Monthly wave heights averaged in the range of 1.0 to 2.1 ft (0.3 to 0.6 m) with the largest waves documented during winter months. Wave direction is primarily from the southerly direction (southeast [135 degrees] through southwest [225 degrees]).

TABLE 4.2-4. MONTHLY AVERAGE SIGNIFICANT WAVE HEIGHT AT BUOYS

		Average Wave Height in (ft [m])											
Buoy ID Buoy Name	**Period**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
44039 Central LIS	2006-2017	2.0 (0.6)	1.9 (0.6)	1.6 (0.5)	1.3 (0.4)	0.9 (0.3)	0.9 (0.3)	0.9 (0.3)	1.0 (0.3)	1.3 (0.4)	1.8 (0.6)	1.9 (0.6)	2.1 (0.6)

Source: NOAA National Data Buoy Center (https://www.ndbc.noaa.gov/)

4.2.1.5 Sea Level

Historical data of sea level rise along the shoreline and coastal regions of the NY Project Area do not indicate significant rates of sea level rise in the past. According to NOAA's Tides and Currents database, sea level rise at the Kings Point location (Station #8516945) in the vicinity of the landfall (**Figure 4.2-4**) has occurred at a rate of approximately 0.09 inches per year (in/yr) (2.3 millimeters per year [mm/yr]), based on monthly mean sea level data from 1931 to 2020. The sea level rise at this location over that period is equal to a change of 0.76 ft (0.23 m) in 100 years.

The New York City Climate Resiliency Design Guidelines version 4.0 (NYC 2020) present climate change sea-level rise projections based on a report from the New York City Panel on Climate Change (NPCC 2015). Each projection estimate has a probability associated with it based on the outcome likelihood; the 75th percentile is defined as the value where 75 percent of outcomes have the same value or lower. Projected sea level rise for New York City in the 25th to 75th percentile range is 11 to 21 inches (0.28 to 0.53 m) by the 2050s, or approximately by the end of the NY Project's expected lifespan (NPCC 2015). Similarly, 6 NYCRR Part 490 adopts sea level projections for New York City with a medium projection of 16 in (406 mm) for the 2050s (a range of 8 in [203 mm] as the lowest estimate to 30 in [762 mm] as the highest estimate). Future predictions of potential sea level rise over the lifespan of the NY Project have been considered in the design basis for the onshore components of the NY Project, including the onshore substation elevation, which has assumed a 2 ft (0.61 m) sea level rise over the lifespan of the NY Project.

4.2.1.6 Water Temperature

Water temperatures in the NY Project Area vary based on seasonal trends, with warmer water temperatures during the warmest months of the year, and colder water temperatures during the coldest months of the year. Thermal stratification develops in the spring and breaks down in the fall (NOAA 2003). Typically, warmest temperatures can be found at surface waters, and temperatures decrease with depth. However, during the coldest months, deeper waters can retain slightly warmer temperatures than the surface waters.

Water temperatures at the NOAA CLIS Buoy (Buoy #44039) were measured at a depth of 3.3 ft (1.0 m) and reported a monthly average temperature range of 35.7 to 74.5 °F (2.1 to 23.6 °C). **Table 4.2-5** provides monthly averages

TABLE 4.2-5. AVERAGE SEA TEMPERATURE IN CENTRAL LONG ISLAND SOUND

Average Sea Temperature in (°F [°C])													
Buoy	**Depth – Below Water Line ft (m)**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
44039 (CLIS)	3.3 (1.0)	39.8 (4.3)	35.7 (2.1)	38.1 (3.4)	42.9 (6.1)	53.0 (11.7)	63.5 (17.5)	72.5 (22.5)	74.5 (23.6)	71.7 (22.1)	64.7 (18.2)	55.2 (12.9)	46.4 (8.0)

Source: NOAA National Data Buoy Center (https://www.ndbc.noaa.gov/). Data collected between 2004 -2019.

4.2.1.7 Sediment Transport, Suspension, and Deposition

Sediment transport or seabed mobility is dependent on the sheer stress imparted by current or wave action that exceeds the resisting forces holding the sediment in place. Seabed mobility is generally anticipated to occur at the eastern end of Long Island Sound near The Race, where a large volume of water passes through a relatively narrow opening with high current velocity (Poppe et al. 2008; Cathie 2021). In addition, fine-grained sediments such as fine sands, silts, or clays, have a higher potential to be released into the water column. Sediments along the submarine export cable corridor transition from sands and gravels near the mouth of Long Island Sound to higher concentrations of silt as the cable corridor extends to the west, toward the East River.

Mobile bedforms higher than 3.28 ft (1 m) are classified as sand waves, and mobile bedforms between 0.66 and 3.28 ft (0.2 m and 1 m) are classified as mega ripples (Poppe et al. 2008). In the eastern part of Long Island Sound and Block Island Sound, there are at least 13 separate areas of large-scale bedforms, including mega ripples and sand waves (Poppe et al. 2008). Nine of the 13 areas are located in western Block Island Sound, with the other four in the eastern edge of Long Island Sound. The sand waves in the southern portion of The Race are formed primarily in gravelly sand, have crest-to-trough heights of up to 25.75 ft (7.85 m), and average wavelengths greater than 492.13 ft (150 m), with some exceeding 590.55 ft (180 m). Mega ripples are present in the stoss slopes and between the sand wave features, suggesting sediment transport is active and sand waves are propagating. In contrast, sand waves in the northwestern part of The Race are much smaller in both height (i.e., less than 6.56 ft [2 m]) and wavelengths (less than 78.7 ft [24 m]) (Poppe et al. 2008).

Three large barchanoid sand waves are located northwest of Great Gull Island, appearing as crescent-shaped features in planar view (Poppe et al. 2008). High resolution seismic reflection data indicate that these sand waves can reach heights of up to 22.97 ft (7 m) above the seafloor on their up-current sides. Sediment transport is not as strong throughout Central Long Island Sound, where it is wider and not as many mobile bedform features are present (Cathie 2021). However, there are four sand wave areas identified via bathymetric data at the eastern end of Long Island Sound through The Race and off Montauk Point (Poppe et al. 2008**).**

The percentage and recurrence of seabed mobility is shown in **Figure 4.2-6** and **Figure 4.2-7**, respectively. The western part of Long Island Sound has the lowest probability of seabed mobility (<2 percent) while the eastern part of Long Island Sound has significantly higher probability with the maximum value at 63.4 percent. Bed mobility in the vicinity of The Race varies substantially ranging from 6 percent to 26 percent (USGS 2012; Cathie 2021).

Figure 4.2-7 shows the frequency of seabed mobility events. Central and western Long Island Sound experience low frequency of bed mobility events (1 to 2 events per year on average) while high frequencies (< 12 days between bed mobility events) occurred around the eastern Long Island Sound, The Race, and Block Island Sound. Sample locations at The Race indicate that bed mobility events occur more than once per day. These results suggest that seabed mobility is more likely in areas of higher currents (up to 60 cm/s) (USGS 2012; Cathie 2021).

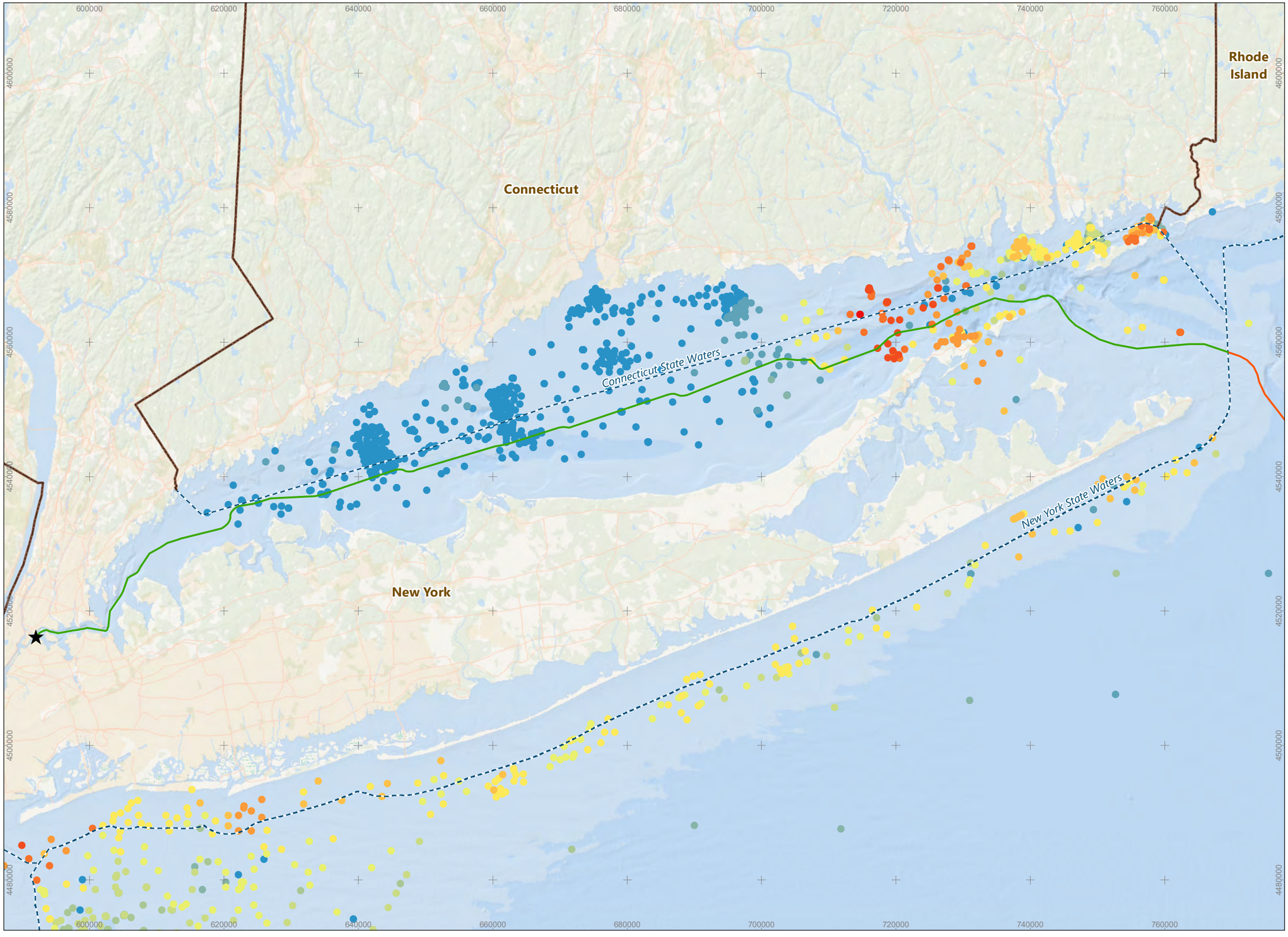
4.2.2 Potential Impacts

The Applicant has reviewed physical oceanographic data to inform the NY Project design and construction methods, including an assessment where surficial geology, bathymetry and metocean conditions may not be suitable for construction. To the extent practicable, the submarine export cable has been sited to avoid seabed formations, wrecks, boulders and hard ground, as well as locations of mobile bedforms. In addition, where feasible, the submarine export cable has been sited outside of the navigation channels which typically exhibit higher current velocity than surrounding waters. The NY Project has also included appropriate cable installation methodologies and mitigation measures to account for existing conditions (see **Section 4.2.3**). NY Project infrastructure will be designed and installed using industry-standard methodology which will minimize the NY Project's potential impacts to existing physical oceanographic conditions.

4.2.2.1 Construction

No significant impacts to tides, currents, bathymetry, water level or temperatures are anticipated from NY Project-related construction activities. The installation of the submarine export cables, associated cable protection and site preparation activities including anchoring of NY Project vessels and pre-sweeping, may cause temporary disturbance to the seabed, resulting in the short-term suspension and dispersal of sediments. However, the seabed is expected to be restored, stabilized, and returned to pre-construction conditions over time as suspended sediments settle out through natural current flow.

Figure 4.2-6. Bed Mobility Percentage



Beacon Wind 1 Project

Long Island Sound, New York

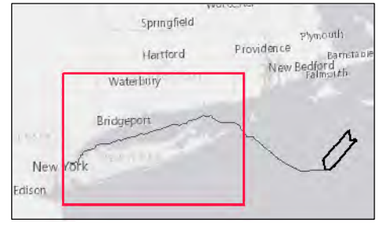
Article VII Application

Bed Mobility Percentage

- 0-1
- 2-3
- 4-5
- 6-7
- 8-10
- 11-14
- 15-18
- 19-23
- 24-28
- 29-38
- 39-59
- 60-93

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

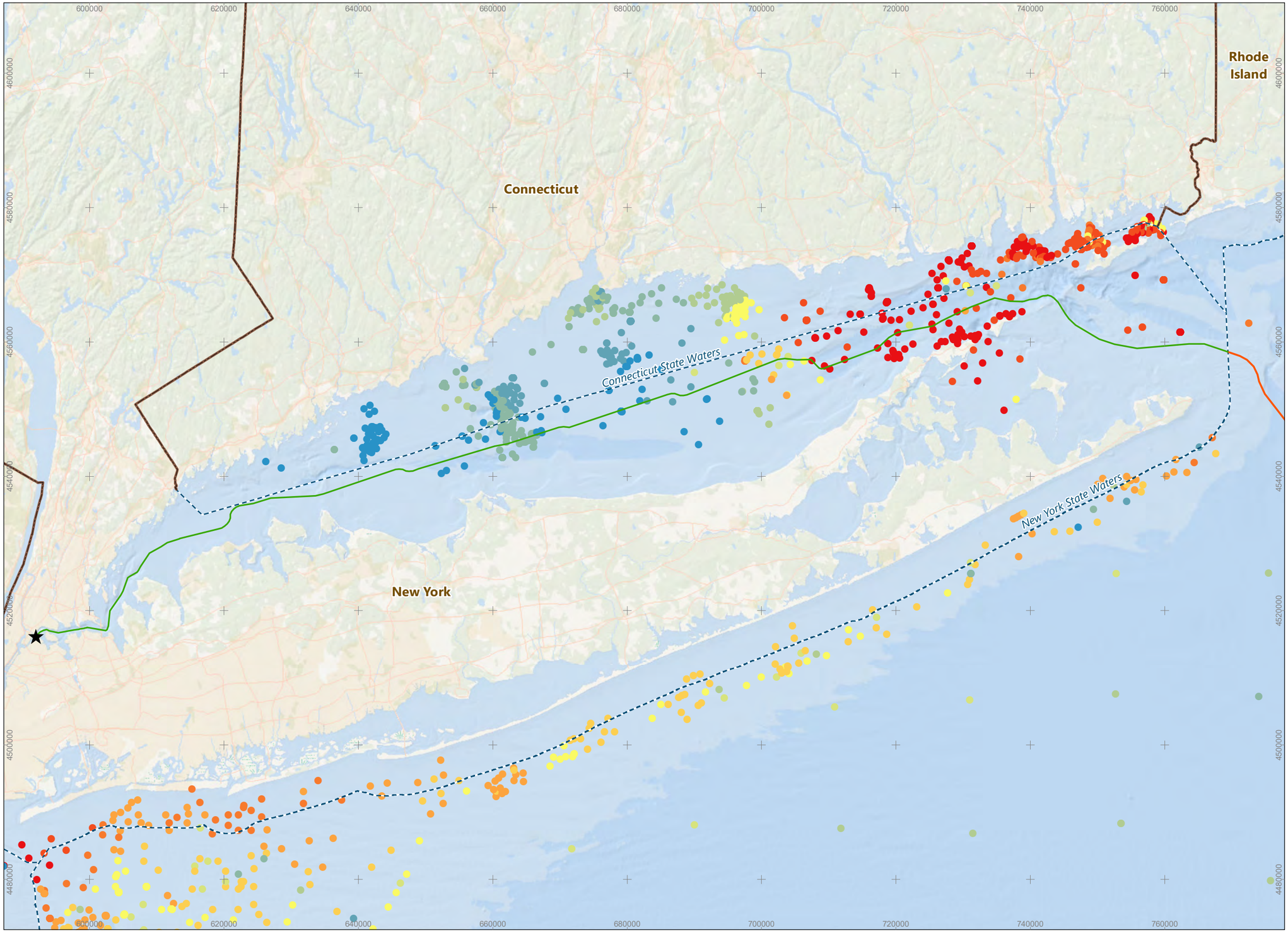


0 5 10 Miles

0 10 20 Kilometers

Prepared May 5, 2022
Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Figure 4.2-7. Bed Mobility Recurrence



Beacon Wind 1 Project

Long Island Sound, New York

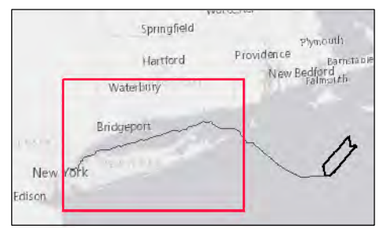
Article VII Application

Bed Mobility Recurrence Interval (Days)

- 0.3-1.3
- 1.4-2.6
- 2.7-4.2
- 4.3-5.9
- 6.0-7.6
- 7.7-10.4
- 10.5-16.6
- 16.7-33.2
- 33.3-73.0
- 73.1-121.7
- 121.8-365

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary



0 5 10 Miles

0 10 20 Kilometers

Prepared May 5, 2022
Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Sediments through Long Island Sound transition from sands and gravels near the mouth of Long Island Sound to higher concentrations of silt as the submarine export cable corridor extends to the west, toward the East River. During periods of sediment disturbance, sediments dominated by fine sand, silts, or clays, are more likely to be released into the water column which can temporarily increase total suspended solids (TSS) near the trench and cause sediment deposition outside of the trench.

Publicly available data collections and modeling studies of plowing, trenching, and dredging projects showed that a majority of disturbed sediments, specifically in areas with sandy sediment similar to those found in Long Island Sound, settled immediately to the seabed and were not dispersed in the water column (Latham et al. 2017; USACE 2015; Elliott et al. 2017). A Block Island Wind Farm cable study, completed during the 2016 cable installation, found that material was deposited 23 ft (7 m) outside the jet plow trench and was up to 10 in (25 cm) thick (Elliot et al. 2017). The deposited overspill sediment may have extended beyond 23 ft (7 m), but the deposition was negligible and less than what could be measured (Elliot et al. 2017). A bathymetric survey conducted four months after the initial cable installation found that the deposited materials had been redistributed by currents, and the sediment deposits were no longer distinguishable (Elliot et al. 2017).

Given results from these studies, sediment disturbance during NY Project construction is expected to be localized and short-term. Furthermore, the seabed and near-bottom water column are highly dynamic environments, with suspension and redeposition of sediment occurring continuously, due to storms and tidal currents. Sediment disturbance from these processes and other anthropogenic processes, such as trawling and commercial vessel anchoring, are similar to or more significant than any potential NY Project-related effects. See **Section 4.3** for additional discussion of potential impacts of sediment dispersion to water quality.

4.2.2.2 Operations and Maintenance

No significant impacts to tides, currents, bathymetry, water levels, or temperatures are anticipated from NY Project-related O&M activities. However, the presence of permanently buried submarine export cables and associated cable protection may result in localized scour. In addition, O&M activities associated with routine cable inspection may result in short-term seafloor disturbance due to potential maintenance dredging and cable protection or repair.

Localized Scour from Cable Protection. The Applicant may use cable protection in locations where target cable burial depth is not feasible or achieved, due to existing assets or where assessments deem necessary, to further minimize the effects of local sediment transport. The existence of cable protection on the seabed can result in localized scouring around the installed protective measure. Scouring processes will likely be more prevalent in the vicinity of The Race where tidal current flow can have a greater effect. The Applicant is consulting with the United States Army Corps of Engineers (USACE) and other applicable agencies regarding cable protection measures and minimizing scour to the extent practicable.

Scour protection, which usually consists of a layer of small sized rock and gravel topped with a layer of larger rocks placed immediately after installation, can reduce scour (Peterson 2014; Whitehouse et al. 2011). Edge scour is related to the size of the rock and the depth and tapering of the protection, with smaller rock and shallower protections with more tapering resulting in less edge scour (Peterson

2014). Potential impacts associated with scour protection are anticipated to be negligible since it will be limited to a small footprint and localized to specific cable protection areas.

Effects Due to Maintenance Dredging. Should one of the submarine export cables fault, the faulty portion of the cable will be spliced and replaced with a new, working segment. If the submarine export cables or cable protection measures require repair, or if new cable protection is required, impacts associated with repair activities will be similar to those described for construction activities but with a shorter duration and within a more limited area of the cable corridor. In certain locations, sedimentation or shoaling over the cables may also result in an exceedance of depth limitations over the cable over time. In these locations, especially along the approach to the landfall, maintenance dredging may be required during operations. Impacts associated with cable repair or maintenance dredging may include localized, direct, short-term seafloor disturbance that could result in short-term impacts to water quality from sediment disturbance. See **Section 4.3** for additional discussion of potential water quality impacts.

4.2.3 Summary of Avoidance, Minimization, and Mitigation Measures

The Applicant proposes the following measures to avoid, minimize, and mitigate potential impacts to physical oceanography during construction and O&M:

- Design and construct NY Project infrastructure with consideration of the existing surficial geology, bathymetry, tidal conditions, current velocities, and mobile bedforms in the submarine export cable corridor, including proper cable routing taking burial risks into account, bedform clearing (where necessary), direct embedment of the submarine cable, and adequate cable protection (where necessary);
- Site the submarine export cable corridor to avoid areas with boulders, wrecks, high currents, and significant bedforms to the extent practicable; and
- Complete additional study and analysis prior to construction and installation activities to inform the selection of methods to allow for the least impact, both to and from, the oceanographic conditions of the submarine export cable corridor.

4.3 Water and Sediment Quality

This section addresses the requirements of 16 NYCRR § 86.5 and describes the marine chemical environment in the vicinity of the submarine export cable corridor, including water and sediment quality characteristics. Potential impacts to water and sediment quality resulting from construction and O&M of the NY Project as well as proposed measures the Applicant will implement to avoid, minimize, and mitigate such impacts are also discussed.

4.3.1 Existing Conditions

Water quality data for this section were collected from several monitoring programs including the Environmental Protection Agency (EPA) National Coastal Condition Assessment, New York City Department of Environmental Protection (NYCDEP) Harbor Water Quality Survey, and New York State Water Quality Standards.

Sediment quality data in the vicinity of the submarine export cable corridor were obtained from data collected by the states of New York and Connecticut, NOAA's National Status and Trends program, the Coastal and Marine Geology Program of the USGS, and the USACE. In addition, the Applicant conducted several geophysical and geotechnical surveys along the submarine export cable route.

4.3.1.1 Water Quality

Water quality generally refers to the physical, chemical, and biological attributes of water. For the purposes of this section, water quality is assessed relative to the ability of these parameters of water to support the uses that currently exist and the flora, fauna, and ecosystem functions that occur within the respective waterbodies in the vicinity of the submarine export cable corridor. Water temperature, salinity, dissolved oxygen (DO), chlorophyll-a, turbidity, and nutrient levels are key parameters for characterizing ocean water quality. Some of these parameters are accepted proxies for ecosystem health (e.g., DO, nutrient levels), while other parameters such as temperature and salinity delineate coastal habitats from marine habitats (BOEM 2021).

4.3.1.1.1 Water Quality Classifications and Impaired Waterbodies

New York State Water Quality Standards, promulgated under 6 NYCRR Part 703, set the required water quality standards to support the best use indicated. Waterbodies that do not meet the criteria associated with their use classification are considered to be impaired. State water quality classifications and best uses of tidal waterbodies along the submarine export cable corridor fall into the following three categories as defined by 6 NYCRR Part 701:

- Classification SA: The best usages of Class SA waters are shellfishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish and wildlife propagation and survival.
- Classification SB: The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish and wildlife propagation and survival.
- Classification I: The best usages of Class I waters are secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

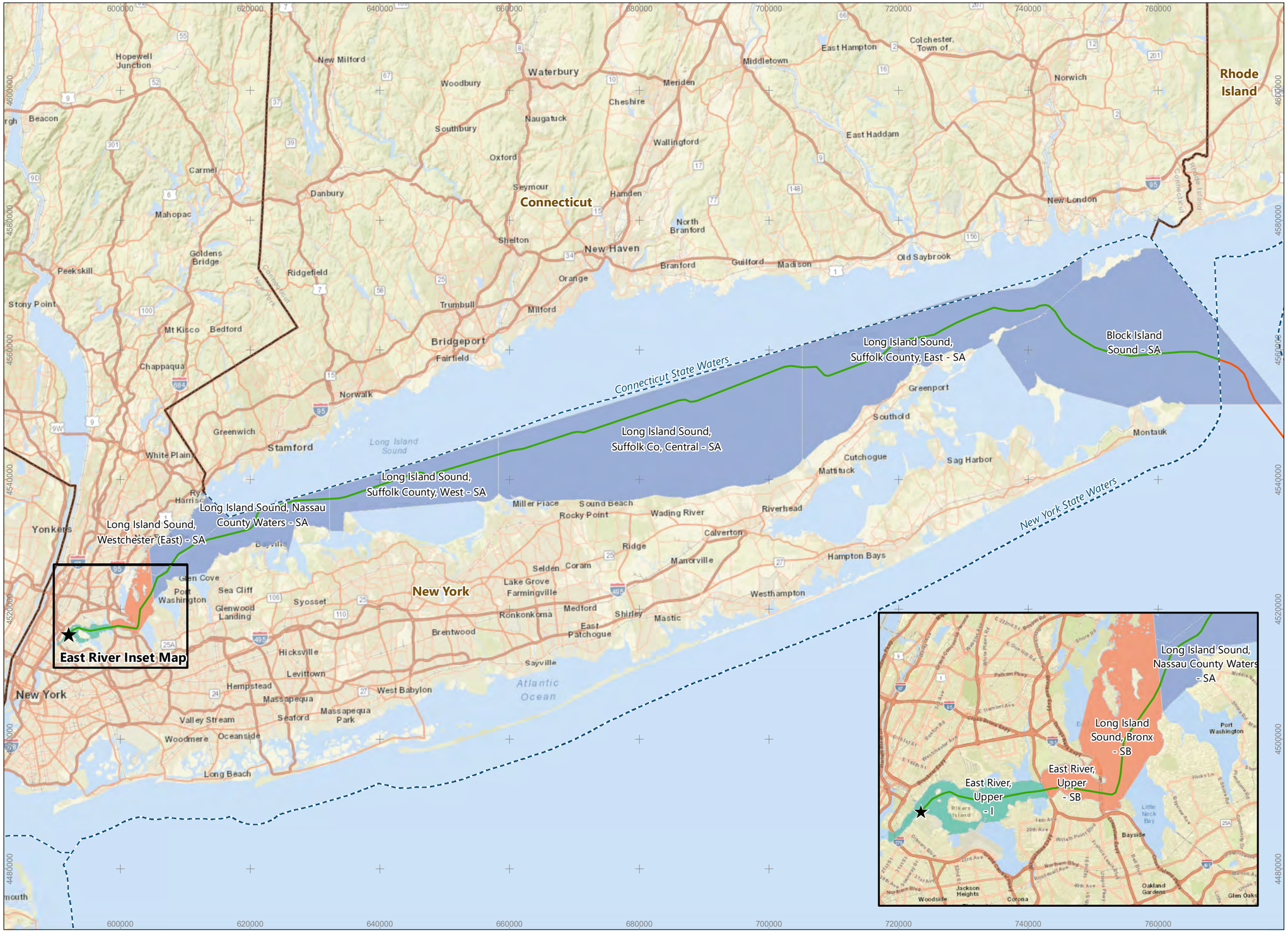
The New York State Department of Environmental Conservation (NYSDEC) maintains the Water Inventory/Priority Waterbodies List (WI/PWL), a database that contains information on water quality, the ability of waters to support their use classifications, and known or suspected sources of contamination or impairment. The submarine export cable corridor intersects several impaired waterways. Based on the most recent NYSDEC WI/PWL reports, these waters are not supportive of the uses specified for Class I, SA, and SB waters and are listed as impaired. State water quality classifications of tidal waterbodies along the submarine export cable corridor are depicted and described in **Table 4.3-1** and **Figure 4.3-1**.

TABLE 4.3-1. SUMMARY OF MARINE WATERBODY CLASSES CROSSED BY THE SUBMARINE EXPORT CABLE ROUTE

NYSDEC Segment	NYSDEC Classification	Best Usage (per 6 NYCRR 701)	Impairment	Impairment Sources
Block Island Sound (1701-0278)	SA	Suitable for shellfishing, public bathing and general recreation use, and support of aquatic life	PCBs in migratory fish	Unknown
Long Island Sound, Suffolk County, East (1702-0266)	SA	Suitable for shellfishing, public bathing and general recreation use, and support of aquatic life	PCBs in migratory fish	Unknown
Long Island Sound, Suffolk County, Central (1702-0265)	SA	Suitable for shellfishing, public bathing and general recreation use, and support of aquatic life	Pathogens, PCBs in migratory fish	Urban/Storm Runoff
Long Island Sound, Suffolk County, West (1702-0098)	SA	Suitable for shellfishing, public bathing and general recreation use, and support of aquatic life	Nutrients (nitrogen), Low DO, Pathogens, PCBs in migratory fish	Municipal Discharges, Urban/Storm Runoff
Long Island Sound, Nassau County, Central (1702-0028)	SA	Suitable for shellfishing, public bathing and general recreation use, and support of aquatic life	Nutrients (nitrogen), Low DO, Pathogens, PCBs in migratory fish	Municipal Discharges, Combined Sewer Overflows, Urban/Storm Runoff
Long Island Sound, Westchester (East) (1702-0001)	SA	Suitable for shellfishing, public bathing and general recreation use, and support of aquatic life	Nutrients (nitrogen), Low DO, Pathogens, Other Pollutants (floatable debris)	Municipal Discharges, Combined Sewer Overflows, Atmospheric deposition, Urban/Storm Runoff
Long Island Sound, Bronx (1702-0027)	SB	Suitable for public bathing and general recreation use, and support of aquatic life	Nutrients (nitrogen), Low DO, Pathogens, Other Pollutants (floatable debris)	Municipal Discharges, Combined Sewer Overflows, Atmospheric deposition, Urban/Storm Runoff
East River, Upper (1702-0032)	SB	Suitable for public bathing and general recreation use, and support of aquatic life	PCBs, Other Pollutants (floatable debris) Nutrients (nitrogen), Low DO, Oil and Grease	Urban/Storm Runoff, Combined Sewer Overflows, Toxic/ Contaminated sediment, Municipal Discharges
East River, Upper (1702-0010)	I	Assessed for general recreation use and support of aquatic life, but not for water supply or for public bathing use	PCBs, Other Pollutants (floatable debris) Nutrients (nitrogen), Low DO, Oil and Grease	Urban/Storm Runoff, Combined Sewer Overflows, Toxic/ Contaminated sediment, Municipal Discharges

Source: 6 NYCRR Chapter X Part 701

Figure 4.3-1. NYS Water Quality Classifications



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

NYS Water Quality Classification
- I
- SA
- SB

Project Components
- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022

Data Sources: NYSDEC Waterbody Inventory/Priority Waterbodies List (WI/PWL), 2017.

Basemap: Esri ArcGIS Online "World Street Map" map service.

4.3.1.1.2 Water Quality Conditions in the NY Project Area

The submarine export cable corridor passes through Block Island Sound and extends westward through the length of Long Island Sound to the proposed landfall at the Astoria power complex in Queens, New York, along the East River. In 1987, Congress designated Long Island Sound as an Estuary of National Significance. It is surrounded by some of the most densely populated areas of the nation, where 23 million people live within 50 mi (80 km) of its shores. The watershed of Long Island Sound drains an area of more than 10,764,800 ac (4,1356,360 ha), and it encompasses virtually the entire State of Connecticut, as well as portions of New York, Massachusetts, New Hampshire, and Vermont, with a small area at the source of the Connecticut River in Canada (LISS 2022).

Unlike a typical estuary, Long Island Sound has no major direct source of fresh water at its head. Instead, Long Island Sound has two marine inlets. Lower salinity waters enter the western end of Long Island Sound (i.e., the "Western Narrows") through two tidal straits—the East River and the Harlem River—which provide tidal connection to the New York Harbor's Upper Bay and the Hudson River, respectively. These rivers are adjacent to one of the highest population density areas and greatest percentage of impervious surface areas in the United States (USACE and PANYNJ 2016). Higher salinity waters of the Atlantic Ocean enter the Long Island Sound at its eastern end, through Block Island Sound and The Race. The largest source of fresh water is the Connecticut River, discharging into the eastern end of Long Island Sound, which contributes approximately 70 percent of the more than 6 trillion gallons of fresh water discharged to Long Island Sound by major tributaries each year. These unusual characteristics contribute to Long Island Sound's complex circulation and mixing patterns.

Stormwater runoff from the East River and the Western Narrows of Long Island Sound contribute large amounts of nonpoint source pollution. There are 14 major wastewater treatment facilities in New York City that discharge to the Western Narrows and New York Harbor (HEP 2011). Sediment loads to the East River are high due to overland runoff, poor land management practices, tributary channel erosion, and shoreline modification (USACE and PANYNJ 2016). Increased stormflow due to urbanization has further modified the natural environment and causes increased scour, and thus high sediment loads, in some areas (USACE and PANYNJ 2016).

Concentrations of contaminants, bacteria, nutrients, and metals have been decreasing due to implementation and enforcement of regulations under the Clean Water Act (CWA) promulgated over 45 years ago (HEP 2012). Despite improvements in water quality, legacy chemicals in the sediments, including mercury, polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), and dioxin, still exceed acceptable levels, and these contaminants can be resuspended in the water column during major storm events or from activities such as dredging (Steinberg et al. 2004).

Water quality generally improves from west to east and with distance from shore as oceanic circulation and tidal flushing disperses, dilutes, and biodegrades contaminants from New York City. Hence, areas closer to shore experience a greater range and frequency of variation in water quality parameters whereas areas farther offshore experience the more stable and less variable conditions of the oceanic waters. Areas with poor water quality are generally close to large population densities and/or industrial activity (EPA 2012).

The condition of coastal water was assessed by the EPA in the 2010 National Coastal Condition Assessment (NCCA) (EPA 2015a). Water quality data from the 2010 NCCA are available for 24 stations within Long Island Sound and Block Island Sound with sample locations shown in **Figure 4.3-2**. Analytes measured in this assessment included chlorophyll-a, dissolved inorganic nitrogen (DIN; the sum of nitrate, nitrite, and ammonium), dissolved inorganic phosphorus (DIP), DO at the bottom of the water column, and light transmissivity. These water quality parameters were used to determine an overall Water Quality Index for each sample characterized as "good," "fair," or "poor." As indicated in **Figure 4.3-2**, the samples within Long Island Sound and Block Island Sound were categorized as having "good" or "fair" water quality; no samples were categorized as having "poor" water quality.

Individual water quality parameters measured as part of the 2010 NCCA are discussed herein as well as the results from other water quality monitoring programs, including the EPA Estuary Monitoring and Assessment Program in 2000 and the NYCDEP Harbor Water Quality Survey locations in the vicinity of the landfall (**Figure 4.3-3**).

Dissolved Oxygen

The amount of DO in the water determines the amount of oxygen that is available for marine life to use. DO levels are strongly influenced by temperature with colder water typically maintaining higher DO concentrations than warmer water. DO levels can also be influenced by biological factors such as respiration, photosynthesis, and bacterial decomposition. Concentrations below 2 milligrams per liter (mg/L) can lead to hypoxia, which is detrimental to most aquatic organisms. DO levels above 5 mg/L are generally accepted as being protective of aquatic life.

Water quality monitoring conducted as part of the Long Island Sound Study (LISS) has shown a reduction in hypoxic conditions since 1987. Hypoxia occurs most frequently near the Western Narrows, where the bottom waters have routinely experienced hypoxia nearly every year since regular monitoring began in 1994 (LISS 2021b).

The NYCDEP monitors water quality in 26 stations within the Upper East River–Western Long Island Sound (UER-WLIS). Sampling in 2018 reported average DO levels of 6.4 mg/L and 5.9 mg/L for surface and bottom waters, respectively, in the region, and the annual report observed that there has been a consistent increase in average DO values since 2012 (NYCDEP 2018). Long-term trends in DO concentrations at depth for two NYCDEP Harbor Water Quality Survey locations near the landfall (**Figure 4.3-3**) indicate seasonal variability in bottom DO concentrations, as would be expected under stratified conditions. The measured DO concentrations at location E14 did not fall below 2 mg/L from 1984 to 2020, indicating DO levels did not reach hypoxic conditions. At location E6, with monitoring data back to the early 1900s, DO concentrations showed an increasing trend over time. Lower DO concentrations occurred in this location up until approximately the 1980s, with increasing concentrations to present.

Nutrients

Increased coastal development on Long Island has and continues to cause increased nutrient loading, particularly for coastal communities, the majority of which is due to septic systems (NYSDEC 2014). Sources of nutrients to coastal systems may also include nonpoint source inputs from watersheds via land uses (e.g., urban and agricultural runoff) as well as point source discharges from industry or water

treatment facilities. Internal loading of legacy nutrients found in the sediment may also release nutrients back into the water column through direct disturbance of the sediment.

According to EPA (2004), DIN is the nutrient type most responsible for eutrophication in open estuarine and marine waters. These forms of nitrogen are readily available to phytoplankton and often control the formation of blooms. DIN occurs naturally in marine ecosystems; however, anthropogenic influences such as fertilizers and wastewater can greatly increase concentrations.

In general, there is an increase in mean annual nitrate in surface waters moving westward along the submarine export cable corridor towards the landfall (Ramboll 2021). Concentrations of DIN in the 24 samples from Long Island Sound and Block Island Sound evaluated in the 2010 NCCA were below 0.1 mg/L and categorized as "good" (EPA 2015a). Near the landfall, average measures of DIN at the two NYCDEP Harbor Water Quality Survey locations (E14 and E6; **Figure 4.3-3**) are classified as "poor" (greater than 0.5 mg/L) based on EPA criteria used in the NCCA (EPA 2015a).

Mean annual concentrations of phosphate from 2000 to 2014 were reported as generally uniform along the submarine export cable corridor within Long Island Sound (at or below 0.180 micromole per liter [µmol/L]) with a slight increase in phosphate concentrations (up to 0.372 µmol/L) near the landfall location (Ramboll 2021). Concentrations of DIP in the 24 samples from Long Island Sound and Block Island Sound evaluated in the 2010 NCCA, ranged from 0.012 to 0.085 mg/L; 20 of these results were categorized as "fair" and four were categorized as "poor" (EPA 2015a).

Mean chlorophyll-a concentrations from 2007 and 2016 were reported to generally increase from east to west along the submarine export cable corridor through Long Island Sound to the landfall location (Ramboll 2021). Historically, high levels of chlorophyll-a in the western portion of Long Island Sound have been linked to summertime hypoxia conditions. Of the 24 samples of chlorophyll-*a* from Long Island Sound and Block Island Sound evaluated in the 2010 NCCA, 20 were categorized as "good" and four were categorized as "fair" (EPA 2015a). Based on data collected by the NYCDEP adjacent to the landfall, surface concentrations of chlorophyll-a at locations E14 and E6 (**Figure 4.3-3**) averaged 5.8 and 6.2 µg/L, respectively. According to EPA criteria used in the NCCA, these locations would be categorized as "fair" (5-20 µg/L) (EPA 2015a).

Turbidity

Estuaries, by nature, are turbid systems (EPA 2004). The supply of sediment from tributary rivers, especially during and following storm events, can increase turbidity of surface waters locally. Delivery of sediment to estuaries is a natural process that supplies source material for maintaining coastal morphological features. However, prolonged or drastic increases in turbidity can have negative effects on local biota by burying organisms in the benthos, preventing effective filter feeding, or blocking light penetration to seagrass beds.

Within Long Island Sound, water clarity improves from west to east. The western portion of Long Island Sound is relatively narrow and shallow compared to the eastern portion, which is a wide deep channel with considerable influx from the Atlantic Ocean. The dense urban land use in the western portion of Long Island Sound also increases the concentrations of pollutants in the water that may affect water clarity. In 2019, monitoring within Long Island Sound showed water clarity (as yearly average Secchi disk depth) ranging from 4.9 ft (1.5 m) in the western portion of Long Island Sound to 12.8 ft (3.9 m)

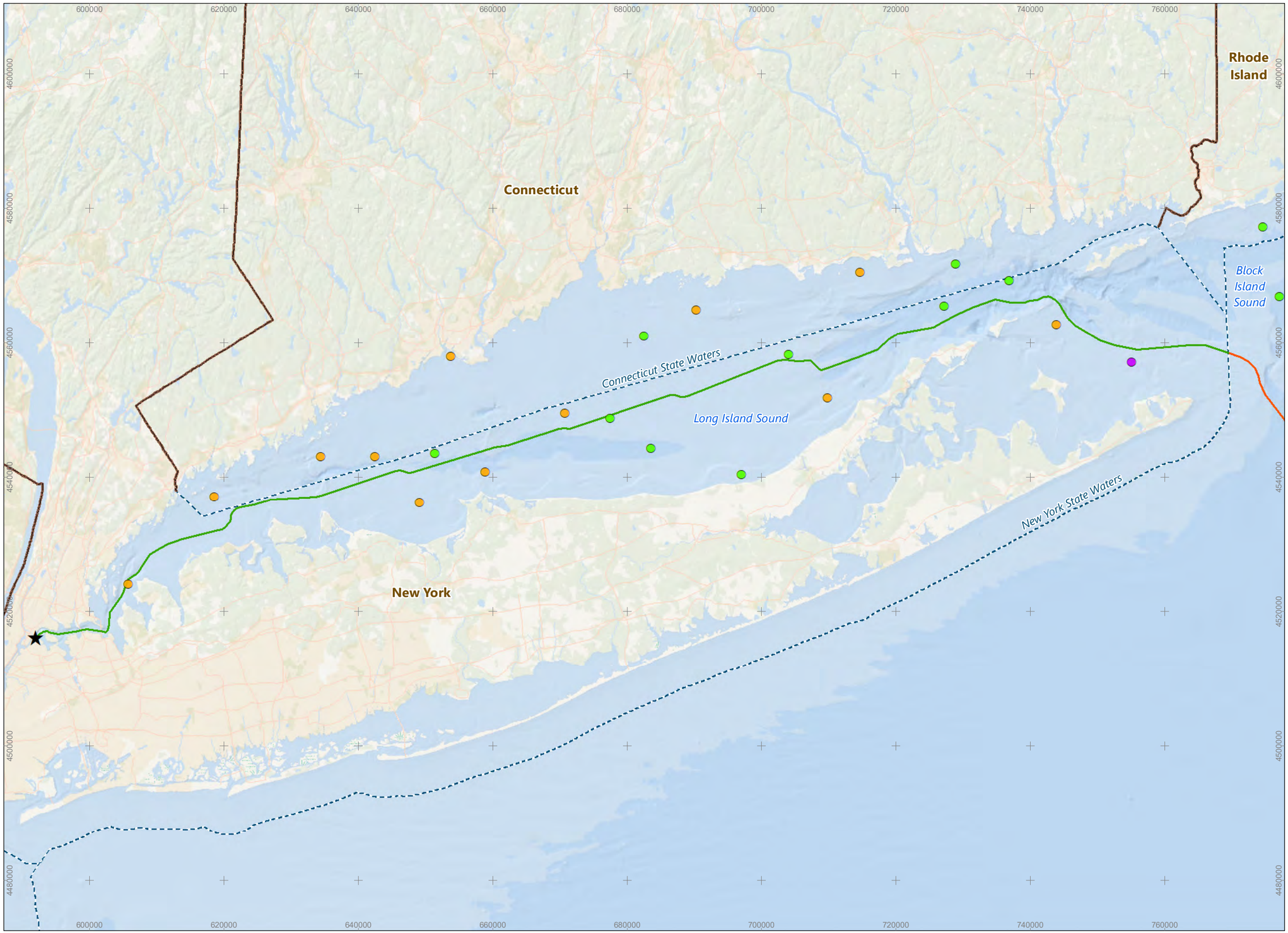
in the eastern portion of Long Island Sound. Annual average Secchi disk depths greater than 7.5 ft (2.28 m) are considered very good, while depths less than 5.9 ft (1.8 m) are considered very poor (CT DEEP et al. 2019).

According to data collected by EPA in 2000, water clarity in Long Island Sound coastal zones (quantified as light penetration at 3.3 ft [1 m] below the surface) was generally characterized as "good" for most of the Connecticut coastline (greater than 20 percent of total light penetration reaching 3.3 ft [1 m] depth) (EPA 2004). At locations closer to New York City, water clarity declines to "fair" (10 to 20 percent total light penetration, 3.3 ft [1 m depth]) and "poor" (less than 10 percent total light penetration, 3.3 ft [1 m] depth) (EPA 2004). Light transmissivity, as a measure of water clarity, in the samples from Long Island Sound and Block Island Sound evaluated in the 2010 NCCA, was categorized as "good" in the 24 samples (EPA 2015a).

Bacteria

Bacterial trend data collected by NYCDEP in 2018 show that most areas within the UER-WLIS region were in compliance with their specified 'best use' classifications for bathing and fishing, which for most waterbodies is fecal coliforms below a monthly geometric mean of 200 colony forming units per milliliter (cfu/mL) and enterococcus below a monthly geometric mean of 35 cfu/100mL. Bacteria concentrations have shown a downward trend for more than 20 years in the UER-WLIS region (NYCDEP 2018).

Figure 4.3-2. 2010 NCCA Sampling Stations in Long Island Sound and Block Island Sound



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

Water Quality Indicator Status
- Good
- Fair
- Missing

Project Components
- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

0 5 10 Miles

0 10 20 Kilometers

Prepared May 5, 2022

Data Sources: BOEM, EPA, NOAA, Long Island Sound Blue Plan.

Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Figure 4.3-3. NYCDEP Harbor Water Quality Monitoring Locations in UER-WLIS

Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

NYCDEP Harbor Survey Location
- Landside
- Open Water
- Tributary

Project Components
- Interconnection Cable
- Submarine Export Cable Route
- Onshore Limit of Disturbance
- Astoria West POI
- Onshore Substation Facility
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)

0 0.5 1 Mile

0 1 2 Kilometers

equinor

EDR

Prepared May 5, 2022
Basemap: Esri ArcGIS Online "USGS Topo" map service.

4.3.1.2 Sediment Quality

The 2010 NCCA data (EPA 2015a) included an assessment of sediment chemistry and sediment toxicity information in the vicinity of the submarine export cable corridor for 23 of the sampling locations identified on **Figure 4-3.2**. For sediment contaminants, 20 of the 23 samples within Long Island Sound and Block Island Sound were categorized as having "good" sediment quality, and three samples were categorized as having "fair" sediment quality. Acceptable sediment toxicity testing results were available for 20 of the samples. On the basis of the toxicity tests, 14 samples were classified as having "good" sediment quality and six as having "poor" sediment quality. A Sediment Quality Index (SQI) was reported for each sample based on the sediment chemistry and toxicity testing results. Of the 23 samples, the SQI was classified as "good" for 13, "fair" for five, and "poor" for five. The five samples with "poor" SQI scores were dispersed throughout Long Island Sound and Block Island Sound and were not clustered in a particular area.

Several active and historical dredge material disposal sites occur within Long Island Sound. Samples at disposal sites must meet various sediment chemistry, toxicity testing, and bioaccumulation criteria to be acceptable for disposal in these areas, so they are not expected to be sources of contamination within Long Island Sound.

Sediment chemistry data within Long Island Sound have been collected by the states of New York and Connecticut, NOAA's National Status and Trends program, the Coastal and Marine Geology Program of the USGS, and the USACE. Monitoring by the USACE within Long Island Sound is focused on coastal harbors (for dredge material evaluations) and on three active unconfined open-water placement sites for dredged material that are located within Connecticut waters outside the submarine export cable corridor.

Historically, sediment quality degrades from east to west in Long Island Sound along the submarine export cable corridor. Levels of contaminants, such as heavy metals, pesticides, polycyclic aromatic hydrocarbons, and chlorinated hydrocarbons are elevated in the Narrows and the East River. Sediments in Central Long Island Sound and eastward through The Race are generally less contaminated (USGS 1999, EPA 2015b). Contaminant concentrations are typically greater in finer grained (muddier) sediments.

In 1996 and 1997, the USGS looked at profiles of fallout isotopes (cesium-137), naturally occurring isotopes (lead-210), and metals within the sediments of Long Island Sound. The study found that mixing depths within the sediment vary greatly within Long Island Sound. Age determinations of the sediments show that sewage began to contaminate Long Island Sound in the late 1800s, with a marked increase of contaminant concentrations following World War II. However, in most depositional areas, the metal concentrations in sediment cores decrease near the surface, reflecting a reduction in contaminant sources during the 1980s and 1990s (USGS 1999).

Sediment quality improvement within Long Island Sound is one of the goals of the LISS, which targets a reduction in the area of impaired sediment by 20 percent by 2035 from 2006 baseline (LISS 2021a). The LISS considers the NCCA SQI in their assessment of sediment quality and noted that in 2006, 48.5 percent of 34 stations in Long Island Sound were considered impaired (falling into the "fair'' or "poor" classifications). As indicated by the 2010 NCCA (EPA 2015a) results discussed previously, the SQI scores showed 43 percent of the 23 stations within Long Island Sound and Block Island Sound

were impaired. This finding is consistent with the 2006 baseline conditions, particularly given that the 2015 results include stations in Block Island Sound, which has better water and sediment quality than Long Island Sound. NCCA surveys are typically done every five years, and planning for the delayed NCCA 2020 effort is in progress (EPA 2021).

4.3.2 Potential Impacts

The following sections describe the potential impacts to water and sediment quality from construction and O&M of the NY Project. Proposed measures to avoid, minimize, and/or mitigate these potential impacts are summarized in **Section 4.3.3**. Impacts to water quality parameters such as temperature, chlorophyll-a, or DO as a result of NY Project-related activities are not anticipated and are therefore not discussed further.

4.3.2.1 Construction

Construction of the submarine export cables, placement of cable protection, and construction of onshore components of the NY Project may result in the following impacts to water and sediment quality:

- Short-term disturbance of seabed sediment; and
- Short-term increase in erosion and runoff.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures (see **Section 4.3.3**), the following impacts have a low probability of occurring:

- Short-term potential for inadvertent return of drilling fluids during HDD; and
- Short-term potential for accidental spills and/or releases offshore and onshore.

Short-term disturbance of seabed sediment: Disturbance of seabed sediments during installation of the submarine export cables and site preparation activities, including anchoring of NY Project vessels, could have an effect on marine water quality due to increases of TSS into the water column resulting from sediment resuspension and dispersal. However, impacts on water quality are expected to be short term and localized (Latham et al. 2017).

Sediments throughout Long Island Sound transition from sands and gravels near the mouth of Long Island Sound to higher concentrations of silt as the submarine export cable corridor extends to the west, toward the East River. During periods of sediment disturbance, sediments dominated by fine sand, silts, or clays, are more likely to be released into the water column which can temporarily increase TSS near the trench and cause sediment deposition outside of the trench.

Publicly available data collection and modeling studies of plowing, trenching, and dredging projects show that displacement of sediments is low, and suspended sediments are typically dissipated to background levels very close to the source (USACE 2015; Burton 1993; Elliott et al. 2017; ESS Group 2008; FHWA 2012). A majority of disturbed sediments, specifically in areas with sandy sediment similar to those found in Long Island Sound, settled immediately to the seabed and were not dispersed

in the water column (Latham et al. 2017; USACE 2015; Elliott et al. 2017). A Block Island Wind Farm cable study, completed during the 2016 cable installation, found that sediment impacts to water quality were negligible from jet plowing, and that there was no observable sediment plume (Elliot et al. 2017).

Given results from these studies, sediment disturbance and subsequent effects to water and sediment quality during NY Project construction are expected to be localized and short-term. Furthermore, the seabed and near-bottom water column in the NY Project Area are highly dynamic environments, with suspension and redeposition of sediment occurring continuously due to storms and tidal currents. Water and sediment quality impacts from these natural processes as well as other existing anthropogenic processes (e.g., trawling and commercial vessel anchoring) are similar to or much larger than any potential NY Project-related effects.

Short-term increase in erosion and/or stormwater runoff. Excavation, soil stockpile, and grading associated with installation of the onshore interconnection cables, onshore staging areas, and construction of the onshore substation facility and supporting infrastructure may have the potential to temporarily impact the water quality and quantity of stormwater runoff from the construction work areas. Impacts to water quality from erosion and runoff during construction are expected to be short term and localized, as onshore construction areas are flat and the soil types are not especially susceptible to erosion. Activities at staging and construction facilities will be consistent with the established and permitted industrial uses of these facilities, and the Applicant will comply with applicable permitting standards to limit potential environmental impacts from NY Project-related activities. In addition, the Applicant will obtain coverage under the New York SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-20-001) and implement a soil and erosion sediment control plan and Stormwater Pollution Prevention Plan (SWPPP) to avoid and further minimize potential impacts from erosion and stormwater runoff (see **Section 4.3.3**).

Short-term potential for inadvertent return of drilling fluids during HDD. HDD or other trenchless technologies will be implemented to avoid sensitive areas such as the shoreline between the submarine export cable landfall on shore and the East River. The HDD installation method requires HDD drilling fluid, which typically consists of a water and bentonite mixture. The bentonite mixture is made up of mainly inert, non-toxic clays, and rock particles consisting predominantly of clay with quartz, feldspars, and accessory material such as calcite and gypsum.

An inadvertent return/release can occur when the drilling fluids migrate unpredictably to the land or seabed surface through fractures, fissures, or other conduits in the underlying rock or unconsolidated sediments. This could potentially increase turbidity in marine, groundwater, and/or surface water resources. Inadvertent returns/releases can be detected by a noticeable loss of pressure during drilling. If this were to occur, then it would likely only result in short-term and localized impacts to water and sediment quality in the shallow marine environment associated with the landfall. The Applicant will develop and implement an Inadvertent Return Plan during construction activities to further avoid and minimize potential impacts from an inadvertent release of drilling fluids (see **Section 4.3.3**).

Short-term potential for accidental spills and/or releases offshore or onshore. During construction, water and sediment quality have the potential to be impacted through the introduction of contaminants, including oil and fuel spills, and releases from NY Project-related construction vessels; however, vessel operations are designed to minimize the potential for these types of releases into the

environment. NY Project-related vessels will be subject to United States Coast Guard (USCG) regulations for wastewater and discharges and will operate in compliance with oil spill prevention and response plans that meet USCG requirements. Additionally, all vessels less than 79 ft (24.1 m) will comply with the Small Vessel General Permit issued by the EPA on September 10, 2014, for compliance with National Pollutant Discharge Elimination System (NPDES) permitting.

Onshore construction vehicles and equipment will be refueled and potentially serviced within the Onshore Project Area. Short-term, accidental releases from onshore construction or equipment will be minimized and managed through an SPCC plan, which will be included in the Project's EM&CP (see **Section 4.3.3**). The SPCC will contain provisions for the use of secondary containment for oils and greases, where appropriate, and will require the availability of spill response kits. As a result, the potential impacts of any accidental spills and/or releases are anticipated to be minor and localized.

4.3.2.2 Operations and Maintenance

O&M activities associated with the maintenance of submarine export cables have the potential to result in short-term effects on water quality from maintenance of the submarine export cables, including maintenance dredging, if required.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures (see **Section 4.3.3**), the following impacts have a low probability of occurring:

- Short-term potential for accidental spills and/or releases offshore and onshore; and
- Long-term effects due to stormwater runoff.

Short-term effects from maintenance of the submarine export cables, including maintenance dredging. As discussed in **Section 4.2.2.2**, O&M of the submarine export cables may require cable repair, cable protection restoration, and/or maintenance dredging. Impacts associated with cable repair or maintenance dredging will include localized, direct, short-term seafloor disturbance that may result in short-term impacts to water quality from sediment disturbance similar to that described in **Section 4.3.2.1**, but with a much shorter duration and affecting a more limited area of the submarine export cable corridor.

Short-term effects due to accidental spills or releases. During O&M, the onshore substation facility and O&M vessels may contain oils, fuels, and/or lubricants. However, the substation equipment will be mounted on foundations with associated secondary oil containment or located within buildings; therefore, an inadvertent release of oil, fuel or other materials is not expected to occur at the onshore substation facility or impact the quality of the surrounding surface water resources. The Applicant will develop an SPCC Plan for operations, which will detail all measures proposed to avoid inadvertent releases and spills and establish a protocol to be implemented should a spill event occur. The Applicant will also have an OSRP for offshore activities during operations (see **Section 4.3.3**).

Offshore activities for the submarine export cables during O&M are expected to be limited to routine inspections, and non-routine cable repairs, when necessary. As stated previously, NY Project-related vessels will be subject to USCG regulations for wastewater and discharges and will operate in

compliance with oil spill prevention and response plans that meet USCG requirements. Therefore, potential inadvertent release or accidental spills of oil or fuel from NY Project vessels are not expected to result in significant releases or impact the surrounding water quality.

Long-term effects due to stormwater runoff. Development of the onshore substation facility could result in minor increases of impervious surface areas within the Onshore Project Area. Impervious areas prevent rain and snowmelt from infiltrating into the soil, thereby increasing overland flow that may enter adjacent waterbodies. The stormwater runoff can carry sediment and pollutants that have built up on site into nearby surface waters, posing a potential risk to water quality and aquatic life. The onshore substation facility will be designed to minimize stormwater runoff and to provide adequate collection and drainage of precipitation in order to avoid sedimentation of nearby waters.

While the onshore construction disturbance area is likely several acres, the expected long-term increase in impervious area within the Onshore Project Area is small, potentially less than 1 ac (0.4 ha). Stormwater pollution prevention controls will be installed in accordance with federal and state requirements to capture and treat stormwater runoff on site before entering nearby surface waters. If required, the Applicant will prepare and begin implementation of a Stormwater Pollution Prevention Plan meeting the requirements of the NY SPDES Multi-Sector General Permit (MSGP; 0-17-004) and then submit a completed Notice of Intent to NYSDEC. The plan will identify the measures that will be employed at the site to manage, control, and treat stormwater. The SWPPP and associated stormwater control practices will be developed to meet the SPDES MSGP.

4.3.3 Summary of Avoidance, Minimization and Mitigation Measures

The Applicant proposes the following measures to avoid, minimize, and mitigate potential impacts to water and sediment quality during construction:

- Manage accidental spills or releases of oils or other hazardous wastes through an SPCC plan for onshore activities and an OSRP for offshore activities, which will be provided for agency review and approval, as applicable;
- Implement soil erosion and sediment control plans for the onshore components of the NY Project that comply with the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), including development of a SWPPP, as applicable;
- Incorporate the NYSDEC Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State into the Project's site-specific best management practices, as applicable;
- If determined to require coverage under the NYSDEC Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity, develop a SWPPP and submit a NOI. The plan will identify the measures that will be employed at the site to control the release of erosion and pollutants to the water and will outline an implementation and maintenance schedule; and
- Implement an agency-approved Inadvertent Return Plan for HDD operations, if necessary.

The Applicant proposes the following measures to avoid, minimize, and mitigate potential impacts to water and sediment quality during O&M:

- Operate NY Project-related vessels in accordance with laws regulating the at-sea discharges of vessel-generated waste;
- Manage accidental spills or releases of oils or other hazardous wastes through an SPCC plan for onshore activities and an OSRP for offshore activities, which will be provided for agency review and approval, as applicable; and
- Conduct routine inspections and clean stormwater control features to remove debris or excess vegetation that may impede the designed functionality. The inspection schedule will be detailed in the SWPPP and SPCC or appropriate Operations Plan.

4.4 Air Quality

This section addresses the requirements of 16 NYCRR § 86.5 and describes the regulatory framework, as well as the affected environment related to air quality for the NY Project. It also describes the potential impacts to air quality resulting from construction and O&M and measures to avoid, minimize, and/or mitigate those potential impacts. Emissions-related benefits of the BW1 Project's renewable energy generation are described in **Section 4.4.4** and **Exhibit 6: Economic Effects of the Proposed Facility.**

4.4.1 Regulatory Standards for Air Emissions

This section describes the regulatory framework for air quality as applicable to the NY Project and the affected air environment. This section also describes the potential effects to air quality resulting from construction and operation of the NY Project, and proposed NY Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate potential effects to air quality. Federal Regulations and Standards

Under the federal Clean Air Act (CAA), the EPA is responsible for developing and enforcing regulations to protect air quality in the United States. As part of the CAA, National Ambient Air Quality Standards (NAAQS) were established for the following common pollutants, known as criteria pollutants: carbon monoxide (CO); lead (Pb); nitrogen dioxides (NO_2); ground level ozone; total particulate matter (PM); particulate matter with aerodynamic diameter 2.5 micrometers or less ($PM_{2.5}$); particulate matter with aerodynamic diameter 10 micrometers or less (PM_{10}); and sulfur dioxide (SO_2). The NAAQS for each criteria pollutant are presented in **Table 4.4-1**.

TABLE 4.4-1. NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Primary/ Secondary	Averaging Time	Level a/	Form
CO	Primary	8 Hours	9 ppm (9,000 ppb)	Not to be exceeded more than once per year
		1 Hour	35 ppm (35,000 ppb)	
Lead	Primary and Secondary	Rolling 3-Month Average	0.15 µg/m^3	Not to be exceeded
NO_2	Primary	1 Hour	0.1 ppm (100 ppb)	98th percentile of 1-hour daily maximum concentration, averaged over 3 years
	Primary and Secondary	1 Hour	0.053 ppm (53 ppb)	Annual Mean
Ozone	Primary and Secondary	8 Hours	0.070 ppm (70 ppb)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter $PM_{2.5}$	Primary	1 Year	12 µg/m^3	Annual mean, averaged over 3 years

Pollutant		Primary/ Secondary	Averaging Time	Level a/	Form
		Secondary	1 Year	15 µg/m^3	Annual mean, averaged over 3 years
		Primary and Secondary	24 Hours	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24 Hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2		Primary	1 Hour	0.075 ppm (75 ppb)	99th percentile of 1-hour daily maximum concentration, averaged over 3 years
		Secondary	3 Hours	0.5 ppm (500 ppb)	Not to be exceeded more than once per year

Notes:
a/ µg/m^3 = micrograms per standard cubic meter
ppb = parts per billion (by volume)
ppm = parts per million (by volume)

Source: EPA NAAQS Table (EPA 2021a)

NAAQS are set by the EPA to protect public health and the environment from harmful air pollutants. The EPA sets both primary and secondary NAAQS. Primary standards serve to protect public health, including the health of sensitive populations, such as asthmatics, children, and the elderly (EPA 2021a). Secondary standards serve to protect the environment and public welfare from adverse effects associated with pollution, including decreased visibility and damage to animals, crops, vegetation, and buildings (EPA 2021a).

Every five years, the EPA conducts a comprehensive review of the NAAQS and revises the standards, as necessary, based on the most recent scientific information available. The EPA monitors compliance with the NAAQS through statewide networks of air pollution monitoring stations measuring the concentration of each criteria pollutant. If ambient concentrations do not exceed the NAAQS, the area is designated as an attainment area and no further action is required. If ambient concentrations exceed the NAAQS for one or more pollutants, the area is designated as a nonattainment area for those pollutants, and the applicable state is required to develop an implementation plan to achieve compliance. Once a nonattainment area demonstrates compliance with the NAAQS standard, the EPA will designate the area as a maintenance area to avoid backsliding into nonattainment (EPA 2020a).

Although many of the criteria pollutants listed in **Table 4.4-1** are directly emitted into the atmosphere by industrial and combustion processes, some criteria pollutants, such as particulate matter and ozone, form in the atmosphere by chemical reactions. Particulate matter is a mixture of solid particles and liquid droplets of varying size found in the atmosphere (EPA 2021b). The EPA has established NAAQS for two different particle sizes: PM_{10} and $PM_{2.5}$. While some particulate matter is emitted directly, $PM_{2.5}$ can form in the atmosphere by chemical reactions between SO_2, nitrogen oxides (NOx), volatile organic compounds (VOCs), and ammonia. These compounds are known as precursors and

are regulated by the EPA to achieve ambient $PM_{2.5}$ reductions. Ozone is another pollutant which forms in the atmosphere as a result of photochemical reactions between VOCs or NOx (EPA 2021c). In this context, VOCs and NOx are known as ozone precursors and are regulated by the EPA to achieve ambient ozone reductions.

In addition to criteria pollutants regulated under NAAQS, other pollutants regulated by the EPA include hazardous air pollutants (HAPs) and greenhouse gases (GHGs). HAPs are pollutants known or suspected to cause adverse health and environmental effects (EPA 2020b). Adverse health effects associated with HAPs include increased likelihood of developing cancer as well as serious impacts to respiratory, reproductive, and immune system health and early childhood development (EPA 2020c). GHGs are gases that trap heat in the atmosphere and contribute to global warming by retaining heat in the atmosphere (EPA 2021a). Common GHGs include carbon dioxide (CO_2), methane, and nitrous oxide, all of which can be released into the atmosphere through the production, transportation, and burning of fossil fuels, and through emissions from livestock and other agricultural and industrial practices (EPA 2021a). In the United States, CO_2 accounted for approximately 80 percent of GHG emissions in 2019 (EPA 2021b). Although the EPA has not established ambient air quality standards for HAPs or GHGs, emissions of HAPs and GHGs are regulated through federal and state emissions standards and specific regulatory requirements.

The EPA permits new or modified emission sources under the New Source Review in order to reduce the risk of exceeding NAAQS or other regulatory standards. Pollutants of focus under the new source review (NSR) include, but are not limited to, criteria pollutants under NAAQS, sulfuric acid, hydrogen sulfide (H2S), VOCs, GHG, and hazardous air pollutants (HAPs) (EPA 2021c; EPA n.d.). The purpose of the NSR is to ensure that air quality does not worsen in nonattainment areas to a level where air is unhealthy to breathe and that in attainment areas air quality is not significantly degraded where the air is clean (EPA n.d.). In New York, the major source thresholds for attainment areas are 100 tons per year (tpy) for all NSR-regulated pollutants (6 NYCRR §231-13.5). For nonattainment areas, thresholds are limited to 50 tpy for VOCs and 100 tpy for NOx in moderate ozone areas and 25 tpy for VOCs and NOx for severe ozone nonattainment areas (6 NYCRR §231-13.1). The NY Project will not produce pollutant levels that would exceed the existing thresholds in New York for pollutants managed under NSR.

Under the CAA, the EPA is responsible for establishing standards of performance for new stationary sources, known as New Source Performance Standards (NSPS). These standards vary by industry or pollution source. For the NY Project, the only component expected to be subject to NSPS is the emergency generator. The key pollutants of concern for emergency generators are NOx, PM, SO_2, CO, and hydrocarbons (EPA 2021d). Standards for emergency generators are provided in 40 CFR Part 60, Subpart IIII, and are based on rated output and model year. Subpart IIII requires engines to use ultra-low sulfur diesel (ULSD) and requires operation of generators to be limited to no more than 100 operating hours per year during non-emergency situations, including up to 50 hours per year for maintenance and testing. Emergency generators are also subject to the National Emission Standards for Hazardous Air Pollutant (NESHAP). The emergency generator will comply with the NSPS regulations provided in 40 CFR Part 60, Subpart IIII which incorporates the requirements of 40 CFR 63 Subpart ZZZZ, including applicable NESHAPS standards.

4.4.1.1 State Regulations and Standards

State-level regulations for air quality are the responsibility of the NYSDEC, under Title 6 of the NYCRR. **Table 4.4-2** lists the rules under Title 6 that could apply to electric transmission projects, the purpose or definition of the regulation, and the applicability of the regulation to the construction and operation of the NY Project.

TABLE 4.4-2. APPLICABILITY OF STATE AIR QUALITY REGULATIONS TO THE NY PROJECT UNDER TITLE 6 OF THE NEW YORK CODES, RULES, AND REGULATIONS (6 NYCRR)

State Regulation	Purpose	Applicability to the NY Project
Part 201 Permits and Registrations	Require owners and operators of air contamination sources to obtain a permit or registration from the department for the construction and operation of such sources	The emergency generator engine at the onshore substation facility will be exempt as it qualifies as an "emergency power generating stationary internal combustion engine" and will follow the following criteria: (1) operate for no more than 500 hours per year, (2) limited to emergency situations, routine maintenance, and routine testing.
Part 211 – General Prohibitions	Prohibit creating a condition of air pollution that is injurious to health or that unreasonably interferes with the comfortable enjoyment of life or property	Applicable to the entire NY Project.
Part 222 – Distributed Generation Sources	Model and emissions compliance requirements for generation sources classified as economic dispatch sources in New York City	Not applicable to the NY Project as the generators on site will not be used for economic dispatch purposes.
Part 225 – Fuel Composition and Use, §1.2	All fuel-burning equipment will be subject to sulfur limitations, which restrict distillate fuel to no more than 0.0015% sulfur by weight	Applicable to all fuel-burning equipment used to construct and operate the NY Project such as internal combustion and diesel engines, generators, compressors, etc.
Part 227 – Stationary Combustion Installations, §1.3	Limit opacity to no more than 20% (6-minute average), except for one 6-minute period per hour of not more than 27% opacity	Applicable to the emergency generator. The emergency generator is only subject to §1.3 of Part 227 because the onshore facilities will remain below other defined thresholds.
Part 231 – New Source Review for New and Modified Facilities	Establish the NSR pre-construction, construction, and operation requirements for new and modified facilities in a manner which furthers the policy and objectives of Article 19 of the Environmental Conservation Law and meet the plan requirements for nonattainment areas and prevention of significant deterioration of air quality of subchapter I of the act	Not applicable to the NY Project as potential emissions will be less than the defined thresholds.

Source: NYSDEC Chapter III-Air Resources (2020)

In addition to state-level regulations, the State of New York has established ambient air quality standards for pollutants beyond those identified as NAAQS by the EPA, including gaseous fluorides and H_2S. These state-defined ambient air quality standards also include standards for various SO_2 concentrations beyond those identified as NAAQS. **Table 4.4-3** lists air quality standards defined by New York that extend beyond those defined by the EPA.

TABLE 4.4-3. NEW YORK STATE AMBIENT AIR QUALITY STANDARDS

Pollutant	Average Timing	Level (ppm [ppb]) a/	Form
SO_2	3-Hour	0.25 ppm (250 ppb)	99th percentile of 3-hour average shall not exceed 0.25 ppm b/
	24-Hour	0.10 ppm (100 ppb)	99th percentile of 24-hour average shall not exceed 0.10 ppm c/
	24-Hour	0.14 ppm (140 ppb)	Not to be exceeded more than once per year
	Annual	0.03 ppm (30 ppb)	Annual average of the 24-hour average concentrations shall not exceed
Gas Fluorides	12-Hour	0.0045 ppm (4.5 ppb)	Not to be exceeded
	24-Hour	0.0034 ppm (3.5 ppb)	Not to be exceeded
	1 Week	0.002 ppm (2.0 ppb)	Not to be exceeded
	1 Month	0.001 ppm (1.0 ppb)	Not to be exceeded
Hydrogen Sulfide	1-Hour	0.010 ppm (10 ppb)	Not to be exceeded

Notes:
a/ $\mu g/m^3$ = micrograms per standard cubic meter
ppb = parts per billion (by volume)
ppm = parts per million (by volume)
b/ For predicting future concentrations, predicted conformity with the 0.50 standard will be sufficient to demonstrate prediction of conformity with the 99% standard.
c/ For predicting future concentrations, predicted conformity with the 0.14 standard will be sufficient to demonstrate prediction of conformity with the 99% standard.
Source: 6 NYCRR §257

4.4.1.2 Local Regulations

Air quality regulations in New York City are addressed in three separate documents including the Rules of the City of New York, New York City Administrative Code, and New York City Zoning Resolution. Please refer to **Exhibit 7** for a review of New York City regulations.

4.4.2 Existing Conditions

In order to determine whether air quality in New York is meeting the EPA-established NAAQS, the Bureau of Air Quality Surveillance, under the NYSDEC, operates 55 active air pollution monitoring stations as part of the Ambient Air Monitoring Program. This program collects data on meteorological

conditions and ambient concentrations of criteria pollutants, VOCs, and other air toxins across the state (NYSDEC 2021). These data are then used to inform air pollution control programs and policies. Of the 55 monitoring stations, approximately 17 stations collect air quality data for the New York City metropolitan area, including stations located in Rockland County, Westchester County, Nassau County, Suffolk County, and the five counties within New York City (NYSDEC 2021). Many of these counties are either identified as maintenance areas or nonattainment areas for the various monitored air pollutants. **Table 4.4-5** provides a list of counties in New York State that are classified as nonattainment or maintenance areas and are where NY Project emissions could potentially occur during construction or operations.

TABLE 4.4-4. NY PROJECT-RELATED NONATTAINMENT OR MAINTENANCE COUNTIES – NEW YORK

Pollutant	County	AQCR	Designation
Ozone (2008 and 2015 8-Hour NAAQS)	Bronx	New Jersey-New York-Connecticut Interstate	Nonattainment
	Kings		Nonattainment
	Nassau		Nonattainment
	New York		Nonattainment
	Queens		Nonattainment
	Richmond		Nonattainment
	Rockland		Nonattainment
	Suffolk		Nonattainment
	Westchester		Nonattainment
CO (1971 NAAQS)	Bronx	New Jersey-New York-Connecticut Interstate	Maintenance
	Kings		Maintenance
	Nassau		Maintenance
	New York		Maintenance
	Queens		Maintenance
	Richmond		Maintenance
	Westchester		Maintenance
PM_{10} (1987 Annual NAAQS)	New York	New Jersey-New York-Connecticut Interstate	Moderate
$PM_{2.5}$ (1997 Annual NAAQS)	Bronx	New Jersey-New York-Connecticut Interstate	Maintenance
	Kings		Maintenance
	Nassau		Maintenance
	New York		Maintenance
	Orange	Hudson Valley Intrastate	Maintenance
	Queens	New Jersey-New York-Connecticut Interstate	Maintenance
	Richmond		Maintenance
	Rockland		Maintenance
	Suffolk		Maintenance
	Westchester		Maintenance
	Bronx		Maintenance

Pollutant	County	AQCR	Designation
$PM_{2.5}$ (2006 24-Hour NAAQS)	Kings	New Jersey-New York-Connecticut Interstate	Maintenance
	Nassau		Maintenance
	New York		Maintenance
	Orange	Hudson Valley Intrastate	Maintenance
	Queens	New Jersey-New York-Connecticut Interstate	Maintenance
	Richmond		Maintenance
	Rockland		Maintenance
	Suffolk		Maintenance
	Westchester		Maintenance

Source: EPA Green Book (EPA 2021e)

In addition to the monitoring of criteria pollutants, the NYSDEC established a toxic monitoring network in 1985 as part of the Governor's Air Monitoring Modernization Capital Budget Program. The purpose of this program is to monitor VOC concentrations in urban, industrial, residential, and rural areas. Currently there are 11 sites across the state measuring the concentration of VOCs, five of which are in and around the New York City metropolitan area. While some compounds exhibit more variable trends, data from 2015 to 2020 indicate that annual average concentrations of VOCs have decreased since 2015 at the five locations in and around the New York City metropolitan area (NYSDEC 2021).

Similar to VOCs, decreases in GHG emissions have been observed in recent years. In July 2019, the New York State Energy Research and Development Authority finalized the New York State Greenhouse Gas Inventory: 1990–2016, which inventories GHG emissions by sector. The report indicated that, while GHG emissions increased between 1990 and 2005, GHG emissions in the state have been decreasing since 2005 (NYSERDA 2019). The state has reduced emissions from 236 million metric tons of GHG in 1990 to 206 million metric tons of GHG in 2016, resulting in a 13 percent decrease in GHG emissions over this period (NYSERDA 2019).

4.4.3 Potential Impacts

Potential impacts from NY Project-related air emissions are expected to be localized and short-term during construction activities. The estimated air emissions from O&M activities will be minor and are not expected to have effects on regional air quality over the operational life of the NY Project.

4.4.3.1 Construction

During the construction phase, emissions will occur within Long Island Sound during submarine export cable installation, and onshore during onshore substation facility installation, onshore export cable installation, and construction staging activities. Sources of air emissions during the construction phase of the NY Project include commercial marine vehicles operating in Long Island Sound and the East River, as well as non-road construction equipment, generators, and on-road vehicles in Queens, New York. Most of the vessels and onboard construction equipment used for cable installation will utilize diesel engines that burn low-sulfur fuel while others may be electric or use alternative fuels. Onshore construction activities such as HDD operations, trenching/duct bank construction, and cable pulling, and termination will primarily utilize diesel-powered equipment. NY Project-related vessels and equipment will comply with applicable EPA or equivalent emission standards. Any fugitive dust

generated during construction will be managed in accordance with the NY Project's onshore Fugitive Dust Control Plan to be included with the EM&CP.

4.4.3.2 Operations and Maintenance

During the O&M phase, NY Project-related emissions may be produced from the operation of emergency generators and gas-insulated switchgear installed at the onshore substation facility. **Table 4.4-6** provides estimated emissions production because of anticipated O&M activities.

TABLE 4.4-5. ESTIMATED EMISSIONS FROM OPERATION OF ONSHORE SUBSTATION (TONS PER YEAR)

VOC	NOx	CO	PM/ PM_{10}	$PM_{2.5}$	SO_2	HAP	GHG (CO_2e)	Pb
0.060	0.220	1.160	0.010	0.001	0.002	0.002	223	<0.001

Note: CO_2e

Although not included in **Table 4.4-6**, additional emissions would be produced by marine vessels and equipment related to cable maintenance and repair activities. These activities would only occur on rare occasions when maintenance or repair of the submarine cable is necessary and would typically include surveying of the submarine cable to evaluate cable exposure and protection measures, repairing the cable if necessary, and modifying or replacing cable protection. Estimated air emissions from operations and maintenance activities are not expected to have substantial effects on regional air quality over the operational life of the NY Project and are expected to be smaller compared to the effects anticipated during construction activities. Additionally, the submarine export cable will facilitate the delivery of wind-generated, clean energy to the electrical grid, thereby reducing the need for electricity generation from traditional fossil fuel powered plants that produce GHG emissions.

4.4.4 Summary of Avoidance, Minimization, and Mitigation Measures

As previously stated, the BW1 Project will facilitate the delivery of clean, renewable wind energy to the electrical grid, thereby avoiding the use of conventional power sources in New York. **Table 4.4-7** provides an estimation of avoided emissions due to the use of electricity generated from BW1 using BOEM's Wind Energy Tool V2.

TABLE 4.4-6. AVOIDED EMISSIONS FROM OPERATION OF THE BW1 PROJECT

	CO_2	NOx	$PM_{2.5}$
eGrid Avoided Emission Factor (lb/MWh)	1,004	0.31	0.05
Annual Avoided Emissions in New York (tons/year)	3,111,245.40	960.64	154.94
Avoided Emissions over BW1 Project Lifespan in New York (tons) (assuming 25 years)	77,781,135.00	24,016.09	3,873.56

Although BW1 will help to offset emissions from traditional fossil fuel powered electricity sources, construction and O&M of the NY Project will result in the production of some air emissions. The NY Project emissions as shown in **Table 4.4-6** will be a small fraction of the avoided emissions resulting from the operation of BW1. In order to limit the quantity of emissions generated by the NY Project, the Applicant proposes the following avoidance, minimization, and mitigation measures:

- Ensure vessels constructed on or after January 1, 2016, will meet Tier III NOx requirements;
- Ensure NY Project-related diesel-powered equipment will use ULSD, per the requirements of 40 CFR Part 80.510(b);
- Ensure NY Project-related vessels will use low-sulfur diesel fuel where possible and be at or below the maximum fuel sulfur content requirement of 1,000 ppm established per the requirements of 40 CFR Part 80.510(k);
- Ensure NY Project-related vessels will comply with applicable EPA, or equivalent, emission standards;
- Provide the EPA with data on horsepower rating of vessel propulsion and auxiliary engines, duration of time operating in state waters, load factor, and fuel consumption for NY Project-related vessels to determine actual emissions from NY Project-related vessels, which will confirm that sufficient emissions offsets have been acquired;
- Ensure NY Project-related vehicles, diesel engines, and/or non-road diesel engines at the staging site will comply with applicable state and New York City regulations regarding idling. In New York State, 6 NYCRR § 217-3 prohibits all on-road diesel-fueled and non-diesel-fueled heavy-duty vehicles from idling for more than 5 minutes;
- Manage fugitive dust caused by onshore construction activities in accordance with an agency-approved Fugitive Dust Plan;
- Follow manufacturer-recommended maintenance procedures and best industry practices to avoid or minimize leakage of sulfur hexafluoride (SF_6) from switchgears at the onshore substation facility. Personnel handling and monitoring the switchgear will be properly trained and, upon removal of any switchgear containing SF_6, the Applicant will provide for the secure storage, reuse, recycling, or destruction of the SF_6; and
- Ensure that the emergency generator engine at the onshore substation facility will meet applicable emission standards under 40 CFR Part 60, Subpart IIII.

4.5 Acoustics

This section addresses the requirements of 16 NYCRR § 86.5 and describes the applicable noise standards and guidelines, as well as the existing acoustic conditions in the vicinity of the NY Project. It also describes the potential impacts on existing acoustic conditions resulting from construction and O&M of the NY Project and proposed measures to avoid, minimize and mitigate those potential impacts.

4.5.1 Applicable Noise Standards and Guidelines

Federal regulations to assess noise impacts from the construction and operation of land development projects are generally limited to the Occupational Health and Safety Act of 1970 (OSHA) regulations that protect construction and operational workers from potentially harmful levels of noise. For the construction and operation of transmission projects like the NY Project, project-related noise is addressed in state and local regulations and guidelines. Applicable New York State guidelines and regulations are summarized in **Section 4.5.1.1**. Applicable New York City guidelines and regulations are introduced in **Section 4.5.1.2**; for a more detailed analysis, please refer to **Exhibit 7**.

4.5.1.1 New York State

The NYSDEC guidelines for evaluating noise impacts are defined in the publication *Assessing and Mitigating Noise Impacts* (NYSDEC 2001). The purpose of this document is to provide guidelines to the NYSDEC for the evaluation of sound levels and characteristics, and context of when noise levels could cause environmental impacts. This document also outlines potential impacts to sensitive receptors at varying sound pressure level ranges (SPL). These potential impacts are provided in **Table 4.5-1**. According to the NYSDEC guidance, a 6 A-weighted decibel (dBA) increase above ambient conditions (using either the minimum measured equivalent sound level [L_{eq}] or time-averaged L_{90} sound level [sound pressure level exceeded 90 percent of the time]) is a common design goal that has been used for other development projects in New York State.

TABLE 4.5-1 NYSDEC GUIDELINES FOR IMPACTS TO SENSITIVE RECEPTORS

Increase in SPL	Impact to Receptors
0–3 dBA	No adverse impact
3–6 dBA	Potential for adverse impact only in cases where the most sensitive of receptors are present
>6 dBA	May require a more detailed analysis of impact potential depending on existing sound levels and the surrounding land uses

Source: NYSDEC 2001

The NYSDEC policy also includes guidance from the EPA "Protective Noise Levels," which found that most humans determine a noise level of 60 to 70 dBA as beginning to create a condition of significant noise effect (NYSDEC 2001). According to the NYSDEC, the introduction of any new sound source should not raise ambient levels above 65 dBA L_{eq} in non-industrial settings to protect against speech disturbance or above approximately 79 dBA L_{eq} for industrial environments for associated noise-related health and safety concerns (NYSDEC 2001). In most cases, NYSDEC recommends that project activities exceeding either of these threshold levels or resulting in an increase of 10 dBA should consider mitigation measures (NYSDEC 2001).

In March 2021, the New York State Department of Public Service (NYSDPS) shared with the Applicant "General Recommendations for Applications for Substations, Stations, and Converter Stations under Article VII" (NYSDPS 2020), which details recommendations on what type of information an Article VII application should contain include the following: design goals for operation, sound power level information for mechanical and electrical equipment and proposed buildings, sound levels generated by a project's operation, and an evaluation of minimization of environmental noise impacts and conformance with the project's design goals and local regulations, if any. It also recommends that sound produced during construction be analyzed, along with plans for the minimization of noise impacts during construction. Lastly, it recommends an evaluation of ambient pre-construction baseline noise conditions by using the L_{90} statistical and the L_{eq} energy-based noise descriptors, and by following the recommendations included in ANSI/ASA S3/SC 1.100 -2014-ANSI/ASA S12.100-2014 American National Standard *Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas*. The guidance details specifications for computer noise modeling, tonality assessment, and specific design goals including the following:

- 35 dBA L_{eq}-1-hour maximum equivalent continuous average sound level from the station outside any residence within the 35 dBA noise contour from any tonal noise sources, (e.g., transformers), on the presumption that a 5 dBA prominent tone penalty applies to a basic design goal of 40 dBA;
- 40 dBA L_{eq}-1-hour maximum equivalent continuous average sound level from the station outside any residence from any other operational sound sources associated with the station not included in (1). If the sound emissions from these sources are found to contain a prominent discrete tone at any residence whether through modeling, calculation, or pre-construction field testing, then the sound levels at the receptors will be subject to a 5 dBA penalty; thus, a reduction in the permissible sound level to 35 dBA L_{eq}-1-hour. Tonality evaluation should follow the guideline recommendations. If no manufacturer's information or pre-construction field tests are available, sounds should be assumed to be tonal for those noise sources; and
- 45 dBA L_{eq}-1-hour maximum equivalent continuous average sound level from the station across all properties, except for delineated wetlands and utility rights-of-way. This should be demonstrated with modeled sound contours and discrete sound levels at worst-case locations. No penalties for prominent tones should be added in this assessment.

NYSDPS representatives subsequently recommended that the Applicant also consider the Section 94-c regulations issued by the New York Office of Renewable Energy Siting (March 2021) to support their new renewable energy siting process, which replaced the previous PSL Article 10 process for applicable renewable generating facilities. Section 900-2.8 of those regulations details the requirements relating to noise and vibration for renewable energy generating projects. The Applicant has considered the Section 94-c regulations, even though they are not required as part of the Article VII process; the design goals described in Section 94-c are relatively consistent with those identified above and therefore are not separately assessed herein.

4.5.1.2 New York City

Regulations for construction-related noise are defined in New York City Administrative Code (NYCAC) §24-219 through 224. Under § 24, sound is regulated by the existing land use of the receiving property, not its zoning regulation. Section 24 of the NYCAC addresses noise from construction by establishing

construction windows. Section 24 of the NYCAC also regulates sound for operational developments primarily under two separate regulations: (1) absolute octave band limits at residential and commercial property, and (2) incremental limits for all off-site locations. Please refer to **Exhibit 7** for an analysis of New York City's construction and operational noise regulations.

4.5.2 Existing Conditions

The following sections include a discussion of the existing acoustic environment and analyses performed for the NY Project. **Sections 4.5.2.1** and **4.5.2.2** provide detail on the existing conditions.

4.5.2.1 Offshore

Sound within the marine environment is generated by natural physical and biological processes. Wind and waves are examples of physical sound sources, while vocalizations of marine mammals and fish are examples of biological sound sources. Although large waves are not common in Long Island Sound, small-scale waves, wind, and heavy precipitation can contribute to underwater sound there (Simmonds et al. 2004).

Aquatic animals generate sounds for communication, echolocation, prey detection, and as by-products of other activities such as feeding and may contribute considerably to the amount of background noise in an area. Biological sound sources can vary from minute-to-minute, hour-to-hour, and seasonally. Biological sound production usually follows seasonal and diurnal patterns, which are dictated by variations in the activities and abundance of the vocal animals. Underwater biological sounds range in frequency from less than 10 Hz to greater than 150 kilohertz (kHz). Source levels show a substantial variation ranging from less than 50 decibels (dB) to more than 230 dB SPL root mean square referenced to 1 micropascal at 3.1 ft (1 m). There is also significant variation in other source characteristics such as the duration, temporal amplitude, frequency patterns, and the rate at which sounds are repeated (Wahlberg 2008).

In addition to natural or ambient sounds that can be found in the marine environment, anthropogenic noises can also be detected in offshore environments. Noise can be defined as any loud, discordant, or disagreeable sound or sounds (NYSDEC 2001). More commonly, noise can be defined as unwanted sound (NYSDEC 2001). For the purposes of this section, sounds created by the construction and O&M of the NY Project are considered noise.

A major source of underwater anthropogenic noise along the submarine export cable corridor is vessel traffic associated fishing, commercial, and recreation uses, U.S. Navy and USCG activities, and research/data collection activities. Ships' propellers and dynamic positioning (DP) propulsion devices such as thrusters, create noise that spread throughout coastal waters while main engines, gearboxes, and generators contribute noises that are secondary to those of the propulsion systems. The use of sonar and depth sounders, which occur at generally high frequencies and attenuate rapidly are also secondary sources. The typical shipping vessel produces noise at frequencies below 1 kHz while smaller fishing, recreational, and leisure craft might generate noise at somewhat higher frequencies (Simmonds et al. 2004). These noise sources are likely to contribute to the ambient noise conditions within and surrounding the submarine export cable corridor.

4.5.2.2 Onshore

Ambient sound levels are characterized by different sound levels. In order to consider sound fluctuations, environmental sound is commonly described in terms of L_{eq}. The L_{eq} value is the energy-averaged sound level over a given measurement period. To describe the background ambient sound level, the L_{90} percentile metric is typically utilized, representing the quietest 10 percent of any time period. Conversely, the L_{10} is the sound level exceeded 10 percent of the time and is a measurement of intrusive noises, such as vehicular traffic or aircraft overflights, while the L_{50} metric is the sound level exceeded 50 percent of the time. The ambient acoustic environment within and surrounding the Onshore Project Area is largely influenced by vehicular traffic. Localized traffic is steady during the daytime hours, with fewer cars traversing local roads at night. Noise from trains and planes is also present during both daytime and night-time hours. Natural sounds from birds, trees, and other wildlife are also minor sound sources in the area, as are ocean waves in coastal areas.

Existing acoustic conditions of the Onshore Project Area were characterized by measuring ambient sound levels at property line sites representative of the closest noise-sensitive receptors to the onshore substation facility. To characterize existing ambient conditions at the Onshore Project Area, unattended baseline sound measurements were conducted for a continuous 48-hour period from August 25 through August 27, 2021. The location of the sound monitoring is depicted in **Figure 4.5-1**, situated along 20th Avenue, southwest of the onshore substation facility. This location represents the nearest noise sensitive area (NSA) which consists of an apartment complex. Sound pressure level monitoring was performed with a Larson Davis Model LxT sound level meter, rated by the American National Standards Institute (ANSI) as Class 1, per ANSI S1.4-2014 (ANSI 2014). The sound level meter microphone was fitted with a standard open-cell foam windscreen and positioned approximately 5 to 8 ft (1.5 to 2.4 m) above grade. The sound level meter was set using slow time-response and the A-weighting scale. Sound level meter calibration was field-checked before and after each measurement period with a Larson Davis Model CAL200 acoustic calibrator, and the meter was factory-calibrated within one year of the measurement period. Sound level measurements performed for this field survey were conducted in accordance with applicable ISO 1996-1 (ISO 2016) and ISO 1996-2 (ISO 2017) standards.

Figure 4.5-2 shows the results of ambient noise at the nearest NSA. Both hourly L_{eq} (light green line) and L_{90} (dark green line) are depicted in **Figure 4.5-2.** The measured hourly L_{eq} ranged from 55 dBA to 61 dBA. The dominant noise sources during the measurement period were continuous nondescript mechanical noise from the manufacturing district, heating, ventilation, and air conditioning (HVAC) unit operation at residential properties, and insect noise. Additional daytime noise sources included intermittent bird calls, aircraft flyovers, vehicle traffic, and bicycle traffic. See **Appendix B1** for additional details on the in-air acoustic modeling and assessment.

Figure 4.5-1. Noise Monitoring Location

Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

Noise Monitoring Location

Project Components

Landfall Site

Onshore Substation Facility

Astoria Power Complex

Submarine Export Cable Landfall Area

Onshore Export Cable Route Area (HDD)

0 300 600 Feet

0 100 200 Meters

equinor

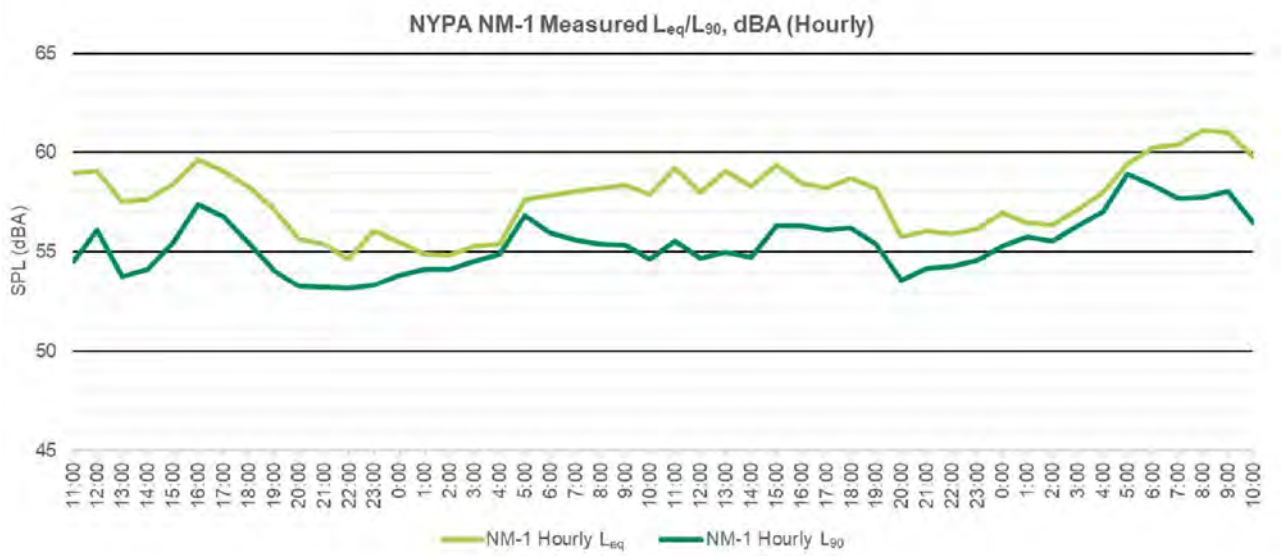
EDR

Prepared May 5, 2022

Data Sources: Sound contours and monitoring locations provided by AECOM.

Basemap: NYSDOP "2020" orthoimagery map service.

Figure 4.5-2. Ambient Noise Monitoring Results



4.5.3 Potential Impacts

Construction and O&M activities associated with the NY Project will generate noise with the potential to impact existing, ambient acoustic conditions. During construction, these impacts can be separated by the offshore and onshore activities. With respect to NY Project operation, most noise will be generated by the onshore substation facility. Maintenance activities associated with the NY Project will be limited and performed on an as-needed basis. **Section 4.5.3.1** describes potential impacts from offshore NY Project construction, **Section 4.5.3.2** describes potential impacts from onshore NY Project construction, and **Section 4.5.3.3** describes potential impacts from O&M of the onshore substation facility and overall maintenance activities that could occur in the NY Project Area. Proposed measures to avoid, minimize and mitigate potential impacts are summarized in **Section 4.5.4**.

4.5.3.1 Offshore Construction

During offshore construction, noise will be generated from the following activities:

- Installation of submarine export cables;
- Installation of cofferdam using vibratory pile driving; and
- Utilization of NY Project-related vessels.

These activities will result in temporary increases in noise levels. While the following section addresses impacts to existing acoustic conditions, underwater noise also has the potential to cause effects to biological resources (e.g., fish and marine mammals). Potential impacts of underwater noise from NY Project construction to biological resources are addressed in **Sections 4.10**, **4.12**, **4.13**, and **4.14** of **Exhibit 4**.

4.5.3.1.1 Installation of Submarine Export Cables and Cable Protection

In-air noise from the installation of submarine export cables in the offshore environment is not expected to adversely affect NSAs along the northern shore of Long Island, due to the distance between the submarine export cable route and the shoreline. Additionally, construction vessels will be constantly moving along the submarine export cable route as the cables are installed, therefore noise generated by those vessels and associated operational construction equipment will not remain in one location for extended periods of time.

Installation of submarine export cables and cable protection measures will result in a temporary increase in underwater noise levels. Cable installation will be completed by jet plow or underwater plow. The cable-laying vessel will utilize DP thrusters, which will be the predominate source of underwater noise during cable-laying activities. DP thruster noise is a continuous noise source and has propagation properties similar to vessel noise. Given the amount of vessel traffic occurring in the vicinity of the submarine export cable corridor, underwater noise generated by the DP thrusters is not expected to significantly increase existing noise conditions.

4.5.3.1.2 Vibratory Pile Driving for Cofferdam Installation

Installation of a nearshore cofferdam by vibratory pile driving for the submarine export cable HDD exit will result in a temporary increase to in-air and underwater noise. The temporary offshore cofferdam will be constructed by installing sheet piles using vibratory pile drivers, which apply a rapidly alternating force to the pile to drive it into the substrate. Vibratory pile driving produces a continuous noise with

peak pressures lower than those observed in the pulses generated by traditional impact pile driving which produces a loud impulsive noise that can propagate through the air, water, and seafloor. Vibratory pile driving activities will result in temporary increases to in-air and underwater noise levels in the vicinity of the cofferdam in the East River. Results of the in-air noise modeling from cofferdam installation showed noise levels of approximately 39 dBA at the nearest NSAs, which is less than the measured ambient level of 55 dBA (**Appendix B1**). The potential impacts to shoreline communities would be minimal, if not non-existent, due to the distance between the cofferdam location and NSA. Results of the underwater noise modeling and potential effects to marine mammals is described in **Section 4.13.2.1** and in **Appendix B2**.

4.5.3.1.3 Vessel Traffic

Incremental vessel traffic along the submarine export cable corridor will occur because of cable installation due to smaller crew transport and supply vessels navigating from the cable-laying vessels to one or more regional ports. Given the existing levels of vessel traffic in Block Island Sound, Long Island Sound, and the eastern reaches of the East River, NY Project vessels are not expected to significantly add to vessel noise in New York State waters and, therefore, are not expected to adversely affect nearby NSAs.

4.5.3.2 Onshore Construction

During onshore construction, noise will be generated from the following activities:

- HDD activities;
- Vehicle and equipment movements during staging activities and assembly of NY Project components at designated facilities or work areas; and
- Construction of the onshore components, including the onshore export and interconnection cables, and the onshore substation facility.

NY Project onshore construction activities will result in temporary increases in noise levels. While the following section addresses impacts to existing acoustic conditions, noise produced during onshore construction also may cause some limited impacts to wildlife (i.e., birds and bats) occurring near the onshore substation facility. A discussion of potential impacts to birds and bats from noise produced during construction can be found in **Sections 4.10 and 4.11**.

4.5.3.2.1 HDD Activities

HDD operations associated with the landing of the submarine export cables were modelled as a representative case of noise-producing activities during the onshore construction. HDD noises will be temporary and expected to be less than the ambient minimum hourly L_{eq} of 55 dBA measured along 20th avenue at the closest NSA. **Table 4.5-2** lists the dominant noise sources associated with the HDD operations along with their referenced noise levels.

TABLE 4.5-2. HDD EQUIPMENT NOISE LEVEL PRESSURE SOURCE LEVELS, DBA AT 3 FT

HDD Equipment Component	Reference Noise Level (dBA)
HDD Drill Rig and Power Unit	102
Drilling Mud Mixer/Recycling Unit	90
Mud Pumping Unit	102
Generator Set, 100 kilowatts	100
Generator Set, 200 kilowatts	102
Vertical Sump Pump	75

HDD construction equipment consists of HDD drill rigs and auxiliary support equipment including electric mud pumps, portable generators, mud mixing and cleaning equipment, forklifts, loaders, cranes, trucks, and portable light plants. Once the HDD and pull-back are complete, noise from the landfall area will be limited to typical construction activities associated with equipment such as tracked graders, backhoes, and pickup trucks. HDD construction activities will occur during daytime periods unless a situation arises that would require construction operations to continue into the night, or as deemed acceptable by the appropriate regulatory authority.

Using the components and noise levels provided in **Table 4.5-2**, the Applicant modeled noise expected to occur due to HDD operations. **Table 4.5-3** summarizes the predicted noise levels at the nearest NSAs to the onshore substation facility, one of which overlaps with the ambient noise monitoring location depicted in **Figure 4.5-1**. Modeled noise levels are also depicted on **Figure 4.5-3**.

TABLE 4.5-3. NOISE LEVELS (DBA) DURING HDD ACTIVITIES

Location	Distance from Entry Pit (ft [m])	Noise Levels at NSAs due to All HDD Sources (Daytime Operations) (dBA)
NYPA-1a/	1,915 ft (583 m)	47
NYPA-2	2,110 ft (643 m)	46

Notes:
a/ NYPA-1 represents the location of the noise monitoring used to measure ambient noise levels as well as a nearby NSA.

Figure 4.5-3. Anticipated Noise Levels from HDD Activities

Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

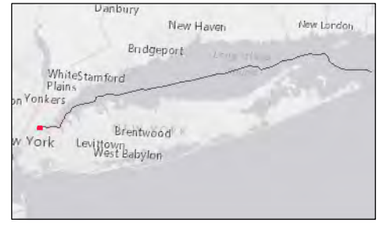
Noise Sensitive Area

Noise Contour (dBA)

- 45
- 50
- 55
- 60
- 65
- 70
- 75

Project Components

- Landfall Site
- Onshore Substation Facility
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)



0 300 600 Feet

0 100 200 Meters

equinor EDR

Prepared May 5, 2022
Data Sources: Sound contours and monitoring locations provided by AECOM.
Basemap: NYSDOP "2020" orthoimagery map service.

While noise levels at the NSAs are already expected to be below ambient noise levels, noise produced by HDD activities may be reduced below the modeled values presented in **Table 4.5-3** through noise control strategies. Noise control strategies under consideration by the Applicant, which will be further evaluated for inclusion in the EM&CP, are listed in **Table 4.5-4**.

TABLE 4.5-4. HDD CANDIDATE NOISE CONTROL STRATEGIES

HDD Equipment Component	Candidate Noise Control Strategies
Trucks	Restrictions of hours of operations and routes (away from receivers)
Light Plants (electric generators)	Acoustical enclosures or barriers for generators
Mud Pumping Units	Acoustical enclosures for mud pumps and engines equipped with exhaust silencers
Loaders/Forklifts	Engines equipped with exhaust silencers; modification of back-up alarms to low-volume types; locating loading bins away from receivers.
Power Unit and HDD Drill Rig	A complete acoustical enclosure for the power unit equipped with a critical-grade exhaust silencer; partial enclosure or barrier for the HDD rig
Light Plants (Electric Generators)	Acoustical enclosures or barriers for electric generators and exhaust silencers
Cranes and Boom Trucks	Exhausts equipped with silencers; engine compartment acoustically treated; usage restrictions

4.5.3.2.2 Construction of Onshore Substation, Onshore Export Cables, and Interconnection Cables

The construction of the onshore substation facility and installation of the onshore export and interconnection cables will result in temporary increases in sound levels; however, modeling shows that such sound levels will be at or below ambient sound levels (i.e., minimum hourly L_{eq} of 55 dBA). Onshore construction activities will last approximately 24 months and will include the following:

- Site preparation, excavation, and grading;
- Construction of foundations for the control building, transformers, reactors, and switchgear;
- Construction of electrical grounding, duct banks, and underground conduits;
- Installation of appropriate drainage systems, security fences, sound barriers (where determined to be applicable), and station service; and
- Installation of above ground structures including transformers, switchgears, and cable systems.

Potential noise impacts from these onshore construction activities are a function of the specific receptors near the Onshore Project Area as well as the equipment used and the proposed hours of operation. Primary noise sources during the construction of the onshore substation facility are presented in **Table 4.5-5**. Construction is anticipated to occur during typical work hours. However, in specific instances at some locations, or at the request of the New York City Department of Public Works, nighttime work, or work outside the normal hours of construction may be necessary and would

require municipal approval. The Applicant is seeking a waiver of NYC Noise Control Code § 24-222 and § 24-223 in order to allow construction activities take place outside the hours of 7:00 a.m. to 6:00 p.m. on weekdays and on weekends (see **Exhibit 7**). Nighttime work will be minimized and conducted on an as-needed basis, such as when crossing a busy road. If nighttime work is required, the Applicant will coordinate with the applicable New York City departments.

TABLE 4.5-5. PRIMARY NOISE SOURCES AND REFERENCE LEVELS FOR ONSHORE SUBSTATION FACILITY CONSTRUCTION ACTIVITIES

Construction Source	Quantity Assumed	L_wA
Large Bulldozer	1	110
All-Terrain Forklift	1	109
Front End Loader	1	107
Medium Crane	1	105
Medium Aerial Lift	1	107
Medium Excavator	1	109
Vibratory Piling Rig	1	126
Generator	1	110

Source: Federal Highway Administration (FHWA) 2006; Federal Transportation Administration (FTA) 2018

Table 4.5-6 summarizes the predicted maximum daytime hourly noise levels from construction of the onshore substation facility at the closest NSAs based on construction noise modeling results. These modeling results are also shown on **Figure 4.5-4**. Based on the modeling results, noise levels are not expected to exceed the existing minimum ambient level of 55 dBA, which is substantially less than the commonly used and accepted guideline of 65 dBA for daytime noise exposures at residential buildings (NYSDEC 2001; Cowan 1994). Following methods outlined by the EPA, sound levels were projected from the acoustic center of the building footprint to the two closest NSAs associated with the onshore substation facility. This calculation conservatively assumes all equipment operating concurrently onsite for the specified construction phase and no noise attenuation for ground absorption or onsite shielding by the existing buildings or structures.

TABLE 4.5-6. PREDICTED SUBSTATION CONSTRUCTION NOISE LEVELS (DBA)

Location	Distance from Approximate Site Center (ft [m])	Predicted Construction Noise Level (L_{eq}, dBA)
NYPA-1	2,110 ft (643 m)	51
NYPA-2	2,285 ft (696 m)	55

In addition to the construction equipment listed in **Table 4.5-5**, pile driving may be needed to install the foundation for the onshore substation facility. The pile driving technique, vibratory or impact, has not been selected at this stage of NY Project design development. If vibratory pile driving is selected, noise levels are expected to be consistent with those reported during the excavation phase of construction. If impact pile driving is required, higher noise levels are expected to be short term.

Figure 4.5-4. Predicted Noise Levels from Construction of the Onshore Substation Facility

Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

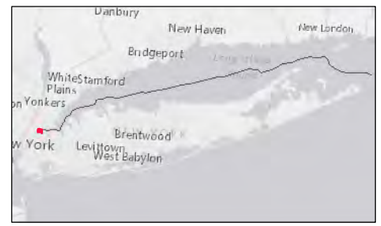
Noise Sensitive Area

Noise Contour (dBA)

- 45
- 50
- 55
- 60
- 65
- 70
- 75

Project Components

- Landfall Site
- Onshore Substation Facility
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)



0 300 600 Feet

0 100 200 Meters

equinor EDR

Prepared May 5, 2022
Data Sources: Sound contours and monitoring locations provided by AECOM.
Basemap: NYSDOP "2020" orthoimagery map service.

4.5.3.3 Operations and Maintenance Activities

During the O&M phase, the following impacts on noise levels are expected:

- Long-term, minor elevated in-air sound levels from operation of the onshore substation facility; and
- Temporary minor elevated in-air sound levels due to periodic maintenance activities in the submarine export cable corridor and Onshore Project Area.

4.5.3.3.1 Operation of the Equipment in Onshore Substation Facility

Operation of the equipment in the onshore substation facility will result in continuous noise. **Table 4.5-7** lists the dominant noise sources associated with the onshore substation facility, as well as their referenced sound levels. L_wA values are sound power levels in dBA, provided by the listed references. Sound power levels, unlike sound pressure levels, are independent of location with respect to a source. The overall A-weighted levels are based on octave band center frequency (OBCF) data from the listed sources.

TABLE 4.5-7. PRIMARY NOISE SOURCES AND REFERENCE LEVELS FOR ONSHORE SUBSTATION FACILITY SITES

Source	Quantity in Layout	Relative Height (ft [m])	L_wA (dBA)	OBCF Source
540 MVA Transformer	3 (+1 back-up)	22 (6.7)	100	EEI XFMR a/
540 MVA Transformer Battery	3 (+1 back-up)	20(6.1)	88	Harris XFMR b/
1600 kVA Auxiliary Transformer	2	22 (6.7) e/	68	Harris XFMR b/
Converter Reactor	8	34 (10.3)	105	EEI XFMR a/
Converter Module (indoors)	46	39 (11.9)	88	Harris XFMR b/
Star Point Reactor	1	20 (6.1) e/	85	Harris XFMR b/
Converter Building HVAC	3	20 (6.1) e/	81	Johnson Controls c/
Converter Cooling Fan Array	1	20 (6.1) e/	95	Wartsila d/

Notes:
a/ EEI: Edison Electric Institute 1984
b/ Harris: Harris 1998
c/ Johnson Controls Series 100 20,000 CFM Unit. Johnson Controls, Series 100 Performance Specification
d/ Wartsila: Standard-Noise Radiator (6-Fan Array) (Wartsila 2012)
e/ Estimated height
HVAC – heating, ventilation, and air conditioning
kVA – kilovolt ampere
L_wA – sound power levels in dBA (provided by the listed references)
MVA – megavolt ampere
OBCF – octave band center frequency
XFMR - transformer

Figure 4.5-5 illustrates the results of noise modeling of the operational onshore substation facility. Operation of the onshore substation facility is not expected to generate noise above 44 dBA at the nearest NSAs, which is substantially less than the measured minimum hourly L_{eq} noise level of 55 dBA, meaning that operation of the onshore substation will not increase ambient noise levels above existing conditions. Therefore, operation of the onshore substation facility will be in compliance with NYCAC §24-218. Although the onshore substation facility is compliant with NYCAC §24-218, its operation slightly exceeds the OBCF noise levels defined in NYCAC §24-232. **Table 4.5-8** provides the predicted operational OBCF noise levels at both noise modeling locations and a comparison with the guidelines of NYCAC §24-232 for a residential dwelling. To reach compliance with NYCAC §24-232, the Applicant will implement noise mitigation measures that will be detailed in the NY Project's EM&CP. See **Exhibit 7: Local Ordinances** for a discussion of local waiver requests related to operational noise levels.

TABLE 4.5-8. COMPARISON OF PREDICTED OPERATIONAL OBCF NOISE LEVELS WITH NYCAC §24-232

OBCF (Hz)	New York City Code Limit a/	NYPA -1 b/	NYPA-2 b/
31.5	70	59	55
63	61	55	50
125	53	**55**	50
250	46	**47**	43
500	40	**46**	**42**
1000	36	**40**	36
2000	64	34	28
4000	33	22	10
8000	32	N/A c/	N/A c/

Notes:
a/ Since the closest receptors are residential (i.e., apartments), these limits reflect the interior of a residential use with windows open
b/ Values listed are unweighted sound pressure levels. Bold values indicate non-compliance with limit.
c/ N/A – Not applicable, no measurable acoustic energy at receptor distance
Source: NYC Code – New York City Administrative Code, Section 24-232, 2005

The NYSDPS recommends a 35 dBA acoustic design goal outside any residence, assuming a 5 dBA penalty for prominent tones, and a 45 dBA acoustic design goal at the property boundary. Operation of the substation will comply with the 45 dBA design goal for the property boundary but exceeds the 35 dBA design for residences. The closest residences are located along 20th Avenue, which was modeled as receiving noise levels of 44 dBA or less. However, operation of the substation will result in lower noise levels than those measured in the current ambient environment. The existing ambient sound levels which consist of vehicular traffic, trains, planes, and sounds of wildlife, are expected to be dominant to noise produced by the operational onshore substation facility and will likely mask those operational noise. Accordingly, the Applicant believes that an incremental increase criterion, similar to those provided by the NYSDEC and NYCAC would be a more appropriate measure for assessing noise impacts at NSAs given the existing ambient acoustic environment of the Onshore Project Area and surrounding areas.

Figure 4.5-5. Predicted Noise Levels from Operation of the Onshore Substation Facility

Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

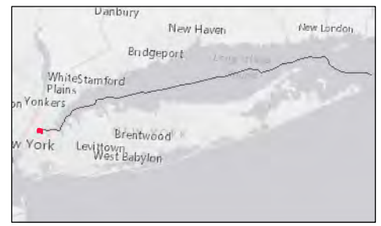
Noise Sensitive Area

Noise Contour (dBA)

- 45
- 50
- 55
- 60
- 65
- 70
- 75

Project Components

- Landfall Site
- Onshore Substation Facility
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)



0 300 600 Feet

0 100 200 Meters

equinor EDR

Prepared May 5, 2022
Data Sources: Sound contours and monitoring locations provided by AECOM.
Basemap: NYSDOP "2020" orthoimagery map service.

4.5.3.3.2 Offshore and Onshore Maintenance Activities

Because vessel traffic during O&M is expected to have an insignificant increase above existing baseline conditions, underwater noise from NY Project-related maintenance activities and support vessel traffic is not expected to be greater than existing ambient noise levels. Maintenance activities in the Onshore Project Area will occur on an as-needed basis and associated noise sources will be largely limited to vehicle traffic. Given the developed nature of the Onshore Project Area, and existing vehicle traffic noise captured during ambient noise modeling, maintenance activities in the Onshore Project Area are not expected to cause adverse effects to surrounding areas or communities.

4.5.4 Summary of Avoidance, Minimization, and Mitigation Measures

The Applicant proposes to implement the following measures to avoid, minimize, and mitigate potential noise-related impacts during construction and O&M.

4.5.4.1 Construction

During construction, the Applicant will implement the following avoidance, minimization, and mitigation measures:

- Comply with relevant noise standards for nearshore work to the extent practicable;
- Ensure construction equipment will be well-maintained and vehicles using internal combustion engines equipped with mufflers will be routinely checked;
- Select newer models, where feasible, to provide the quietest performance;
- Turn off construction equipment when not in use;
- Minimize idling times;
- Use quiet, adjustable backup alarms for vehicles, when feasible;
- Locate noisy equipment as far as possible from NSAs;
- Use temporary barriers between dominant stationary equipment and NSAs where noise levels may be excessive;
- Minimize hours of construction operations, to the extent practical, especially if nighttime operations are necessary;
- Establish a project hotline to handle general project information requests, complaints, and other community-related concerns.

4.5.4.2 Operations and Maintenance

In the NY Project Area, the only known operational noise sources anticipated to generate potential acoustical impacts to NSAs are associated with the onshore substation facility and offshore operation vessel use. Modeling of the onshore substation facility determined that two locations would exceed New York City's octave band Noise Code limits. The Applicant will implement the following measures to mitigate potential impacts and to comply with state and local performance standards, as applicable to the NY Project:

- Comply with IMO noise standards for vessel operations in Long Island Sound;
- Maintain onshore substation facility equipment and, where appropriate, install mufflers;
- Locate noise-generating equipment (e.g., reactors and transformers) inside or outside with the use of noise barriers if deemed necessary based on regulatory requirements and stakeholder engagement; and
- The final design and noise mitigation strategies will be presented in the EM&CP.

4.6 EMF

This section addresses the requirements of 16 NYCRR § 86.5 and describes offshore and onshore electromagnetic fields (EMF) that may occur within and surrounding the NY Project. Potential impacts from EMF during operation of the NY Project, as well as measures the Applicant will implement to avoid, minimize, and mitigate such impacts are also discussed in this section.

4.6.1 Electric and Magnetic Field Assessment and Criteria

The Applicant contracted Integral to conduct an EMF Assessment associated with the DC magnetic fields for the HVDC submarine and onshore export cables and the AC magnetic fields for the HVAC onshore interconnection cables. The EMF Assessment is provided in **Appendix C: Electric and Magnetic Field Assessment**. The NY Project, as proposed, will not be a direct source of electric fields above ground onshore or at the seabed due to shielding of the electric field by the cable's metallic sheaths and the ground, seabed, or other cable protection.

New York State has established guidelines and limits for EMF that must be followed by utility companies seeking certificates of environmental compatibility and public need. In 1990, the NYPSC established guidelines for magnetic field levels for new transmission lines in its Interim Policy Statement on Magnetic Fields. Previously, in 1978, the NYPSC established guidelines for electric fields generated by new transmission lines in Opinion No. 78-13. The federal government has not established standards for EMF produced by transmission infrastructure, but other health and safety organizations have, including the International Commission on Non-Ionizing Radiation Protection (ICNIRP 2010) and the International Committee on Electromagnetic Safety (ICES 2019).

4.6.1.1 Magnetic Fields

Currently, regulations regarding magnetic field emissions only exist for AC fields, not DC fields. The Interim Policy Statement on Magnetic Fields limits the magnitude of AC magnetic fields generated by Article VII transmission lines to 200 milligauss (mG) or less at a frequency of 60 Hertz (Hz) at the edge of the right-of-way (ROW). The value of 200 mG is referenced by NYPSC (1990) as an interim standard. The value is based on the average of calculated magnetic fields for overhead 345-kV transmission circuits in New York State. The interim standard was established so that EMF from new transmission lines would not exceed typical levels from existing transmission lines throughout New York.[5]

Although the 1990 Interim Policy Statement was developed specifically for AC EMF, Integral calculated the magnetic fields that would be produced by the DC portions (i.e., HVDC submarine export cables, HVDC onshore export cables) of the NY Project in general accordance with the direction provided by NYPSC (1990) (see **Appendix C** for more details).

4.6.1.2 Electric Fields

In Opinion No. 79-13, the NYPSC established 1.6 kV/m at the ROW edge as its electric field limit based on its finding that the voltage applied to overhead conductors is a direct source of electric fields in the surrounding environment. As described above, the cables considered in the EMF Assessment

[5] Other national and international health and safety organizations have established EMF guidelines for magnetic fields that are an order of magnitude higher than the NYPSC interim standard of 200 mG, including the ICNIRP (2,000 mG, general public) (ICNIRP 2010) and ICES (9,040 mG, general public) (ICES 2019).

will not be a direct source of any aboveground electric fields since the NY Project's cables will be covered by metallic sheath blocking the electric fields from moving beyond the cable. In addition, any electric field induced by the magnetic field will be *de minimis* and below the NYPSC limit. Accordingly, neither AC nor DC electric fields are further evaluated in this section or in the EMF Assessment (**Appendix C**).

4.6.2 Existing Conditions

The earth's geomagnetic field creates a background DC magnetic field that is present everywhere. Earth's geomagnetic field is a result of the magnetism of the minerals in the earth's crust and core. The DC current flowing through an HVDC cable will produce a DC magnetic field. The strength of this magnetic field will vary based on the configuration of the cable conductors, the direction of the cable path relative to earth's geomagnetic field, the loading, and the cable burial depth. This cable-induced DC magnetic field can combine with earth's background magnetic field increasing or decreasing the total magnetic field strength. Along the proposed route of the HVDC submarine export cables and HVDC onshore export cables, the earth's DC magnetic field has a strength of 507–514 mG (Chulliat et al. 2020). This ever-present DC magnetic field can influence the DC magnetic field generated by the two HVDC submarine and onshore export cables.

Unlike DC magnetic fields, no background AC magnetic fields naturally exist. The current flowing through an AC cable will produce an AC magnetic field. The strength of this magnetic field will vary based on the configuration of the 3-phase AC cable, the loading, and the cable burial depth.

4.6.3 Potential Impacts

Operation of the submarine and onshore export cables, as well as the onshore interconnection cables associated with the NY Project, will generate magnetic fields that will interact with ambient magnetic fields. A summary of predicted magnetic fields generated by the NY Project are provided in the following sections. The complete results of the magnetic field modeling assessment for the NY Project are provided in **Appendix C**. Impacts to biological resources (i.e., benthic, finfish, and invertebrate resources; marine mammals; and sea turtles) are discussed in the resource-specific sections in **Exhibit 4**. Proposed measures to avoid, minimize and mitigate potential EMF impacts are summarized in **Section 4.6.3**.

4.6.3.1 HVDC Submarine Export Cables

Magnetic field strength was evaluated for the bundled HVDC submarine export cables at 3.3 ft (1 m) above the seabed for four proposed burial depths conditions: 1 ft (0.3 m) representing a concrete mat covering, 3 ft (0.9 m), 6 ft (1.8 m), and 15 ft (4.6 m). The largest predicted value of 705 mG occurred directly above the cable at a burial depth of 1 ft (1.8 m) which represents a concrete mat covering. When buried at a depth of 3 ft (0.9 m), the maximum magnetic field strength was predicted directly above the cable to be 600 mG. At burial depths of 6 ft (1.8 m) and 15 ft (4.6 m), the maximum magnetic field strengths directly over the cable centerline was predicted to be 553 and 522 mG, respectively. For all burial depths, modeled field strength levels decrease dramatically at distances away from the cable and reach background levels within approximately 5 ft (1.5 m) of the cable. The relative difference from earth's geomagnetic field value of 512 mG, based on the cable's proposed route, is less than the NYPSC interim standard of 200 mG at the maximum value directly over the cable poles for all the burial depth scenarios.

Magnetic field strength was also evaluated for the unbundled HVDC submarine export cables, which will be separated by 33 ft (10 m). The same four burial depths used in the bundled scenario were used for the unbundled scenario. The largest predicted value occurred at 3.3 ft (1 m) above the seabed, directly over one pole of the cable when covered by a concrete mat, which resulted in a magnetic field of 2,882 mG. As the burial depth increases, the modeled magnetic field strength rapidly declines to 1,106 mG, at a burial depth of 15 ft (4.6 m). Similar to the bundled scenario, magnetic fields decline rapidly on either side of the cable poles, quickly approaching background levels within 12 ft (3.7 m) on either side of the separated cable poles (within 27 ft [8.2 m] of the centerline between the separated cables).The relative difference from earth's geomagnetic field value of 512 mG is less than 200 mG at 10 ft (3 m) away from one of the separated cable poles for the mat covering burial depth scenario (25 ft [7.6 m] away from the centerline of the separated cables). For the deepest burial scenario of 15 ft (4.6 m), the 200 mG difference from earth's geomagnetic field is reached within 8 ft (2.4 m) (23 ft [7.0 m] away from the centerline of the separated cables).

4.6.3.2 Onshore HVDC Export Cables

Magnetic field strength was also modeled for the HVDC onshore export cables with the poles separated by 6.6 ft under burial depths ranging from the proposed target burial depth of 4.4 ft (1.3 m) to the proposed maximum depth of 13 ft (4 m). The largest predicted value for the magnetic field strength is 1,702 mG, at 3.3 ft (1 m) above the ground, directly over one pole of the cable at its target burial depth of 4.4 ft (1.3 m). Field strength is predicted to rapidly decrease with distance from the cables, reaching background levels within 12 ft (3.7 m) from the cable's poles (15 ft [4.6 m] from the centerline). At the maximum burial depth of 13 ft (4 m), the maximum modeled magnetic field is 799 mG and is predicted to rapidly decrease to background levels within 21 ft (6.4 m) from the cable poles (24 ft [7.3 m] from the centerline). The relative difference from earth's geomagnetic field value of 512 mG is less than 200 mG at 11 ft (3.4 m) away from the cable centerline for the 4.4 ft (1.3 m) burial depth scenario. For the deeper burial depth scenario, the difference from earth's geomagnetic field is reached within 9 ft (2.7 m) of the cable centerline.

4.6.3.3 Onshore HVAC Interconnection Cables

Magnetic field strength was evaluated for the HVAC onshore interconnection cables at 3.3 ft (1 m) above the ground resulting from the burial of three duct banks, each consisting of nine cables at the proposed minimum burial depth of 3 ft (0.9 m) and the proposed maximum burial depth of 8 ft (2.4 m). Under both burial depth conditions, the magnetic fields resulting from HVAC operation are predicted to be less than 200 milligauss (mG), which is the NYPSC's AC magnetic field interim standard at the edge of a 110-ft right-of-way (ROW) at 3.3 ft (1 m) above the ground. The largest modeled magnetic fields from the HVAC interconnection cables at 3.3 ft (1 m) above the ground and directly over a duct bank are 1,300 mG and 550 mG at burial depths of 3 ft (0.9 m) and 8 ft (2.4 m), respectively.

4.6.4 Summary of Avoidance, Minimization, and Mitigation Measures

During operation, the Applicant will implement the following avoidance, minimization, and mitigation measures:

- Use cable sheathing to avoid electric field emissions in the offshore and onshore environment; and
- Bury cables which will reduce magnetic field emissions into the offshore and onshore environment.

4.7 Onshore Topography, Geology, Soils, Groundwater

This section addresses the requirements of 16 NYCRR § 86.5 and describes the topography, geology, soils, and groundwater in and surrounding the onshore project components and landfall. Potential impacts resulting from construction and O&M of the NY Project are discussed, as well as measures that the Applicant will implement to avoid, minimize, and mitigate potential impacts related to topography, geology, soils, and groundwater.

4.7.1 Existing Conditions

The affected environment is defined as the Onshore Project Area, which includes the onshore substation facility and onshore interconnection and export cable routes, as well as the nearshore waters at the cable landfall that have the potential to be directly or indirectly affected by the construction or O&M of the NY Project. Marine conditions are discussed in **Section 4.2**, and onshore wetlands and waterbodies are discussed in **Section 4.9**. Information was collected for this section from the following publicly available sources: USGS sediment data, NRCS soil data, topographic mapping, and peer-reviewed journals and studies.

4.7.1.1 Geology

The Onshore Project Area is located in the Long Island Sound Coastal Lowlands sub-region of the Atlantic Coastal Plain physiographic province. The natural surficial geology of the Long Island Coastal Lowlands Section consists of Pleistocene sandy till; sandy loamy till; moraine gravel, sand, and silt; and outwash gravel, sand, and silt as well as saline and estuarine marsh deposits underlain by unconsolidated Quaternary glacial and alluvial deposits and/or Harrison/Ravenswood gneiss (Bryce et al. 2010; National Conservation Training Center 2021; USGS 2021).

Glaciation of the Long Island Sound Coastal Lowlands occurred during the early to mid-Pleistocene period. This area represents the end or terminal moraines of the Great Ice Sheet glacier and is characterized by having extremely low topographic relief with elevations ranging from sea level to nearly 400 ft (120 m) above mean sea level (amsl), with most areas less than 100 ft (30 m) amsl.

4.7.1.2 Topography

The Onshore Project Area ranges in elevation from 0 ft (0 m) at the cable landfall to 16.4 ft (5 m) at the Astoria West POI. Topographic relief is characterized as flat, and slopes are minimal. The Onshore Project Area is heavily urbanized and composed of graded and filled land indicating that any previously existing topographic grades have been leveled.

4.7.1.3 Soils

As previously noted, the Onshore Project Area is heavily urbanized, and all natural soils have likely been removed or covered with fill and construction materials.

Based on U.S. Department of Agriculture Natural Resources Conservation Service soil survey data (NRCS 2021), the soils in the vicinity of the Onshore Project Area in Astoria, New York, are comprised primarily of “Urban land” soils (**Figure 4.7-1**). Individual soil units that occur in the Astoria power Complex are described in **Table 4.7-1**. Surficial soils in this area are underlain by Wisconsinan glacial deposits with variable thicknesses generally ranging from approximately 50 to 100 ft (15 to 30 m) (Soren 1978).

TABLE 4.7-1. ASTORIA POWER COMPLEX SOILS

Soil Unit	Map ID	Slopes (percent)	Typical Profile of Dominant Components
Greenbelt-Urban land complex	GUA	0 to 3	loam over sandy loam; cemented material over gravelly sandy loam
Laguardia-Urban land complex	LUA	0 to 3	cobbly-artifactual coarse sandy loam over very cobbly-artifactual coarse sandy loam cemented material over gravelly sandy loam
Laguardia artifactual coarse sandy loam	LaA LaC	0 to 3 8 to 15	cobbly-artifactual coarse sandy loam over very cobbly-artifactual coarse sandy loam
Secaucus artifactual fine sandy loam	SeA	0 to 3	gravelly to very gravelly artifactual fine sandy loam over extremely cobbly-artifactual fine sandy loam
Urban land-Laguardia complex	ULAl	0 to 3	cemented material over gravelly sandy loam cobbly-artifactual coarse sandy loam over very cobbly-artifactual coarse sandy loam
Urban land, tidal marsh substratum	UmA	0 to 3	cemented material over very gravelly sand
Urban land, reclaimed substratum	UrA	0 to 3	cemented material over gravelly sandy loam
Urban land, till substratum	UtA	0 to 3	cemented material over gravelly sandy loam
Water	W	Not applicable	not applicable

Source: NRCS 2021

Figure 4.7-1. Onshore Study Area Soils

Beacon Wind 1 Project

Long Island Sound, New York

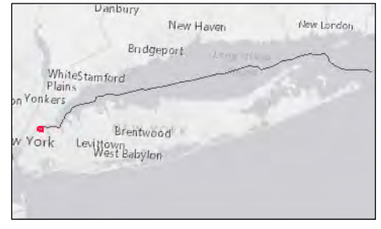
Article VII Application

NRCS Soils

- GUA - Greenbelt-Urban land complex, 0-3% slopes
- LaA - Laguardia artifactual coarse sandy loam, 0-3% slopes
- LaC - Laguardia artifactual coarse sandy loam, 8-15% slopes
- LUA - Laguardia-Urban land complex, 0-3% slopes
- SeA - Secaucus artifactual fine sandy loam, 0-3% slopes
- UrA - Urban land, reclaimed substratum, 0-3% slopes
- UmA - Urban land, tidal marsh substratum, 0-3% slopes
- UtA - Urban land, till substratum, 0-3% slopes
- UGA - Urban land-Greenbelt complex, 0-3% slopes
- UGB - Urban land-Greenbelt complex, 3-8% slopes
- ULAl - Urban land-Laguardia complex, 0-3% slopes, low impervious surface
- W - Water

Project Components

- Access Road
- Interconnection Cables
- Astoria West POI
- Onshore Substation Facility
- Staging Area
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)



0 300 600 Feet

0 100 200 Meters

Prepared May 5, 2022
Data Sources: USDA NRCS SSURGO
Basemap: NYSDOP "2020" orthoimagery map service.

4.7.1.4 Groundwater

The Onshore Project Area overlays the Kings/Queens Counties (Brooklyn-Queens) Sole Source Aquifer. Sole source aquifers are designated by the EPA as aquifers that are used as the sole or main sources of drinking water for a community and are regulated under the provisions of the federal Safe Drinking Water Act of 1974 (NYSDEC 2011). The Safe Drinking Water Act also requires states to adopt drinking water quality standards to implement and enforce the national standards.

New York State classifies groundwater quality under 6 NYCRR Part 701. State groundwater quality classifications fall into the following three categories based on the assigned best uses by NYSDEC:

- Class GA: a source of potable water supply. Class GA waters are fresh groundwaters.
- Class GSA: a source of potable mineral waters, or conversion to fresh potable waters, or as raw material for the manufacture of sodium chloride or its derivatives or similar products. Class GSA waters are saline groundwaters.
- Class GSB: receiving water for disposal of wastes. Class GSB waters are saline groundwaters that have a chloride concentration in excess of 1,000 milligrams per liter or a total dissolved solids concentration in excess of 2,000 milligrams per liter.

All fresh groundwater in New York State is class GA, with a best use as potable water supply. New York City drinking water is predominately sourced from reservoirs in the Catskills, approximately 100 mi (160 km) north of the Onshore Project Area.

According to a review of the United States Department of Agriculture Web Soil Survey, groundwater depth ranges from 1.7 ft (0.5 m) to greater than 6.5 ft (2.0 m) below grade throughout the Onshore Project Area. The Web Soil Survey also indicates that bedrock may be greater than 6.5 ft (2 m) below ground surface.

The USGS does not monitor groundwater elevations near the Onshore Project Area and landfall in New York, although they have a robust monitoring network to the east throughout Nassau and Suffolk Counties. The nearest USGS groundwater monitoring station is located in Corona Heights approximately 5 mi (8.05 km) southeast of the Onshore Project Area. This station is recorded as having low water levels.

4.7.2 Potential Impacts

The Applicant has reviewed topographical, geological, soil, and groundwater data to inform the NY Project design and construction methods, including an assessment of where geologic, soil, groundwater, and topographic conditions may not be suitable for construction. As such, the NY Project has included appropriate cable installation methodologies and mitigation measures to account for these conditions (see **Section 4.7.3**). Onshore infrastructure and construction methods will be designed and installed using industry-standard methodology and will be supported by an onshore geotechnical investigation to be completed in advance of final design, which will minimize potential impacts to topography, geology, soils, and groundwater. Potential impacts to offshore bathymetry, seabed formations, and sediment along the submarine export cable route are discussed in **Section 4.2**.

4.7.2.1 Construction

Onshore construction may result in the following impacts to onshore topography geology, soils, and groundwater:

- Short-term, minor disturbance to topography and existing surficial geological conditions as a result of excavation and grading activities;
- Short-term, minor disturbance to soils, including potential impacts from erosion and stormwater runoff; and
- Short-term, minor impacts to groundwater.

Short-term disturbance to topographic and surficial geological conditions. During the construction of onshore components, there will be short-term disturbance of the upper layers of soil along the onshore interconnection cable routes, and during site preparation for the onshore substation facility. However, because the Onshore Project Area is flat and located on previously filled land, the Applicant does not anticipate that modifications to existing topography will result in appreciable changes to the site's geology or topography. Following installation of the underground onshore interconnection cables, all trenches will be backfilled with suitable material, and surface grades will be returned to pre-construction contours to the extent practicable. Site preparation activities for the onshore substation facility may include excavation and removal of existing below and above ground infrastructure, bulkhead replacement, grading, raising the elevation of the substation pad, and/or installation of foundations and supports. Changes in elevation and grade as a result of the onshore substation facility will be minor and will conform with New York City building and zoning requirements, as applicable. Installation of the onshore export cable from the cable landfall to the onshore substation facility will utilize trenchless technologies (e.g., HDD), thereby avoiding additional surface disturbance. In addition, the Applicant will consider the use of trenchless installation for portions of the onshore interconnection cables to avoid existing subsurface infrastructure, as needed, which will further minimize the extent of surface disturbance associated with construction.

Design and installation of the onshore components will be supported by an onshore geotechnical investigation to be completed in advance of final design. This additional design information will be provided as part of the Applicant's EM&CP.

Short-term disturbance to soils. As previously noted, construction of the onshore infrastructure will result in short-term, minor disturbance of the upper layers of soil within the Onshore Project Area. Excavation, soil stockpiles, and grading associated with the installation of onshore interconnection cables, the onshore substation facility, and supporting infrastructure may have the potential to temporarily increase erosion and impact the quality and quantity of stormwater runoff from the construction work areas. Impacts from erosion and runoff during construction are expected to be short term and localized, as the Onshore Project Area is flat, and the soil types are not especially susceptible to erosion. In addition, the Applicant will implement sediment and erosion control methods in accordance with the applicable state and local requirements. Installation of the onshore export cable from the cable landfall to the onshore substation facility will utilize trenchless technologies (e.g., HDD), thereby avoiding additional soil disturbance. In addition, the Applicant will also consider implementation of trenchless installation for portions of the onshore interconnection cables to avoid

existing subsurface infrastructure, as needed, which will further minimize the extent of soil disturbance associated with construction.

The Applicant will evaluate the suitability of excavated soils to be reused onsite, and if soil reuse is not possible, excess soils will be disposed of at a licensed facility. If unanticipated contamination is encountered during construction, it will be addressed in accordance with soil management plans to be provided in the EM&CP or in accordance with an approved remedial action plan, if applicable. Following installation, areas temporarily disturbed for installation of the onshore cables and onshore substation will be backfilled with suitable native material, stabilized, and restored to pre-construction conditions to the extent practicable. Because soil impacts are anticipated to be temporary and limited in extent, and because the Onshore Project Area will be sited entirely on filled land and urban soils, no substantial impacts to soils are expected from construction of the onshore components.

Short-term impacts to groundwater. Excavation during the installation of the onshore interconnection cables and the onshore substation facility may result in short-term disturbance to localized shallow groundwater. Although the Onshore Project Area is sited within a sole source aquifer, drinking water for Brooklyn and Queens is sourced from the Catskills, New York. Therefore, neither soil nor groundwater disturbance will affect drinking water resources, as no public or private drinking water wells are located in the vicinity of the Onshore Project Area.

Final engineering design will determine if groundwater must be managed during excavation activities for the onshore facilities. As discussed in **Section 4.7.1.4**, groundwater may be less than 5 ft (15 m) below ground surface in portions of the Onshore Project Area and, therefore, may be encountered by trenching for the onshore interconnection cable installation or onshore substation foundation excavation activities. Final designs for the onshore components will be supported by onshore geotechnical investigations, and the Applicant will determine through the site-specific test pits whether groundwater is expected to be encountered during construction activities. If shallow groundwater is anticipated, the Applicant will develop a site-specific dewatering plan to protect groundwater and nearby surface water resources during NY Project construction in accordance with a NY Project-specific SWPPP, which will be provided as part of the NY Project's EM&CP. The rate of dewatering and the quality of the water will determine whether the water may be placed into frac tanks for off-site disposal, or if permissible, discharged into the storm drain system or onsite. Any potential impacts on groundwater quality or quantity associated with dewatering will be minor and short term, assuming best management practices are employed.

Trenchless installation methods (e.g., HDD or jack-and-bore) will be utilized for installation of the onshore export cables from the cable landfall to the onshore substation facility. In addition, the trenchless technologies will be considered for installation of the onshore interconnection cables to avoid existing subsurface infrastructure, in the event that currently unknown utilities or other infrastructure are identified within the onshore interconnection cable corridors. The HDD installation method requires HDD drilling fluid, which is typically composed of a water and bentonite mixture. The bentonite mixture is made up of mainly inert, non-toxic clays and rock particles; the mixture is not anticipated to significantly affect groundwater quality if inadvertently released. Any increased turbidity in groundwater will be short-term, localized, and will not affect wells or drinking water. If HDD installation is proposed as part of final design, the Applicant will develop and implement an Inadvertent Return Plan, to avoid, minimize, and/or mitigate potential impacts.

4.7.2.2 Operations and Maintenance

Maintenance of onshore cables may result in short-term soil disturbance and associated impacts similar to those that occur during construction, but at a smaller scale and only in localized areas where repairs may be needed.

Short-term disturbance to existing topographic and geological conditions. Following installation of the onshore cables, all trenches will be backfilled, and surface grades will be returned to pre-construction conditions to the extent practicable. Impacts on topography and geology are not expected during O&M.

Short-term disturbance to soils. Soil disturbance is not anticipated during operation of the onshore infrastructure except during routine maintenance. The onshore substation facility will be regularly inspected during operations, which may result in routine maintenance activities, such as the replacement of and/or update to electrical components/equipment. However, such maintenance would occur inside the onshore substation facility and would not typically result in soil disturbance. The onshore export and interconnection cables will require periodic testing, with readings taken from access chambers or manholes, and should not require maintenance except in the case of a fault or damage caused by a third party or unanticipated event. If excavation is required for repairs during operations, disturbance to soils is expected to localized and short term, and impacts would be minimized through use of erosion and sediment controls, when needed.

Short-term impacts to groundwater. During operations, the onshore substation facility will contain oils, fuels, and/or lubricants. However, as the equipment will be mounted on foundations with associated secondary oil containment or located within buildings, an inadvertent release of oil at these facilities is not expected to impact groundwater. The Applicant will prepare an SPCC plan detailing spill prevention, control, and mitigation measures to be implemented during onshore operations, which will be provided as part of the NY Project's EM&CP. In the unlikely event of an impact to groundwater due to an inadvertent spill, that impact is expected to be temporary and will be addressed immediately.

4.7.3 Summary of Avoidance, Minimization and Mitigation Measures

The Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts to onshore topography, geology, soils, and groundwater during construction:

- Design and construct onshore infrastructure based on the results of site-specific survey and geotechnical investigations within the Onshore Project Area;
- Test for soil contamination and remove/dispose of any contaminated soils within the Onshore Project footprint, in accordance with applicable regulations;
- Complete additional study and analysis prior to construction and installation activities to inform the selection of methods to allow for onshore infrastructure to be constructed in a way that allows for the least impact, both to and from, the geological conditions in the Onshore Project Area;
- Site onshore components in previously disturbed areas, existing roadways, and/or rights-of-way to the extent practicable;
- Restore (i.e., grade) areas disturbed by construction to pre-construction conditions to the extent practicable; and

- Implement a soil erosion and sediment control plan that complies with the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), including the development of a SWPPP, as applicable. The soil erosion and sediment control plan will identify temporary erosion control devices and soil stabilization measures to be implemented during construction.

In addition, the Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts from the long-term presence of structures during O&M:

- Adhere to the NY Project SWPPP and EM&CP; and
- Develop and implement an SPCC Plan. The SPCC Plan will detail spill prevention, control, and mitigation measures to be implemented during onshore O&M.

4.8 Terrestrial Vegetation and Wildlife

This section addresses the requirements of 16 NYCRR § 86.5 and describes the terrestrial vegetation and wildlife resources that have been observed, or have the potential to occur, in the vicinity of the NY Project and the potential impacts resulting from construction and operation of the onshore components of the NY Project. Additionally, measures adopted by the Applicant to avoid, minimize, and/or mitigate potential impacts to terrestrial vegetation and wildlife are discussed.

Other wildlife and habitat resources and assessments detailed in **Exhibit 4** of this Article VII Application include the following:

- Wetlands and Waterbodies (**Section 4.9)**;
- Avian Species (**Section 4.10**);
- Bat Species (**Section 4.11**);
- Benthic Resources and Finfish, Invertebrates, and Essential Fish Habitat (**Section 4.12**);
- Marine Mammals (**Section 4.13**);
- Sea Turtles (**Section 4.14**); and
- Important Habitats and Protected Species (**Section 4.15**)

4.8.1 Existing Conditions

The following sections include a discussion of the terrestrial vegetation and wildlife studies and analyses performed for the NY Project, existing vegetation community composition as it relates to the presence and quality of habitat, and a review of existing sensitive terrestrial habitats. In addition, terrestrial wildlife species documented within or in the vicinity of the Onshore Project Area are summarized. The affected environment described in this section is defined as the Onshore Project Area that has the potential to be directly impacted by the construction and O&M of the onshore components, including the landfall, onshore cables, and onshore substation facility.

4.8.1.1 Terrestrial Vegetation and Wildlife Studies and Analysis

For the purpose of this section, coastal and terrestrial habitats that may be directly and/or indirectly impacted by construction of the NY Project are anticipated to be limited to the locations of the onshore components of the NY Project and where the submarine export cables make landfall. In order to determine the baseline terrestrial vegetation and wildlife conditions, a desktop review was conducted within 1 mi (1.6 km) of the Onshore Project Area using the following resources:

- 2019 National Land Cover Dataset (NLCD): Land Cover Conterminous United States (USGS 2019);
- 2020 Half-Foot 4 Band Long Island Zone NYC Aerial Ortho-Photography (NYSDEC 2021); and
- New York Nature Explorer digital database (NYSDEC 2021).

In addition, consultation with state and federal agencies was conducted as part of a preliminary review of biological resources documented within and in the vicinity of the Onshore Project Area. A formal

inquiry was submitted to the New York Natural Heritage Program (NYNHP) requesting information on State-listed rare, threatened, or endangered species and significant natural communities documented within or in the vicinity of the NY Project. An Official Species List was also obtained from the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool to identify federally listed threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may be present within or in the vicinity of the NY Project. The responses from these requests have been incorporated into the analysis in this section as well as in **Sections 4.10, 4.11,** and **4.15**. Relevant agency correspondence is provided in **Appendix A Agency Outreach and Correspondence**.

4.8.1.2 Terrestrial Vegetation

The Onshore Project Area comprises approximately 9.5 ac (3.8 ha) within the Astoria power complex, a highly developed industrial energy complex, at the northwest corner of Queens adjacent to Lawrence Point and the East River. The Onshore Project Area is situated within the urbanized landscape of New York City and contains a mosaic of paved impervious surfaces (concrete pads, bituminous concrete driveways, and parking areas) with maintained lawn areas and a few scattered shrubs and trees, reflecting past industrial land use activities and development (**Figure 4.8-1**). Several buildings are located along the southeastern limits of the Onshore Project Area including storage sheds and a maintenance garage. The north and west perimeter of the Onshore Project Area are bound by the East River and a fenced security road. The shoreline areas adjacent to the East River consist primarily of concrete seawalls and sloping rip-rap revetments.

A review of NLCD mapping indicates that land cover within 1 mi (1.6 km) of the Onshore Project Area is dominated by high and medium intensity developed lands with few areas of low intensity development and developed open space (**Figure 4.8-2**). **Table 4.8-1** summarizes the areal coverage of each land cover type. There are only a few sparse pockets of contiguous terrestrial vegetation or habitat in this area, which is otherwise is dominated by urban land uses.

TABLE 4.8-1. NATIONAL LAND COVER DATA WITHIN 1 MILE OF THE ONSHORE PROJECT AREA

NLCD Land Use Type	Area (ac [ha])	Portion of 1-Mile (1.6 km) Study Area
Developed, High Intensity	1,105.22 ac (447.27 ha)	67.5%
Developed, Medium Intensity	326.6 ac (132.17 ha)	20.0%
Developed, Low Intensity	101.58 ac (41.11 ha)	6.2%
Developed, Open Space	53.04 ac (21.46 ha)	3.2%
Open Water	18.28 ac (7.40 ha)	1.1%
Deciduous Forest	9.6 ac (3.88 ha)	0.6%
Woody Wetlands	9.12 ac (3.69 ha)	0.6%
Emergent Herbaceous Wetlands	6.01 ac (2.43 ha)	0.4%
Grassland/Herbaceous	4.01 ac (1.62 ha)	0.2%
Barren Land, Rock	0.89 ac (0.36 ha)	0.1%
Pasture/Hay	0.67 ac (0.27 ha)	0.0%
TOTAL	**1,636.55 ac (662.29 ha)**	**100%**

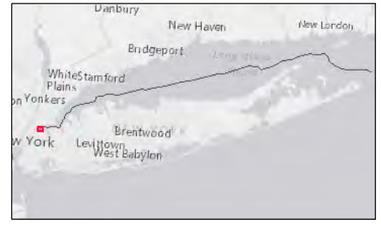
Figure 4.8-1. Onshore Components Over Aerial Imagery

Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

- Access Road
- Interconnection Cables
- Astoria West POI
- Onshore Substation Facility
- Staging Area
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)



0 300 600
Feet

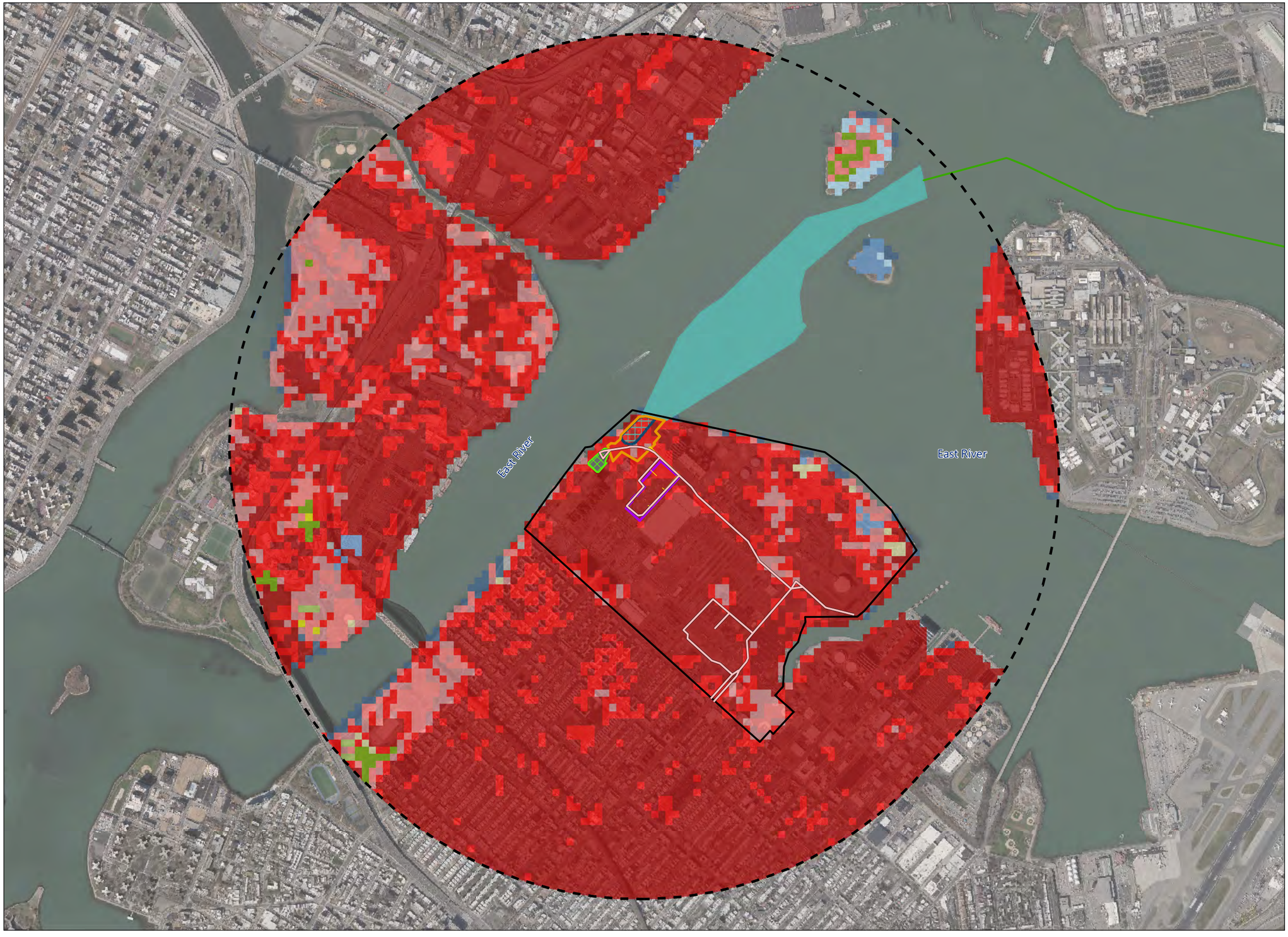
Meters
0 100 200

equinor

EDR

Prepared May 5, 2022
Basemap: NYSDOP "2020" orthoimagery map service.

Figure 4.8-2. Regional Land Cover Mapping



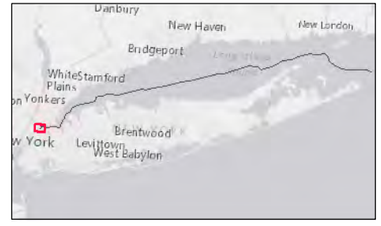
Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

NLCD Land Cover
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land, Rock
- Deciduous Forest
- Mixed Forest
- Grassland/Herbaceous
- Pasture/Hay
- Woody Wetlands
- Emergent Herbaceous Wetlands

Project Components
- Access Road
- Interconnection Cables
- Submarine Export Cable Route
- Astoria West POI
- Onshore Substation Facility
- Staging Area
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- Onshore Project Area 1-Mile Study Area



0 500 1,000 Feet

0 200 400 Meters

equinor EDR

Prepared May 5, 2022
Data Sources: USGS National Land Cover Dataset (NLCD), 2020.
Basemap: NYSDOP "2020" orthoimagery map service.

Areas with notable open space within 1 mi (1.6 km) of the Onshore Project Area include the North and South Brother Islands and portions of Randall's Island and the Steinway neighborhood of Queens. With the exception of the North and South Brother Islands, these open areas are managed green space within heavily developed and populated sections of New York City. The North and South Brother Islands are the only natural areas located within 1 mi (1.6 km) of the Onshore Project Area. These once-settled islands are located approximately 0.66 mi (1.06 km) and 0.75 mi (1.21 km) northeast of the Onshore Project Area, respectively. North Brother Island consists of approximately 20 ac (8 ha) of woody wetlands and deciduous forest with scattered abandoned buildings (i.e., the former Riverside Hospital), while South Brother Island consists of approximately 6 ac (2.4 ha) of undeveloped emergent herbaceous and woody wetlands (Wickham et al. 2021; NLCD 2019; NYSDOS 1992).

During field reconnaissance of the Astoria power complex, a few small, isolated patches of vegetation were observed in the northeastern corner of the complex. Seven plant species listed in the New York State Prohibited and Regulated Invasive Plants list (NYSDEC 2014) were observed within these areas during field reviews (**Table 4.8-2**). However, vegetation in the area of the proposed facility is composed mostly of maintained lawn, shrubs, and trees.

TABLE 4.8-2. INVASIVE PLANT SPECIES OBSERVED WITHIN THE ASTORIA POWER COMPLEX

Common Name	Scientific Name
Black locust	*Robinia pseudoacacia*
Garlic mustard	*Alliaria petiolata*
Japanese knotweed	*Reynoutria japonica*
Mugwort	*Artemisia vulgaris*
Common reed	*Phragmites australis*
Princess Tree	*Paulownia tomentosa*
Tree of heaven	*Ailanthus altissima*

The Applicant coordinated with state and federal agencies to determine the possibility of encountering special status plant communities in the vicinity of the NY Project. The Official Species List provided by the USFWS via the IPaC system, pursuant to Section 7 of the Endangered Species Act (**Appendix A Agency Outreach and Correspondence**), identified one federally threatened plant as potentially occurring in the vicinity of the Astoria power complex: seabeach amaranth (*Amaranthus pumilus)*.

Seabeach amaranth is a flowing plant that is typically found on barrier island beaches between the foredune and the wrack line and on open over wash areas behind the foredune. Suitable beach habitat is usually over 65 ft (20 m) wide and protected from foot traffic and vehicles. Current range and distribution mapping for this species indicates that it may be found on the south shore of Long Island (USFWS 2021). Based on the current distribution trends for this species and the lack of suitable habitat conditions, seabeach amaranth is not expected to occur within the Onshore Project Area.

4.8.1.3 Terrestrial Wildlife

The Onshore Project Area will be located within an urban landscape that is predominantly devoid of natural vegetation; therefore, it is expected that wildlife is limited to species adapted to living in urban environments with associated human activity, disturbance, and noise. These species may include gulls, pigeons, house sparrows, European starlings, squirrels, and other small rodents. Other seabird

species and migratory birds (see **Section 4.10**) may occur in the vicinity of the cable landfall and along the submarine export cable corridor; however, due to the lack of natural habitat within the Onshore Project Area, these species are not expected to occur at high densities in the vicinity of the onshore components. Potential bat species that may be present in the vicinity of the NY Project are discussed in **Section 4.11**. Small habitat patches of mixed cover types (i.e., open water, wetlands, shrubs, trees) may provide habitat for additional species. However, these areas are spatially isolated from other habitats and tend to be dominated by invasive plants. In addition, many of these areas show evidence of past disturbances including vegetation removal, cut and fill of soils, and former structures.

The Applicant coordinated with state and federal agencies to determine the presence of special status wildlife communities in the vicinity of the NY Project. The Official Species List provided by the USFWS via the IPaC system, pursuant to Section 7 of the Endangered Species Act (**Appendix A Agency Outreach and Correspondence**), identified three birds as potentially occurring in the vicinity the Astoria power complex. These special status wildlife species are listed in **Table 4.8-3**.

TABLE 4.8-3. USFWS IPAC OFFICIAL SPECIES LIST IN THE VICINITY OF THE NY PROJECT

Species Common Name	Species Scientific Name	Federal Listing	NYS Listing
Piping plover	*Charadrius melodus*	Threatened	Endangered
Red knot	*Calidris canutus rufa*	Threatened	Threatened
Roseate tern	*Sterna dougallii dougallii*	Endangered	Endangered

The three federally listed birds are considered shorebird species that require natural stretches of beaches and other coastal, marine, and estuarine habitats. In addition, the roseate tern nests almost exclusively on islands to avoid higher predation rates on the mainland. Therefore, these species are unlikely to occur within the Onshore Project Area.

In addition to threatened and endangered species, certain birds are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The IPaC identified 29 species of migratory birds in the vicinity of the Astoria power complex. A copy of the USFWS IPaC report is provided in **Appendix A**. Avian species identified as occurring or potentially occurring within or in the vicinity of the NY Project are described in detail in **Section 4.10**.

The NYNHP maintains data on state-listed rare, threatened, and endangered plant and animal species, as well as significant ecological communities. Formal requests for site-specific documentation of species occurrences were submitted to NYNHP. The NYNHP response received on November 8, 2021 (**Appendix A**) identified one state endangered species, peregrine falcon (*Falco peregrinus*), nesting on the Throgs Neck Bridge, approximately 6 mi (9.7 km) east of the Onshore Project Area. In addition to the peregrine falcon, the NYNHP identified five rare birds nesting in trees on South Brother Island, approximately 0.66 mi (1.06 km) northeast of the Onshore Project Area, and one historic documentation from 1984 of a barn owl (*Tyto alba*) nesting in the abandoned buildings on North Brother Island, approximately 0.75 mi (1.21 km) northeast of the Onshore Project Area. Rare species identified by the NYNHP are detailed in **Table 4.8-4**.

TABLE 4.8-4. NYNHP TERRESTRIAL RARE SPECIES IDENTIFIED IN THE VICINITY OF THE NY PROJECT

Species Common Name	Species Scientific Name	NY State Listing	Heritage Conservation Status
Glossy Ibis	*Plegadis falcinellus*	Protected Bird	Imperiled in NYS
Cattle Egret	*Bubulcus ibis*	Protected Bird	Imperiled in NYS
Little Blue Heron	*Egretta caerulea*	Protected Bird	Imperiled in NYS
Snowy Egret	*Egretta thula*	Protected Bird	Imperiled in NYS
Yellow-crowned Night Heron	*Nyctanassa violacea*	Protected Bird	Imperiled in NYS
Historic Identified Species			
Barn Owl	*Tyto alba*	Protected Bird	Critically Imperiled in NYS

The majority of the species identified by the NYNHP are considered colonial waterbirds that prefer habitats including marshes, swamps, tidal flats, and natural shorelines. These species were documented at or near North and South Brother Islands near the submarine export cable route. The NYNHP also indicated that the North and South Brother Islands are recognized as a state-significant Colonial Waterbird Nesting Area. In addition, the New York State Department of State (NYSDOS) designated the North and South Brother Islands a Significant Coastal Fish and Wildlife Habitat (SCFWH) with their primary significance as providing nesting habitat for a relatively large number of colonial waterbirds, including several species of herons, egrets, gulls, and cormorants as well as Canada geese. As previously stated, the North and South Brother Islands are located outside of the Onshore Project Area, approximately 0.75 mi (1.21 km) and 0.66 mi (1.06 km) away, respectively.

Section 4.10 provides a detailed description of common avian species documented in the vicinity of the NY Project. Additional information on protected species and important habitat areas is provided in **Section 4.15**.

4.8.2 Potential Impacts

As the Onshore Project Area is an urban landscape that is predominantly devoid of natural vegetation and wildlife habitat, it is anticipated that NY Project-related impacts to terrestrial vegetation and wildlife will be minimal. Vegetation on-site is either sparce, landscaped, or marginal (i.e., consisting of invasive species). As such it presents only marginal habitat for a small number of common wildlife species. The following sections describe the potential impacts to terrestrial vegetation and wildlife from construction and O&M of the onshore components in more detail. The measures that the Applicant will implement to avoid, minimize, and/or mitigate these potential impacts are summarized in **Section 4.8.3**.

4.8.2.1 Construction

Considering the high level of development and minimal habitat within the Onshore Project Area, construction-related impacts to terrestrial vegetation and wildlife are expected to be negligible. The Onshore Project Area is nearly devoid of natural vegetation and likely does not support wildlife populations, with the exception of individuals of disturbance-tolerant wildlife species typical of human-influenced landscapes. These wildlife species may be temporarily displaced from the Onshore Project Area by noise and construction activities, but they are expected to return once construction and restoration are completed. Accidental releases or spills of oils or other petroleum products that could

adversely impact vegetation and wildlife will be avoided, minimized, or mitigated to the extent practicable through the development and implementation of an SPCC plan for construction. Consequently, NY Project construction is not expected to impact terrestrial vegetation, wildlife, or wildlife habitats.

Soils disturbed during construction can provide a suitable seed bed for invasive species. Invasive species can out-compete native species, reduce biological diversity, alter community structure and, in some cases, change entire ecosystems. To reduce the potential for invasive species infestation, temporarily disturbed areas will be revegetated with appropriate native or naturalized plant species in compliance with applicable permits and mitigation plans. As required, an invasive species control and management plan (ISCMP) to prevent the introduction and spread of invasive plant species will be implemented, as described in **Section 4.8.3**.

4.8.2.2 Operations and Maintenance

No new impacts to terrestrial vegetation and wildlife are anticipated during O&M of the NY Project. NY Project-related activities are expected to use permitted access roads and entry points, and temporary workspaces utilized during construction will be restored to pre-construction conditions to the extent practicable. Permanent above ground structures associated with the onshore substation facility will remain onsite throughout the lifetime of the NY Project. Stormwater management and sediment control features will be maintained throughout NY Project O&M, as necessary. Accidental releases or spills of oils or other petroleum products will be avoided, minimized, or mitigated to the extent practicable, through the development and implementation of an SPCC plan for O&M.

The onshore export and interconnection cables are proposed to be located within or directly adjacent to existing paved roads and within maintained lawn areas. If inspection or repairs during the O&M phase require excavation or other ground disturbance, short-term localized impacts to existing lawn areas may occur; however, these activities will not affect native vegetation or wildlife. To the extent necessary, the Applicant will implement mitigation strategies similar to those detailed for construction, as appropriate and in accordance with applicable regulations (see **Section 4.8.3**).

Due to the urbanized nature of the onshore cable routes, as well as the onshore substation facility, routine vegetation management to maintain the right-of-way during O&M will not likely be required. Therefore, the Applicant does not anticipate regular use of herbicides or pesticides as part of maintenance activities. If required, minimal handheld herbicide application, consistent with manufacturer's recommendations, may be conducted. An O&M Plan will be developed and finalized by the Applicant prior to the commencement of construction.

4.8.3 Summary of Avoidance, Minimization, and Mitigation Measures

During construction, the Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts to terrestrial vegetation and wildlife:

- Site all onshore components in previously disturbed areas, existing roadways, and/or rights-of-way;
- Avoid off-site impacts to vegetation and wildlife by implementing soil erosion and sediment control plans, which will be provided for agency review and approval, as applicable, and will

comply with the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), including development of a SWPPP, as applicable;

- Limit construction access to existing paved roads and approved routes;
- Limit lighting associated with construction vehicles and work zones to the extent practicable, to reduce the attraction of insect prey for wildlife species such as bats and insectivorous birds;
- Implement an ISCMP, as required, which will be provided for agency review and approval to avoid the spread of invasive species and replant with native vegetation only; and
- Complete restoration work using a seed mix with appropriate native or naturalized plant species, in compliance with the ISCMP, to prevent the introduction of invasive plant species.

Mitigation strategies will continue to be developed during the design process and incorporated into the final design, as appropriate. Proposed mitigation measures will adhere to all applicable state and federal requirements and will be outlined in the NY Project's EM&CP.

During O&M, the Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts to terrestrial vegetation and wildlife:

- Adhere to the ISCMP, as applicable, which will be provided for agency review and approval; and
- Implement lighting reduction measures such as downward projecting lights, lights triggered by motion sensors, and limiting artificial light to the extent practicable, where safe.

4.9 Wetlands and Waterbodies

This section addresses the requirements of 16 NYCRR § 86.5 and describes freshwater and tidal wetlands, surface waterbodies, and floodplains identified within and surrounding the NY Project Area. Potential impacts to wetlands and waterbodies associated with construction and O&M of the NY Project are also discussed, as well as measures the Applicant proposes to avoid, minimize, and/or mitigate potential impacts. Other resources and assessments detailed in **Exhibit 4** of this Article VII Application that are related to wetlands and waterbodies include the following:

- **Section 4.3** Water and Sediment Quality;
- **Section 4.8** Terrestrial Vegetation and Wildlife;
- **Section 4.12** Benthic Resources and Finfish, Invertebrates, and Essential Fish Habitat; and
- **Section 4.15** Important Habitats and Protected Species.

4.9.1 Existing Conditions

Wetlands and waterbodies in New York may be protected under federal law, New York State law, or both, as described in the following subsections. For the purposes of this section, tidal and freshwater wetlands, and streams, as well as designated floodplains that may be directly and/or indirectly impacted by construction of the NY Project, are anticipated to be limited to the locations of the onshore components of the NY Project and where the submarine export cables make landfall. A desktop assessment was conducted within 1 mi (1.6 km) of the Onshore Project Area using the following data sources to gain an understanding of wetland and stream resources that may be present:

- USFWS National Wetlands Inventory (NWI) (USFWS 2021);
- Natural Resource Conservation Service soils mapping (NRCS 2021);
- NYSDEC:
    - Regulatory Freshwater Wetlands, Queens and Bronx Counties (NYSDEC 2013)
    - Tidal Wetlands (NYSDEC 2005)
    - Water Quality Classifications (NYSDEC 2019)
- United States Geologic Survey (USGS) National Hydrography Dataset (USGS 2021);
- USGS topographic maps; and
- Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (FEMA 2021b)

Where access was permitted, a preliminary reconnaissance of the Onshore Project Area was conducted on May 17, 2021, to verify the presence of any mapped wetland and waterbody resources identified during desktop analysis, and to assess the potential presence of unmapped wetlands and waterbody resources. An additional visit to the Study Area was conducted on June 17, 2021, to field delineate and locate with GPS the High Tide Line (HTL) adjacent to the site to further define Tidal Wetland Adjacent Areas. Upper limits of the HTL adjacent to the cable landfall could not be field delineated during either site visit because of access restrictions.

4.9.1.1 Federal Mapped Wetlands and Streams

Under Section 404 of the CWA and Section 10 of the 1899 Rivers and Harbors Act, the USACE has regulatory jurisdiction over navigable waters and waters of the United States, including wetlands. As defined by the USACE, waters of the United States include lakes, ponds, streams (intermittent and

perennial), tidal waters and wetlands. Wetlands are defined as "*those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*"

Desktop review of NWI mapping revealed that no mapped fresh or tidal waterbodies exist within the Onshore Project Area. The cable landfall is located on the shoreline of the East River which is classified by NWI as an estuarine subtidal system with an unconsolidated bottom and a subtidal water regime (E1UBL). In addition, four small and isolated wetlands were identified within the Astoria power complex, including three freshwater ponds (PUBHx) located approximately 0.34 mi (0.55 km), 0.39 mi (0.63 km), and 0.55 mi (0.89 km) south and southeast of the Onshore Project Area, respectively, and a freshwater forested-shrub wetland (PFO1C) located adjacent to Luyster Creek approximately 0.72 mi (1.16 km) southeast of the Onshore Project Area. These features are depicted in **Figure 4.9-1**.

4.9.1.2 New York State Mapped Wetlands and Streams

This subsection describes existing tidal and freshwater wetlands and surface waterbodies as well as the regulatory authority of the NYSDEC with respect to these resources.

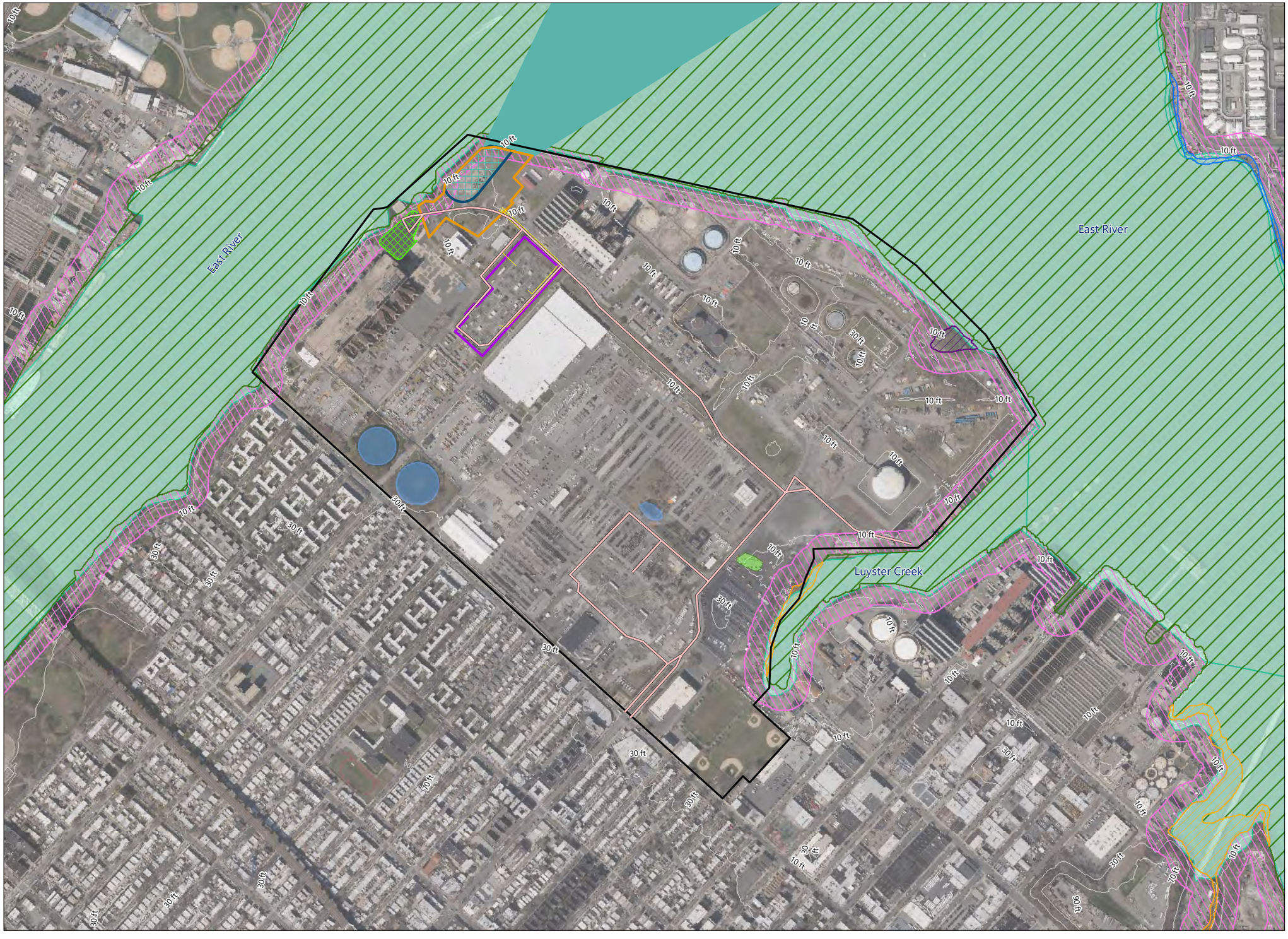
4.9.1.2.1 Tidal Wetlands

Tidal wetlands in New York State are protected under Article 25 of the Environmental Conservation Law (ECL), known as the Tidal Wetlands Act. Under this Act, New York regulates tidal wetlands and the associated adjacent area.

According to the NYSDEC tidal wetlands mapping, most of the East River, adjacent to the Onshore Project Area and where the submarine export cable makes landfall, is mapped as a "Littoral Zone." In addition, a small area adjacent to the mouth of Luyster Creek approximately 0.61 mi (0.98 km) west of the proposed onshore substation facility is mapped as "Formerly Connected Tidal Wetlands" (**Figure 4.9-1**). Both tidal systems are regulated under the Tidal Wetlands Act and assigned a protected Adjacent Area, as described in 6 NYCRR §661.4.

The tidal wetlands adjacent area is defined by 6 NYCRR § 661.4(b) as the land adjacent to the wetland that are generally not inundated by tidal waters and that extend from the wetland boundary to a maximum landward distance of 300 ft (91 m). In New York City, the maximum landward distance is 150 ft (46 m) from the tidal wetland boundary. This maximum landward distance is reduced in the presence of a lawfully and presently existing (i.e., as of August 20, 1977) functional structure greater than 100 ft (30 m) in length (including, but not limited to, paved streets and highways, railroads, bulkheads and sea walls, and rip-rap walls) or where an elevation reaches 10 ft (3 m) amsl (6 NYCRR § 661.4(b)(1)).

Figure 4.9-1. Mapped Wetlands and Waterbodies



Beacon Wind 1 Project

Long Island Sound, New York

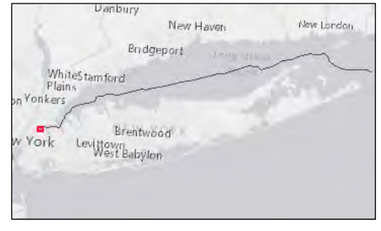
Article VII Application

- 10 ft Contour

NYSDEC-Mapped Tidal Wetland
- Mapped Adjacent Area
- Mapped Coastal Shoal
- Mapped Formerly Connected
- Mapped Intertidal Marsh
- Mapped Littoral Zone

NWI-Mapped Wetland
- Mapped Freshwater Wetland
- Mapped Freshwater Lake/Pond/Other
- Mapped Estuarine and Marine Wetland

Project Components
- Access Road
- Interconnection Cables
- Astoria West POI
- Onshore Substation Facility
- Staging Area
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)



0 300 600 Feet

0 100 200 Meters

equinor

EDR

Prepared May 5, 2022
Basemap: NYSDOP "2020" orthoimagery map service.

4.9.1.2.2 Freshwater Wetlands

Freshwater wetlands in the State of New York are jointly regulated by both the NYSDEC and the USACE. Under Article 24 of the ECL, commonly referred to as the Freshwater Wetlands Act, New York generally regulates freshwater wetlands greater than 12.4 ac (5.0 ha) or freshwater wetlands of any size that possess unique qualities, such as a documented presence of a threatened or endangered species. Under Article 24, NYSDEC also regulates a wetland-adjacent area (or buffer), defined as those areas of land or water that are outside a regulated freshwater wetland but within 100 ft (30 m) of the wetland boundary. Activities subject to regulation within wetlands and adjacent areas include any form of draining, dredging, or excavation, either directly or indirectly, and any form of dumping, depositing, or placement of fill of any kind, either directly or indirectly.

According to a review of NYSDEC Freshwater Wetlands mapping, no NYSDEC-mapped freshwater wetlands or 100-foot regulated adjacent areas occur in the vicinity of the Onshore Project Area.

4.9.1.2.3 Surface Waterbodies

Under Article 15 of the ECL, New York regulates surface water resources by their best uses (fishing, source of drinking water, etc.; 6 NYCRR § 701) or as Wild, Scenic and Recreation Rivers (6 NYCRR §666). Temporary or permanent disturbances to the bed or bank of a stream with a classification of AA, A or B, or with a classification of C with a standard of (T) or (TS) requires a Protection of Waters Permit administered by the NYSDEC. Article 15 also requires a Protection of Waters Permit from the NYSDEC to construct any structure in or above any navigable waters of the state, as well as any proposed action that would alter or disturb these waters (such as excavation/dredging or deposition of materials).

Based on a review of NYSDEC stream classification mapping, no NYSDEC-mapped fresh surface waterbodies occur in the vicinity of the Onshore Project Area. However, as previously noted, the submarine export cable makes landfall in the East River which is classified by NYSDEC as a Class I saline waterbody and is a state navigable waterway. Class I saline surface waters are assessed for general recreation use and support of aquatic life, but not for water supply or for public bathing use. State water quality classifications of tidal waterbodies are described in in more detail in **Section 4.3**.

4.9.1.3 Mapped Floodplains

Development within floodplains in New York State is regulated by local municipalities (e.g., town, city, or village) that participate in the National Flood Insurance Program. Construction proposed within those areas of land covered by the floodwaters of the base flood, also known as Special Flood Hazard Areas (SFHAs), is subject to floodplain development regulations. The regulations require that the proposed development will not increase the surrounding flood hazard and that the development is constructed in a way that minimizes exposure to flooding. Each structure must be designed in accordance with the ASCE standards for Flood Resistant Design and Construction (ASCE 24) and/or Minimum Design Loads for Buildings and Other Structures (ASCE 7). These standards set forth specific design requirements detailing elevation, building performance during flood events, the use of flood damage-resistant materials, attendant utilities and equipment, and siting requirements.

The USACE also considers floodplain impacts under the Section 404 program by requiring compliance with Executive Order 11988 on Floodplain Management. FEMA may also require formal reviews of actions in floodplains pursuant to the flood insurance program, such as a Letter of Map Revision.

FEMA data indicate that portions of the Onshore Project Area are situated within SFHAs, including Zone VE, Zone AE, and Zone X. FEMA defines these SFHAs as follows (FEMA 2021a):

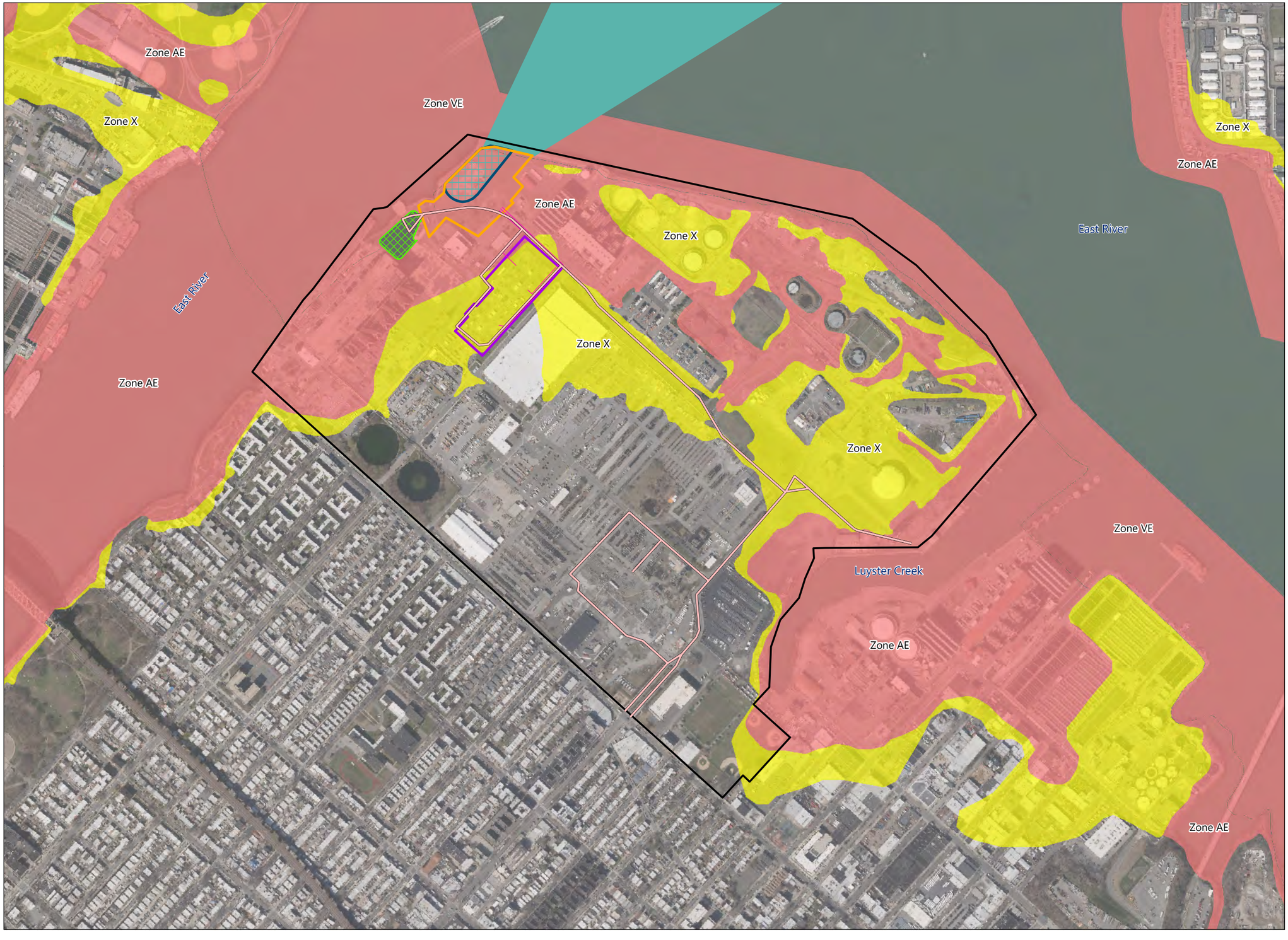
- Zone VE, also known as a Coastal High Hazard Area, is where wave action and fast-moving water can cause extensive damage during a base flood event. To address the added wave hazard in these areas, more stringent building practices are required in Zone VE, such as elevating a home or buildings on pilings so that waves can pass beneath it, or a prohibition to building on fill, which can be easily washed away by waves. These practices are intended to improve the chance of a home safely weathering a flood event;
- Zone AE areas are subject to inundation by the 1-percent-annual-chance flood event but not subject to high velocity wave action and are considered high risk flooding areas;
- Zone X is defined as moderate FHAs between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood; and
- Unshaded areas on FEMA maps are those areas at minimal flood hazard risk.

Mapped SFHAs located in the vicinity of the Onshore Project Area are identified on **Figure 4.9-2**, and mapped SFHAs within the potential onshore substation facility footprint are provided in **Table 4.9-1**.

TABLE 4.9-1. FEMA-MAPPED SFHAS AT THE ONSHORE PROJECT AREA

Route Feature	FEMA Flood Zone	Area (ac [ha])
Onshore substation facility	VE (1% Annual Chance Flood Hazard)	0.34 (0.14)
	AE (1% Annual Chance Flood Hazard)	5.78 (2.34)
	X (shaded; 0.2% Annual Chance Flood Hazard)	0.05 (0.02)
	Total	6.17 (2.50)
Onshore interconnection cables	AE (1% Annual Chance Flood Hazard)	1.34 (0.54)
	X (shaded; 0.2% Annual Chance Flood Hazard)	1.89 (0.76)
	Unshaded	0.30 (0.12)
	Total	3.53 (1.43)

Figure 4.9-2. FEMA Mapped Special Flood Hazard Areas



Beacon Wind 1 Project

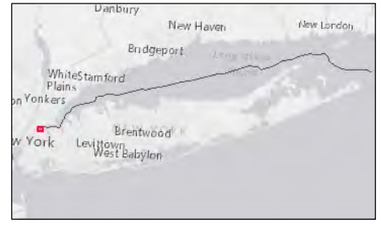
Long Island Sound, New York

Article VII Application

- FEMA 100-Year Flood Hazard Area
- FEMA 500-Year Flood Hazard Area

Project Components

- Access Road
- Interconnection Cables
- Astoria West POI
- Onshore Substation Facility
- Staging Area
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)



0 300 600 Feet

0 100 200 Meters

equinor

EDR

Prepared May 5, 2022
Basemap: NYSDOP "2020" orthoimagery map service.

4.9.1.4 Coastal Resources

Coastal areas of the United Stated are managed under the Coastal Zone Management Act of 1972 which also helps and encourages coastal states to voluntarily develop and implement state management programs for their coastal areas. New York State's Waterfront Revitalization of Coastal Areas and Inland Waterway Act (New York State Executive Law Article 42, also known as the "Waterways Act"), designates the NYSDOS as the administrator of New York's Coastal Management Program (CMP). In recognition of the state policy to encourage the revitalization of waterfront areas in a manner consistent with local objectives, the Waterways Act also allows for the creation of optional local waterfront revitalization programs (LWRPs).

The NY Project is located within New York State and New York City mapped coastal zones. Activities proposed within a state coastal zone require a coastal consistency review by NYSDOS under the CMP. Furthermore, under the NYS CMP, and pursuant to the Waterways Act, NYSDOS has approved an LWRP for New York City, which supplements the policies of the state CMP. Permitting, funding, and other direct actions by the state must also be consistent with the approved LWRP. The Applicant has completed a Coastal Consistency review of the NY Project (**Appendix I Coastal Consistency Determination**).

4.9.1.5 Onsite Wetland and Stream Delineation

The Onshore Project Area was surveyed for the presence of wetlands in the field using the routine methodology outlined in the *Corps of Engineers Wetland Delineation Manual* (USACE 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0) (USACE 2012), and the *New York State Freshwater Wetlands Delineation Manual* (Brown et al. 1995). Full details of the survey methodology and results of the wetland delineation are available in **Appendix D Wetland Delineation Report**.

No federal or state jurisdictional freshwater wetlands or waterbodies were identified within or in the immediate vicinity of the Onshore Project Area. Additionally, no tidal wetlands (e.g., intertidal marsh, coastal shoals, bars, or mudflats) were observed.

The shoreline and intertidal zone of the East River at the export cable landfall consist of an armored rip-rap revetment that extends from several feet above the high tide line down below the lower limits of the low tide line. Aerial imagery taken on October 29, 1976, appears to show the existing rip-rap revetment in place at that time along the edge of the East River. In accordance with 6 NYCRR 661.4(b)(1)(ii), this rip-rap revetment would qualify as a lawful, presently existing, functional, and substantial fabricated structure and would likely limit the jurisdictional adjacent area to the most seaward edge of this rip-rap revetment.

No other freshwater or tidal wetland resources were identified in the vicinity of the Onshore Project Area. Mapped and delineated wetlands, waterbodies, and coastal resources in the vicinity of the Onshore Project Area are depicted in **Figure 4.9-1.**

4.9.2 Potential Impacts

There are no freshwater wetlands or onshore surface waterbodies located within the Onshore Project Area. Potential impacts to adjacent tidal wetlands (the East River) may occur as a result of construction and operation of the NY Project; however, because the onshore components and the landfall are

located within a highly developed area that is predominately comprised of impervious surfaces with rip rapped and bulkheaded shorelines and lacks sensitive wetland habitats, impacts to these resources are anticipated to be negligible.

4.9.2.1 Construction

NY Project-related impacts from construction of the onshore NY Project components as well as installation of the submarine export cable system will be limited to the shoreline and intertidal zone of the East River and the associated tidal wetland adjacent area, including the following:

- Disturbance to tidal wetlands and associated adjacent areas;
- Disturbance within designated coastal zones and SFHAs; and
- Short-term potential for erosion from construction activities into adjacent coastal resources.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures (see **Section 4.9.3**), the following impacts have a low probability of occurring:

- Incidental and short-term potential for inadvertent return of drilling fluids during HDD activities; and
- Accidental releases from construction vehicles or equipment.

Disturbance to tidal wetlands and associated adjacent areas. Onshore components are sited within previously developed areas to avoid jurisdictional water resources and their corresponding protected adjacent areas, to the extent practicable. The submarine export cable route is proposed to make landfall along the East River shoreline and is located within NYSDEC-designated tidal wetland and adjacent area. However, as previously described, the East River shoreline at the cable landfall consists of an armored rip-rap revetment that extends from several feet above the high tide line down below the lower limits of the low tide line; therefore, the coastal adjacent area would terminate at the top of the rip-rap. Landfall will be installed through HDD or other trenchless methods that would extend from the onshore substation facility northward into the East River, terminating in a water depth of approximately 20 ft (6 m). A temporary cofferdam composed of steel sheet piles and concrete slabs set at the HDD or other trenchless exit would serve to contain drilling muds and to facilitate connection to the submarine export cable. The use of HDD or other trenchless methods will avoid direct impacts to the East River littoral zone.

Disturbance to designated coastal zone and SFHAs. The onshore substation facility will include concrete foundations, gravel lots, fencing, and associated structures located within the SFHAs AE, VE, and X. The placement of structures within SFHAs is unavoidable throughout most of the Onshore Project Area due to its proximity to the coastline. However, the Onshore Project Area is comprised of predominantly impervious surfaces and the NY Project is not anticipated to significantly increase impervious surfaces or change existing topography. In addition, construction will satisfy the design requirements governing the placement of structures within mapped floodplains and specific mitigation strategies with regard to SFHAs, and stormwater management will be designed on a case-by-case basis during the regulatory process.

The Applicant has reviewed the NY Project for consistency with all applicable coastal zone policies (see **Appendix I Coastal Consistency Determination**). Activities at staging and construction facilities will be consistent with the established and permitted uses of these facilities, and the Applicant will comply with applicable standards and guidelines, including NYC WRP requirements, to limit environmental impacts from NY Project-related activities.

Short-term potential for erosion from construction activities into adjacent coastal resources. Excavation, soil stockpile, grading, and dewatering associated with the installation of the onshore cables, the onshore substation facility, and supporting infrastructure may increase the potential for erosion and sedimentation to the East River. In order to avoid, minimize, and mitigate impacts from potential erosion, the Applicant will implement a soil erosion and sediment control plan as part of the NY Project SWPPP (see **Section 4.9.3**) which will be further detailed in the Applicant's EM&CP.

Incidental, short-term potential for inadvertent return of drilling fluids during HDD. HDD or other trenchless installation methods are planned at the cable landfall to avoid sensitive coastal and tidal areas in the East River and Adjacent Areas. In the unlikely event of an inadvertent return within a regulated area, drilling fluids have the potential to escape to the surface and impact coastal resource habitats and the biota inhabiting such areas. However, such inadvertent returns are rare, and the Applicant will implement an Inadvertent Return Plan (see **Section 4.9.3**), which will be provided in the EM&CP, to avoid, minimize, and mitigate potential impacts.

Incidental, short-term potential for accidental releases from construction vehicles or equipment. Although very unlikely, contaminants or accidental releases (e.g., fuel or oil) from construction vehicles or equipment working adjacent to regulated areas during construction activities could reach regulated areas of the East River indirectly through stormwater runoff. The Applicant will implement an SPCC Plan to prevent and manage accidental spills or releases of oil and other contaminants during construction (see **Section 4.9.3**).

4.9.2.2 Operations and Maintenance

During O&M, no new impacts to tidal wetland resources or Adjacent Areas are anticipated, as NY Project-related activities are expected to utilize existing permitted access roads and entry points. The onshore substation facility and associated equipment will be designed above flood elevations. Stormwater management and sediment control features approved and installed during NY Project construction, such as infiltration ponds, will avoid soil erosion to coastal resource areas during NY Project O&M. When onshore export cable inspection or repairs require excavation or other ground disturbance, the Applicant will implement soil erosion and sediment control measures in accordance with the NY Project SWPPP to avoid potential erosion into adjacent coastal areas. Accidental releases into coastal resource areas will be avoided, minimized, or mitigated to the extent practicable by the development and implementation of an SPCC plan (see **Section 4.9.3**).

4.9.3 Summary of Avoidance, Minimization, and Mitigation Measures

During construction, the Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts to wetlands and waterbodies:

- Site all onshore components in previously disturbed areas, existing roadways, and/or rights-of-way;

- Implement soil erosion and sediment control plans, which will be provided for agency review and approval, as applicable, for each onshore component in accordance with the requirements detailed in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), including development of a SWPPP;
- Use trenchless methods (e.g., HDD, jack-and-bore, or micro-tunnel) for installation of the export cable landfall to avoid surficial disturbances and impacts to coastal resources including the intertidal zone, tidal wetlands, and associated regulated adjacent areas.
- Implement an Inadvertent Return Plan, which will be provided for agency review and approval, as applicable;
- Manage accidental spills or releases of oils or other hazardous wastes through an SPCC plan, which will be provided for agency review and approval, as applicable; and
- During construction, restrict access to existing paved roads and approved access routes to minimize soil disturbance.

As the NY Project design is still preliminary and specific impacts are not known, additional mitigation strategies may be developed and submitted as part of the final design and included in the EM&CP. These will conform to the requirements of applicable state and federal permitting respective to wetlands and waterbody resources.

During O&M, the Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts to wetlands and waterbodies:

- Install protective measures around NY Project components to restrict access to coastal resources during O&M activities; and
- Routinely inspect and clean stormwater control features to remove debris or excess vegetation that may impede the designed functionality. The inspection schedule will be detailed in the SWPPP and/or SPCC plan.

4.10 Avian Species

This section addresses the requirements of 16 NYCRR § 86.5 and describes the documented occurrence of marine, coastal, and terrestrial avian species and habitat in the vicinity of the NY Project Area. Potential impacts to avian species resulting from construction and O&M of the NY Project are discussed, as well as the measures the Applicant will implement to avoid, minimize, and/or mitigate potential impacts to avian resources.

4.10.1 Existing Conditions

The NY Project will occupy relatively small areas of marine, estuarine, coastal, and terrestrial habitats utilized by avian species. The submarine export cable route begins in the open ocean at the New York state boundary 3 nm (5.6 km) offshore, travels through Block Island Sound into and along the length of Long Island Sound and the eastern reaches of the East River to a landfall at Lawrence Point in Queens, New York. Once making landfall, the onshore export cables, onshore substation facility, and interconnection cables will be located in the Astoria power complex, which is a highly developed and industrialized area in Queens, New York. The length of the submarine export cable route in New York is approximately 108 nm (124 mi, 200 km) from the state boundary offshore to the cable landfall. Each segment of the submarine cable route offers slightly different habitat that supports a varying diversity of avian species.

Table 4.10-1 provides a list of common avian species in each type of habitat that could occur in the vicinity of the NY Project based on data obtained from the following sources: 2020–2024 New York State Breeding Bird Atlas (BBA),[6] 2016–2020 Audubon Christmas Bird Count (CBC),[7] and eBird hotspots.[8] Species were considered 'common' if they were identified in all three sources (i.e., BBA, CBC, and eBird hotspots).

[6] 2020–2024 NYS Breeding Bird Atlas Survey Blocks: Central Park SE (ebird 2022a).
[7] 2016–2020 Audubon Christmas Bird Count: Bronx-Westchester Region Count (National Audubon Society 2022a).
[8] Reported by eBird users in the Astoria Generating Ponds, Astoria Park, Randalls Island, Randalls Island Ferry Dock and environs, Randalls Island Freshwater Wetlands, Randalls Island Icahn Stadium and environs, Randalls Island NE field and shoreline, Randalls Island saltmarsh and backstop 42 vicinity, Randalls Island saltmarsh at Little Hell Gate Inlet, Randalls Island Southeast section, Randalls Island Southwest section, Randalls Island Urban Farm and Scylla Playground, Randalls Island Waters Edge Garde hotspots (ebird 2022a).

TABLE 4.10-1. COMMONLY OBSERVED AVIAN SPECIES IN THE VICINITY OF LONG ISLAND SOUND

Species	Scientific Name	Species	Scientific Name
Marine/Estuarine Birds			
American Coot	*Fulica americana*	Greater Scaup	*Aythya marila*
American Wigeon	*Mareca americana*	Green-winged Teal	*Anas crecca*
Black Scoter	*Melanitta americana*	Herring Gull	*Larus argentatus*
Black-legged Kittiwake	*Rissa tridactyla*	Hooded Merganser	*Lophodytes cucullatus*
Bonaparte's Gull	*Chroicocephalus philadelphia*	Iceland Gull	*Larus glaucoides*
Bufflehead	*Bucephala albeola*	Lesser Black-backed Gull	*Larus fuscus*
Canada Goose	*Branta canadensis*	Lesser Scaup	*Aythya affinis*
Canvasback	*Aythya valisineria*	Long-tailed Duck	*Clangula hyemalis*
Common Eider	*Somateria mollissima*	Mute Swan	*Cygnus olor*
Common Goldeneye	*Bucephala clangula*	Northern Gannet	*Morus bassanus*
Common Loon	*Gavia immer*	Northern Pintail	*Anas acuta*
Common Tern	*Sterna hirundo*	Northern Shoveler	*Spatula clypeata*
Double-crested Cormorant	*Phalacrocorax auritus*	Pied-billed Grebe	*Podilymbus podiceps*
Gadwall	*Mareca strepera*	Red-breasted Merganser	*Mergus serrator*
Glaucous Gull	*Larus hyperboreus*	Red-throated Loon	*Gavia stellata*
Great Black-backed Gull	*Larus marinus*	Ring-necked Duck	*Aythya collaris*
Great Cormorant	*Phalacrocorax carbo*	Ruddy Duck	*Oxyura jamaicensis*
Gadwall	*Mareca strepera*	Surf Scoter	*Melanitta perspicillata*
		White-winged Scoter	*Melanitta deglandi*
Coastal Birds			
American Bittern	*Botaurus lentiginosus*	Greater Yellowlegs	*Tringa melanoleuca*
American Black Duck	*Anas rubripes*	Horned Grebe	*Podiceps auritus*
American Bittern	*Botaurus lentiginosus*	Killdeer	*Charadrius vociferus*
Bald Eagle	*Haliaeetus leucocephalus*	Laughing Gull	*Leucophaeus atricilla*
Belted Kingfisher	*Ceryle alcyon*	Lesser Yellowlegs	*Tringa flavipes*
Black-bellied Plover	*Pluvialis squatarola*	Mallard	*Anas platyrhynchos*
Black-crowned Night Heron	*Nycticorax nycticorax*	Marsh Wren	*Cistothorus palustris*
Blue-winged Teal	*Spatula discors*	Osprey	*Pandion haliaetus*
Brant	*Branta bernicla*	Piping Plover	*Charadrius melodus*

Species	Scientific Name	Species	Scientific Name
Cackling Goose	*Branta hutchinsii*	Purple Sandpiper	*Calidris maritima*
Clapper Rail	*Rallus crepitans*	Red-necked Grebe	*Podilceps grisegena*
Common Merganser	*Mergus merganser*	Ring-billed Gull	*Larus delawarensis*
Dunlin	*Calidris alpina*	Ruddy Turnstone	*Arenaria interpres*
Fish Crow	*Corvus ossifragus*	Semipalmated Plover	*Charadrius semipalmatus*
Great Blue Heron	*Ardea herodias*	Snowy Egret	*Egretta thula*
Great Egret	*Ardea alba*	Spotted Sandpiper	*Actitus macularius*
Greater white-fronted Goose	*Anser albifrons*	Wilson's Snipe	*Gallinago delicata*
		Wood Duck	*Aix sponsa*
		Yellow-crowned Night Heron	*Nyctanassa violacea*
Terrestrial Birds			
American Crow	*Corvus brachyrhynchos*	Mourning Dove	*Zenaida macroura*
American Goldfinch	*Spinus tristis*	Nashville Warbler	*Leiothlypis ruficapilla*
American Kestrel	*Falco sparverius*	Northern Cardinal	*Cardinalis cardinalis*
American Pipit	*Anthus rubescens*	Northern Flicker	*Colaptes auratus*
American Robin	*Turdus migratorius*	Northern Harrier	*Circus cyaneus*
American Tree Sparrow	*Spizelloides arborea*	Northern Mockingbird	*Mimus polyglottos*
Baltimore Oriole	*Icterus galbula*	Northern Saw-whet Owl	*Aegolius acadicus*
Black Vulture	*Coragyps atratus*	Northern Waterthrush	*Parkesia noveboracensis*
Black-and-white Warbler	*Mniotilta varia*	Orange-crowned Warbler	*Leiothlypis celata*
Black-capped Chickadee	*Poecile atricapillus*	Palm Warbler	*Setophaga palmarum*
Blue jay	*Cyanocitta cristata*	Peregrine Falcon	*Falco peregrinus*
Boat-tailed Grackle	*Quiscalus major*	Pine siskin	*Spinus pinus*
Brown Creeper	*Certhia americana*	Pine Warbler	*Setaphaga pinus*
Brown Thrasher	*Toxostoma rufum*	Prairie Warbler	*Setophaga discolor*
Brown-headed Cowbird	*Molothrus ater*	Purple Finch	*Haemorhous purpureus*
Carolina Wren	*Thryothorus ludovicianus*	Red-bellied Woodpecker	*Melanerpes carolinus*
Cedar Waxwing	*Bombycilla cedrorum*	Red-breasted Nuthatch	*Sitta canadensis*
Chipping Sparrow	*Spizella passerina*	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Common Grackle	*Quiscalus quiscula*	Red-shouldered Hawk	*Buteo lineatus*
Common Raven	*Corvus corax*	Red-tailed Hawk	*Buteo jamaicensis*

Species	Scientific Name	Species	Scientific Name
Common Yellowthroat	*Geothlypis trichas*	Red-winged Blackbird	*Agelaius phoeniceus*
Cooper's Hawk	*Accipiter cooperii*	Rock Pigeon	*Columba livia*
Dark-eyed Junco	*Junco hyemalis*	Ruby-crowned Kinglet	*Regulus calendula*
Downy Woodpecker	*Dryobates pubescens*	Rusty Blackbird	*Euphagus carolinus*
Eastern Bluebird	*Sialia sialis*	Savannah Sparrow	*Passerculus sandwichensis*
Eastern Meadowlark	*Sturnella magna*	Sharp-shinned Hawk	*Accipiter striatus*
Eastern Phoebe	*Sayornis phoebe*	Snow Bunting	*Plectrophenax nivalis*
Eastern Towhee	*Pipilo erythrophthalmus*	Song Sparrow	*Melospiza melodia*
European Starling	*Sturnus vulgaris*	Summer Tanager	*Piranga rubra*
Field Sparrow	*Spizella pusilla*	Swainson's Thrush	*Catharus ustulatus*
Fox Sparrow	*Passerella iliaca*	Swamp Sparrow	*Melospiza georgiana*
Golden-crowned Kinglet	*Regulus satrapa*	Tree Swallow	*Tachycineta bicolor*
Gray Catbird	*Dumetella carolinensis*	Tufted Titmouse	*Baeolophus bicolor*
Great Horned Owl	*Bubo virginianus*	Turkey Vulture	*Cathartes aura*
Hairy Woodpecker	*Dryobates villosus*	Vesper Sparrow	*Pooecetes gramineus*
Hermit Thrush	*Catharus guttatus*	White-breasted Nuthatch	*Sitta carolinensis*
Hooded Warbler	*Setophaga citrina*	White-crowned Sparrow	*Zonotrichia leucophrys*
House Finch	*Haemorhous mexicanus*	White-eyed Vireo	*Vireo griseus*
House Sparrow	*Passer domesticus*	White-throated Sparrow	*Zonotrichia albicollis*
House Wren	*Troglodytes aedon*	Wilson's Warbler	*Cardellina pusilla*
Indigo Bunting	*Passerina cyanea*	Winter Wren	*Troglodytes hiemalis*
Lincoln's Sparrow	*Melospiza lincolnii*	Yellow-bellied Sapsucker	*Sphyrapicus varius*
Merlin	*Falco columbarius*	Yellow-breasted Chat	*Icteria virens*
Monk Parakeet	*Myiopsitta monachus*	Yellow-rumped Warbler	*Setophaga coronata*

Sources:
2020–2024 NYS Breeding Bird Atlas Survey Blocks: Central Park SE.
2016–2020 Audubon Christmas Bird Count: Bronx-Westchester Region Count.
Reported by eBird users in the Astoria Generating Ponds, Astoria Park, Randalls Island, Randalls Island Ferry Dock and environs, Randalls Island Freshwater Wetlands, Randalls Island Icahn Stadium and environs, Randalls Island NE field and shoreline, Randalls Island saltmarsh and backstop 42 vicinity, Randalls Island saltmarsh at Little Hell Gate Inlet, Randalls Island Southeast section, Randalls Island Southwest section, Randalls Island Urban Farm and Scylla Playground, Randalls Island Waters Edge Garde hotspots.

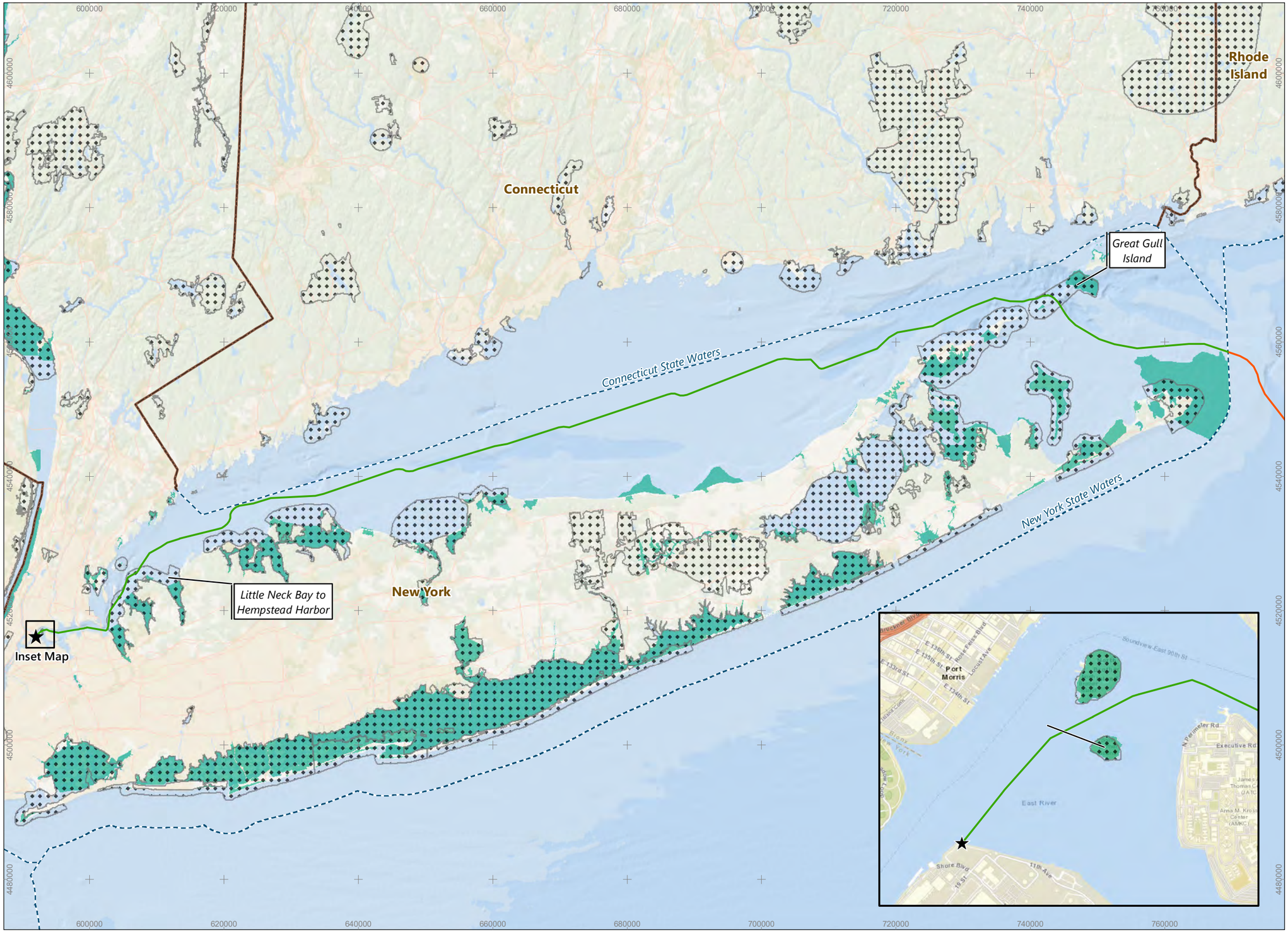
4.10.1.1 Marine, Estuarine, and Coastal Habitat and Species

The NY Project will occupy marine, estuarine, and coastal habitats of Long Island Sound and western Block Island Sound. Long Island Sound is home to over 70 species of seabirds and shorebirds that use the waters and coastline for breeding, nesting feeding, and hunting (Benson 2019). Common bird species located around Long Island Sound include terns, osprey, northern gannets, loons, gulls, and cormorants (Tavares 2019). The NY Project will also occupy small areas of Block Island Sound and the East River; however, given the proximity of those waterbodies to Long Island Sound, marine, estuarine, and coastal bird species occurring in Long Island Sound may also be observed in and around western Block Island Sound and the East River.

Numerous habitats within and along Long Island Sound have been identified as important bird areas (IBAs) for marine and coastal avian species. IBAs are areas which have been identified as providing habitat for species of global conservation concern, assemblages of species with restricted range and/or biomes, and congregations of multiple species. The submarine export cable corridor will traverse the outer boundaries of two IBAs: Little Neck Bay to Hempstead Harbor and Great Gull Island. These areas are depicted on **Figure 4.10-1**. Little Neck Bay to Hempstead Harbor IBA encompasses the waters and wetlands along the southern shoreline of Long Island Sound, extending from Little Neck Bay, east to Hempstead Harbor and serves as a wintering area for waterfowl (National Audubon Society 2022b). Great Gull Island IBA is a rocky inland island covered by herbaceous vegetation that provides habitat for many waterbirds and coastal birds including nesting habitat for tern species (National Audubon Society 2022b).

In addition to IBAs, the NYSDOS designated the North and South Brother Islands as an SCFWH with its primary significance as providing nesting habitat for a relatively large number of colonial waterbirds including gulls, herons, cormorants, and geese (NYSDOS 2022). North and South Brother Islands are located 283 and 440 ft (86 and 134 m) north and south of the submarine export cable route and are depicted on **Figure 4.10-1**. These islands provide undisturbed upland wildlife habitat that is rare in coastal areas of the New York City metropolitan area (NYSDOS 2022).

Figure 4.10-1. Important Bird Habitat



Beacon Wind 1 Project

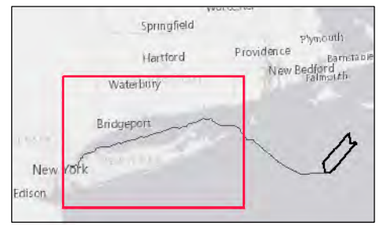
Long Island Sound, New York

Article VII Application

- Important Bird Habitat
- Significant Coastal Fish and Wildlife Habitat

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary



0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022
Data Sources: USFWS, 2013
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

4.10.1.2 Terrestrial Habitat and Species

The Onshore Project Area is in an ecological zone designated by the NYSDEC as coastal lowland (Zone I) known to be experiencing a rapid expansion of urban and suburban development. The onshore portion of the NY Project is developed and industrialized offering very limited avian habitat so that few species of terrestrial birds are expected to occupy this area. The most common species expected in the Onshore Project Area include the mourning dove, American robin, killdeer, barn swallow, rock pigeon, European starling, and house sparrow.

4.10.1.3 Threatened and Endangered Species

A total of 12 federally and/or state-listed threatened or endangered species have been identified as potentially occurring in and around the NY Project Area. The Onshore Project Area and landfall area are not expected to provide suitable breeding, nesting, or foraging habitat for these species due to the developed nature of the site and lack of beach and dune features. Four of these species were identified through NYSDEC and USFWS consultation, and the remaining eight were observed during BBA surveys, CBC surveys, and eBird hotspot observations around the NY Project Area. **Table 4.10-2** provides a list of the 12 listed threatened (T) or endangered (E) species, as well as species identified by the NYNHP as species of special concern (SSC) in New York State. A discussion of each state or federally listed threatened or endangered species is provided after **Table 4-10.2**.

TABLE 4.10-2. LISTED SPECIES WITH POTENTIAL PRESENCE IN THE NY PROJECT AREA

Common Name	Scientific Name	Source a/					Conservation Status	
		BBA	CBC	eBird	NYNHP	IPaC	Federal	New York b/
Marine/Estuarine Species								
Black tern	***Chlidonias niger***	x	-	x	-	-		**E**
Common loon	*Gavia immer*	x	x	x	-	-		SSC
Common tern	***Sterna hirundo***	x	x	x	-	-		**T**
Pied-billed grebe	***Podilymbus podiceps***	x	x	x	-	-		**T**
Coastal Species								
American bittern	*Botaurus lentiginosus*	x	x	x	-	-		SSC
Bald eagle	***Haliaeetus leucocephalus***	x	x	x	-	-		**T**
Black skimmer	*Rynchops niger*	x	-	x	-	-		SSC
Osprey	*Pandion haliaetus*	x	x	x	-	-		SSC
Piping plover	***Charadrius melodus***	x	x	x	-	x	**T**	**E**
Red knot	***Calidris canutus***	-	x	x	-	x	**T**	**T**
Roseate tern	***Sterna dougallii***	x	-	x	-	x	**E**	**E**
Seaside sparrow	*Ammospiza maritima*	-	-	x	-	-		SSC
Terrestrial Species								
Bicknell's' thrush	*Catharus bicknelli*	-	-	x	-	-		SSC
Common nighthawk	*Chordeiles minor*	x	-	x	-	-		SSC
Cooper's hawk	*Accipiter cooperii*	x	x	x	-	-		SSC
Grasshopper sparrow	*Ammodramus savannarum*	-	-	x	-	-		SSC
Loggerhead shrike	***Lanius ludovicianus***	-	-	x	-	-		**E**
Northern goshawk	*Accipiter gentilis*	x	x	x	-	-		SSC
Northern harrier	***Circus cyaneus***	x	x	x	-	-		**T**
Peregrine falcon	***Falco peregrinus***	x	x	x	x	-		**E**

Common Name	Scientific Name	Source a/					Conservation Status	
		BBA	CBC	eBird	NYNHP	IPaC	Federal	New York b/
Red-headed woodpecker	*Melanerpes erythrocephalus*	x	x	x	-	-		SSC
Red-shouldered hawk	*Buteo lineatus*	x	x	x	-	-		SSC
Sedge wren	***Cistothorus platensis***	-	x	-	-	-		**T**
Sharp-shinned hawk	*Accipiter striatus*	x	x	x	-	-		SSC
Short-eared owl	***Asio flammeus***	-	x	x	-	-		**E**
Vesper sparrow	*Pooecetes gramineus*	x	x	x	-	-		SSC
Whip-poor-will	*Caprimulgus vociferus*	-	-	x	-	-		SSC
Yellow-breasted chat	*Icteria virens*	x	x	x	-	-		SSC

Notes:
a/ Species identified from these surveys/sources occurred within the vicinity of the NY Project Area, not necessarily within the NY Project Area.
b/ T- threatened, E- endangered, SCC- species of special concern

Black Tern

The black tern is a New York State-listed, endangered species that can be found across the Great Lakes plains and St. Lawrence River valley (NYSDEC 2022a). This semi-colonial waterbird is typically found in New York from early May to September, nesting on inland marshes, ponds, river mouths, and shorelines of large lakes (NYSDEC 2022a; NYNHP 2022). Although Long Island Sound does not fall within the common habitat types for black terns, they have been observed along the shorelines of Long Island Sound, particularly in the Town of Stratford and City of Milford, Connecticut, which lie approximately 8 nm (13 km) and 9 nm (15 km), respectively north of the submarine export cable route (Save the Sound 2012). The largest threat facing black tern populations is habitat loss. This species was also identified in the vicinity of the submarine export cable corridor during BBA surveys and eBird hotspot observations.

Common Tern

The common tern is a state-listed threatened species that can be found in New York across Long Island, the Great Lakes plains, and the St. Lawrence and Niagara River valleys (NYSDEC 2022b). The common tern is the most abundant tern species found on Long Island in April and May, utilizing sandy beaches, grassy uplands, natural and artificial islands, and rocky inland shores (NYSDEC 2022b). The largest threats facing common tern populations are human disturbance and habitat loss. Currently on Long Island, there are approximately 40 to 50 breeding colonies (NYNHP 2022). This species was also identified in the vicinity of the submarine export cable corridor and the Onshore Project Area during BBA surveys, CBC surveys, and eBird hotspot observations.

Pied-Billed Grebe

The pied-billed grebe is a state-listed, threatened species that can be found in New York between spring and fall (NYNHP 2022). This species typically utilizes fresh and brackish water environments with dense stands of vegetation for nesting (NYSDEC 2022c). In New York, they're most commonly found in the Lake Ontario Plain and St. Lawrence Valley; however, they have been observed on Long Island (NYNHP 2022). The largest threat facing the pied-billed grebe is habitat loss. The pied-billed grebe was observed during BBA and CBC surveys and was also identified in eBird in the vicinity of the submarine export cable corridor and the Onshore Project Area.

Bald Eagle

The bald eagle is a state-listed, threatened species that can be found around large waterbodies, marshes, and swamps which provide their primary food source, fish (The Cornell Lab 2022; NYSDEC 2022d). On Long Island, bald eagles can be commonly found around Mill Pond and Wertheim National Wildlife Refuge, both of which are located on the southern side of Long Island, New York, approximately 18 mi (30 km) and 20 mi (32 km) south of the submarine export cable corridor, respectively, and Caumsett State Historic Park, which is located along the southern shore of Long Island Sound approximately 1.5 mi (2.4 km) south of the submarine export cable route (Audubon New York 2022). The largest threats facing bald eagles include environmental pollution (e.g., pesticides) and habitat destruction; however, since the banning of DDT in the 1970s, the number of bald eagles has been increasing (NYSDEC 2022d; Audubon New York 2022). Bald eagles have been observed

during BBA surveys, CBC surveys, and eBird hotspot in the vicinity of the submarine export cable corridor and the Onshore Project Area.

Piping Plover

Piping plovers are migratory shorebirds that breed along the U.S. Atlantic coast from Florida to Maine and overwinter in the southeastern United States and Caribbean (Loring et al. 2019). This federal and state-listed threatened species can be found breeding on the beaches of Long Island and on eastern bays in northern Suffolk County between March and September (NYSDEC 2022e). In addition to breeding, piping plovers use beaches, dunes, and the tidal zone for foraging opportunities, often in search of marine worms, insect larvae, beetles, crustaceans, and mollusks (NYSDEC 2022e). The largest threat facing the piping plover is habitat loss; however the number of breeding pairs has increased since 2000. In 2010, the Atlantic coast piping plover population was estimated to have 1,782 breeding pairs, 390 of which were located on Long Island (NYSDEC 2017). Piping plovers were identified by the USFWS as having potential presence in the NY Project Area; however, no critical habitat exists in the NY Project Area for piping plovers. Additionally, the Onshore Project Area and landfall area are not expected to provide suitable breeding, nesting, or foraging habitat due to the developed nature of the site and lack of beach and dune features.

Red Knot

Red knots are long-distance migratory shorebirds that breed in the Canadian Arctic, migrate along the U.S. Atlantic coast from Florida to Maine, and overwinter in South America (Burger et al. 2011). This state and federally listed threatened species can be found in New York primarily in the months of May, June, August, and September (NYC Audubon 2020). The state's coastline serves as a stopping location along their migration routes (NYC Audubon 2020). In New York, the red knot can be found in the salt meadows and mud flats of Long Island, where they feed primarily on horseshoe crab eggs (NYSDEC 2014; NYC Audubon 2020). Threats facing the red knot include decreases in horseshoe crab populations, climate change, and development (NYSDEC 2014). Red knots were identified by the USFWS as having potential presence in the NY Project Area; however no critical habitat has been identified in the NY Project Area. Additionally, the Onshore Project Area and landfall area are not expected to provide suitable habitat for red knots due to the developed nature of the site and lack of salt meadow and mud flat features.

Roseate Tern

Roseate terns are migratory seabirds that breed along the Atlantic coast of the northeastern United States and overwinter in South America and the Caribbean (Loring et al. 2019). Within Long Island Sound, Great Gull Island, located approximately 0.8 mi (1 km) south of the submarine export cable route, and Falkner Island, located approximately 6 mi (10 km) north of the submarine export cable route, provide key breeding habitat for roseate terns (Tavares 2019). In fact, the roseate tern nesting colonies found on these two islands comprise roughly 48 percent of the total population found along the Atlantic coast, with Great Gull Island containing the largest nesting colony (Tavares 2019; NYSDEC 2022f). Roseate terns can often be found co-existing with common terns at nesting and foraging sites (O'Brian 2016). Nesting habitat for the roseate tern consists of sandy barrier islands, rocky islands, and occasionally in salt marshes, while foraging habitat consists of shoals, tidal rips, and sand bars (The Cornell Lab 2022). The largest threats facing roseate terns are changes in

vegetation cover, competition for suitable nesting areas, and predation; however, since 2010, an increase in breeding pairs on Great Gull Island has been observed, increasing from 1,250 pairs in 2010 to over 2,000 pairs in 2018 (NYSDEC 2022f; NYSDEC 2018). Roseate terns were identified by the USFWS as having potential presence in the NY Project Area; however, no critical habitat has been identified in the NY Project Area. Additionally, the Onshore Project Area and landfall site is not expected to provide breeding or nesting habitat for the species due to the area's developed nature.

Loggerhead Shrike

The loggerhead shrike is a state-listed, endangered species with a distribution range throughout most of North America, from southern Canada to southern Mexico (NYSDEC 2022g). Historically, this species was a common breeder in western and central New York, with breeding habitat consisting of agricultural areas and pastures; however, the New York population of loggerhead shrikes has been declining possibly due to the abandonment of farms and orchards, which has resulted in a loss of suitable nesting habitat (NYSDEC, 2022g). The loggerhead shrike is not expected to be present in the Onshore Project Area due to the developed and industrialized nature of the Astoria power complex.

Northern Harrier

The northern harrier is a state-listed, threatened species with a distributional range that spans from North America to northern South America (NYSDEC 2022h). In New York, the northern harrier can be found in open grasslands, shrubland, and salt and freshwater marshes (NYNHP 2022). Additionally, northern harrier breeding habitat in New York has been documented in the western plain portion of the Great Lakes, open habitat of the Adirondacks, western Finger Lakes, Long Island, and the Hudson, St. Lawrence, and Lake Champlin Valleys (NYSDEC 2022h). Declines in the northern harrier population began in the 1950s and were attributed to loss of breeding habitat and pesticide use; however, the breeding population in New York currently appears stable (NYSDEC 2022h). The northern harrier has been documented in the vicinity of the submarine export cable corridor and the Onshore Project Area during BBA surveys, CBC surveys, and eBird hotspot observations.

Peregrine Falcon

The peregrine falcon is a state-listed endangered species with an extensive distribution range, spanning six continents (NYSDEC 2022i). Along the Atlantic coast, this species can be found from Greenland to Georgia, occupying a variety of habitats including tundra, savannah, coastlines, mountains, forests, and buildings (NYSDEC 2022i). Within New York, the peregrine falcon is listed as an endangered species. At one time, 40 to 50 nesting sites were identified in New York; however, by 1965 all previously identified nesting sites disappeared. This decrease was largely attributed to pesticide use and its accumulation in prey species (NYSDEC 2022j). Through captive breeding and release programs, nesting site and breeding pair abundance began to increase, achieving 77 pairs by 2012 (NYSDEC 2022i). One known nesting location was identified in the submarine export cable corridor through NYNHP consultations. This location is situated atop the Throgs Neck Bridge, which is equipped with nesting boxes by the NYSDEC at a height of approximately 700 ft (213 m) above New York Bay (Silber 2015). The submarine export cable route will extend under the Throgs Neck Bridge. Given the presence of peregrine falcon on the Throgs Neck Bridge, their use of urban areas for nesting and foraging, and observations made in the vicinity of the Project Area during BBA surveys,

CBC surveys, and eBird hotspot observations, the peregrine falcon could be present in the NY Project Area.

Sedge Wren

The sedge wren is a stated-listed threatened species with a distributional range spanning from Canada to Mexico. This species can primarily be found in wet meadows or hayfields dominated by sedges and grasses (NYSDEC 2022k). In New York, the sedge wren is most commonly found on the plains of the Great Lakes and St. Lawrence; however, they have been historically documented in the Long Island region (NYNHP 2022). The sedge wren largely does not overwinter in the New York region, with the exception of two locations—Westhampton Beach and Jones Beach, located approximately 22 mi (35 km) and 23 mi (37 km), respectively, south of the submarine export cable route on the southern shores of Long Island. The largest threat facing the sedge wren is breeding habitat loss due to wetland draining (NYSDEC 2022k). The Onshore Project Area and landfall site does not provide suitable habitat for the species due to the area's developed nature.

Short-eared Owl

The short-eared owl is a state-listed endangered species with a distributional range spanning throughout North America, Europe and Asia (NYSDEC 2022l). In New York, short-eared owls are typically winter residents, with some breeding population present in the St. Lawrence and Lake Champlain Valleys, Great Lakes Plain, and marshes along the Long Island shoreline (NYSDEC, 2022l). The short-eared owl was observed in the vicinity of the submarine export cable corridor and the Onshore Project Area during CBC surveys and eBird hotspot observations.

4.10.2 Potential Impacts

The following sections describe the potential impacts to avian species and habitats from construction and O&M of the NY Project. Proposed measures to avoid, minimize, and/or mitigate these potential impacts are summarized in **Section 4.10.3**.

4.10.2.1 Construction

The construction phase of the NY Project could result in the following impacts to avian species:

- Short-term attraction to NY Project-related vessels, equipment, components, and/or work areas;
- Short-term displacement of avian species from marine and terrestrial habitats; and
- Short-term disturbance of marine foraging habitat and prey species availability.

Short-term attraction to NY Project-related vessels, equipment, components and/or work areas. During certain construction activities offshore, avian species may be attracted to construction equipment, Project components, and vessels that provide roosting habitat (Environment Canada 2015). Additionally, lighting, particularly during nighttime activities, could lead to the attraction of nocturnal avian species to vessels. Nighttime lighting is associated with an increased risk for collision and entrapment or stranding when birds become disoriented by lighting (Fox and Peterson 2019; Gjerdrum et al. 2021). However, the NY Project Area is characterized by an abundance of light

sources, and many of the species that may occur in the vicinity of the submarine export cable corridor are not nocturnal and therefore would not be affected by vessel lighting. The Applicant will implement safeguards to limit lighting during construction to reduce attraction for birds. Such measures may include downward projecting lights, lights triggered by motion sensors, and limiting artificial light to the extent safe and practicable.

During construction activities onshore, certain species may be attracted to the work site. Common, native species that are frequently found on construction sites include the killdeer, American robin, mourning dove, and barn swallow. Non-native, non-protected species that frequent such areas include the rock pigeon, European starling, and house sparrow. Although these species may be attracted to construction activity and equipment in search of foraging and/or perching opportunities, significant impacts to avian species are not expected due to their ability to vacate the construction area. Lighting at the Onshore Project Area has the potential to attract avian species; however, there are already abundant light sources in the area, and most construction activities will occur during daylight hours which further minimizes the risk of attraction.

Short-term displacement of avian species from marine and terrestrial habitats. Vessels operating in Block Island Sound, Long Island Sound, and the East River have the potential to disturb birds on the water or in flight. Construction vessel operation for the NY Project will occur over an estimated duration of 30 weeks. The incremental increase associated with the NY Project vessel activity will not be substantially different from existing vessel activities in Block Island Sound, Long Island Sound, and the East River. Birds that are exposed to vessel traffic are likely to fly away to other areas to forage or roost and are expected to return post-disturbance. These disturbances can cause increases in energy expenditure as birds take flight to avoid vessels (Schwemmer et al. 2011). However, the vessels used for submarine cable installation will move at speeds less than 10 knots and within a narrow corridor of Long Island Sound, with the exception of smaller crew transfer or supply vessels. Smaller, faster project vessels will be instructed to avoid rafting seabirds to minimize disturbance.

Due to the lack of suitable habitat and the surrounding developed nature of the Onshore Project Area, the NY Project is expected to have minimal effects of disturbance and displacement to avian species. During onshore construction, species known to congregate in industrial sites may be displaced due to increases in noise, vibration, lighting, or human activity. However, effects are expected to be temporary and highly localized to the Onshore Project Area. Onshore construction activities will be conducted within heavily developed areas lacking suitable habitat for most bird species. Additionally, it is expected that avian species present in the Onshore Project Area are tolerant to elevated noise levels, like those produced by construction, due to the highly industrialized nature of the Astoria power complex.

Short-term disturbance of marine foraging habitat and prey species availability. Short-term disturbance of the seafloor and water column will occur during installation of the submarine export cables. Installation of the cables will result in localized, short-term suspension of sediment in the water column. Increases in suspended sediment concentration have the potential to temporarily disrupt and displace prey species of seabirds and coastal birds (e.g., horseshoe crab [Limulus polyphemus], sand lance [*Ammodytidae* spp.]). These effects on prey species would be temporary and highly localized to the submarine export cable corridor. During installation activities, prey species will disperse, except

for immobile organisms, to other areas and will be available for avian predation. Once construction is complete, suspended sediments will quickly settle back to the seafloor, allowing for rapid re-establishment of pre-construction conditions in most locations. See **Section 4.12** for additional detail on disturbance impacts to benthic and finfish resources.

4.10.2.2 Operations and Maintenance

NY Project activities during the O&M phase could result in the following potential impacts to avian species:

- Localized changes in the availability of prey species as benthic habitats re-establish from seafloor disturbances from submarine export cables and cable protection installation;
- Incremental increase in attraction risk to NY Project-related vessels, equipment, components, and/or work areas; and
- Short-term displacement from vessel traffic.

Localized changes in the availability of prey species as benthic habitats re-establish from seafloor disturbances from submarine export cables and cable protection installation. The presence of cable protection for the submarine export cables (where required) will introduce hard substrate onto the seafloor comprised of either rock, rock bags, or concrete mattresses. These materials will cover approximately 10 percent of the submarine export cable route and will extend up to 36 ft (11 m) on either side of the submarine export cable. This addition of hard substrate could result in the displacement of avian prey species in the immediate vicinity of the submarine export cables, which could affect foraging activities for diving avian species; however, cable protection may also attract prey species that occupy more complex or hard seafloor types. This phenomenon is known as the reef effect and has the potential to increase foraging opportunities for piscivorous birds (Taormina et al. 2021). For more information on impacts to fish and invertebrate species, see **Section 4.12**.

Presence of the submarine export cables will result in the emissions of weak magnetic fields into the marine environment. Magnetic fields in the marine environment have been observed to cause behavioral impacts in some marine life during laboratory and in-situ experiments. However, such studies have shown that the presence of a DC cable does not result in mortality or a barrier to the movement of fish or invertebrate species (Hutchison et al. 2018). Magnetic field exposure studies have used magnetic field emissions significantly greater than those proposed for the NY Project to test impacts to invertebrate and fish species, and do not account for the many physical variables associated with a cable system embedded in the seafloor (Hutchison et al. 2018; Woodruff et al. 2012 and 2013). Moreover, the installed submarine cables will occupy a narrow corridor of seafloor compared to the remaining undisturbed seafloor habitat. As such, magnetic fields generated by the submarine export cable are not expected to significantly impact the abundance of avian prey species. For more information on potential project-related impacts to fish and invertebrate species, see **Section 4.12**.

Incremental increase in attraction risk to NY Project-related vessels, equipment, components, and/or work areas. Once the NY Project is operational, the use of vessels, vehicles, and equipment to perform specific O&M activities will be limited, with infrequent periods of concentrated activity. Only

in rare circumstances, when a repair or in-depth facility inspection is required, would the level of project O&M activities reach that comparable to the construction phase, and such activities would be in a limited area and for a short duration. Therefore, no appreciable impacts to avian species are expected from O&M work activities. With respect to the O&M phase for onshore components, the Onshore Project Area is situated within and/or immediately adjacent to urbanized areas, so effects from additional light emitted by the NY Projects' activities and installations (e.g., the onshore substation facility) are expected to be minimal. To prevent attraction to vessels and equipment both onshore and offshore, lighting will be limited to the extent practicable, while still adhering to safety and USCG requirements and local ordinances. Additionally, vessels and equipment will be equipped with anti-perching devices to further deter attraction, where appropriate.

Short-term displacement from vessel traffic. Short-term displacement of avian species in the submarine export cable corridor could occur from vessel traffic associated with O&M activities. The risk of bird displacement from vessel operation in Long Island Sound during the O&M phase of the NY Project will be less than the potential risks of the construction phase. Vessels operating in Long Island Sound have the potential to disturb birds on the water, or in flight. However, it should be noted that vessel traffic during the O&M phase of the NY Project will occur on an as-needed basis, primarily for cable maintenance activities, and will not be substantially different from existing vessel activities in Block Island Sound, Long Island Sound, and the East River. Additionally, it should be noted that the Applicant is committed to implementing measures that avoid rafting seabirds to the extent practicable during offshore vessel activities. Given the short-term and sporadic nature of vessel traffic required during the O&M phase, as well as mitigation measures, substantial effects to aquatic birds within Block Island Sound, Long Island Sound, and the East River are not anticipated.

4.10.3 Summary of Avoidance, Minimization, and Mitigation Measures

During construction, the Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts to avian resources:

- Site all onshore components in previously disturbed areas, existing roadways, or otherwise unsuitable avian habitat and/or rights-of-way to the extent practicable;
- Utilize an existing O&M Base, thereby avoiding additional potential impacts to birds from new construction and possible habitat conversion;
- Consult agencies about the identification of appropriate avoidance or minimization measures, as necessary, during construction of the submarine export cable route to avoid sensitive bird habitat;
- Limit lighting to the extent practicable, while still meeting safety and regulation (e.g., USCG) requirements, to minimize the potential for attraction and collision of birds at night;
- Avoid disturbing rafting seabirds during offshore construction activities as long as safe operations of project vessels can be maintained; and
- Utilize anti-perching devices on NY Project-related vessels and equipment to minimize introduction of perching structures to the offshore environment during cable installation.

During O&M, the Applicant proposes the following measures to avoid, minimize, and mitigate potential impacts to avian resources:

- Limit lighting during O&M to the extent practicable, while still meeting safety and regulation requirements, to minimize the potential for attraction and collision of birds at night; and
- Avoid disturbing rafting seabirds as long as safe operations of project vessels can be maintained.

4.11 Bat Species

This section addresses the requirements of 16 NYCRR § 86.5 and describes the potential presence of bat species and habitat in the vicinity of the submarine export cable corridor and in the Onshore Project Area. Potential impacts to bat species and habitat resulting from construction and O&M of the NY Project are discussed, as well as the measures to be taken to avoid, minimize, and/or mitigate potential impacts to bat resources.

4.11.1 Existing Conditions

Nine different bat species can be found within New York State, six of which are referred to as cave bats and three of which are referred to as tree bats (Wildlife NYC 2022). The six cave bat species that can be found in New York include the big brown bat (*Eptesicus fuscus*), eastern small-footed bat (*Myotis leibii*), Indiana bat (*Myotis sodalis*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), and tri-colored bat (*Perimyotis subflavus*) (Stegemann and Hicks 2008). The three tree bat species that can be found in New York include the red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*) (Stegemann and Hicks 2008). Both groups of bats are nocturnal insectivores that are active from March to November. Of the nine species that can be found in New York, two are protected on a federal and state level: the Indiana bat and northern long-eared bat. These two species are discussed in further detail in **Section 4.11.1.3**.

4.11.1.1 Cave Bats

Cave bats are regionally migratory species that typically travel between hibernacula and roosting/foraging habitat. These bats are typically active between April 1 and October 31, with the greatest levels of migration activity occurring between July and October, according to acoustic studies (Peterson et al. 2014). The maternity roosting period occurs from June 1 to July 31. During the summer, cave bats roost under bark, in tree crevices, and foliage of both dead and live trees (Harvey et al. 2011). Cave bats forage within forests, along forest edges, forest openings, and in riparian areas (Harvey et al. 2011). Beginning in fall, cave bats migrate to caves and mines where they will stay hibernating for the winter (Stegemann and Hicks 2008).

Although cave bats are regional migrants, they can migrate up to 200 mi (322 km) (International Bat Conservation 1991) and have been documented in offshore environments. In fact, acoustic studies performed for BW1 observed big brown bats within the Lease Area, which is located approximately 20 mi (32 km) offshore in the Atlantic Ocean (AECOM 2022). Additionally, acoustic monitoring at Block Island, Rhode Island, located 8 nm (15 km) east of the nearest point of the submarine export cable corridor, identified *Myotis* species during the summer and fall of 2009 and spring of 2010 (Svedlow et al. 2012). Given that cave bats have been detected during acoustic studies in offshore environments, it is possible that cave bats will be present in the marine environment of Block Island Sound, Long Island Sound, and the East River.

Within the Onshore Project Area, the species most likely to be encountered is the big brown bat due to their large population and ability to co-exist in buildings and disturbed areas (Stegemann and Hicks 2008). The Onshore Project Area is located in a highly developed area that lacks contiguous forested habitat that could be used for roosting or foraging habitat. Some cave bats, like the big brown bat, have been observed hibernating in buildings and human-made structures; however, without surrounding foraging habitat such as forests, the presence of these types of species is not anticipated.

4.11.1.2 Migratory Tree Bats

Tree bats are highly migratory species that can travel over 620 mi (1,000 km) during migrations (Flemming 2019). Many of these species migrate south in the winter in search of warmer temperatures and return to northern breeding grounds in the spring (Stegemann and Hicks 2008; Wildlife NYC 2022). In New York, tree bats begin to arrive around mid-April and stay until late summer or early fall (Wildlife NYC 2022; NYNHP 2022). As the name suggests, tree bats can be found roosting in the foliage or trunks of trees (Cryan 2003).

Offshore, long-distance migratory bats have been documented in the northeastern United States, although there is uncertainty regarding the specific movements of these species (Grady and Olson 2006; Cryan and Brown 2007; Johnson et al. 2011; Hatch et al. 2013; Pelletier et al. 2013; Dowling et al. 2017). In Maine, bats have been detected on islands up to 25.8 mi (42 km) from the mainland (Peterson et al. 2014). These bats have been documented most often in the offshore environment during fall migration (August–November) (BOEM 2014). Historical observations of eastern red bats offshore as well as recent acoustic survey results have shown migrating bats temporarily roosting on structures, such as lighthouses and on nearshore islands (Biodiversity Works 2016; Dowling et al. 2017; Hatch et al. 2013; Peterson et al. 2014; Sjollema et al. 2014). Given the presence of small islands and lighthouses in Long Island Sound, migratory tree bats, like the eastern red bat, may be present in the marine environment.

The Onshore Project Area is not expected to support migratory tree bat species. Long-distance migratory tree bats are less dependent on contiguous forest for foraging than cave-hibernating bats; however, they depend on forest for foliage roosts. The Onshore Project Area will be located in the Astoria power complex, which lacks tree stands that could serve as suitable roosting habitat. Therefore, tree bat presence in the Onshore Project Area is not expected.

4.11.1.3 Threatened and Endangered Species

Although the northern long-eared and Indiana bat are both federally and New York state-listed species and can be found across New York State, they are not anticipated to occur in the vicinity of the NY Project based on agency consultations and habitat requirements. Both the USFWS IPaC system and the NYSDEC Natural Heritage Program were consulted for the presence of federally and state-listed species in the NY Project Area. Neither the northern long-eared bat nor the Indiana bat were identified as occurring in the vicinity of the NY Project Area. Additionally, the habitat preferences and behavior of these two species are not consistent with habitat features and land use present in the NY Project Area, as described below.

4.11.2 Potential Impacts and Proposed Mitigation

Overall, the NY Project is not anticipated to have an adverse effect on bats, given the lack of identified bat habitat in the vicinity of the NY Project Area and habitat preferences of known bat species in New York. However, minimal effects could be experienced during the construction and O&M phases, including disturbance and displacement of bats and interference from lighting that can avoided or otherwise minimized by implementing appropriate measures, as described below.

4.11.3 Summary of Avoidance, Minimization, and Mitigation Measures

During construction, the Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts described in the previous subsections:

- Site all onshore components in previously disturbed areas, existing roadways, or otherwise unsuitable bat habitat to the extent practicable;
- Utilize an existing O&M Base. The NY Project will not require demolition of existing structures or the construction of a new O&M Base in the State of New York, thereby avoiding additional potential impacts to bats as a result of new construction; and,
- Limit lighting during offshore and onshore construction to the extent required by regulation and for safety, to reduce attraction (or attraction of insect prey).

During O&M, the Applicant proposes the following measures to avoid, minimize, and mitigate potential impacts described in the previous subsections:

- Limit lighting at the onshore substation facility and during any extended duration offshore O&M activities to the extent required by regulation and for safety, to reduce attraction (or attraction of insect prey).

4.12 Benthic, Finfish, Invertebrates, and Essential Fish Habitat

This section addresses the requirements of 16 NYCRR § 86.5 and describes the benthic, finfish, and invertebrate resources present within and in the vicinity of the submarine export cable corridor, as well as the presence of Essential Fish Habitat (EFH). This section also addresses potential effects and mitigation measures related to benthic resources, finfish, invertebrates, and EFH resulting from construction and O&M of the NY Project. Outreach and information gathered on the commercial and recreational fishing industry are discussed in **Exhibit 6: Economic Effect of the Proposed Facility**.

4.12.1 Existing Conditions

The submarine export cable route extends 108 nm (200 km) through New York State jurisdictional waters, entering through the Block Island Channel between Montauk Point, New York, and Block Island, Rhode Island, and traveling through Long Island Sound and the East River before making landfall at the Astoria power complex in Queens, New York. Given the length of the submarine export cable route and waterbodies crossed, a variety of habitat types and benthic and finfish resources were identified. Data for existing fish and benthic resources were compiled from the following sources: the Nature Conservancy, the LISS, Long Island Sound Blue Plan, Connecticut Department of Energy and Environmental Protection (DEEP) Long Island Trawl Surveys, Northeast Ocean Data portal, and peer-reviewed publications.

4.12.1.1 Habitat

The submarine export cable corridor is located in the New York State jurisdictional waters of Long Island Sound and the East River. Long Island Sound is an estuarine water body where salt water from the Atlantic Ocean mixes with fresh water from river discharges (LISS 2022a). Across Long Island Sound, depths can range from less than 20 to 350 ft (6 to 107 m) with an average depth of 63 ft (19 m) (LISS 2020; Anderson and Frohling 2015). The East River is largely comprised of salt or brackish waters and connects Long Island Sound to the New York Harbor (Swanson et al. 1983). Within the East River, the maximum water depth is 90 ft (30 m); however, the average depth is approximately 31 ft (10 m) (Blumberg and Pritchard 1997).

The marine environment in Long Island Sound and the East River can be broken up between the benthic habitat and the pelagic habitat; however, marine communities are sustained by benthic-pelagic coupling in which energy is continuously transferred between the seafloor and the water column through foraging, animal waste, and decomposition. Benthic-pelagic habitat coupling is essential for the sustainability of a healthy ecosystem that supports the species inhabiting the area in and surrounding the submarine export cable corridor. Many key benthic life stages depend on pelagic habitats for feeding and/or reproducing. For example, the Atlanticsea scallop (*Placopecten magellanicus*) disperses its eggs on the seafloor, which transform into planktonic larvae, drifting through the water column (Munroe et al. 2018). After drifting as planktonic larvae for 5 to 6 weeks (generally southward), juvenile scallops recruit to the substrate where they filter-feed on plankton, enrich the sediment with their wastes, and release the next generation to the overlying water (Munroe et al. 2018). Other benthic invertebrates (e.g., Atlantic surfclam [*Spisula solidissima*]) are known to have similar life stages that switch between benthic and pelagic habitats (Cargnelli et al. 1999).

4.12.1.1.1 Benthic Habitat

Long Island Sound

The seafloor differs across Long Island Sound with the eastern portion having the greatest presence of steep slope and bathymetric heterogeneity compared to the western portion (Anderson and Frohling 2015). Long Island Sound is characterized by flat silt basins and shallow channels, with interspersed shoals, ridges, and steep slopes (Anderson and Frohling 2015). One prominent shoal feature within Long Island Sound and in the vicinity of the submarine export cable corridor is Stratford Shoals. Stratford Shoals is a topographically high ridge dominated by boulders that descend to sediment comprised of cobble, coarse sand, and shell debris (Stefaniak et al. 2014). This feature runs in a north-south direction, separating the western and central basins of Long Island Sound (Stefaniak et al. 2014). Currents over the shoal are tidally generated and run in an east-west direction, with accelerated flows occurring over the shoal (Knebel and Poppe 2000). This shallow feature is ecologically important, as it contains reef habitat which is used by invertebrate and fish species (Stefaniak et al. 2014). Hard stratum reefs like those on Stratford Shoals are spatially rare in Long Island Sound, particularly in the central and western portions; therefore, this feature adds to the heterogeneity of Long Island Sound (Stefaniak et al. 2014). Additional information on seafloor morphology is provided in **Section 4.2**.

The seafloor of Long Island Sound predominantly consists of fine sediment (e.g., silt, sand, clay), with patchy portions of coarse sediment (e.g., gravel, gravelly sand) dispersed throughout, typically corresponding to shoaled areas (Reid et al. 1979; TNC 2016). **Figure 4.2-1** depicts the distribution of sediment sizes throughout Long Island Sound as mapped by The Nature Conservancy as part of the Northwest Atlantic Marine Ecoregional Assessment (TNC 2016). The largest areas of coarse sediment occur in the eastern portion of Long Island Sound (TNC 2016; USGS 1998), and are attributed to sediment erosion, transport, and sorting caused by strong tidal currents, and the overall western movement of sediments into the Sound (USGS 1998). This tidal action removes fine sediment from the eastern portion of Long Island Sound and disperses it westward in the Sound (USGS 1998). Areas of coarse sediment contribute to habitat heterogeneity in areas dominated by soft sediment, thereby increasing habitat diversity which can be beneficial to marine organisms. Surveying efforts as part of the Long Island Sound Mapping and Research Collaborative Pilot Project, which served to characterize the infaunal communities across the different seafloor environments, found areas of gravel or gravelly sand to contain the highest levels of species diversity, while areas of softer sediment contained the highest levels of species abundance (Lamont – Doherty Earth Observatory Collaboration 2015). Other studies suggest that both species richness and abundance are highest in coarse sediment such as gravel and shell (Pellegrino and Hubbard 1983; Battista 2015).

In addition to morphological and geological features, living benthic features such as coral, sponges, and submerged vegetation also contribute to the overall benthic habitat present in Long Island Sound. Cold-water corals have been identified in Long Island Sound through seafloor mapping efforts initiated by the Long Island Sound Fund Steering Committee (Long Island Sound Cable Fund Steering Committee 2015; Babb et al. 2021). Although surveys did not span the entirety of Long Island Sound, of the areas covered by the survey, cold-water corals were identified along portions of the submarine export cable corridor (CT DEEP 2019a). Areas surveyed are located in the eastern portion of Long Island Sound, where coarser substrate and higher current speeds are present, both of which contribute to suitable habitat for hard corals (CT DEEP 2019a). Given the lack of hard substrate in the central and western portions of Long Island Sound, extensive presence of cold-water corals is not expected,

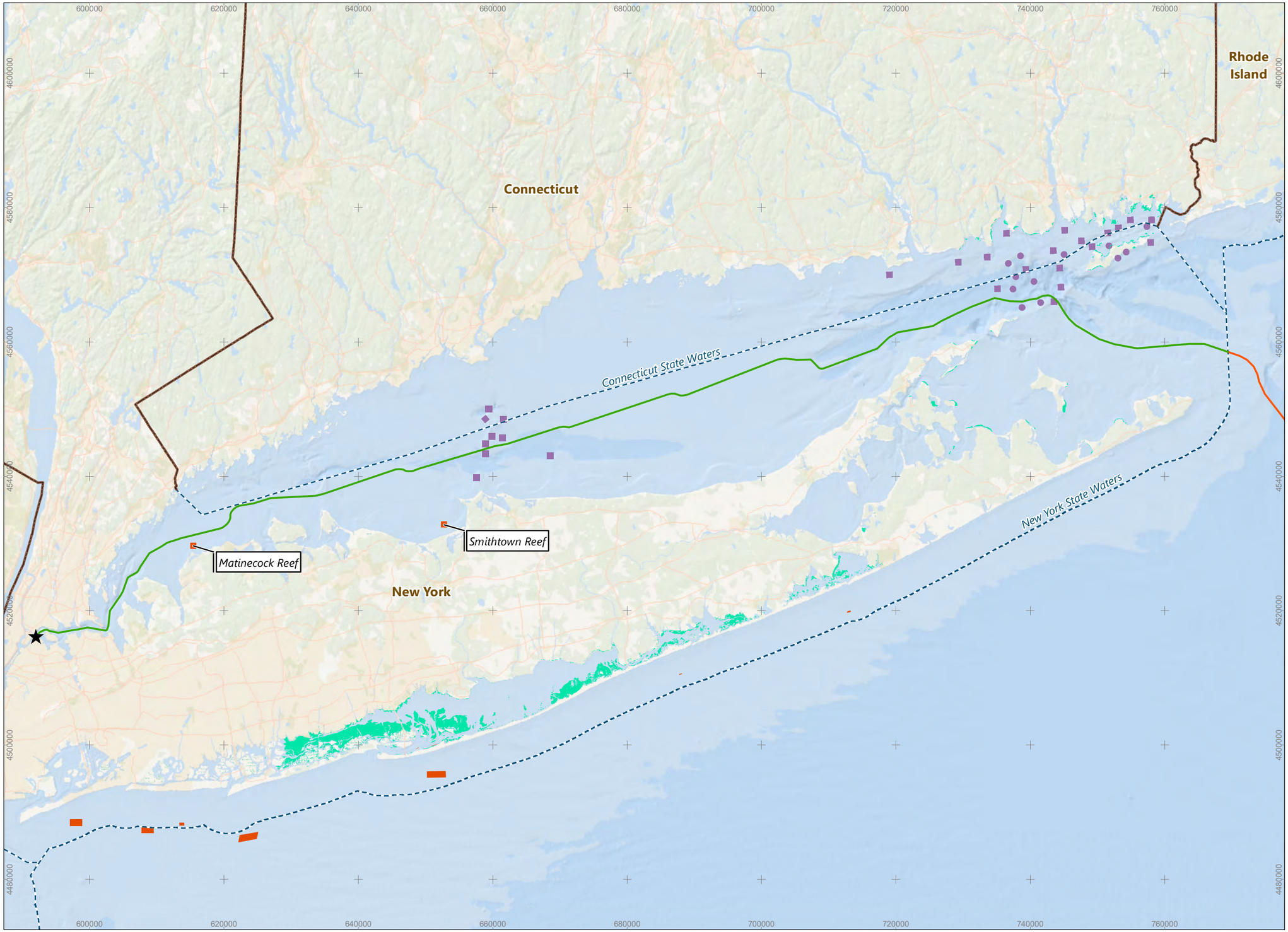
with the exception of shoaled areas like Stratford Shoals, where colonies of northern star coral have been documented.

Northern star coral is a common cold-water coral species found in Long Island Sound that is known to settle and grow on hard substrates (Long Island Sound Cable Fund Steering Committee 2015). Northern star coral is known for building small colonies rather than extensive reefs (NOAA Fisheries 2019). Survey results showed that northern star coral is most commonly associated with areas of ample hard bottom structures (i.e., boulders, rocks), as well as areas of scattered cobble among silty sand sediment (Babbs et al. 2021). Sponge species also contribute to the benthic habitat within Long Island Sound; however, their presence, particularly that of branching sponge, has declined in recent years (Stefaniak et al. 2014). Over a 19-year study, branching sponge had been regularly observed on Stratford Shoals; however, declines in their abundance have been recorded in this area (Stefaniak et al. 2014). These sponge species are important to marine organisms in Long Island Sound as they provide shelter for invertebrates and fish and provide a food source for some sea stars (Wahle and Balcom 2020).

Submerged aquatic vegetation (SAV) also contributes to the benthic habitat of Long Island Sound. The most common type of SAV in Long Island Sound is eelgrass (*Zostera marina*), which is a long-leaf, rooted, aquatic grass found in saline waters (UCONN 2022). Eelgrass beds offer food and habitat to many fish and invertebrate species and serve as essential nurseries (UCONN 2022). Most areas of SAV occur in shallow waters near the coastline where sufficient light and nutrients are present (LISS 2022b). Given that the portion of the submarine export cable route that traverses Long Island Sound will be located in water depths generally ranging from 36 to 223 ft (11 to 68 m), the presence of SAV within the submarine export cable corridor in Long Island Sound is not expected.

In addition to the natural morphological, geological, and biological features that create the benthic habitat of Long Island Sound, two NYSDEC-managed artificial reefs are located within Long Island Sound: Matinecock Reef and Smithtown Reef. These reefs are depicted on **Figure 4.12-1**. The Matinecock Reef is located approximately 0.81 nm (1.5 km) south of the submarine export cable corridor and approximately 0.5 nm (0.9 km) north of Peacock Point. The Matinecock Reef is comprised of one barge and seven pontoons and provides 41 ac (16.6 ha) of habitat. The Smithtown Reef is located approximately 4.8 nm (8.9 km) south of the submarine export cable corridor and approximately 1.6 nm (3 km) northwest of the Stony Brook Harbor entrance. The Smithtown Reef is comprised of two vessels, five barges, steel pipes, and six concrete-filled steel cylinders and provides 3 ac (1.2 ha) of habitat. The presence of these reefs increases available habitat for structure-oriented species. Common species collected by recreational anglers around these reefs include: Atlantic menhaden (*Brevoortia tyrannus*), black sea bass (*Centropristis striata*), tautog (*Tautoga onitis*), bluefish (*Pomatomus saltatrix*), cunner (*Tautogolabrus adspersus*), oyster toadfish (*Opsanus tau*), scup (*Stenotomus chrysops*), smooth dogfish (*Mustelus canis*), striped bass (*Morone saxatilis*), summer flounder (*Paralichthys dentatus*), searobin spp. (*Triglidae*), weakfish (*Cynoscion regalis*), and winter flounder (*Pseudopleuronectes americanus*) (NYSDEC 2020).

Figure 4.12-1. Benthic and Fish Habitat Features



Beacon Wind 1 Project

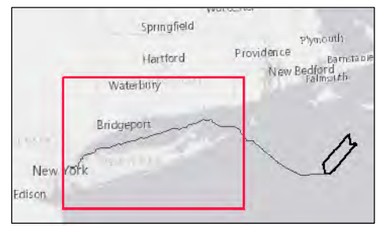
Long Island Sound, New York

Article VII Application

- Artificial Reef
- Coldwater Coral
- Seagrass

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary



0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022
Data Sources: NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

East River

Based on sediment data published by The Nature Conservancy, benthic substrate in the East River in the vicinity of the submarine export cable corridor consists of clay, very fine sands, and coarse sands (TNC 2016; Park et al. 2020). In addition to sediment, SAV could be present in the vicinity of the submarine export cable corridor in the East River. Although not explicitly documented within the submarine export cable corridor, SAV has been documented in the East River, primarily in shallow areas where the plants can obtain sufficient sunlight for growth (New York City 2019). Surveys conducted as part of East Side Coastal Resiliency Project have observed SAV and benthic algae on rip-rap located along the shoreline and piers in the East River (New York City 2019). These growths can also be seen on rocks, jetties, pilings, and sandy or muddy bottoms (New York City 2019). Given the documented occurrences of SAV in the East River and habitat requirements of SAV, SAV may be present in shallow portions of the submarine export cable corridor in the East River, particularly around the landfall area.

4.12.1.1.2 Pelagic Habitat

Long Island Sound

Pelagic habitat refers to the entirety of the water column, excluding the areas near the seafloor or shoreline (NOAA 2021). While benthic habitat can be largely characterized by seafloor composition and morphology, the pelagic environment is typically characterized by oceanographic processes (e.g., tides) and the physical and chemical properties of the water column (e.g., water temperature, salinity, etc). Long Island Sound encounters semi-diurnal tides, with tidal ranges increasing from east to west (Anderson and Frohling 2015). Currents in the Sound are strongest at The Race. At this location, tidal currents flow at a speed of 5 knots or greater (Patten et al. 2009). Average water temperatures range from 37 degrees Fahrenheit (°F) (2.8 degrees Celsius [°C]) in the winter to 69°F (21°C) in the summer (Anderson and Frohling 2015). Salinity in Long Island Sound ranges from 23 parts per thousand in the western portion to 35 parts per thousand in the eastern portion (Anderson and Frohling 2015).

Another feature of the pelagic environment is the presence of phytoplankton and zooplankton. Phytoplankton are small, photosynthetic microalgae. Zooplankton are small animals suspended in the water column that either drift with currents or have weak swimming abilities (NOAA Fisheries 2021a). Both phytoplankton and zooplankton serve as important food sources for invertebrate and fish species. Phytoplankton is not only an important food source, but it also produces oxygen within the water column (Wahle and Balcom 2020). Groups of phytoplankton that can be found in Long Island Sound include diatoms, dinoflagellates, euglenoids, coccolithophores, prasinophytes, and sillicoflagellates (Patten et al. 2012). Examples of zooplankton that can be found in Long Island Sound include copepods and ciliates (LISS 2010).

East River

The East River is a turbid waterway that is influenced heavily by tidal variations in Long Island Sound and New York Harbor (Park et al. 2020). The turbid waters of the East River results in low chlorophyll levels and, therefore, low levels of productivity (e.g., phytoplankton production) (Park et al. 2020). Water temperatures within the East River range from 35°F (2°C) in the winter to 77°F (25°C) in the summer (Blumberg and Pritchard 1997). The maximum water flow in the upper reaches of the East River, where the nearshore reaches of the submarine export cable corridor are located, is

approximately 3 ft per second (1 m per second) (Park et al. 2020). Flow direction in the East River changes constantly (Hunters Point Parks Conservancy 2022). The East River is predominantly fed by salt water and is often referred to as a tidal estuary or tidal straight rather than a river (Hunters Point Parks Conservancy 2022; Park et al. 2020). Due to the influences of New York Harbor and Long Island Sound, salinity levels within the East River fluctuate, which in turn provides support to a variety of aquatic species (Hunters Point Parks Conservancy 2022).

4.12.1.2 Invertebrate and Finfish Resources

Long Island Sound provides habitat to approximately 184 finfish and 1,200 invertebrate species (Anderson and Frohling, 2015). Due to the salinity content in the East River, and its hydrological connection to Long Island Sound, similar species that inhabit Long Island Sound are expected to be found in the East River. Species present in both of these waterbodies are discussed in the following sections.

4.12.1.2.1 Invertebrate Resources

The approximately 1,200 invertebrate species inhabiting Long Island Sound consist of molluscs, arthropods, sponges, bryozoans, echinoderms, cnidarians, and worms (Anderson and Frohling 2015). Of those species, approximately 545 are benthic species, including at least 111 species of arthropods (e.g., crabs, lobster), 80 species of mollusks (e.g., clams, snails), 147 species of annelids (e.g., seaworms), and 4 species of cnidarians (e.g., corals, jellyfish) (Anderson and Frohling 2015).

The Connecticut DEEP conducts yearly surveys using an otter trawl throughout Long Island Sound to gather information on the abundance, biomass, and size composition of marine fishery resources in order to evaluate the effects of fishing and environmental conditions on the distribution and abundance of organisms in Long Island Sound (CT DEEP 2019b). This survey, known as the Long Island Sound Trawl Survey, has been conducted for 36 years, with the last year of publication reflecting data collection in 2019 (CT DEEP 2019b). Surveys occur in the spring (from April to June) and fall (from September to October) (CT DEEP 2019b). Results of invertebrates collected from trawling efforts in 2019 are presented in **Table 4.12-1**.

TABLE 4.12-1. INVERTEBRATE SPECIES COLLECTED IN LONG ISLAND SOUND TRAWL SURVEY IN THE SPRING AND FALL OF 2019, ORDERED BY WEIGHT OF CATCH (LARGEST TO SMALLEST)

Spring	Fall
Horseshoe Crab (*Limulus polyphemus*)	Longfin Squid (*Doryteuthis pealeii*)
Spider Crab (*Libinia emarginata*)	Horseshoe Crab (*Limulus polyphemus*)
Longfin Squid (*Doryteuthis pealeii*)	Lion's Mane Jellyfish (*Cyanea capillata*)
Common Slipper Shell (*Crepidula fornicate*)	Bushy Bryozoan (*Bugula* spp.)
Mixed Sponge	Common Slipper Shell (*Crepidula fornicate*)
Bushy Bryozoan (*Bugula* spp.)	Mantis Shrimp (*Stomapoda* spp.)
American Lobster (*Homarus americanus*)	Spider Crab (*Libinia emarginata*)
Hydroid (Hydrozoa spp.)	Knobbed Whelk (*Busycon carica*)
Flat Claw Hermit Crab (*Pagurus pollicaris*)	Blue Crab (*Callinectes sapidus*)
Common Oyster (*Ostrea edulis*)	Flat Claw Hermit Crab (*Pagurus pollicaris*)
Lion's Mane Jellyfish (*Cyanea capillata*)	Channeled Whelk (*Busycotypus canaliculatus*)
Sand Shrimp (Crangon septemspinosa)	Hard Clams (*Mercenaria mercenaria*)
Channeled Whelk (*Busycotypus canaliculatus*)	Fan Worm Tubes (*Sabella* sp.)
Rock Crab (*Cancer productus*)	Mud Crabs (*Panopeus herbstii*)
Knobbed Whelk (*Busycon carica*)	Comb Jelly (Ctenophora spp.)
Blue Crab (*Callinectes sapidus*)	Hydroid (Hydrozoa spp.)
Lady Crab (*Ovalipes ocellatus*)	Sea Cucumber (*Holothuroidea* spp.)
Mantis Shrimp (*Stomapoda* spp.)	Common Oyster (*Ostrea edulis*)
Northern Moonsnail (*Polinices heros*)	Mixed Sponge
Mud Crabs (*Panopeus herbstii*)	Star Coral (*Astrangia poculata*)
Hydroid (*Tubularia* spp.)	Blue Mussel (*Mytilus edulis*)
Hard Clams (*Mercenaria mercenaria*)	Rock Crab (*Cancer productus*)
Arks (*Annadara* spp.)	Arks (*Annadara* spp.)
Deadman's Fingers Sponge	Sand Shrimp (Crangon septemspinosa)
Blue Mussel (*Mytilus edulis*)	Ghost Shrimp (*Palaemonetes paludosus*)
Star Coral (*Astrangia poculata*)	Moon Jelly (*Aurelia aurita*)
Green Sea Urchin (*Strongylocentrotus droebachiensis*)	Purple Sea Urchin (*Strongylocentrotus purpuratus*)
Red-Bearded Sponge (*Microciona prolifera*)	
Northern red shrimp (*Pandalus borealis*)	
Polychaete spp.	
Coastal Mud Shrimp (*Upogebia affinis*)	
Fan Worm Tubes (*Sabella* spp.)	
Japanese Shore Crab (*Hemigraspus sanguineus*)	
Starfish (Asteroidea spp.)	
Surf Clam (*Spisula solidissima*)	

Source: Marine Fisheries Division Long Island Sound Trawl Survey Report (CT DEEP 2019b)

4.12.1.2.2 Finfish Resources

Long Island Sound and the East River provide habitat for demersal and pelagic fish species. Fish species in Long Island Sound can either have a year-round presence (e.g., winter flounder [*Pseudopleuronectes americanus*] and scup [*Stenotomus chrysops*]) or seasonal presence (e.g., summer flounder [*Paralichthys dentatus*] and striped bass [*Morone saxatilis*]) (Wahle and Balcom 2020; CT DEEP 2019; ASMFC 2009). Over time as waters have warmed, shifts in the seasonal abundance of species have been observed (NOAA Fisheries 2021b). Species that once utilized the Sound during summer and fall months are now staying year-round (NOAA Fisheries 2021b). The following sections provide details on the types of demersal and pelagic species present in Long Island Sound and the East River.

Demersal Species

Demersal fish refers to those species that live and feed on or near the bottom of waterbodies (Tethys 2022). The distribution of demersal fish is largely dependent on seabed morphology and substrate types. As previously stated, the seafloor of Long Island Sound predominantly consists of soft sediment (e.g., silt, sand, clay), with areas of coarse sediment (e.g., gravel, gravelly sand) largely concentrated in the eastern portion of the Sound and interspersed in the western and central portions. The presence of reefs (both natural and artificial) in Long Island Sound also influences species distribution, particularly structure-oriented demersal species. Video surveys conducted by NOAA at the Milford Lab observed fish assemblages at various structures located in Long Island Sound, including rock reefs and aquaculture equipment (e.g., oyster cage) (NOAA 2022). The most commonly observed species at these structures were black sea bass, cunner, scup, and tautog, all of which are structure-oriented species (NOAA 2022a).

In addition to the invertebrates collected during the 2019 Connecticut DEEP otter trawls, **Table 4.12-2** provides a list of demersal species collected during spring and fall trawls. The five most collected demersal species in the spring of 2019 were scup, silver hake (*Merluccius bilinearis*), northern searobin (*Prionotus carolinus*), striped searobin (*Prionotus evolans*), and spotted hake (*Urophycis regia*). The five most collected demersal species in the fall of 2019 were Atlantic butterfish (*Peprilus triacanthus*), scup, weakfish (*Cynoscion regalis*), smooth dogfish (*Mustelus canis*), and striped searobin (CT DEEP 2019b).

TABLE 4.12-2. DEMERSAL FINFISH SPECIES COLLECTED IN LONG ISLAND SOUND TRAWL SURVEY IN THE SPRING AND FALL OF 2019, ORDERED BY TOTAL COUNT NUMBER (LARGEST TO SMALLEST)

Spring	Fall
Scup (*Stenotomus chrysops*)	Atlantic Butterfish (*Peprilus triacanthus*)
Silver Hake (*Merluccius bilinearis*)	Scup (*Stenotomus chrysops*)
Northern Searobin (*Prionotus carolinus*)	Weakfish (*Cynoscion regalis*)
Striped Searobin (*Prionotus evolans*)	Smooth dogfish (*Mustelus canis*)
Spotted Hake (*Urophycis regia*)	Striped Searobin (*Prionotus evolans*)
Atlantic Butterfish (*Peprilus triacanthus*)	Northern Searobin (*Prionotus carolinus*)
Black Sea Bass (*Centropristis striata*)	Spotted Hake (*Urophycis regia*)
Windowpane (*Scophthalmus aquosus*)	Black Sea Bass (*Centropristis striata*)
Summer Flounder (*Paralichthys dentatus*)	Windowpane (*Scophthalmus aquosus*)
Red Hake (*Urophycis chuss*)	Summer Flounder (*Paralichthys dentatus*)

Spring	Fall
Fourspot Flounder (*Hippoglossina oblonga*)	Hogchoker (*Trinectes maculatus*)
Striped Bass (*Morone saxatilis*)	Tautog (*Tautoga onitis*)
Smooth Dogfish (*Mustelus canis*)	Red Hake (*Urophycis chuss*)
Little Skate (*Leucoraja erinacea*)	Striped Bass (*Morone saxatilis*)
Winter Flounder (Pseudopleuronectes americanus)	Spot (*Leiostomus xanthurus*)
Tautog (*Tautoga onitis*)	Silver Hake (*Merluccius bilinearis*)
Hogchoker (*Trinectes maculatus*)	Blue Runner (*Caranx crysos*)
Smallmouth Flounder (*Microstomus kitt*)	Clearnose Skate (*Raja eglanteria*)
Weakfish (*Cynoscion regalis*)	Fourspot Flounder (*Hippoglossina oblonga*)
Clearnose Skate (*Raja eglanteria*)	Winter Flounder (Pseudopleuronectes americanus)
Winter Skate (*Leucoraja ocellata*)	Smallmouth Flounder (*Microstomus kitt*)
Fourbeard Rockling (*Enchelyopus cimbrius*)	Northern Kingfish (*Menticirrhus saxatilis*)
Atlantic Cod (*Gadus morhua*)	Atlantic Sturgeon (Acipenser oxyrhynchus oxyrhynchus)
Northern Kingfish (*Menticirrhus saxatilis*)	Little Skate (*Leucoraja erinacea*)
Northern Pipefish (*Syngnathus fuscus*)	Northern Puffer (*Sphoeroides maculatus*)
Northern Puffer (*Sphoeroides maculatus*)	Atlantic Bigeye (*Priacanthus arenatus*)
Atlantic Sturgeon (Acipenser oxyrhynchus oxyrhynchus)	Inshore Lizardfish (*Synodus foetens*)
Fawn Cusk Eel (*Lepophidium profundorum*)	Oyster Toadfish (*Opsanus tau*)
Goosefish (*Lophius americanus*)	Conger Eel (*Conger oceanicus*)
Oyster Toadfish (*Opsanus tau*)	Planehead Filefish (*Stephanolepis hispida*)
White Perch (*Morone americana*)	Northern Sennet (Sphyraena borealis)
Conger Eel (*Conger oceanicus*)	Fourbeard Rockling (*Enchelyopus cimbrius*)
American Eel (*Anguilla rostrata*)	Roughtail Stingray (*Dasyatis centroura*)
Longhorn Sculpin (Myoxocephalus octodecemspinosus)	Winter Skate (*Leucoraja ocellata*)

Source: Marine Fisheries Division Long Island Sound Trawl Survey Report (CT DEEP 2019b)

Similar demersal fish species have been documented in the East River. A study conducted by Park et al. (2020) compiled marine faunal data for the East River from community science programs and the public to determine fish diversity. In total, 47 species were recorded, 44 of which are considered native to the East River. Of the 44 species, 34 were demersal species. The most abundant demersal species recorded in the East River were striped killifish (*Fundulus* spp.), black sea bass, and striped bass (Park et al. 2020).

Pelagic Species

Pelagic fish are those species which occupy the open waters of the water column, otherwise known as the pelagic zone of waterbodies (Tethys 2022; NOAA 2021). Pelagic organisms in Long Island Sound include not only adult pelagic species (e.g., Atlantic herring [*Clupea harengus*] and Atlantic menhaden [*Brevoortia tyrannus*]), but also pelagic life stages of demersal adult species (e.g., flounder) (LISS 2021).

Pelagic fish collected during Connecticut DEEP otter trawl surveys in Long Island Sound in 2019 are presented in **Table 4.12-3**. The most collected pelagic fish in the spring of 2019 included alewife (*Alosa pseudoharengus*), Atlantic herring, bay anchovy (*Anchoa mitchilli*), American shad (*Alosa sapidissima*), and Atlantic menhaden (CT DEEP 2019b). The five most collected species during fall trawl surveys included moonfish (*Selene setapinnis*), bluefish (*Pomatomus saltatrix*), Atlantic menhaden, bay anchovy, and American shad (CT DEEP 2019b). **Table 4.12-3** may include fewer species than that of **Table 4.12-2** due to the nature and location in the water column of the otter trawl, which operates close to the seafloor.

TABLE 4.12-3. PELAGIC FINFISH SPECIES COLLECTED IN LONG ISLAND SOUND TRAWL SURVEY IN THE SPRING AND FALL OF 2019, ORDERED BY TOTAL COUNT NUMBER (LARGEST TO SMALLEST)

Spring	Fall
Alewife (*Alosa pseudoharengus*)	Moonfish (*Selene setapinnis*)
Atlantic Herring (*Clupea harengus*)	Bluefish (*Pomatomus saltatrix*)
Bay Anchovy (*Anchoa mitchilli*)	Atlantic Menhaden (*Brevoortia tyrannus*)
American Shad (*Alosa sapidissima*)	Bay Anchovy (*Anchoa mitchilli*)
Atlantic Menhaden (*Brevoortia tyrannus*)	American Shad (*Alosa sapidissima*)
Blueback Herring (*Alosa aestivalis*)	Spanish Mackerel (*Scomberomorus maculatus*)
Hickory Shad (*Alosa mediocris*)	Alewife (*Alosa pseudoharengus*)
Spiny Dogfish (*Squalus acanthias*)	Striped Anchovy (*Anchoa mitchilli*)
Bluefish (*Pomatomus saltatrix*)	Blueback Herring (*Alosa aestivalis*)
	Crevalle Jack (*Caranx hippos*)
	Hickory Shad (*Alosa mediocris*)
	Harvestfish (*Peprilus alepidotus*)

Source: Marine Fisheries Division Long Island Sound Trawl Survey Report (CT DEEP 2019b)

Similar pelagic fish species have been documented in the East River. Park et al. (2020), which used fishery and observational data from community science programs and the public, identified 44 native species in the East River with three non-native species. Of the 44 native species, 10 were pelagic species. The most observed or caught pelagic species from the study were Atlantic silverside (*Menidia menidia*), Atlantic menhaden, and bluefish (Park et al. 2020).

4.12.1.3 Protected Species

According to the Endangered Species Act (ESA) mapper published by NOAA, the only threatened and endangered invertebrate or finfish species that may be present along the submarine export cable corridor in Long Island Sound and the East River are the Atlantic sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) and shortnose sturgeon (*Acipenser brevirostrum*) (NOAA 2019). Based on habitat requirements and agency publications, both the Atlantic sturgeon and shortnose sturgeon could occur within and in the vicinity of the submarine export cable corridor. Additional information about these species is provided in the following sections.

Atlantic sturgeon

The Atlantic sturgeon is a federally listed endangered species. The Atlantic sturgeon is a large, bottom-dwelling, long-lived anadromous fish that can be found in rivers and coastal waters from Canada to Florida (NOAA Fisheries 2022a). Atlantic sturgeon stock has been divided into the following distinct population segments (DPS) based on locality: Carolina DPS, Chesapeake Bay DPS, New York Bight DPS, South Atlantic DPS, and the Gulf of Maine DPS (NOAA Fisheries 2022a). All of these DPS are listed as endangered under the ESA, with the exception of the Gulf of Maine DPS, which is listed as threatened. The listing of these DPS is the result of population declines due to overfishing and habitat loss (NOAA Fisheries 2022a).

Of the five DPS established for the Atlantic sturgeon, the New York Bight DPS is the most likely to occur in the vicinity of the submarine export cable corridor. Both Long Island Sound and the East River are identified as providing foraging habitat for Atlantic sturgeon. The majority of Atlantic sturgeon caught in Long Island Sound were collected in water depths between 89 and 121 ft (27 and 37 m), over mud or transitional bottoms (NOAA Fisheries 2022b). Studies have shown that Atlantic sturgeon in Long Island Sound are typically centrally located in deepwater areas (ASMFC 2017). Foraging is less common in the East River but still occurs where suitable habitat exists. Additionally, the East River is identified as being used for Atlantic sturgeon migration, as the species travels between the Hudson River, a known spawning location, and Long Island Sound (NOAA Fisheries 2022b; NOAA Fisheries 2022c). Given the presence of soft bottom habitat, Atlantic sturgeon could utilize the submarine export cable corridor for foraging and migration purposes. No Atlantic sturgeon spawning habitat occurs within or in the vicinity of the submarine export cable corridor.

Shortnose sturgeon

The shortnose sturgeon is a state- and federally listed endangered species under 6 NYCRR Part 182.2 and the ESA (NYSDEC 2014). The shortnose sturgeon is an anadromous species, but their movement between fresh and salt water is not dictated by breeding (NOAA Fisheries 2010). This species was once present in most major river systems along the Atlantic Ocean coastline; however, threats such as overexploitation and habitat degradation have led to their declining population (NOAA Fisheries 2010). Shortnose sturgeon have been known to utilize waters of Long Island Sound and the East River for foraging purposes but are not known to utilize those waterways for overwintering, spawning or rearing habitats (NOAA Fisheries 2022d). Shortnose sturgeon forage primarily over sandy-muddy bottoms which support benthic invertebrates like small bivalves, gastropods, and polychaetes, and some small demersal fish (NOAA Fisheries 2010). Given the documented presence of shortnose sturgeon in Long Island Sound and the East River, and the presence of soft bottom habitat in the submarine export cable corridor, it is likely that shortnose sturgeon could be present in the submarine export cable corridor when foraging.

4.12.1.4 Essential Fish Habitat and Habitat Areas of Concern

EFH is an important element of the regulatory scheme established in the Magnuson–Stevens Fishery Conservation and Management Act regulations and is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. § 1802(10)). NOAA further clarifies the terms in this definition as follows (50 CFR 600.10):

- Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate;
- Substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities;
- Necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and
- Spawning, breeding, feeding, or growth to maturity covers a species' full life cycle.

A total of 33 species have designated EFH within the submarine export cable corridor. **Table 4.12-4** provides a list of those species as well as the designation for each life stage. An EFH Assessment was prepared for this Application and is included as **Appendix E Essential Fish Habitat Assessment**.

TABLE 4.12-4. DESIGNATED EFH BY SPECIES AND LIFE STAGE WITHIN THE SUBMARINE EXPORT CABLE CORRIDOR

Species	Life Stage			
	Eggs	Larvae/ Neonate	Juvenile	Adult
New England Species				
Atlantic Cod (*Gadus Morhua*)	X	X	X	X
Atlantic Herring (*Clupea Harengus*)	-	X	X	X
Atlantic Sea Scallop (*Placopecten Magellanicus*)	X	X	X	X
Atlantic Clearnose Skate (*Raja Eglanteria*)	-	-	X	X
Little Skate (*Leucoraja Erinacea*)	-	-	X	X
Monkfish (*Lophius Americanus*)	X	X	X	X
Ocean Pout (*Macrozoarces Americanus*)	X	-	X	X
Pollock (*Pollachius Virens*)	X	-	X	X
Red Hake (*Urophycis chuss*)	X	X	X	X
Silver Hake (*Merluccius bilinearis*)	X	X	-	X
White Hake (*Urophycis tenuis*)	-	-	X	-

Species	Life Stage			
	Eggs	Larvae/ Neonate	Juvenile	Adult
Windowpane Flounder (*Scophthalmus aquosus*)	X	X	X	X
Winter Flounder (*Pseudopleuronectes americanus*)	X	X	X	X
Winter Skate (*Leucoraja ocellata*)	-	-	X	X
Witch Flounder (*Glyptocephalus cynoglossus*)	X	X	-	-
Yellowtail Flounder (*Limanda ferruginea*)	X	X	X	X
Mid-Atlantic Species				
Atlantic Butterfish (*P triancanthus*)	X	X	X	X
Atlantic Mackerel (*Scomber scombrus*)	X	X	X	X
Black Sea Bass (*Centropristis striata*)	-	-	X	-
Bluefish (*Pomatomus saltatrix*)	X	-	X	X
Longfin Inshore Squid (*Doryteuthis [Amerigo] pealeii*)	X	-	X	X
Scup (*Stenotomus chrysops*)	X	X	X	X
Spiny Dogfish (*Squalus acanthias*)	-	-	-	X
Summer Flounder (*Paralichthys denatus*)	X	X	X	X
Highly Migratory Species				
Atlantic Albacore Tuna (*Thunnus alalonga*)	-	-	X	-
Atlantic Bluefin Tuna (*Thunnus thynnus)*	-	-	X	X
Atlantic Skipjack Tuna (*Katsuwonus pelamis*)	-	-	-	X
Atlantic Yellowfin Tuna (*Thunnus albacres*)	-	-	X	-
Common Thresher Shark (*Alopias vulpinus*)		X	X	X
Sand Tiger Shark (*Carcharhinus taurus*)	-	X	X	-
Sandbar Shark (*Carcharhinus plumbeus*)	-	-	X	X

Species	Life Stage			
	Eggs	Larvae/ Neonate	Juvenile	Adult
Smooth Dogfish (*Mustelus canis*)		X	X	X
White Shark (*Carcharodon carcharias*)	-	X	-	-

Source: NOAA EFH – Data Inventory (NOAA Fisheries 2021c)

In addition to EFH, NOAA also maps habitats of particular concern (HAPC). HAPCs reflect areas of high priority for EFH conservation. HAPCs are typically areas that contribute major ecological functions that are sensitive to habitat declines or anthropogenic stressors such as coastal estuaries, canopy kelp, shallow corals, seagrass and rocky reefs (NOAA Fisheries 2021d). One HAPC for summer flounder was identified as potentially occurring in the submarine export cable corridor. However, HAPC for summer flounder only occurs within areas designated as adult and juvenile summer flounder EFH if that area contains SAV. The definition of summer flounder HAPC is "all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH is HAPC. If native species of SAV are eliminated then exotic species should be protected because of functional value; however, all efforts should be made to restore native species." No areas of SAV have been identified in the submarine export cable corridor.

4.12.1.5 Commercial and Recreational Fishing

Long Island Sound provides an abundance of resources for commercial fishing operations. Common fish species caught in Long Island Sound include bluefish, scup, striped bass, summer flounder, tautog, weakfish, winter flounder, and black sea bass (LISS 2022c). The concentration of commercial fishing efforts varies across Long Island Sound. Vessel Monitoring System data published on the Northeast Ocean Data portal illustrate the distribution of commercial fishing activities in Long Island Sound for the following groups and species: groundfish (e.g., windowpane flounder, Atlantic cod, haddock, pollock), monkfish (*Lophius Americanus*), scallop, and squid (Northeast Ocean Data 2018). A majority of the commercial fishing activity for groundfish, monkfish, scallops and squid, as mapped by the Northeast Ocean Data portal, occurs where Long Island Sound meets Block Island Sound, through The Race (Northeast Ocean Data 2018). Additional areas of concentrated commercial fishing effort were mapped around Hart Island (for groundfish), in the middle of the eastern portion of Long Island Sound (for scallops), and around submerged obstructions off the coast of Jacobs Point, New York (for squid) (Northeast Ocean Data 2018). No commercial fishing activities were mapped in the East River in proximity to the submarine export cable corridor. The waters of Long Island from Sands Point, New York, westward through the East River are identified as prohibited areas for shellfishing due to degraded water quality (Northeast Ocean Data 2017; NYSDEC 2022).

In addition to commercial fishing, recreational fishing is a popular activity in Long Island Sound (LISBP 2019). Most saltwater recreational fishing involves the use of hook and line (rod and reel), either from a boat, or from a shoreline access point (beach, jetty, pier, bulkhead, etc.). Recreational hook and line techniques generally fall into the following categories: bait fishing, bottom jigging, casting lures, fly fishing, trolling, spearfishing, shell fishing. Recreational fishers target both shellfish and finfish; however, the location of fishing and target species varies due to natural and regulatory influences

(LISBP 2019). Based on the 2012 Northeast Recreational Boater Survey, which surveyed fishers from both New York and Connecticut about fish species targeted in fishing effort, the five most targeted fish species identified in that survey were striped bass (*Morone saxatilis*), scup (*Stenotomus chrysops*), bluefin tuna (*Thunnus thynnus*), summer flounder, and tautog (*Tautoga onitis*) (LISBP 2019). In addition to these species, black sea bass have become another popular target species within the past decade (LISBP 2019). In addition to fish species, recreational fishers also target invertebrate species in Long Island Sound such as squid, lobster, whelk, blue crab, and Jonah crab (CT DEEP 2019a).

4.12.2 Potential Impacts

The following sections describe the potential impacts to benthic, finfish, and invertebrate habitat and resources, including EFH, from construction and O&M of the NY Project. Measures to avoid, minimize, and/or mitigate these potential impacts are summarized in **Section 4.12.3**.

4.12.2.1 Construction

The construction phase of the NY Project could result in the following potential impacts to benthic, finfish, invertebrate, and EFH resources:

- Short-term habitat disturbance from cable installation activities;
- Localized direct disturbance, injury, and/or mortality of less mobile benthic and demersal species, as well as early life stages;
- Short-term disturbance to benthic and demersal organisms from increased sediment suspension and deposition; and
- Short-term disturbance to benthic, demersal, and pelagic species from construction-related noise and vibration.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures (see **Section 4.12.3**), the following impacts have a low probability of occurring:

- Incidental, short-term direct and indirect impacts associated with temporary changes in water quality, due to inadvertent leaks and spills.

Short-term Habitat Disturbance from Cable Installation Activities. As described in **Section 4.12.1.1**, much of the seabed of Long Island Sound and the East River is comprised of soft bottom sediments such as sand, clay, and silt, with some areas of gravelly sediment in the eastern portion of Long Island Sound. Construction activities associated with the submarine export cables, which include pre-sweeping, pre-lay grapnel runs, and cable installation, will result in a temporary and localized impact to limited portions of the seafloor of Long Island Sound and the East River. However, given the tidal influences and dynamic nature of sediment processes in both Long Island Sound and the East River and the dominance of soft bottom habitat, the seafloor and benthic community is expected to rapidly recover following construction (Brooks et al. 2004; Guida et al. 2017). Recovery of the seafloor is also anticipated for areas covered by sandwaves (Kraus and Carter 2018). These features are important to benthic and demersal species as they provide topographic relief where fish can shelter from high current flow and hide from predators and prey (Auster et al. 2003; Lock and Packer 2004; Hallenbeck et al. 2012). Sandwaves along the submarine export cable are expected to

re-form by natural processes (i.e., tidal influences and bottom currents) following cable installation (McMullen et al. 2012). In addition, the submarine export cable route was selected to minimize overlap with sensitive benthic habitats, and cables will be further micro-sited within the submarine export cable corridor to avoid boulders and other fine-scale hard bottom to the extent feasible (see **Section 4.12.3**).

Localized Disturbance, Injury, or Mortality of Less Mobile Benthic and Demersal Species, and Early Life Stages. Installation of submarine export cables will result in localized direct seabed disturbance and injury or mortality to individual immobile or slow-moving demersal life stages of fish and invertebrates (including eggs and larvae) in the immediate area of disturbance. However, these short-term disturbances would not result in detectable population-level or stock-level effects to species and effects on the diversity and abundance of benthic and fish species are expected to be negligible (Hiddink et al. 2017; Goldberg et al. 2012).

Pre-construction activities and dredging, which would be completed throughout the submarine export cable corridor prior to cable installation, would result in the same temporary disturbance as bottom dredging and trawl activities, both of which occur in Long Island Sound and the East River (CT DEEP 2019). Similarly, placement and the potential dragging of anchors on NY Project construction vessels could injure or kill individual organisms by direct contact. However, most NY Project construction vessels will maintain position using dynamically positioning, limiting the use of anchors. For the portions of the NY Project that would require anchors, some areas of the bottom would be disturbed, but most of the affected area would be within habitats with prior and ongoing impacts from non-NY Project-related anchoring, trawling, and dredging.

Following the pre-lay grapnel run and seabed preparation within the submarine export cable corridor, cable-laying equipment would disturb the bottom within a narrower band where the submarine export cables would be buried. The jet plow would move slowly, which would allow most mobile fish and invertebrates time to move away from the equipment and likely escape injury; soft-bodied sessile invertebrates within the trenched area will experience direct injury (e.g., crushed or buried). Shelled mollusks are expected to fare better as demonstrated by a study conducted by Kuykendall et al. (2019) where the mortality of surfclams left behind in the path of a commercial clam dredge was generally assumed to be 12 percent. Mortality could be considerably lower as demonstrated by a study conducted by Sabatini (2007) where only 1 percent of the surfclam in an experimentally trawled area in Portugal died from trawl injury. Injury and death of surfclam following commercial dredging are attributed to the direct impact of the dredge teeth. In contrast, the jet plow has no metal teeth, so it would not cause physical breakage of surfclam shells. The jet plow would remain in a given area for only a few hours, representing a transient impact on fish and invertebrates. Surfclams, ocean quahogs, and other burrowing bivalves would use their muscular foot to reposition themselves at the desired depth in the sediment after the submarine export cable installation was complete.

Submarine export cable installation activities could also result in the entrainment of pelagic planktonic species, particularly during jet plow activities. Entrainment of planktonic species typically results in high levels of mortality due to temperature changes and injury as organisms travel through piping systems (USDOE 2009). With respect to jet plowing activities, injury to entrained organisms can occur when water is injected into sediments at high pressure, resulting in mortality. However, such occurrence will be limited to periods of vessel operation and jet plowing. In addition, the area of impact would be small relative to the available habitat for planktonic species, a conclusion which was noted

by BOEM from an entrainment analysis for offshore wind farms in Southern New England (BOEM 2019).

Species entrained would vary by location, water depth, and season. Although entrained organisms would likely be killed, the loss would not be detectable against the background of existing vessel operations in Long Island Sound and the East River, including hydraulic scallop and clam dredging that occur in the submarine export cable corridor. Additionally, mortality of ichthyoplankton is not expected to result in population-level impacts due to the localized and brief nature of the activities and the life histories of species within Long Island Sound. Many species that inhabit Long Island Sound and the East River produce millions of eggs each year (e.g., Atlantic herring, winter flounder), which allows the species to persist in the presence of natural and anthropogenic-related effects (NOAA Fisheries 2022a; Adams 1980).

Short-term Disturbance to Benthic and Demersal Organisms from Increased Sediment Suspension and Deposition. Submarine export cable installation activities are expected to result in short-term, localized increases in sediment suspension and deposition in the immediate vicinity of the submarine export cables. These temporary increases have the potential to cause physiological stress to marine organisms, particularly to early life stages of fish species and to less mobile and sessile species. However, as described earlier, the submarine export cable corridor is located in a dynamic environment that experiences natural and anthropogenic disturbances (e.g., bottom dredging, trawling, and vessel traffic) and the species that live in this area are adapted to survive periodic disturbances similar to what they would experience from submarine export cable installation activities.

Suspended Sediment Concentration

Suspended sediment concentration will increase in the immediate vicinity of the submarine export cable during installation; however suspended sediment concentrations generated during the construction phase are expected to decrease rapidly with distance from the installation equipment, a phenomenon commonly observed in other submarine cable installation projects. Therefore, suspended sediment concentration and duration are not expected to reach lethal limits.

Increases in suspended sediment concentration and duration are expected to have the greatest effect on sessile or less mobile organisms. For sessile or less mobile invertebrates and early life stages of fish (e.g., eggs and larvae), impacts from elevated suspended sediment concentrations can include abrasion, respiration interference, feeding disruption, excretion disruption, reduced growth rate, and in some cases, mortality (Johnson 2018; Wilber and Clarke 2001; Kjelland et al. 2015; Roberts and Elliott 2017; Roberts et al. 2016). However lethal impacts have the potential to occur only at significantly high concentrations and prolonged durations of exposure (Wilber and Clark 2001). For mobile fish and invertebrate species, many are capable of mediating short-term turbidity plumes by leaving the area, expelling filtered sediments, or reducing filtration rates (NYSERDA 2017; Bergstrom et al. 2013; Clarke and Wilbur 2000), thereby reducing the extent of or avoiding lethal impacts.

Results of sedimentation from submarine cable installation are expected to be similar to other cable installation projects. Sediment plumes are expected to rapidly settle and remain relatively close to the seabed. Levels of suspended sediment are expected to return to pre-construction conditions within hours to days (ASA 2008; BOEM 2021; Elliott et al. 2017). The area affected by increased suspended sediment is expected to be small compared to the surrounding habitat in Long Island Sound and the

East River. In addition, species inhabiting the estuarine and coastal habitats of Long Island Sound and the East River are generally adapted to temporary turbidity events caused by storms (EPA 2004) and anthropogenic disturbances. Juvenile and adult life stages, including those of the Atlantic and shortnose sturgeon, may temporarily avoid the disturbed area, which would have a temporary displacement effect; however, these species are expected to return after the activities cease in a given location.

Sediment Deposition

Following cable installation and placement of cable protection where required, suspended sediments would settle in and adjacent to the submarine export cables. The duration and height of the suspended sediment above the bottom would be influenced by particle size and bottom currents; however, the extent of impacts from sediment deposition will be localized to the vicinity of the submarine cable route. The main activities that could cause sediment deposition are pre-sweeping activities which can result in side-casting of sediment and material and jet plow installation of the submarine export cables.

Sediment deposition is expected to have the greatest impact to demersal eggs and larvae (e.g., longfin squid, winter flounder, ocean pout, sand lance) and sessile invertebrates. However, based on modeling for other submarine cable installation projects, measurable sediment deposition is expected to be limited to areas within and directly adjacent to the installation trench. Currents, storms, and other oceanographic processes frequently disturb soft bottom habitats in estuaries like Long Island Sound (EPA 2004); therefore, native fish and invertebrates are likely adapted to respond to such disturbances. For example, the surfclam is considered tolerant of smothering and burial by sediment because it is a fast burrower that can move both vertically in the sediment and laterally across the surface of the sediment; its recovery following sedimentation events is very high. Under experimental trawl conditions, the surfclam reburied in the sediment within a few minutes of the trawl disturbance (Sabatini 2007). Mobile scavengers such as hermit crabs, whelks, sea stars, and some fish would likely move into the area to eat the dead and injured invertebrates (Sciberras et al. 2018; Vallejo et al. 2017; Kaiser and Hiddink 2007; Ramsay et al. 1997; NYSERDA 2017).

Indirect impacts on fish and invertebrate resources from sediment suspension and deposition would be short term and minimal. This one-time disturbance would not prevent natural recovery of benthic communities. Estimates of recovery time following construction vary by region, species, and type of disturbance. Case studies from cable installations on the continental shelf at depths comparable to those found in the submarine export cable corridor indicate that recovery begins immediately after construction and is complete within two years after jet plowing; the duration depends on the availability of mobile sediment (Brooks et al. 2006). Soft bottom habitat recovers more quickly after cable installation by mechanical plowing than by water jetting (Kraus and Carter 2018). Evidence of recovery following sand mining in the Atlantic and Gulf of Mexico outer continental shelf indicates that similar soft bottom benthic habitat to that found in the submarine export cable corridor would fully recover within 3 months to 2.5 years (Kraus and Carter 2018; BOEM 2015; Normandeau 2014; Brooks et al. 2006). NOAA Fisheries estimated recovery of the soft bottom benthic community at Block Island Wind Farm within three years (NOAA Fisheries 2015).

Suspension of Potentially Contaminated Sediment

Subsurface sediment disturbed by cable installation in the submarine export cable corridor, particularly in the western portion of Long Island Sound and in the East River, may contain elevated concentrations of contaminants, as discussed in **Section 4.3**. However, contaminants in sediment in this area would not necessarily affect local benthic organisms. A joint USGS/NOAA Fisheries study used standard coastal monitoring protocols to evaluate the effect of suspended sediments on mussels from sites in northern New Jersey, Hudson/Raritan Bay, and southern Long Island following Hurricane Sandy (Smalling et al. 2016). Despite well-documented elevated concentrations of PCBs in sediments in the Hudson River/Raritan Bay area, concentrations of PCBs in mussels were unchanged following the storm. Likewise, concentrations of legacy organochlorine pesticides (chlordane and dichlorodiphenyltrichloroethane) in mussels from Jones Beach, Long Island, and dieldrin in Hudson River/Raritan Bay mussels were lower than before the hurricane (Smalling et al. 2016). These results indicate that resuspension of sediments during installation of the submarine export cables may not necessarily cause an increase in contaminant uptake by local organisms.

Short-term Disturbance to Benthic, Demersal, and Pelagic Species from Construction-related Noise and Vibration. The NY Project will generate noise during construction, which could directly and indirectly affect marine fish and invertebrates. Noise sources for the NY Project will include vibratory pile driving for cofferdam installation, cable installation activities, and vessel operation. Vibratory pile drivers used to install temporary cofferdams would temporarily elevate underwater sound pressure and particle velocities, which could affect fish and invertebrates in the vicinity. Noise will also be generated by cable installation equipment and vessels during construction; however, such underwater noise levels are not expected to be significantly different than existing conditions from vessel operations currently conducted in Long Island Sound and the East River.

Elevated underwater noise levels have the potential to cause behavioral changes, permanent or temporary threshold shifts, injury, or death in marine organisms (Popper and Hastings 2009; Popper et al. 2014; Popper and Hawkins 2016; Andersson et al. 2017). Extended exposure to mid-level noise or brief exposure to extremely loud sound can cause a permanent threshold shift, which leads to long-term loss of hearing sensitivity. Less-intense noise may cause a temporary threshold shift, resulting in short-term, reversible loss of hearing acuity (Buehler et al. 2015). The potential impact of underwater noise is influenced by the physiology of the receiver, the magnitude of the sound, and the distance of the receiver from the sound. Fish and invertebrates may be sensitive to both sound pressure and particle motion (oscillation of water molecules set in motion by sound) generated by underwater construction. While marine fish and invertebrates can detect particle motion, fish with swim bladders connected to the ear are the most sensitive to sound pressure (Popper and Hawkins 2016; Hawkins and Popper 2018; Popper et al. 2014) (see **Table 4.12-5**).

TABLE 4.12-5. RELATIVE SENSITIVITY OF FISH AND INVERTEBRATES

Morphological Type	Vulnerability to Barotrauma	Vulnerability to Sound Pressure	Typical Species in the vicinity of the Submarine Export Cable Corridor
No swim bladder or other gas-filled organ linked to hearing	Low	No	**Fish**: flatfish, sharks, rays, some tunas **Invertebrates**: squid, clams, whelk, crabs, lobster
Swim bladder not related to hearing	Medium	No	Sturgeons, striped bass, yellowfin and bluefin tuna
Swim bladder or gas-filled organ related to hearing	High	Yes	Atlantic cod, haddock, herring

For mobile species like fish, impacts from vibratory pile driving of the cofferdam might result in temporary displacement for the duration of cofferdam installation. The extent of displacement may vary by species, which was observed in one study conducted at a wharf in Port Canaveral, Florida. This study conducted by Lafrate et al. (2016) observed the effects of impact pile driving on two reef species: sheepshead (*Archosargus probatocephalus*) and grey snapper (*Lutjanus griseus*). Results of the study showed that sheepshead (*Archosargus probatocephalus*) remained for 10 days in a pile driving area while the grey snapper (*Lutjanus griseus*) left the area after only three days (Iafrate et al. 2016). It should be noted that impact pile driving produces higher noise levels than vibratory pile driving, so impacts are expected to be less for vibratory pile driving activities. In addition to vibratory pile driving for the cofferdam, noise will be generated by cable installation equipment and vessel operation; however, these sources are not expected to cause significant impacts to fish species and they are expected to produce less noise than vibratory pile driving. One study conducted within the New York Harbor determined that noise from maintenance dredging would not differ from vessel background sounds and would pose no barrier to migratory behavior of fishes in New York (USACE 2015b). Therefore, it can be reasonably assumed that cable installation activities would not significantly impact migratory behavior of fish species within Long Island Sound and the East River (e.g., Atlantic sturgeon or shortnose sturgeon).

Sessile demersal species and life stages such as surfclam, scallop, ocean quahog, squid egg mops, and demersal fish eggs and larvae would be susceptible to changes in sound pressure, particle motion, and substrate vibrations throughout the period of vibratory pile driving for cofferdam installation. Surfclam, ocean quahog, and scallops would likely respond to the vibration from pile driving by closing their valves or “flinching,” which prevents feeding (Charifi et al. 2017; Day et al. 2017). The loss of foraging opportunity resulting from closed valves would be a short-term, reversible, adverse impact on these species; once the disturbance ends, the bivalves would resume feeding. Physiological (e.g., respiration) and behavioral (e.g., feeding, predator avoidance) responses to particle motion from noise production have been documented in crustaceans (Edmonds et al. 2016; Roberts et al. 2016). However, it should be noted that many of the studies examined in the Edmonds et al. (2016) and Roberts et al. (2016) reports focused on impulsive sound sources, including impulsive pile driving. Vibratory pile driving is expected to be less impactful than impulsive pile driving because impact pile driving produces a loud impulse sound that can propagate through the water and substrate, whereas

vibratory pile driving produces a continuous sound with peak pressures lower than those observed in pulses generated by impact pile driving.

Short-term change in water quality from Non-Routine Spills or Releases. Sources of non-routine chemical releases during construction include fuel spills from vessels and releases of bentonite drilling muds associated with the HDD installation method at the landfall.

Typical offshore construction support vessels burn diesel fuel and have the potential to accidentally release small amounts of fuel to waterways. Diesel fuel floats on the water's surface briefly before volatilizing; it does not sink to the bottom and would not affect benthic habitat or species. Prior to construction activities, the Applicant will create and follow an OSRP, which would detail measures to minimize fuel spills and leaks from construction vessels (e.g., prohibit re-fueling at sea). Construction vessels would comply with USGS regulations and with discharge limits mandated by the Vessel Incidental Discharge Act of 2018 as appropriate for the vessel size and type. Chemical releases from vessels are considered unlikely; impacts would be short-term and localized.

During HDD at the landfall site for the submarine export cables, the release of non-toxic drilling mud would be unlikely, but possible. Prior to construction, the Applicant will create an Inadvertent Return Plan, which will detail response actions to be implemented if an accidental release occurred. Given the non-toxic characteristics of the drilling mud, the unlikely occurrence of a release, and the precautions outlined in the Inadvertent Return Plan, impacts of drilling muds on benthic habitat would be indirect and temporary, a conclusion made by BOEM regarding HDD activities at the Virginia Offshore Wind Technology Advancement Project (BOEM 2015).

4.12.2.2 Operations and Maintenance

During O&M, the potential impacts to benthic, finfish, invertebrate, and EFH resources may include the following:

- Long-term disturbance, displacement, and/or modification of habitat and the introduction of artificial habitat;
- Short-term disturbance from underwater noise/vibration; and
- Potential risks from NY Project-related EMF.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures (see **Section 4.12.3**), short-term changes in water quality (turbidity, incidental spills, and marine debris) have a low probability of occurring.

Long-term disturbance, displacement, and/or modification of habitat and the introduction of artificial habitat. Once installed, the majority of the submarine export cables will be buried and the seafloor is expected to return to pre-construction conditions, with the exception of locations where cable protection measures are installed. The Applicant conservatively assumed that 10 percent of the submarine export cable route will be installed with cable protection measures such as rocks, rock bags, and concrete mattresses. The width of cable protection was conservatively assumed to be 36 ft (11 m). Over the 115 nm (213 km) long submarine export cable route, approximately 57 ac (23 ha) may be covered by cable protection.

Although these cable protection measures will convert sandy bottom habitat to hardened substrate, the loss of sandy and silty habitat is minimal when compared to the overall available habitat within Long Island Sound and the East River. Additionally, the introduction of hardened substrate could provide ecological benefits for structure-oriented invertebrate and fish species. One study conducted by Taormina et al. (2021) examined colonization of epibenthic communities on two different cable protection structures, concrete mattresses and cast-iron protection shells. The study revealed an ecological succession of barnacles, followed by acidians, followed by algae and hydrozoans on cable protection structures, thereby providing habitat for structurally complex communities which could increase local diversity of species (Taormina et al. 2021). In addition to biofouling communities, results of a four-year monitoring study around concrete mattresses showed that such structures can provide suitable and sustainable habitat for fish and crustaceans (Taormina et al. 2021). Therefore, although the presence of cable protection structures will result in the conversion of approximately 54 ac (22 ha) of existing sandy or gravelly habitat, it will be replaced by hardened structures which can increase habitat diversity and species diversity in Long Island Sound and the East River.

Short-term Disturbance from NY Project-related Underwater Noise. Vessels used for O&M activities will generate noise in the vicinity of the submarine export cable corridor; however, such noise will be infrequent, and is not expected to contribute substantially to existing sound levels in the submarine export cable corridor due to the frequency of vessel traffic in Long Island Sound and the East River. Therefore, the acoustic impact of O&M vessels on invertebrate and fish species will be intermittent and negligible.

Potential Risks from NY Project-related EMF. Operation of the high-voltage direct current (HVDC) submarine export cables will generate magnetic fields; however, magnetic fields will reach ambient levels at approximately 21 ft (6 m) from the submarine export cables at 3.3 ft (1 m) above the seabed. Due to cable shielding, electric fields are not expected to be detected by marine organisms (Gill and Desender 2020) and therefore are not further discussed.

Magnetic fields produced by the operation of the submarine export cables can be detected by a limited number of fish and invertebrate species. Magnetic field detection varies between invertebrates and fish species. In invertebrates, the most supported theory for magnetic field detection is the use of a magnetite-based system which involves the presence of magnetic crystals (magnetite) that can detect differences in magnetic fields (CSA Ocean Sciences, Inc. and Exponent 2019; Normandeau et al. 2011). Magnetosensitivity has been observed in three invertebrate phyla: Mollusca (e.g., snails and bivalves), Echinodermata (e.g., sea urchins), and Arthropoda (e.g., lobsters) (Normandeau et al. 2011). It is hypothesized that species of these phyla that are magnetosensitive utilize the earth's natural magnetic field for orientation, navigation, and homing (Normandeau et al. 2011).

Although precise magnetic field sensitivity thresholds for marine invertebrates are unknown, studies conducted to date have found responses to such fields to be behavioral rather than physiological. One field study conducted by Hutchison et al. (2018) on American lobsters observed subtle changes in behavioral activities (e.g., exploration activity) and spatial distribution (e.g., use of enclosure space, proximity to seabed) when exposed to a magnetic field of 653 milliGuass (mG) from a DC cable. However, although some subtle differences were observed, the cable did not act as a barrier to movement. Laboratory studies conducted by Woodruff et al. (2012 and 2013) did not observe statistically significant differences in behavior or distribution between controlled and experimental trials

when exposing species like Dungeness crabs and American lobster to high levels of DC magnetic fields (e.g., 10,000 mG, 30,000 mG).

Studies conducted on fish species also largely observed behavioral rather than physiological impacts from exposure to magnetic fields produced by a DC source. In addition to American lobsters, Hutchison et al. (2018) examined behavioral impacts in little skates when exposed to a magnetic field of 655 mG from a HVDC cable. Results of this field study showed changes in behavior such as altered travel pattens and increased travel speed; however, the cable did not represent a barrier for crossing. Additional field studies examined migrating European eels (*Anguilla anguilla*) across a DC cable. While slower swimming speeds were observed when crossing the DC cable, the cable did not create a barrier to crossing or present any permanent obstacles to migrating adult eels or elvers (Normandeau et al. 2011). Woodruff et al. (2013) studied responses in the non-magnetosensitive Atlantic halibut (*Hippoglossus hippoglossus*) to graduated magnetic field strengths from a DC source ranging from 2,700 to 12,300 mG and found no significant changes in behavior.

An EMF analysis of the submarine export cables was performed and the technical report from this analysis is provided as **Appendix C**. Magnetic field levels modeled for the HVDC submarine export cables, when buried at a depth of 3 ft (0.9 m) were 600 mG at a location directly above the cable, which is less than those modeled in both the Hutchison et al. (2018) and Woodruff et al. (2012 and 2013) studies. Modeling results also showed decreases in magnetic field strength as burial depth increased, with magnetic field levels of 553 mG and 522 mG at burial depths of 6 ft (1.8 m) and 15 ft (4.6 m), respectively. Additionally, modeling showed that magnetic fields from the submarine export cables will decrease to background levels (512 mG) within 21 ft (6.4 m) of the cables at 3.3 ft (1 m) above the seafloor. Although the studies cited above found that the presence of the cable resulted in some spatial and behavioral responses in both invertebrates and fish species, the presence of the cable did not represent a barrier to cable crossing. Additionally, the magnetic fields are expected to dissipate as distance from the cable increases, a phenomenon that has been observed in other submarine cable projects (BOEM 2021) and has been confirmed by modeling presented in **Appendix C**. Therefore, although magnetic fields would be present as long as the NY Project is in operation, impacts from EMFs generated by the submarine export cables would be highly localized and would likely be biologically insignificant, a conclusion also reached by BOEM (2020).

Short-term changes in water quality including oil spills. During O&M, routine maintenance activities have the potential to result in temporary increases in turbidity and sedimentation in the vicinity of the submarine export cable corridor. Potential impacts to water quality resulting from turbidity are further discussed in **Section 4.3**. Water quality also has the potential to be impacted through the introduction of contaminants, including oil and fuel spills. The Applicant will establish an OSRP, which will detail the measures to avoid inadvertent releases and spills and a protocol to be implemented should a spill event occur. In addition, NY Project-related vessels will operate in accordance with laws regulating the at-sea discharges of vessel-generated waste.

4.12.3 Summary of Avoidance, Minimization, and Mitigation Measures

During construction, the Applicant will implement the following avoidance, minimization, and mitigation measures to limit the impacts described in **Section 4.12.2**:

- Avoid installing submarine export cables in areas of sensitive habitat, where feasible;
- Utilize construction techniques such as jet plowing and vibratory pile driving that minimize potential impacts on fish and invertebrates;
- Use appropriate measures for vessel operation and implement an OSRP, which includes measures to prevent, detect, and contain accidental release of oil and other hazardous materials. NY Project personnel will be trained in accordance with relevant laws, regulations, and NY Project policies, as described in the OSRP;
- Maintain position of most construction vessels using dynamic positioning, limiting the use of anchors, where feasible;
- Use HDD or other trenchless installation methods at the landfall to minimize physical disturbance of coastal habitats. The Applicant will implement appropriate measures during HDD activities at the landfall to minimize potential release of HDD fluid. To minimize an inadvertent fluid return, an HDD Inadvertent Return Plan will be developed and implemented;
- Use appropriate measures and timing during cable installation activities to minimize sediment resuspension and dispersal in areas of known historically contaminated sediments; and
- Consider the timing of construction activities; work with the fishing industry and fisheries agencies on sensitive spawning and fishing periods to actively avoid or reduce interaction with receptors, where feasible.

During the O&M phase, the Applicant will implement the following avoidance, minimization, and mitigation measures to limit impacts described in **Section 4.12.2**:

- Sufficiently bury electrical cables where feasible, minimizing seabed habitat conversion and reducing the effects of EMF; where deep burial is not technically feasible, rock armoring will shield the cable from the overlying water; and,
- Implement an agency-reviewed OSRP.

4.13 Marine Mammals

This section addresses the requirements of 16 NYCRR § 86.5 and describes marine mammals including cetaceans (whales, dolphins, porpoise) and pinnipeds (seals) and their habitat that have the potential to occur in the waters within and surrounding the submarine export cable corridor. Potential impacts to marine mammals resulting from construction and O&M of the submarine export cables are discussed, as well as proposed measures to avoid, minimize, and/or mitigate potential impacts to marine mammals.

4.13.1 Existing Conditions

For the purposes of this section, the Study Area includes the coastal and offshore areas where marine mammals may be present, traverse, or incidentally occur and have the potential to be directly or indirectly affected by the construction and operation of the NY Project. The Marine Mammals Study Area includes the waters and coastlines of western Block Island Sound, Long Island Sound, and the eastern reaches of the East River.

Geographically specific marine mammal species' occurrence and distribution data are limited for the Study Area. However, several studies and monitoring surveys have been conducted within northeastern waters providing data on marine mammals within the general region.

4.13.1.1 Regulatory Framework and Introduction

All marine mammals are protected under the Marine Mammal Protection Act (MMPA), as amended in 1994. The MMPA prohibits the "take" of marine mammals, including the act or attempt of harassment, hunting, or capturing of marine mammals. Within the framework of the MMPA, marine mammal populations are further defined into a "stock", which is defined as "a group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature" (16 U.S.C. § 1362) or groups of nonspecific individuals that are managed separately (Hayes et al. 2020) Some marine mammal stocks may be designated as strategic under the MMPA, which may require the jurisdictional agency (i.e., NOAA Fisheries) to impose additional protective measures.

In addition, some marine mammal species inhabiting U.S. waters are also protected under the ESA. The ESA protects endangered and threatened species and their habitats by prohibiting the "take" of listed animals. The ESA defines "take" as any action to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Marine mammals inhabit all of the world's oceans and are highly mobile, so they can be found in coastal, estuarine, and pelagic (offshore) habitats. A total of 39 species of marine mammals occur in the Northwest Atlantic Outer Continental Shelf (OCS) regional waters, some of which have portions of their documented ranges occurring in the vicinity of the NY Project (BOEM 2014). All 39 species are protected by the MMPA, and five species are also listed under the ESA, including the fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), blue whale (*Balaenoptera musculus*), North Atlantic right whale (*Eubalaena glacialis*), and sperm whale (*Physeter macrocephalus*). However, most of these species are not expected to be found in in the vicinity of the NY Project except for incidental occurrences.

4.13.1.2 Occurrence in the Study Area

The NOAA Fisheries ESA Section 7 mapper tool (NOAA Fisheries 2021) includes the area of the submarine export cable corridor from the New York State boundary through Block Island Sound, Gardiners Bay, and Long Island Sound to Horton Neck as having the potential for occurrence of North Atlantic large whales, including adult and juvenile fin whales during all seasons and migrating adult and juvenile North Atlantic right whales. In addition, the Long Island Sound Blue Plan Map Viewer (Connecticut Department of Energy and Environmental Protection [CT DEEP] 2019) maps eastern Long Island Sound from Hammonasset Beach State Park in Connecticut, south to Mattituck on Long Island and east through The Race as an area where cetaceans occur in higher concentrations and/or significant areas that support cetaceans (e.g., particular feeding areas, nursery grounds). Several locations along Long Island Sound shorelines are also mapped as higher concentrations and/or significant areas that support pinnipeds (e.g., particular haul-out sites, nursery grounds).

According to the Connecticut Wildlife Action Plan (Terwilliger Consulting Inc. 2015), cetacean observations in Long Island Sound are rare, and many reports are of isolated individuals often compromised or stranded along the shoreline (Terwilliger Consulting Inc. 2015; Durham 2020). However, cetaceans may also visit Long Island Sound waters in pursuit of schools of small fish. Menhaden or bunker, for example, are common in Long Island Sound waters and are known to attract various large predator species, including humpback whales and dolphins (CT DEEP 2018). The only regular sightings of whales occur in the far eastern part of Long Island Sound and Block Island Sound, where humpback and North Atlantic right whales are known to occur with some frequency. Whale occurrences are uncommon and unpredictable throughout the rest of the Study Area. Occasional visitors have included the North Atlantic right whale, humpback whale (*Megaptera novaeangliae*), beluga whale (*Delphinapterus leucas*), pilot whale (*Globicephala spp.*), fin whale, sei whale, sperm whale, blue whale, minke whale (*Balaenoptera acutorostrata acutorostrata*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis delphis*), bottlenose dolphin (*Tursiops truncatus truncatus*), and harbor porpoise (*Phocoena phocoena phocoena*). However, reports of these species are separated by years at a time, and there is no predictability for when they might enter Long Island Sound (Terwilliger Consulting Inc. 2015; CT DEEP 2018).

ESA-listed blue whales may occur in the region but are not expected to occur in the Marine Mammal Study Area. They are considered rare in this region and their distribution and habitat preferences make them unlikely to occur in the shallower, warmer waters of the Study Area. In addition, beluga whales are considered artic or sub-arctic species and are not anticipated to occur in this region. Therefore, blue and beluga whales are not discussed further in this analysis.

Long Island Sound is home to four pinniped species (NYSDEC n.d.; Kopelman 2022a; Terwilliger Consulting Inc. 2015). Harbor seals and gray seals are present in Long Island Sound from September through June, although some have been observed year-round. Since the mid-1990s, two species of arctic seals, including harp seals (*Pagophilus groenlandicus*) and hooded seals (*Cystophora cristata*) have been spotted in Long Island Sound, from mid-January through early May, although rarely (Durham 2009; CT DEEP 2018; Kopelman 2022a). Several seal haul-out sites occur at rocky ledges, beaches, and islands along coastlines of Long Island Sound, including the nearby Little Gull Island (CT DEEP 2018; Kopelman 2022a; Wahle and Balcom 2020).

Marine mammal sightings collected between 1976 and 2020 within the Study Area are depicted in **Figure 4.13-1**. Marine mammal observations depicted within the Study Area are based on publicly available information (including existing literature and reporting on sightings, such as from newspaper or other historical accounts), NOAA Fisheries Stock Assessment Reports (Hayes et al. 2017, 2019, 2020), scientific publications or technical reports, and geospatial sighting information retrieved from the Ocean Biodiversity Information System datasets (Roberts et al. 2016a, 2016b, 2017, 2018, 2020, and 2021). Other data sources include the NOAA Fisheries aerial and vessel-based surveys (AMAPPS I and II), and its associated Passive Acoustic Monitoring studies for marine mammals along the eastern United States (NOAA Fisheries 2017a and 2019a). Older published reports such as the Cetacean and Turtles Assessment Program (CETAP 1982) are also included.

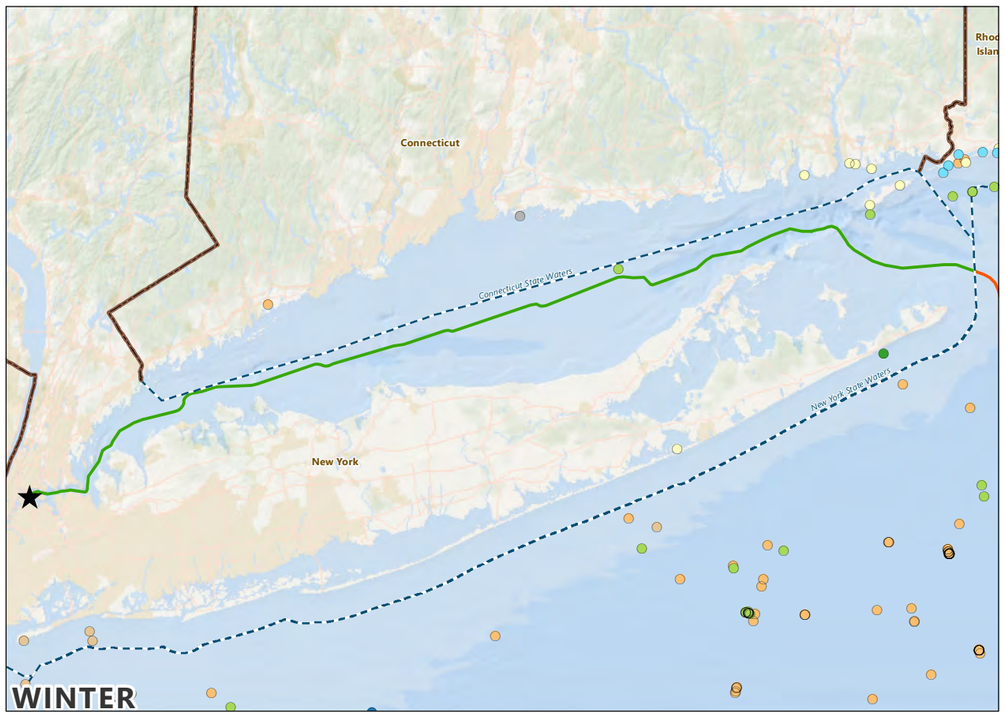
In the Study Area, site-specific marine wildlife surveys were conducted by Protected Species Observers (PSO) during 2019 and 2020 as part of BW1. The PSO sighting data for protected species observed within the Study Area are summarized in **Table 4.13-1**. During the 2019 and 2020 surveys, common dolphin, gray seal, harbor seals, humpback whales, and minke whales were positively identified within or in the vicinity of the Study Area, as well as several unidentified marine mammal species.

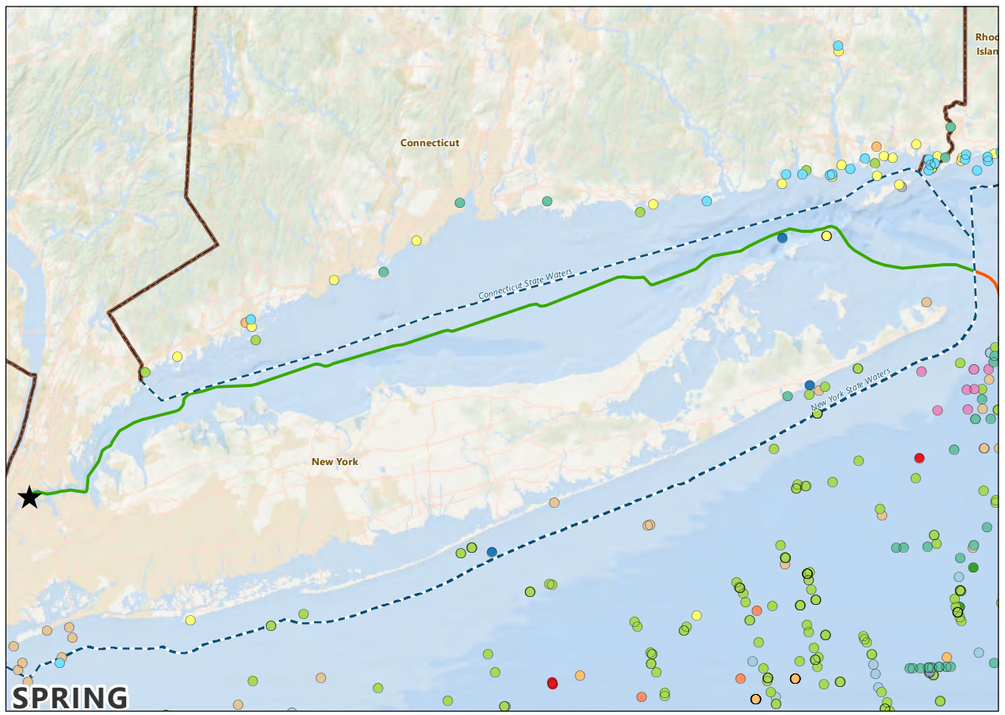
TABLE 4.13-1. PROTECTED SPECIES OBSERVER (PSO) REPORT SIGHTINGS SUMMARY

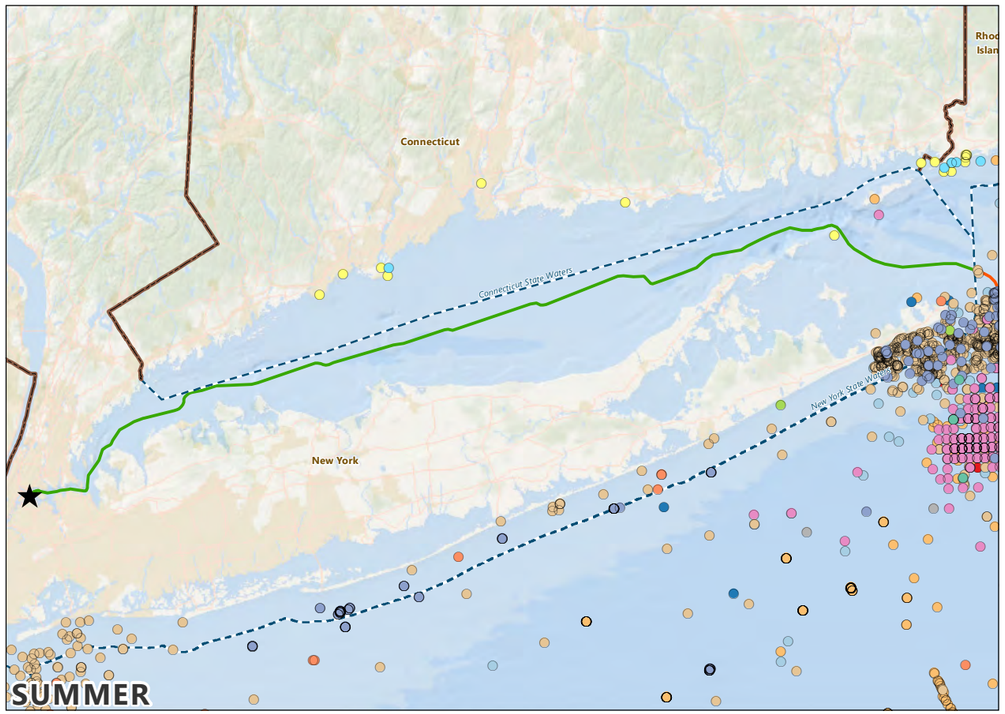
Species (Common Name)	Number of Observations within the Study Area
Common Dolphin	40
Humpback Whale	6
Harbor Seal	5
Gray Seal	9
Unidentified Pinniped	4
Unidentified Sea Turtle	1
Atlantic White-sided Dolphin	0
Bottlenose Dolphin	0
Unidentified Dolphin	0
Unidentified Whale	0
Bottlenose Dolphin	0
Other (see notes)	0
Unidentified Mysticete Whale	0
Fin Whale	0
Unidentified Marine Mammal	0
Minke Whale	0
Leatherback Sea Turtle	0
Unidentified dolphin or porpoise	0
North Atlantic Right Whale	0
Sei Whale	0
Loggerhead Sea Turtle	0
Green Sea Turtle	0
White-beaked dolphin	0

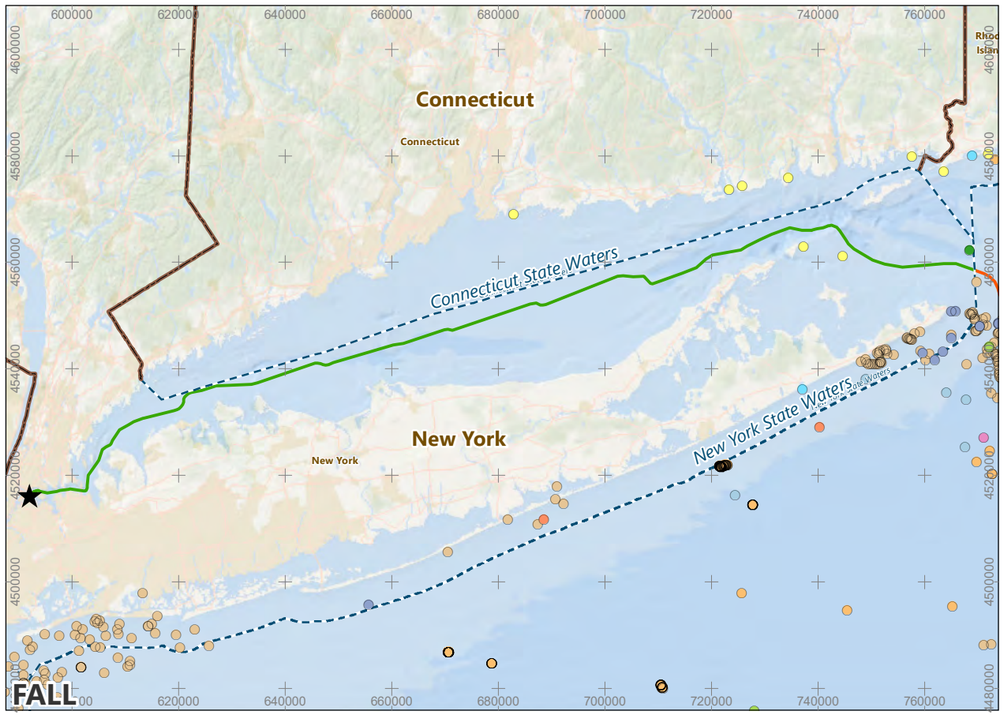
Source: Marine Ventures 2019 and 2020 (PSO visual sightings data)

Figure 4.13-1. Seasonal Marine Mammal Sightings in the Study Area (February 1976 - December 2020)









Beacon Wind 1 Project

Long Island Sound, New York

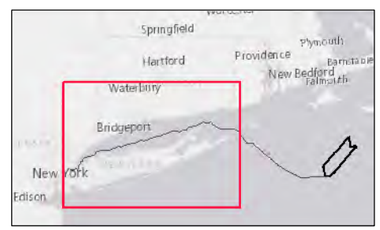
Article VII Application

Seasonal Marine Mammal Sighting
February 1976 - December 2020

- Atlantic Gray Seal
- Atlantic White-Sided Dolphin
- Bottlenose Dolphin
- Common Bottlenose Dolphin
- Common Minke Whale
- Harbor Porpoise
- Harbor Seal
- Humpback Whale
- Long-Finned Pilot Whale
- Minke Whale
- North Atlantic Bottle-Nosed Whale
- North Atlantic Right Whale
- Northern Bottlenose Whale
- Pilot Whale
- Risso's Dolphin
- Sei Whale
- Short-Beaked Common Dolphin
- Short-Finned Pilot Whale
- Sperm Whale
- Striped Dolphin
- White-Beaked Dolphin

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary



0 5 10
Miles

Kilometers
0 10 20

Prepared May 5, 2022
Seasons: Winter (Dec/Jan/Feb), Spring (Mar/Apr/May), Summer (Jun/Jul/Aug), Fall (Sep/Oct/Nov).
Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

4.13.1.3 Species Descriptions

Two groups of marine mammals inhabit the marine waters in the vicinity of the NY Project, cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals). While many of these species are more likely to occur outside of New York State waters, several species have been documented in western Block Island Sound and Long Island Sound. The following subsections provide additional information on the status, habitat preferences, distribution, and likelihood of occurrence in the vicinity of the submarine export cable corridor (see **Table 4.13-1**).

4.13.1.3.1 Cetaceans

The order *Cetacea* is very diverse and includes whales, dolphins, and porpoises. Baleen whales (*Mysticeti*) generally live solitarily but occasionally come together in large groups to feed and/or reproduce. Toothed cetaceans (*Odontoceti*) live and hunt in groups and use echolocation to target individual prey. Dolphins are often very social and can be seen in groups with hundreds of individuals while porpoises are less social.

According to the NYSDOS SCFWH rating forms for the Montauk Point Shoals, the nearshore waters off Montauk Point are an important migratory corridor for marine mammals. Concentrations of North Atlantic right whale, fin whale, humpback whale, minke whale, and pygmy sperm whale migrate through this SCFWH, and feed nearshore throughout most of the year (January through September, depending upon the species) (NYSDOS 2002). In addition, although infrequent, cetaceans have been observed to enter the Study Area, mainly occurring in western Block Island Sound and eastern Long Island Sound near The Race. However, cetaceans are more commonly documented in the New York Bight off the coast of Long Island than in the waters of the Study Area.

Starting in 2014, the Marine-life Data and Analysis Team (MDAT) consisting of the Marine Geospatial Ecology Lab of Duke University, Northeast Regional Ocean Council, NOAA National Centers for Coastal Ocean Science, NOAA Northeast Fisheries Science Center, and Loyola University Chicago, embarked on a long-term effort to characterize and map marine life in the Northeast Region (Curtice et al. 2019). MDAT generated a series of online data viewing tools including the modelled distribution of avian, fish, and cetacean species, which covers the Study Area. These tools allow for cetacean abundance and species richness to be viewed geographically to provide an indication of expected cetacean presence and overall species richness in western Block Island Sound and Long Island Sound. With the exception of the waters south of Montauk, approximately where the federal jurisdictional boundary begins, MDAT data show low cetacean abundance and species richness in the Study Area (Curtice et al. 2019)

Building off this earlier effort, the Duke Marine Geospatial Ecology Laboratory continues to lead an ongoing public-private collaboration to pool scientific data and expertise to develop marine mammal species density models spanning the U.S. east coast and southeast Canada. According to the Duke website (https://seamap.env.duke.edu/models/Duke/EC/), the available models, “estimate absolute density, rendered as maps of the number of individual animals per 100 square kilometers (km^2) (38.6 square mi [mi^2]), by statistically correlating sightings reported on shipboard and aerial surveys with oceanographic conditions.” For the Study Area, cetacean density models illustrate what has been established by sightings and monitoring data, which is that most cetaceans expected to be found in along the submarine export cable corridor will occur in western Block Island Sound and eastern Long

Island Sound with relatively strong trends dependent on species and time of year (Marine Geospatial Ecology Lab, Duke University. 2021).

Whales

The following sections briefly describe the whale species that may infrequently occur in New York State waters and possibly within the eastern limits of the Study Area. A review of historical references to specific whale species sightings in the Study Area are provided, if available. For instance, humpback and North Atlantic right whales have been sighted more regularly than other whales in the far eastern part of Long Island Sound; otherwise, whale occurrences are uncommon and unpredictable in Long Island Sound (CT DEEP 2019).

North Atlantic Right Whale (*Eubalaena glacialis*)

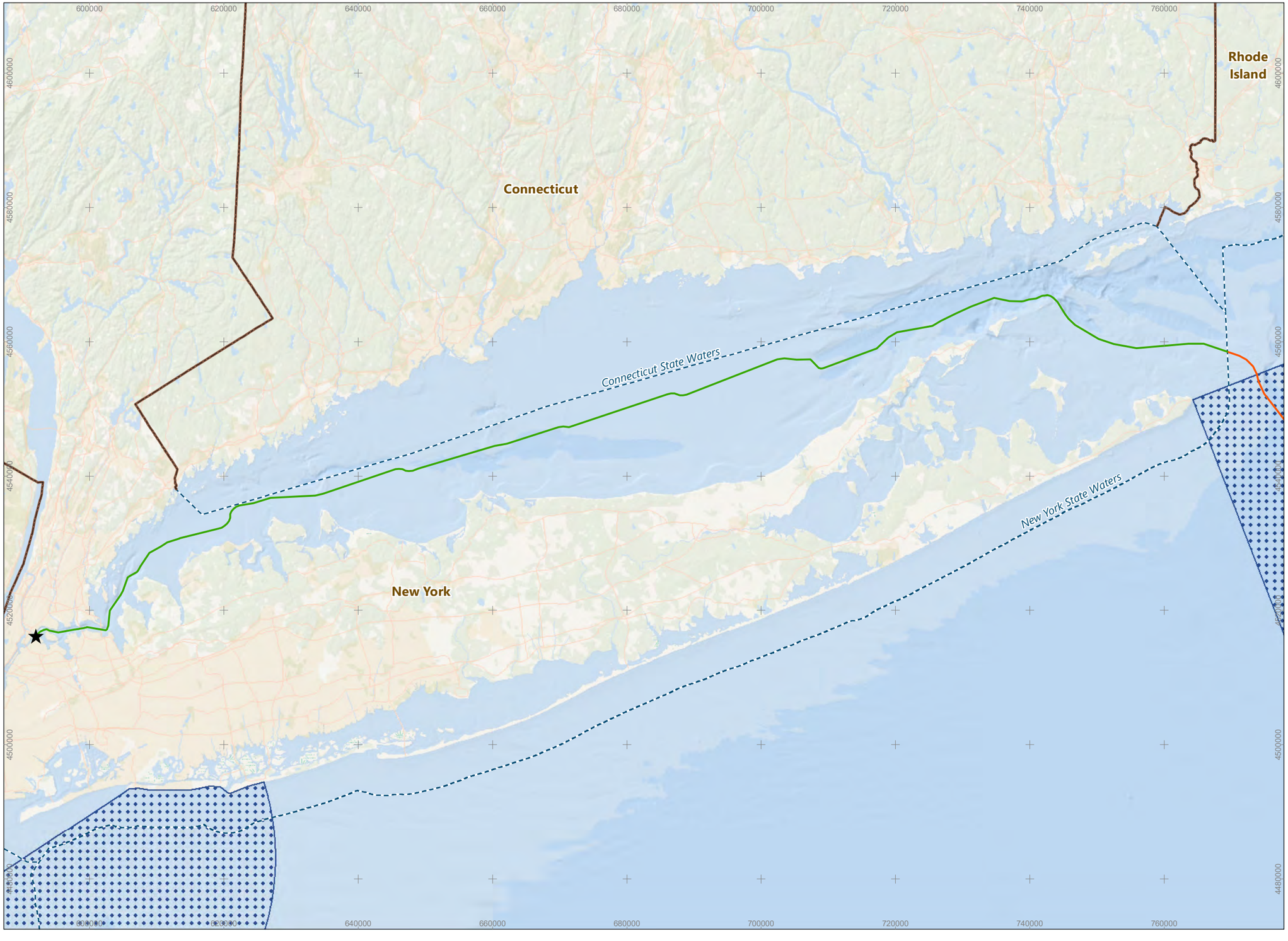
The North Atlantic right whale was listed as a federally protected endangered species in 1970 and is considered one of the most critically endangered large whale species in the world (Clapham et al. 1999; Hayes et al. 2021; Quintana-Rizzo et al. 2021; Weinrich et al. 2000; 71 FR 77704; 73 FR 12024). The North Atlantic right whale belongs to the Western North Atlantic stock, which is considered a strategic stock[9] (Hayes et al. 2020).

To address the potential for vessel strike, NOAA Fisheries designated the nearshore waters of the Mid-Atlantic Bight as the Mid-Atlantic U.S. Seasonal Management Area (SMA) for right whales in December 2008. This area is subject to vessel speed restrictions during North Atlantic right whale migration season. The submarine export cable corridor intersects this SMA in federal waters outside of the NY Project Area (**Figure 4.13-2**). No critical habitat or management areas for the North Atlantic right whale occur along the NY Project submarine export cable corridor. Consequently, no seasonal vessel speed restrictions apply to NY Project vessels within state waters.

The North Atlantic right whale is a migratory species that moves annually between high-latitude feeding grounds and low-latitude calving and breeding grounds (NYSDEC 2013a). It is believed that right whales primarily traverse New York waters during the summer along their migration to and from their traditional feeding grounds, as they rarely remain in the area for an extended period (Sadove and Cardinale 1993; NMFS 2005; NYSDEC 2013). The majority of North Atlantic right whale sightings in New York are in shallow, coastal waters off the south side of Long Island within 50 mi (80.5 km) of shore. However, they have also been observed in Long Island Sound, Block Island Sound, Gardiners Bay and south shore inlets and bays (Sadove and Cardinale 1993; Khan et al. 2010; Schlesinger et al. 2012). Therefore, while there is a potential for this species to occur in the Study Area during summer, habitat preferences and distribution of this species suggests rare, infrequent use of the Study Area waters, and they are not expected to be encountered along the submarine export cable corridor.

[9] Marine mammal stocks (defined as a group of nonspecific individuals that are managed separately) may be designated as strategic under the MMPA, which may require the jurisdictional agency to impose additional protective measures.

Figure 4.13-2. North Atlantic Right Whale Seasonal Management Area



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

North Atlantic Right Whale Mid Atlantic Seasonal Management Area

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022
Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Fin Whale (*Balaenoptera physalus*)

The fin whale was listed as federally endangered in 1970 and is considered a strategic stock although no critical habitat is designated. The fin whale is considered depleted throughout its range under the MMPA. NOAA Fisheries initiated a five-year review of the fin whale in January 2018 to determine whether a reclassification or delisting may be warranted (83 FR 4032; NMFS 2019). In February 2019, the review indicated that, based on the most reliable available scientific and commercial information, the fin whale status should change from endangered to threatened; however, this status change has not occurred and is recommended for future action (NMFS 2019). A final recovery plan was written for fin whales in 2010 (NMFS 2010).

Fin whales are the most abundant large whale in New York and most widely distributed in continental shelf waters (NYSDEC 2013b; Muirhead et al. 2018). They are one of the most often encountered whale species by local whale-watching operations in most years; in the New York Bight, fin whales can be found year-round (Sadove and Cardinale 1993; BRP 2010). Surveys done by Okeanos Ocean Research Foundation found fin whales concentrated in five feeding grounds within 30 mi (48.3 km) of shore during the summer, over the continental shelf during the fall and early winter and feeding very close to Long Island from late winter to spring (Sadove and Cardinale 1993). Common prey species include sand lance, herring, squid, krill, and copepods (Kenney and Vigness-Raposa 2010). Based on the PSO sightings report, no fin whales were reported within the submarine export cable corridor or adjacent nearshore waters during the 2019 and 2020 surveys (**Table 4.13-1**). Typically, fin whales occur farther offshore in federal waters; however, there have been nearshore sightings along Long Island (Halpin et al. 2009) and therefore while unlikely, this species could potentially occur in the vicinity of the submarine export cable corridor.

Sei Whale (*Balaenoptera borealis*)

The sei whale was listed as federally endangered in 1970, and a final recovery plan was published for the species in 2011 (NOAA Fisheries 2011). The stock that resides in the U.S. Exclusive Economic Zone is the Nova Scotian stock, which is highly migratory from the northeastern United States to Newfoundland (Hayes et al. 2021) and is considered a strategic stock.

Sei whales have a highly variable and unpredictable distribution. They prefer deeper waters and are frequently found over the continental slope, shelf breaks, and deep ocean basins between banks (Perry et al. 1999; NMFS 2011; Prieto 2011). Occasionally, they are found in more inshore waters, presumably in response to changes in prey density (Prieto 2011). No known resident seasonal population has been found in New York waters; however, the continental shelf off of New York may be important as a migration corridor (NYSDEC 2013c). Based on the habitat and distribution preferences of the sei whale favoring deeper, offshore waters, and the low occurrences of this species in New York, it is not anticipated that sei whales will be encountered along the submarine export cable corridor.

Sperm Whale (*Physeter macrocephalus*)

Sperm whales are listed as endangered under the ESA and are considered a strategic stock by NOAA Fisheries (Hayes et al. 2021). The sperm whale has an extensive distribution and is found globally in deep ocean environments, from equatorial to polar zones (Rice 1998; Whitehead 2003). In the Atlantic

Ocean, sperm whales are found throughout the Gulf Stream and North Central Atlantic Gyre and are typically associated with waters over the continental shelf and into deeper waters (Jefferson et al. 2015; Whitehead et al. 1992).

Sperm whales have occasionally been spotted in the shallow waters near Montauk and Block Island (NYSDEC n.d.). However, based on their distribution and strong preference for deep waters (Jefferson et al. 2015; Whitehead et al. 1992), the sperm whale is more likely to occur in federal offshore waters and is not anticipated to be encountered along the submarine export cable corridor.

Minke Whale (*Balaenoptera acutorostrata*)

Minke whales are not listed as threatened or endangered under the ESA. Minke whales are among the most widely distributed of the baleen whales. They occur in the North Atlantic and North Pacific, from tropical to polar waters and can be found in both coastal/inshore and oceanic/offshore areas (NOAA 2021). Minke whales are usually seen either alone or in small groups, although large aggregations sometimes occur in feeding areas (Reeves et al. 2002). Known for their curiosity, minke whales often approach vessels (NOAA 2021). The primary prey species for minke whales are most likely sand lance, clupeids, gadoids, and mackerel (Kenney and Vigness-Raposa 2010). These whales feed below the surface of the water, and calves are usually not seen in adult feeding areas.

Minke whales are almost absent from OCS waters off the western Atlantic in winter; however, they are common in the fall and abundant in spring and summer (CeTAP 1982; Kenney and Vigness-Raposa 2010). A Passive Acoustic Monitoring project implemented in the New York Harbor in 2018 reported few detections of minke whales, with the only detections occurring during late summer and fall at the mouth of the Lower New York Bay near the Rockaways. This species has been sighted south of Long Island Sound on surveys from 2011 and 2012 in every month except October and December (Kraus et al. 2013) and has been observed during PSO surveys in the vicinity of the Study Area (**Table 4.13-1**). Therefore, while this species is more likely to occur in federal offshore waters, it has the potential to occur in the vicinity of the Study Area.

Humpback Whale (*Megaptera novaeangliae*)

The humpback whale was listed as endangered under the ESA in 1970, but it was delisted on September 8, 2016 (81 FR 62259). Under this new final rule, humpback whales along the East Coast of the United States are part of the West Indies DPS. While humpback whales are no longer federally listed, they are currently state-listed as endangered in New York and are protected under the MMPA. There is a pending proposed change to the listing status of humpback whales in New York. Humpback whale populations are increasing in most areas of their distribution (NYSDEC 2013d).

Humpback whales in the North Atlantic range from high-latitude feeding grounds to low-latitude breeding grounds (NYSDEC 2013d). They feed on small prey often found in large concentrations, including krill and fish such as herring and sand lance (Hayes et al. 2021; Kenney and Vigness-Raposa 2010). Humpback whales are thought to feed mainly while migrating and in summer feeding areas.

Surveys by Okeanos Ocean Research Foundation from the 1970s to the early 1990s found that humpback whale abundance in the New York Bight region varied widely year to year (Sadove and Cardinale 1993). During these surveys, humpback whales were often observed in shallow waters for

extended periods, including Long Island Sound, Block Island Sound, Gardiners Bay, Fire Island and New York Harbor (Sadove and Cardinale 1993; Kopelman 2022a). Humpbacks of all age classes were seen on surveys from June through September, and juvenile whales were also observed in December and January (Sadove and Cardinale 1993).

Twelve humpback whales were sighted in the region between 2011 and 2012 in the southern portion of the federal Massachusetts Wind Energy Area (Kraus et al. 2013). During the New York Bight Whale Monitoring Aerial Surveys March 2017–February 2018, humpback whales were recorded during all seasons and most frequently in spring and winter (Tetra Tech and LGL 2019). Of the large whales considered in this application, humpback whales are likely to be the most abundant species in the vicinity of the submarine export cable corridor.

Dolphins

Bottlenose dolphins, common dolphins, pilot whales, and Risso's dolphins can often be seen off the south shore of Long Island, in federal waters outside of the NY Project Area (NYSDEC, n.d.). However, small numbers of bottlenose dolphin sightings are possible throughout Long Island Sound from May through September. Large pods of dolphins (75 to 150 individuals) enter Long Island Sound on occasion, most likely attracted by large schools of bait fish. These larger occurrences are unpredictable and usually occur many years apart (2015 and 2009 most recently). Although harbor porpoises are known to frequent the waters of Long Island Sound, there are no existing surveys and very little is known about their actual numbers or distribution. The common dolphin and Atlantic white-sided dolphin are not considered common in Long Island Sound, although they may be occasionally sighted (CT DEEP 2018). The majority of dolphin sightings occur in the warm summer months when the water is productive (NYSDEC n.d.). Additional discussion of these species and their likelihood of occurrence within the Study Area is presented below.

Risso’s Dolphin (*Grampus griseus*)

Risso’s dolphins are not listed as threatened or endangered under the ESA. Risso’s dolphins have a worldwide distribution (CeTAP 1982; Jefferson et al. 2014, 2015), are common to the U.S. East Coast OSC and shelf edge (BOEM 2014) and are found in the northwest Atlantic from Florida to Newfoundland (Baird and Stacey 1991; Hayes et al. 2021; Leatherwood et al. 1976). There is currently not enough information to distinguish between separate stocks in the northwest Atlantic, but the Gulf of Mexico and Atlantic are treated as two separate stocks (Hayes et al. 2021).

Risso’s dolphins are common on the northwest Atlantic outer continental shelf in summer and fall, with low abundance in winter and spring (Payne et al. 1984; Roberts et al. 2016). The Risso’s dolphin is thought to inhabit deeper, offshore waters (Kenney and Vigness-Raposa 2010) and is therefore not anticipated to be encountered along or in the vicinity of the submarine export cable corridor.

Pilot Whale (*Globicephala spp*.)

Pilot whales are not listed as threatened or endangered under the ESA. Two species of pilot whales occur in the western North Atlantic. These species—the long-finned pilot whale (*Globicephala melas*) and short-finned pilot whale (*Globicephala macrorhynchus*)—are difficult to identify to species level at

sea (Hayes et al. 2017; Rone et al. 2012). Pilot whales are social animals that tend to be found in large, stable aggregations (Olson 2017).

While long- and short-finned pilot whales are likely to overlap between New Jersey and Georges Bank (Payne and Heinemann 1993; Hayes et al. 2017), long-finned pilot whales have the more northerly distribution and are more likely to be found in the vicinity of the Study Area than short-finned pilot whales. However, the latitudinal distributions of these two species are uncertain (Hayes et al. 2021). Both species are present in deep offshore waters of the eastern United States in winter and spring (Abend and Smith 1999; CeTAP 1982; Hamazaki 2002; Payne and Heinemann 1993) and are therefore not anticipated to occur in the vicinity of the submarine export cable corridor.

Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*)

Atlantic white-sided dolphins are not listed as threatened or endangered under the ESA. The Atlantic white-sided dolphin is typically found in the cool, temperate and subpolar waters of the North Atlantic, generally along the continental shelf between the Gulf Stream and the Labrador current to as far south as North Carolina (Bulloch 1993; Jefferson et al. 2015; Reeves et al. 2002). Therefore, they are more likely to occur in federal waters along the continental shelf than the warmer, shallower waters of the Study Area and are not expected to occur in the vicinity of the submarine export cable corridor.

Common Dolphin (*Delphinus delphis*)

Common dolphins are not listed as threatened or endangered under the ESA. The common dolphin is a widely distributed cetacean globally and occurs in temperate, tropical, and subtropical regions (Hayes et al. 2021; Jefferson et al. 2015). Common dolphins feed on squid and small fish, including species that school in proximity to surface waters as well as mesopelagic species found near the surface at night (Jefferson et al. 2015; Perrin 2017). These dolphins can gather in schools of hundreds or thousands, although the schools generally consist of smaller groups of 30 or fewer. They are eager bow riders and are active at the surface (Reeves et al. 2002).

Common dolphins can be found along the 650 to 6,500 ft (198 to 1,981 m) isobaths over the continental shelf and in pelagic waters of the Atlantic and Pacific Oceans (Hayes et al. 2021). This species has been sighted in the vicinity of the submarine export cable area in 2011 and 2012 surveys (Kraus et al. 2013) and during the PSO surveys. Based on typical distribution, this species would be more likely to occur in the deeper federal offshore waters; however, there is potential for common dolphins to occur in the Study Area year-round.

Common Bottlenose Dolphin (*Tursiops trucatus*)

Common bottlenose dolphins (referred to as bottlenose dolphin) are not listed as threatened or endangered under the ESA. Because this species occupies a variety of habitats, it is regarded as one of the most adaptable cetacean species (Reeves et al. 2002). It occurs in oceans and peripheral seas at both tropical and temperate latitudes. In North America, bottlenose dolphins are found in surface waters with temperatures ranging from 50 to 90°F (10 to 32°C). Bottlenose dolphins feed on a variety of organisms depending on their habitat. The coastal, shallow population tends to feed on benthic fish and invertebrates, while deepwater populations consume pelagic or mesopelagic fish such as croakers, sea trout, mackerel, mullet, and squid (Reeves et al. 2002).

There are two distinct bottlenose dolphin morphotypes: coastal and migratory. The coastal morphotype resides along the inner continental shelf (within 4.5 mi [7.5 km] of shore) and around islands and is subdivided into seven stocks based largely upon spatial distribution (Hayes et al. 2021). These animals often move into (or reside in) bays, estuaries, and the lower reaches of rivers (Reeves et al. 2002). Generally, the offshore migratory morphotype is found exclusively seaward of 21 mi (34 km) and in waters deeper than 112 ft (34 m) (Hayes et al. 2017) and is not anticipated to occur in the vicinity of the Study Area. NOAA Fisheries species stock assessment reports the Western North Atlantic Offshore stock as non-strategic; however, the Northern Migratory Coastal Stock is a strategic stock due to their depleted status under the MMPA (Waring et al. 2016).

This species was sighted in the vicinity of the submarine export cable corridor in 2011 and 2012 (Kraus et al. 2013) as well as during 2019 and 2020 PSO surveys and, therefore, has the potential to occur in the Study Area.

Atlantic Spotted Dolphin (*Stenella frontalis*)

Atlantic spotted dolphins are not listed as threatened or endangered under the ESA. The Atlantic spotted dolphin inhabits tropical, warm waters of the western North Atlantic typically along the continental shelf (Leatherwood et al. 1976). They have a wide range of distribution in the western North Atlantic from southern New England through the Gulf of Mexico, extending south to the Caribbean and Venezuela (Leatherwood et al. 1976; Perrin et al. 1994).

The seasonal distribution of the Atlantic spotted dolphin is not well known, but it has been suggested that they travel more inshore in spring (Caldwell and Caldwell 1966; Fritts et al. 1983). The Atlantic spotted dolphin is hard to distinguish from the pantropical spotted dolphin at sea, and their range is likely to overlap in tropical waters (Fulling et al. 2003; Mullin and Fulling 2003; Perrin et al. 1987; Waring et al. 2016). It is likely that the Atlantic spotted dolphin is rare near the submarine export cable corridor, as these dolphins typically spend their time along the continental shelf, and southern New England is the northernmost area of their range.

Porpoises

Harbor Porpoise (*Phocoena phocoena*)

Harbor porpoises are not listed as threatened or endangered under the ESA. In 2001, the harbor porpoise was removed from the candidate species list for the ESA; a review of the biological status of the stock indicated that a classification of “Threatened” was not warranted (Waring et al. 2009). This species has been listed as “non-strategic” because average annual human-related mortality and injury does not exceed the potential biological removal (Hayes et al. 2021).

In the western Atlantic, harbor porpoises are found from Cape Hatteras north to Greenland (Hayes et al. 2021). Four populations of harbor porpoise are generally recognized in the western North Atlantic (Gaskin 1984, 1992; Wang et al. 1996; Westgate et al. 1997; Westgate and Tolley 1999; Johnston 1995; Read and Hohn 1995). These four populations include: the Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, Newfoundland and Greenland stocks. Genetic studies indicate that approximately 60 percent of harbor porpoises found in New York and other mid-Atlantic waters are from the Gulf of Maine stock, approximately 25 percent are from the Newfoundland stock, approximately 12 percent

are from the Gulf of St. Lawrence stock and less than 3 percent are from the Greenland stock (Rosel et al. 1999; Hiltunen 2006, NMFS 2013).

Harbor porpoises are the only porpoise species typically found in New York's marine waters. They are seen locally in bays, estuaries, and Long Island Sound (NYSDEC n.d.). They feed primarily on fish, but also prey on squid and crustaceans (Kenney and Vigness-Raposa 2010; Reeves and Reed 2002). Sadove and Cardinale (1993) found that sightings in Long Island Sound frequently occurred between January and March. Research conducted by the Okeanos Ocean Research Foundation from the 1970s through the early 1990s reported harbor porpoise sightings in the vicinity of the Study Area were predominantly clustered in Block Island Sound and eastern Long Island Sound near The Race (NYSDEC 2013e). Therefore, it is anticipated that this species may occur in the Study Area during winter.

4.13.1.3.2 Seals

Seals are found in New York from late fall until late spring, with the highest concentration generally occurring around April. Seals "haul out" or leave the water to rest on sandy beaches or rocks to regulate their body temperature, socialize, give birth, and molt. Hauling out in groups also helps seals avoid predators (NYSDEC n.d.). In November 2018, the Atlantic Marine Conservation Society AMSEAS team completed an aerial survey of haul-out sites around Long Island, Connecticut, and Rhode Island in support of the Northeast US Pinniped Unusual Mortality Event UME investigation. More than 900 harbor and gray seals were observed in Moriches Bay, Shinnecock Bay, Montauk, Fishers Island, Little Gull Island, Block Island, and Narragansett Bay (AMSEAS 2019).

Up to five species can be seen locally, but harbor, gray, and harp seals are the most common in New York and Connecticut waters (NYSDEC n.d.; CT DEEP 2018). These species are discussed in more detail herein.

Harbor Seal (*Phoca vitulina*)

Harbor seals are not listed as threatened or endangered under the ESA. On the East Coast, harbor seals are found from the Canadian Arctic to the Mid-Atlantic (NOAA 2022). South of Cape Cod (i.e., southern New England to New Jersey), harbor seals only occur during winter migration, typically September through May (Hayes et al. 2021; Kenney and Vigness-Raposa 2010). Harbor seals, like most other seal species, migrate southward every winter, returning to New England and Canada in the summer.

Harbor seals are the most common pinniped species in Long Island Sound and have established regular haul-out sites along the coastlines of Long Island. On Long Island, an influx of these seals arrives in late summer or fall and remains through mid-May, although some are thought to stay throughout the year (Kopelman 2022; CT DEEP 2018). The harbor seal population on Long Island and Connecticut has been increasing in recent years, and they are considered common in Long Island Sound during winter, spring, and fall, with less abundance during the summer (Terwilliger Consulting Inc. 2015).

Harbor seals prey upon small to medium-sized fish, octopus, and squid, and to some extent shrimp and crabs (Kenney and Vigness-Raposa 2010). Fish eaten by harbor seals include commercially

important species such as mackerel, herring, cod, hake, smelt, shad, sardines, anchovy, capelin, salmon, rockfish, sculpins, sand lance, trout, and flounders. They spend about approximately 85 percent of the day diving, and much of the diving is presumed to be active foraging in the water column or on the seabed. They dive to depths of approximately 30 to 500 ft (10 to 150 m), depending on location. Harbor seals forage in a variety of marine habitats, including deep fjords, coastal lagoons and estuaries, and high-energy, rocky coastal areas. In Long Island Sound, harbor seals typically haul out on the sheltered parts of offshore rocky ledges and boulders during low tide. Plum Island is known as the home of the largest winter seal haul-out site in New York State and among the largest in southern New England (DiGiovanni Jr. et al. 2011). Major harbor seal haul-outs occurring in New York State waters are depicted in **Figure 4.13-3**.

Gray seal (*Halichoerus grypus*)

Gray seals are not listed as threatened or endangered under the ESA. The gray seal occurs in cold temperate to sub-arctic waters in the North Atlantic and is partitioned into three major populations occurring in eastern Canada, northwestern Europe, and the Baltic Sea (Kenney and Vigness-Raposa 2010; Jefferson et al. 2015). The gray seal is primarily found in coastal waters and forages in OCS regions (Lesage and Hammill 2001).

In North America, most gray seals occupy shoreline areas along the Canadian Maritime provinces, although smaller numbers are found along the shores of New England and New York (Kopelman, A. H. 2022). They share habitat with many other species and often live in the same areas as harbor seals. In the vicinity of the Study Area, gray seals are most likely to be found at common haul-outs from December through early April.

In the Study Area, gray seals are also common but not nearly as abundant as the harbor seal (CT DEEP 2018; DiGiovanni RA and Sabrosky AM 2010). They have recently increased dramatically in the region and are now common on haul-outs near Little Gull Island where they have established a year-round haul-out (CT DEEP 2018; DiGiovanni Jr. et al. 2009). They have been seen in the water near the seal haul-out site on Plum Island in summer and winter (Digiovanni Jr. et al 2009).

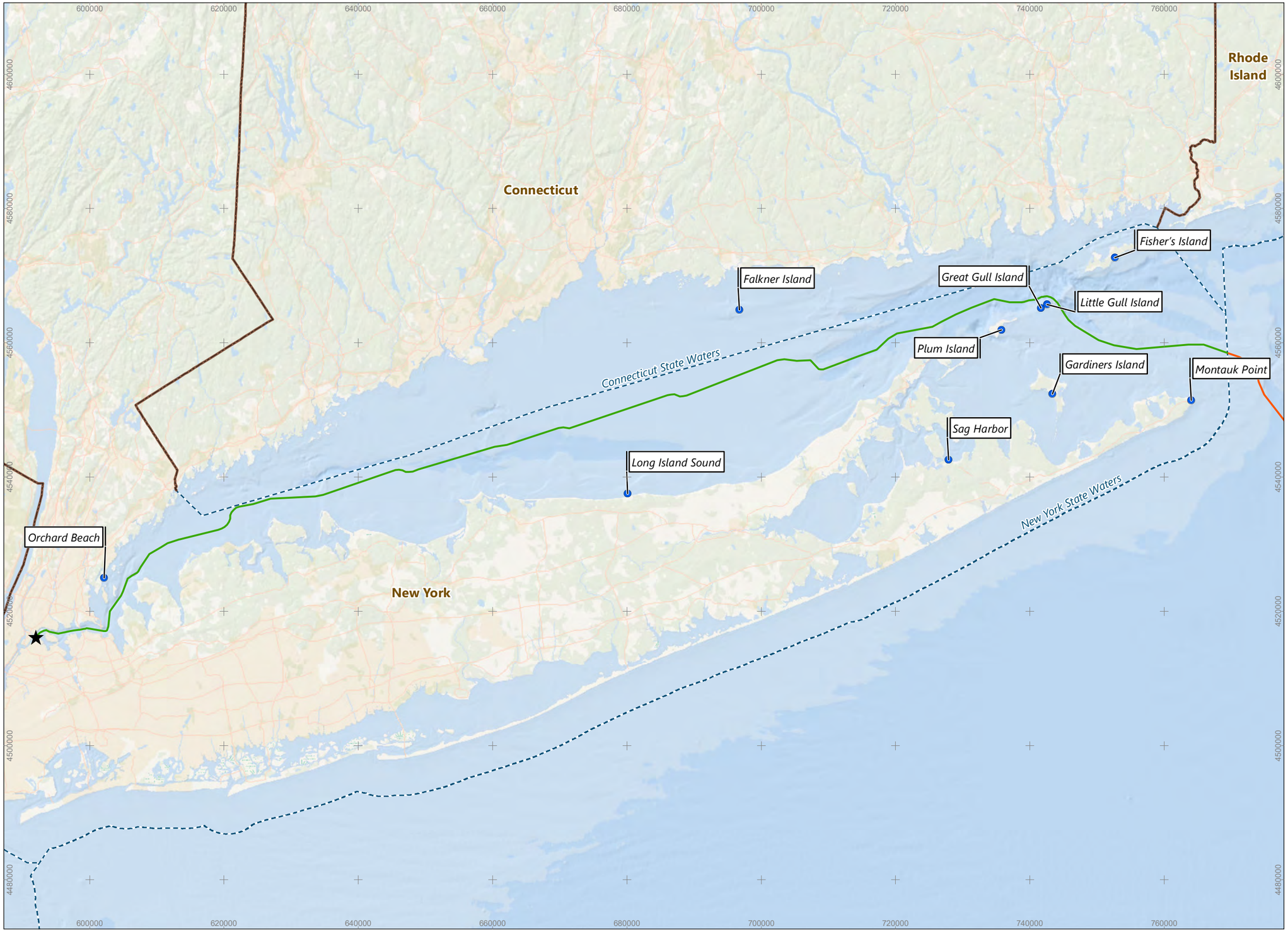
When feeding, most seals remain within 45 mi (72 km) of their haul-out sites. Gray seals feed on numerous fish species and cephalopods (Kenney and Vigness-Raposa 2010). Major harbor seal and gray seal haul-outs documented within Long Island Sound and Block Island Sound waters are summarized in **Table 4.13-2** and shown in **Figure 4.13-3.** The most consistent haul-out locations for harbor and gray seals in the vicinity of the submarine export cable corridor include Plum Island, Fishers Island, and Great and Little Gull Islands within Long Island Sound (Kenney and Vigness-Raposa 2010, DiGiovanni Jr. et al. 2011).

TABLE 4.13-2. MAJOR HARBOR AND GRAY SEAL HAUL-OUT LOCATIONS IN THE STUDY AREA

Haul-out Location	Harbor Seal	Gray Seal
Montauk Point	X	
Gardiners Island	X	X
Sag Harbor	X	
Long Island Sound	X	
Plum Island	X	
Goose Island	X	
Orchard Beach	X	
Hoffman Island	X	
Swinburne Island	X	
Fishers Island	X	X
Great Gull Island	X	X
Little Gull Island	X	X
Oyster Bay Harbor	X	

Sources: Kenney and Vigness-Raposa 2010; McCormack 2015; Pace et al. 2019; Woo and Biolsi 2018; NYSDOS 2005.

Figure 4.13-3. Major Seal Haul Outs in the Vicinity of the Project



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

- Major Seal Haul Out

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary

0 5 10 Miles

0 10 20 Kilometers

equinor EDR

Prepared April 28, 2022

Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.

Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Harp Seal (*Pagophilus groenlandicus*)

Harp seals are not listed as threatened or endangered under the ESA. The harp seal occurs throughout much of the North Atlantic and Arctic Oceans (Lavigne and Kovacs 1988; Ronald and Healey 1981). The Western North Atlantic stock is also known as the Front/Gulf stock, which is a combination of the Front and Gulf herds that breed off the coast of Newfoundland and Magden Island in the Gulf of St. Lawrence, respectively (Hayes et al. 2021). Harp seals consume a variety of prey, such as pelagic and benthic fish species, invertebrates, and krill (NOAA Fisheries 2022).

Although harp seal sightings have increased along the eastern United States coastline, currently the species has no established haul-out locations exhibiting site fidelity, with individual seals occasionally hauling out in areas where they are sighted or stranded. Most sightings or strandings have occurred from January to May when harp seals are at the southern extent of their yearly migration (Harris et al. 2002). Harp seals are reported in southern New England, including Connecticut, almost solely due to strandings (Terwillinger Consulting Inc. 2015). Strandings data in Connecticut collected by the Mystic Aquarium indicate harp seal strandings are most common of all marine mammal strandings reported between 1990 and 2014 (approximately 83 strandings in Connecticut) (Terwillinger Consulting Inc. 2015).

Because they are a predominantly arctic species, observations of harp seals in New York are rare and limited in numbers. When present, this species is often seen in New York Harbor and farther north in the Hudson River (NYSDEC n.d.) and, therefore, is not anticipated to occur frequently in the Study Area. However, while harp seals are the least likely pinniped to occur near the submarine export cable corridor compared to gray seals or harbor seals (Kenney and Vigness-Raposa 2010), they could be found at common seal haul-outs during winter months.

4.13.2 Potential Impacts

The following sections describe the potential impacts to marine mammals and important habitats from construction and O&M of the NY Project. Measures the Applicant will implement to avoid, minimize, and/or mitigate these potential impacts are summarized in **Section 4.13.3**.

4.13.2.1 Construction

Observations of cetaceans within the Study Area will likely be the result of isolated individuals searching for prey during a broader migration. No breeding or nursery habitat has been documented in the Study Area. The most likely cetacean occurrences are expected to be humpback whales and North Atlantic right whales, which have been documented in western Block Island Sound and eastern Long Island Sound on a seasonal basis. Harbor seals are likely to be the most abundant marine mammal species in the vicinity of the Study Area, followed by gray seals, as they have established regular haul-out sites in the Study Area. Based on the relatively low abundance and species richness of marine mammals expected to occur along the submarine export cable corridor and the nature of proposed construction activities, the NY Project does not represent a significant risk of negative effects on marine mammals found in New York State waters. Some temporary effects could result if marine mammals are present at the time and in the vicinity of certain construction activities, such as vessel movements, seafloor preparation, and installation of the submarine export cables. The following construction-related impacts could affect a limited number of marine mammals:

- Short-term disturbance of habitat;
- Short-term disruption of local prey species availability;
- Short-term disturbance from temporary increase in NY Project-related underwater noise; and
- Short-term increased risk for vessel strike.

In addition, while the following potential impacts are considered unlikely or rare, due mainly to the implementation of avoidance, minimization, and mitigation measures (see **Section 4.13.3**), these impacts are summarized in this section:

- Incidental, short-term risks associated with potential increase in marine debris;
- Incidental, short-term increased risk for entanglement and entrapment in NY Project-related equipment; and
- Incidental, short-term direct and indirect impacts associated with temporary changes in water quality, due to inadvertent leaks and spills.

Short-term disturbance of habitat. No breeding, nursery, or designated critical habitat for marine mammals occurs within the Study Area and the Applicant has proactively sited the submarine export cable corridor to avoid sensitive benthic habitats, complex seafloor areas, and designated SCFWHs. The potential to disturb marine mammals has been reduced as a result. Several documented seal haul-outs occur in the Study Area, some of which are located within 1 mi of the planned submarine export cable corridor and landfall location. The nearest haul-outs include Great and Little Gull Islands, Plum Island, and Orchard Beach (**Figure 4.13-3**). No direct impacts to haul-outs are anticipated; however, the installation work may result in short-term disturbances to benthic and seafloor foraging habitat and surrounding marine water quality that could affect seals foraging near these haul-outs.

The disturbance of potential foraging habitat is expected to negligible due to the limited area of disturbance and the dynamic and sequential manner that cables will be installed. Because marine mammals are extremely mobile, with most ranging over very broad geographical ranges, individual animals can choose to move away from temporary localized construction activities and are expected to return to temporarily disturbed areas once construction is complete. **Section 4.12** describes the temporary disturbance of benthic habitat and displacement of marine mammal prey sources in more detail.

Water quality in the marine environment occupied by marine mammals may experience a temporary increase in turbidity and sedimentation during seabed preparation and installation of the submarine export cables. An increase in turbidity is not expected to have direct, deleterious effects on marine mammals as any increase in turbidity will be short term. In addition, several studies have indicated that numerous marine mammal species preferentially choose to live in turbid environments and can successfully forage in low visibility conditions (Cronin et al. 2017; Todd et al. 2015). As detailed in **Section 4.3**, turbidity and sedimentation during construction is anticipated to be similar in nature to existing disturbances from other natural (e.g., waves, storms, mobile sediment) and anthropogenic (e.g., fishing and vessel activity) forces. Moreover, NY Project-related sediment disturbances and effects on marine water quality will be limited to a relatively small area over a short duration.

Short-term disruption of local prey species availability. Marine mammal species foraging within the Study Area are expected to be limited to pinnipeds (e.g., harbor and gray seals) with the infrequent occurrence of humpback whales and other sporadic cetacean visitors, which primarily target plankton (copepods; krill), small schooling fish such as capelin, mackerel, or herring; mesopelagic finfish and squids; or benthic species including crustaceans, cephalopods, and flounders. Primary production as well as zooplankton production of copepods (the main prey source of North Atlantic right whales and other marine species) are not expected to be impacted by construction and installation activities from the NY Project.

Seabed preparation and installation activities associated with the submarine export cables may temporarily disturb the benthic ecosystem and increase water turbidity in the water column. Prey species in proximity to installation activities may not be available to foraging marine mammals in these areas during the installation process. These effects are considered temporary and would be limited to the specific areas in which construction is occurring, which will likely be avoided by marine mammals due to construction sounds and human activity. Fish displaced by construction activity will still be available to highly mobile marine mammals. In addition, benthic community recolonization and recovery is anticipated to occur relatively quickly despite significant disturbances (Guida et al. 2017). Away from construction activities, the surrounding available habitat will not be disturbed. Therefore, the NY Project is not expected to cause long-term population-level effects to the resident benthic organisms and communities and marine mammals that prey on these food sources.

Further detailed assessments on the potential impacts on prey species and proposed mitigation are described in **Section 4.12** and **Appendix E Essential Fish Habitat Assessment**.

Short-term disturbance from NY Project-related noise. Construction activities such as Project-related vessel noise, sheet pile cofferdam installation with a vibratory hammer, and seabed preparation and cable-laying activities, will temporarily increase underwater noise along the submarine export cable corridor. Anthropogenic underwater noise may affect marine mammal species both behaviorally and physiologically; however, any potential effects are largely dependent on the species and frequency of sound.

During Project construction, vibratory hammers used to install the cofferdam at the export cable landfall in the East River would temporarily elevate underwater sound pressure and particle velocities. These effects normally represent an environmental impact to marine mammals. However, because of the location of the cofferdam in the East River near the heavily developed Astoria power complex, sources of underwater sound are already abundant, and marine mammals are not expected to occur in the area. Vibratory hammers do not generate lethal sound levels under most conditions and if a marine mammal were within the zone of ensonification from vibratory pile driving, it would likely respond to the increased activity by moving away from the zone of influence. Results of the underwater acoustic modeling (see **Appendix B2)** indicate that marine mammal injury is unlikely to occur from cofferdam construction and the longest modeled distance to behavioral thresholds is approximately 1.2 mi (2 km). However, this distance is conservative since bathymetry and land features obscure the sound source, resulting in shorter distances to the behavioral threshold in several directions.

One seal haul-out has been documented at Orchard Beach, approximately 1.79 nm (3.32 km) north of the cable landfall site where the in-air and underwater sound emissions from vibratory pile driving

may disturb wildlife. Seal exposure to disturbing sounds will depend on the time of year of the activity and seal occupancy of the haul-out. With documented haul-outs throughout the Study Area, any disturbed seals could move to other locations. Any dislocated seals will likely return to their haul-outs once the noise-generating activities cease. Consequently, the risk of noise-related impacts to seals is anticipated to be minimal.

Vessels designed for laying and burying cables typically maintain their position throughout the cable lay process (fixed location or pre-determined track) by means of its propellers and thrusters. Operation of these vessels generate underwater noise that is non-impulsive and continuous in nature (NMFS and NOAA 2017). These sounds are generally considered to be non-lethal to marine fauna and only pose a small risk of scaring or harassing marine mammals that are in proximity to the vessels. Because Long Island Sound experiences regular commercial and recreational vessel traffic, including cargo and defense ships, the vessel-generated noise baseline is significant. Noise generated by NY Project vessels could incrementally add to the underwater anthropogenic noise generated by other commercial vessels in the Study Area, but it would be unlikely to have any negative effects on marine mammals. Moreover, several marine mammal behavioral studies documented whales exhibited only a short-term response to vessel sound and vessel traffic (Watkins 1986; Baker et al. 1983; Magalhães et al. 2002). Therefore, noise impacts to marine mammals resulting from NY Project vessels are expected to be short term and negligible.

However, any NY Project activities that could result in potential harm to marine mammals are regulated under the MMPA. The Applicant will apply for an Incidental Harassment Authorization to the National Marine Fisheries Service (NOAA Fisheries) prior to engaging in any such activities. In addition, the Applicant has completed underwater sound propagation modeling for each noise-producing construction activity. Based on the results of representative acoustic modeling scenarios, the Applicant will implement necessary mitigation measures, where applicable, to lower the potential impacts of elevated underwater noise levels to marine mammal health and behavior.

Short-term increased risk for vessel strike from increased vessel traffic. As discussed **in Exhibit E-6: Effect on Transportation**, the type and number of NY Project vessels during construction does not represent a significant increase in vessel traffic in New York State waters and would be temporary in nature. The main factors that increase the likelihood of collision are vessel speed, vessel type, marine weather and visibility, and the animal's size and behavior (Douglas et al. 2008). Studies of whale strikes have established that vessel speed is correlated with risk of striking a whale and with the resulting level of injury (Laist et al. 2001; Neilson et al. 2012; Vanderlaan and Taggart 2007). Laist et al. (2001) correlates the lethality of vessel strikes with ships that are 262 ft (80 m) and greater in length traveling at speeds greater than 14 knots.

Vessels utilized during construction will likely consist of both large, slow-moving installation support vessels and smaller, faster moving vessels that will be required for transit along the submarine export cable corridor. Large vessels traveling at high speeds are not proposed. NY Project vessels will adhere to all applicable speed restrictions and will utilize existing maintained channels and transit lanes to the extent practicable. Additionally, given the limited number of marine mammals expected to occur in the vicinity of the submarine export cable corridor, NY Project vessels are not expected to substantially increase the risk of vessel ship strike in marine mammals.

Incidental, short-term risks associated with accidental release of marine debris. NY Project-related personnel and vessel contractors will be required to implement appropriate debris control practices and protocols, thereby preventing the release of marine debris into the waters surrounding the submarine export cable corridor. NY Project-related vessels will also operate in accordance with applicable laws regulating the at-sea discharges of vessel-generated waste. However, marine debris may be accidentally introduced to the marine environment from NY Project construction vessels, which could result in the potential for marine mammals to become entangled in and/or ingest debris which could result in injury or death. Instances of accidental release of marine debris during construction are expected to be isolated given the implementation of avoidance and minimization measures. Therefore, the Applicant anticipates that any impacts to marine mammals resulting from NY Project marine debris would be rare, accidental occurrences that will otherwise be avoided.

Incidental, short-term increased risk for marine mammal entanglement and entrapment in NY Project-related equipment. Entanglement and entrapment regularly occur when marine mammals are caught by strong, flexible, man-made materials such as nets, fishing line, or buoy lines associated with fixed gear like, lobster or crab trap pots. It is unlikely that marine mammal entanglement will occur as a result of NY Project construction activities. While most scientific studies have focused on entanglement as fishing industry bycatch, recent work explored the entanglement risk to marine wildlife from offshore renewable development (Reeves et al. 2013; Benjamins et al. 2014; Harnois et al. 2015). The key parameters used in these risk assessments were cable/line tension characteristics, line swept volume ratio, and line curvature of moorings; these assessments determined that taut line configurations represent a low risk of entanglement to marine mammals. For the NY Project, the construction barge anchor cables, cable plow/trencher towing cables and air supply umbilical lines with be heavy, larger diameter, and under high tension. Considering that cable installation activities will be short term and localized away from areas where marine mammals are known to concentrate, along with the area of risk (of entanglement) being a very small portion of available habitat, the risk of marine mammal entanglement from NY Project-related vessels and equipment on marine mammals is low.

Incidental, short-term change in water quality due to accidental leaks and spills. As previously noted, NY Project-related vessels will operate in accordance with laws and regulations regarding at-sea discharges of vessel waste, thereby preventing the release of contaminants into the waters surrounding the submarine export cable corridor. In addition, the Applicant will develop an OSRP with specific mitigation measures to prevent unintended spills. Although unlikely due to the implementation of avoidance and mitigation measures, inadvertent oil and fuel spills by NY Project-related vessels have the potential to affect marine mammals over a short duration with just a small amount of contaminant if left unchecked or without proper spill response. However, the OSRP will also contain specific protocols for NY Project personnel to follow should an accidental spill or leak occur. Therefore, any accidental spills and leaks associated with NY Project vessels will be addressed in a timely manner, in accordance with the OSRP and all applicable regulations. Therefore, any impacts associated with an unintended release would be short term.

4.13.2.2 Operations and Maintenance

NY Project-related vessel operations during the O&M Phase are expected to be insignificant against baseline conditions as discussed in **Exhibit E-6** and are therefore not anticipated to increase the risk of collision with marine mammals. Additionally, noise from NY Project-related operations and support

vessel traffic is not anticipated to be greater than the ambient noise levels in the Study Area, given the extent of existing vessel traffic in the Study Area. Therefore, the Applicant does not anticipate an increase in the risk of vessel strike or noise impacts to marine mammals in the vicinity of the submarine export cable corridor during NY Project O&M. During O&M, the presence of new buried submarine export cables may result in minor potential impacts from NY Project-related EMF.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures, the following impacts have a low probability of occurring:

- Incidental, short-term risks associated with potential NY Project-related marine debris; and
- Incidental short-term direct and indirect impacts associated with temporary changes in water quality, due to inadvertent leaks and spills.

Minor potential impacts associated with NY Project-related Electric and Magnetic Fields (EMF). The operation (energization) of submarine export cables can emit magnetic fields extending into the seafloor and water in close proximity to the buried cable; however, such increases in magnetic field levels will only occur in the immediate vicinity of the cable. EMF modeling for the submarine export cables found that magnetic fields will reach ambient levels at approximately 21 ft (6 m) from the submarine export cables at 3.3 ft (1 m) above the seabed. Modern submarine cables are properly shielded to prevent electrical fields from emanating from buried cables (see **Section 4.6** for additional information). Several studies have determined that cetaceans would be unlikely to sense or experience effects from magnetic fields generated by energized subsea cables, mainly because the area of the fields would be too small to interact with larger, highly mobile marine mammals (Normandeau Associates et al. 2011, Gill et al. 2014, Copping et al. 2016).

Indirect effects on marine mammals from alterations in prey due to EMF are also unlikely, as the average magnetic field strengths in proximity to the submarine export cables are below levels documented to have adverse impacts to fish behavior. As detailed in **Section 4.12,** impacts to mid-water fish species including small schooling fish (e.g., mackerel, herring, capelin) consumed by marine mammals would not be substantially affected by the EMF associated with the submarine export cables.

Incidental, short-term impacts associated with NY Project-related marine debris. As previously noted, since offshore personnel will be required to implement appropriate practices and protocols, the release of significant marine debris into the submarine export cable corridor waters is not anticipated.

Incidental, short-term changes in water quality, due to inadvertent leaks and spills. During the O&M phase, although unlikely, the introduction of contaminants, including oil and fuel spills and leaks have the potential to impact water quality. As with construction, measures to be taken to prevent the unintentional release of contaminants from NY Project-related vessels as part of the normal O&M phase, will minimize any impact from an unanticipated spill are anticipated to be negligible. The Applicant will implement an OSRP that details the measures that will be followed to avoid inadvertent releases and spills and a protocol to be implemented should a spill occur.

4.13.3 Summary of Avoidance, Minimization, and Mitigation Measures

The Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts to marine mammals during construction and O&M of the NY Project:

- Develop and enforce an OSRP with clear notification and activation procedures to respond to an oil (or other hazardous) spill or substantial fluid discharge;
- Use real-time marine mammal monitoring systems to avoid potential conflicts with marine mammals observed in the area to the extent practicable;
- Implement vessel collision avoidance mitigation measures for NY Project-related vessels working in, or in transit to and from, the submarine export cable corridor, including maintenance of a 328 ft (100 m) separation distance from marine mammals, except for the North Atlantic right whale, which requires a 1,640 ft (500 m) separation;
- Provide reference materials to onboard NY Project-related vessels for identification of marine mammals;
- Vessel operators will be aware of and adhere to applicable, NOAA SMAs,Dynamic Management Areas (DMA), and Right Whale Slow Zones;
- Ensure PSOs and/or NY Project personnel check NOAA Fisheries' website and the Whale Alert app for any updates on Right Whale Slow Zones and respond with vessel movement strategies or working hours;
- Operate NY Project-related vessels in accordance with the laws regulating the at-sea discharges of vessel-generated waste; and
- Report any potential vessel strikes or dead/injured marine mammals (regardless of cause) to NOAA Fisheries Protected Resources Division.

Additional NY Project activity-specific mitigation measures will be added to NY Project protocols specific to construction upon receipt of a MMPA incidental take authorization from NOAA Fisheries. Those measures applicable to the Article VII process will be described in detail in the EM&CP.

4.14 Sea Turtles

This section addresses the requirements of 16 NYCRR § 86.5 and describes the sea turtle species that could potentially be present, traverse, or incidentally occur in the waters within and surrounding the submarine export cable corridor and their associated habitats. Potential impacts to sea turtles resulting from construction and O&M of the submarine export cables are discussed, as well as the measures to be taken to avoid, minimize, and/or mitigate potential impacts to sea turtles.

4.14.1 Existing Conditions

For the purposes of this section, the Study Area includes the coastal and offshore areas where sea turtles may be present, traverse, or incidentally occur and have the potential to be directly or indirectly affected by the construction and operation of the NY Project. The Sea Turtles Study Area includes the waters and coastlines of western Block Island Sound, eastern Long Island Sound, and the western East River.

4.14.1.1 Regulatory Framework and Introduction

All sea turtle species inhabiting United States waters are protected under the Endangered Species Act. The ESA protects endangered and threatened species and their habitats by prohibiting the “take” of listed animals. The ESA defines “take” as any action to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

In the United States, both NOAA Fisheries and the USFWS have shared jurisdiction over sea turtles. NOAA Fisheries is responsible for leading conservation and recovery of sea turtles in the marine environment, and the USFWS is responsible for leading conservation and recovery of sea turtles on nesting beaches. NOAA Fisheries also works closely with other nations to ensure the global conservation and recovery of sea turtles through diplomatic efforts, scientific exchange, and capacity building.

In addition, NYSDEC is responsible for the management and conservation of marine animals that are protected under the ESA and New York State Conservation Law, including sea turtles. NYSDEC works in close coordination with NOAA Fisheries Greater Atlantic regional offices, USFWS, and other partners within the State of New York. All sea turtle species in New York State waters have a status of either threatened or endangered in New York State (NYSDEC 2015).

4.14.1.2 Occurrence in the Study Area

The NOAA Fisheries ESA Section 7 Mapper (NOAA Fisheries 2019) indicates the occurrence of sea turtles within the Study Area. In addition, the Long Island Sound Blue Plan Map Viewer (Connecticut Department of Energy and Environmental Protection [CT DEEP] 2019) maps several areas where sea turtles have occurred or contain characteristics that could support sea turtles (e.g., particular feeding areas, nesting grounds, hibernation areas) throughout the Study Area.

Sea turtles are large turtles that inhabit warm waters of the planet's oceans, bays and estuaries. All sea turtles are cold-blooded, and their body temperature is dependent on the ambient temperature of their environment. Sea turtles are therefore particularly vulnerable to cold temperatures and can become hypothermic as water temperatures decline. In cold conditions, sea turtles will either strand

on shore or will be found floating and unresponsive on the surface of the water, a condition known as cold stunning (Kopelman 2022; Schuh 2009).

Although sea turtles spend most of their lives at sea, adult females nest on land and typically migrate over 1,000 mi (1,600 km) from their northern latitude feeding grounds to nesting grounds in the warmer waters of southern latitudes. Juvenile sea turtles may occupy nearshore areas that contain algae or eelgrass habitat, as well as benthic habitat, where they forage for species of mollusks and arthropods, the preferred diet of juvenile sea turtles (Morreale et al. 1992; Burke et al. 1994; Morreale and Standora 1998).

As water temperatures begin to rise in late spring and early summer, the waters of New York become more suitable for sea turtles. They remain local to New York from approximately May through November and are drawn to the warmer waters in coastal bays and Long Island Sound. By the end of November, they begin their migration south to warmer nesting waters. (NYSDEC n.d.). Some sea turtles that do not migrate southward in the fall are vulnerable to cold stunning. Cold stunning in the Study Area typically peaks in the month of November, with a reduction in incidents through December and January (Burke et al. 1994; Morreale et al. 1992; Morreale and Standora 1998).

Four species of sea turtles have been documented in waters of the Study Area between 1966 and 2020, including the Atlantic (Kemp's) Ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), Atlantic green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*) (see **Figure 4.14-1**) (NYSDEC, n.d.; Schuh 2009; Long Island Sound Inventory and Science Subcommittee of the Blue Plan Advisory Committee 2019). All four species are documented as regularly occurring in Long Island Sound (Lopez, G. et al. 2014). No current habitual nesting sites or designated critical habitat for sea turtles occur within New York State. The following subsections provide additional information on these species' status, habitat preferences, distribution, and likelihood of occurrence in the vicinity of the submarine export cable corridor.

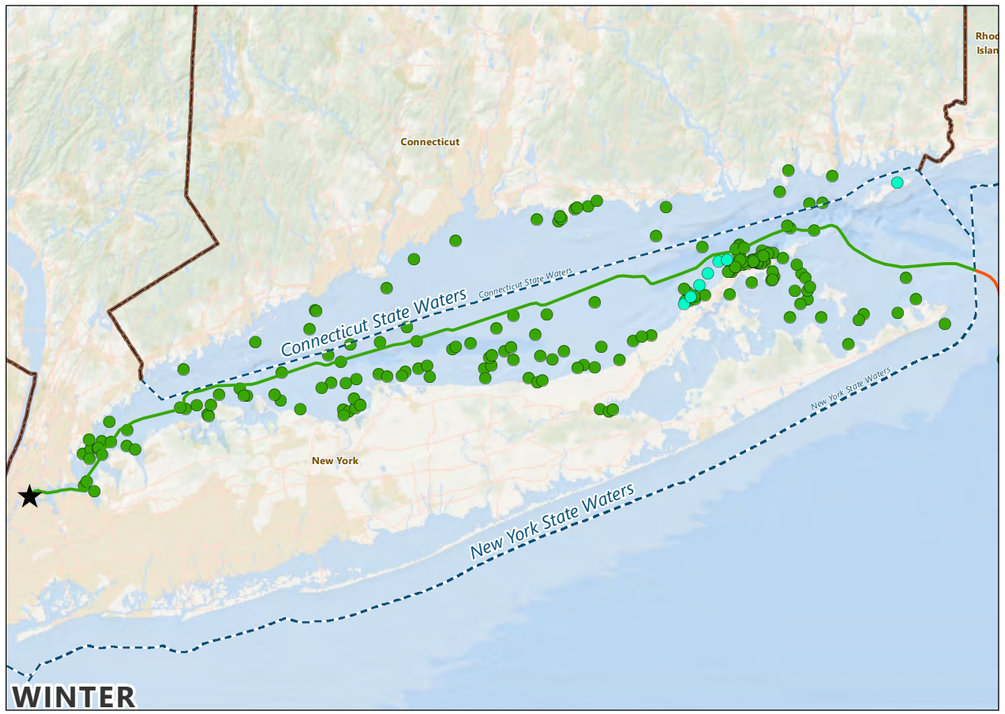
4.14.1.3 Species Descriptions

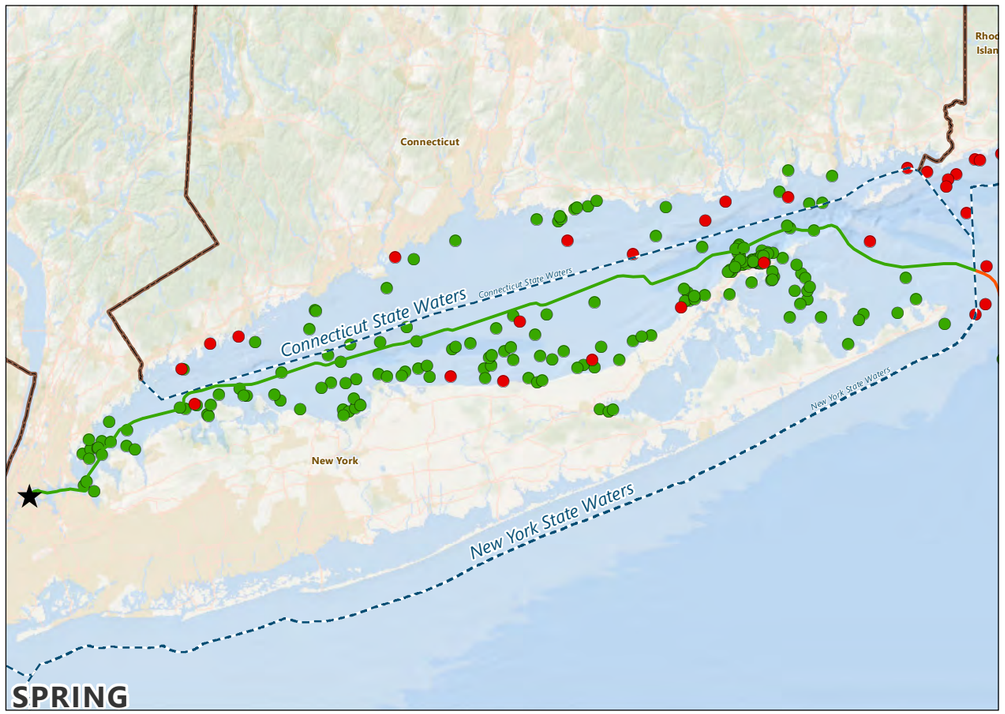
Kemp's Ridley Sea Turtle (Lepidochelys kempii)

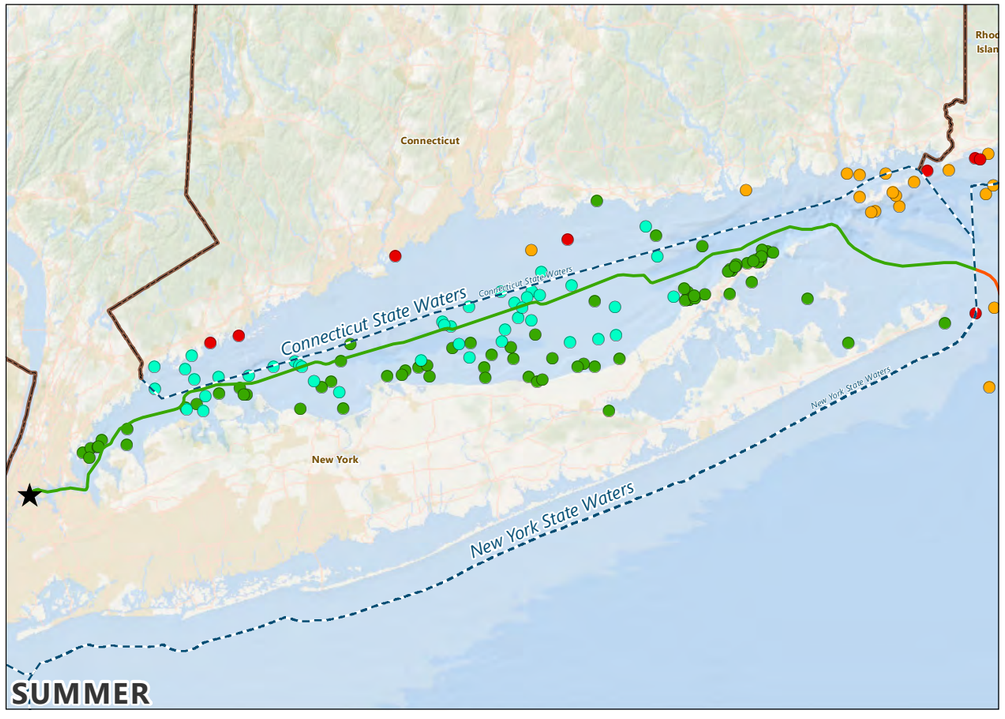
The Kemp's ridley sea turtle is both federally and state-listed as endangered and is Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List (NOAA Fisheries 2019). They are widely distributed along the eastern Atlantic coastline and are a highly migratory species (NYSDEC 2019; NMFS and USFWS 2015). Kemp's ridley sea turtles hatch in Mexico, and primarily inhabit southern waters. Many juveniles travel up the warm current of the Gulf Stream to Long Island's waters each summer (NYSDEC n.d.). As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November (NMFS and USFWS 2015).

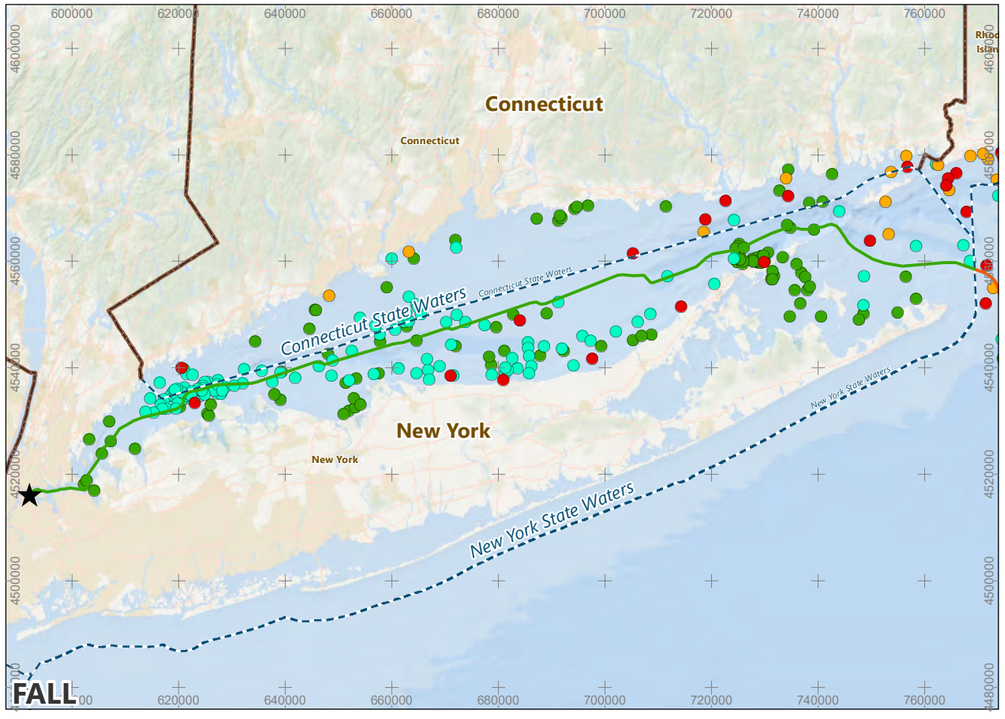
This species is the second most commonly observed sea turtle in New York and has been observed within shallow-benthic environments of Long Island Sound, Block Island Sound, Gardiners Bay, Peconic Estuary, and occasionally in Jamaica Bay, the Great South Bay, and the Lower New York Harbor (NYSDEC 2013a). Individuals encountered off the coast of the northeastern United States are mostly juveniles, as adults and hatchlings typically reside at sea (NMFS and USFW 2015).

Figure 4.14-1 Seasonal Sea Turtle Occurences in the Vicinity of the Project (July 1966 - August 2020)









Beacon Wind 1 Project

Long Island Sound, New York

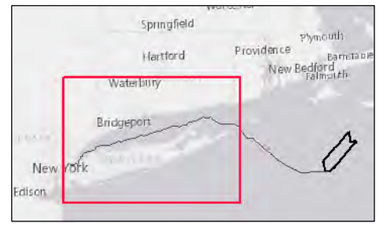
Article VII Application

Seasonal Sea Turtle Sighting
July 1966 - August 2020

- Green Sea Turtle
- Leatherback Turtle
- Loggerhead Turtle
- Kemp Ridley Turtle

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary



0 5 10 Miles

0 10 20 Kilometers

Prepared May 5, 2022
Seasons: Winter (Dec/Jan/Feb), Spring (Mar/Apr/May), Summer (Jun/Jul/Aug), Fall (Sep/Oct/Nov).
Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

Kemp's ridley turtles have been observed within and near the submarine export cable corridor throughout Long Island Sound and Block Island Sound with the highest densities in summer and fall (**Figure 4.14-1**). While there were some winter sightings, these were likely cold-stunned animals.

Loggerhead Sea Turtle (Caretta caretta)

The loggerhead sea turtle occurs worldwide, with nine Distinct Population Segments (DPS)[10] identified under the ESA (50 CFR Parts 223 and 224). The Northwest Atlantic Ocean DPS is classified as Threatened under the ESA and as Endangered on the IUCN Red List (NMFS and USFWS 2007). In the Western Atlantic Ocean, loggerhead sea turtles occur from Newfoundland, Canada, to Argentina. There is no critical habitat designated for this species in the Study Area.

This species is found globally in both nearshore and offshore waters throughout their lifespans (NOAA Fisheries 2019). In general, juvenile and adult loggerhead sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November (NYSDEC 2013b).

Loggerhead sea turtles occupy different habitats during different lifecycle stages. Juveniles are most frequently found in nearshore bays and in waters of Long Island Sound and other New York coastal areas (Halpin et al. 2009) and feed on shellfish and invertebrates while adults and hatchlings are most often observed in federal offshore waters (Kenney and Vigness-Raposa, 2010). Therefore, juvenile loggerhead sea turtles are more likely to be found in the vicinity of the submarine export cable corridor than adults.

Leatherback Sea Turtle (Dermochelys coriacea)

Leatherback sea turtles are both federally and state-listed as endangered and are Critically Endangered on the IUCN Red List (NOAA 2021). This species is the largest, most pelagic sea turtle. Leatherbacks feed on soft-bodied pelagic prey including jellyfish and salps (pelagic tunicates). Unlike other sea turtle species, leatherbacks are more dependent on prey availability and reproductive requirements than temperature for determining their distribution because they can maintain a body temperature well above ambient temperatures (Kenney and Vigness-Raposa 2010; NYSDEC 2013c). Despite that ability, leatherback strandings accounted for nearly half of all sea turtle strandings in Connecticut between 1990 and 2015 (Terwillinger Consulting Inc. and CT DEEP 2015).

Leatherback sea turtles are highly migratory species known to travel long distances between nesting and foraging grounds (NYSDEC 2013c). When in New York, the leatherback is most often seen along the south shore of Long Island and within Long Island Sound (Sadove and Cardinale 1993; NYSDEC 2013c). Nearshore waters south of central Long Island had the densest aggregation of sightings (Kenney and Vigness-Raposa 2010). Leatherback sea turtles are often seen in groups of one to five individuals because this species is more pelagic than other sea turtles, it is expected to prefer federal waters offshore of Long Island. However, they are common in Long Island Sound and may be

[10] Under the ESA, a DPS is a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species.

encountered along the submarine export cable corridor generally between May and November (NYSDEC 2013c).

Atlantic Green Sea Turtle (Chelonia mydas)

Green sea turtles are listed as threatened in New York State and are federally divided into several DPSs that have different ESA status listings. Green turtles found in the vicinity of the NY Project are part of the North Atlantic DPS, which are listed as threatened both federally and by New York State (NYSDEC 2013d). The range of the threatened green sea turtle in U.S. Atlantic waters includes inshore and nearshore waters from Massachusetts to Texas.

During the warmer months of the year, juveniles and occasionally adults are sighted in sea grass beds off the eastern shore of Long Island and free-swimming in pelagic environments. They have also been sighted foraging in the Peconic Estuary (Morreale and Standora 1998; NYSDEC 2013c). Juveniles utilize Long Island's warm shallow bays and Long Island Sound to feed on crabs, crustaceans and SAV such as eel grass (NYSDEC n.d.; Kopelman 2022).

4.14.2 Potential Impacts

Common threats to sea turtles throughout their range include the risk of vessel strikes, entanglement or entrapment in fishing gear, marine pollution, and climate change. The submarine export cables are sited to make landfall at a heavily developed, industrial site in Queens, New York, that does not contain any potentially suitable nesting habitat for sea turtles. Therefore, onshore construction related to the NY Project is not anticipated to impact sea turtles and is not discussed in this section.

The following sections describe the potential impacts to sea turtles from offshore construction and O&M of the submarine export cables. Measures the Applicant will take to avoid, minimize, and/or mitigate these potential impacts are summarized in **Section 4.14.3**.

4.14.2.1 Construction

Impacts to sea turtles during the construction phase are expected to be short-term and limited in location, similar to the impacts discussed for marine mammals in **Section 4.13**. The highest density of sea turtle occurrences in the NY Project Area is from late spring through fall (April through October), which would be when these potential impacts could have the greatest effect.

The following impacts may occur as a consequence of the installation of the submarine export cables and associated NY Project vessel traffic:

- Short-term disturbance of habitat;
- Short-term disruption of local prey species availability;
- Short-term disturbance from project-related underwater noise; and
- Short-term increased risk of vessel strike.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures (see **Section 4.14.3**), the following impacts may also occur as isolated incidents:

- Incidental, short-term risks associated with potential increase in marine debris;
- Incidental, short-term direct and indirect impacts associated with temporary changes in water quality, due to inadvertent leaks and spills.

Short-term disturbance of habitat. As previously noted, no critical habitat for sea turtles occurs within the Study Area and the Applicant has proactively sited the submarine export cable corridor to avoid, to the extent practicable, known SCFWHs, areas of sensitive benthic habitats, and known seagrass beds where the greatest potential for impact to sea turtle foraging habitat would be expected. Appropriate siting is anticipated to reduce the disturbance to sea turtles to a negligible level.

Installation of the submarine export cables will result in the temporary disturbance of the seafloor and benthic habitat during construction activities. The disturbance will occur only during the construction period and actual areas of disturbance will be localized as the cable installation proceeds over time. The surrounding marine water quality may experience a temporary increase in turbidity and sedimentation during seabed preparation and installation of the submarine export cables. As detailed in **Section 4.3**, turbidity and sedimentation during construction are expected to return to pre-construction conditions within a short period and will be limited to a small construction footprint in the submarine export cable corridor and its immediate vicinity. Temporary increases in turbidity and sedimentation are unlikely to significantly affect sea turtles and their prey base.

Sea turtles are mobile and would be expected to move away from temporary construction activities and may return when construction is complete. Therefore, no permanent disturbance to or displacement from suitable habitat is expected for sea turtles in the vicinity of the submarine export cable corridor.

Short-term disruption of local prey species and availability. Most sea turtle foraging takes place on eelgrass and small invertebrates in nearshore bays, which will not be impacted by construction of the NY Project as areas of known seagrass beds were avoided during the siting of the submarine export cable corridor.

In addition, the soft bottom benthic habitat disturbed by submarine export cable laying is expected to quickly recover (see **Section 4.3** and **Section 4.12**). Few sea turtles are expected to be affected by these activities because the area of disturbance will be small relative to the total area of surrounding undisturbed habitat.

Short-term disturbance from temporary increase in NY Project-related underwater noise. As described in **Section 4.13**, construction activities such as Project-related vessel noise, sheet pile cofferdam installation with a vibratory hammer, and seabed preparation and cable-laying activities, will temporarily increase underwater noise along the submarine export cable corridor. Cofferdam installation via vibratory hammer will be limited to the cable landfall at the East River shoreline. Sea turtles within the Study Area are predominately observed in Long Island Sound and Block Island Sound; therefore, given the unlikely occurrence of sea turtles in the vicinity of the cofferdam installation, potential impacts to sea turtles resulting from underwater noise during NY Project

construction are anticipated to be minimal and limited to NY Project vessels and submarine export cable-laying activities.

Vessel traffic noise may elicit behavioral changes in individuals near vessels, such as diving, changing swimming speed, or changing direction in order to avoid the noise. However, due to the existing underwater noise from baseline levels of vessel traffic in the area, noise impacts resulting from NY Project vessels are not anticipated to be substantially greater than ambient conditions.

As described in **Section 4.12** and **Section 4.13**, cable installation activities generate non-impulsive, intermittent sounds when using mechanical or water jetting equipment, and the dominant sound sources during cable installation are the thrusters on the dynamically positioned vessels that will be used. Published impact studies for various cable projects have concluded that sound related to subsea cable installation was not a significant issue, as recorded sound levels were below the non-impulsive acoustic thresholds for injury in sea turtles (Nedwell et al. 2003). In addition, areas in proximity to the source of noise can easily be avoided by highly mobile sea turtles. The potential impacts of noise exposure on sea turtles associated with this cable installation activity are therefore expected to be low and are likely to be less than background vessel traffic noise.

Short-term increased risk for vessel strikes due to increased NY Project-related vessel traffic. Sea turtles are mainly found in the Study Area from late spring through fall, and individuals near the water surface along transit routes may be vulnerable to ship strike during this time. Additionally, as sea surface temperatures drop in the fall and winter months, it is common for sea turtles, in particular loggerhead and Kemp's ridley turtles, to be affected by the drop in water temperature and become cold-stunned. The cold affects their diving capacities and constrains them to floating motionless at the surface, becoming more prone to ship strike (Burke et al. 1991; Hochscheid et al. 2010; Meylan and Sadove 1986). As discussed in **Exhibit E-6**, the type and number of NY Project vessels during construction does not represent a significant increase in vessel traffic in New York State waters and would be temporary in nature.

Incidental, short-term risks associated with potential increase in marine debris. In the event marine debris is accidentally released into the waters surrounding the submarine export cable corridor and cannot be retrieved sea turtles encountering this debris could become entangled in or ingest marine debris which may result in injury or death. However, to minimize this risk, NY Project vessels will be required to implement debris control practices and protocols and will abide with the laws regulating the at-sea discharge of vessel-generated waste.

Incidental, short-term change in water quality due to leaks and spills. NY Project-related vessels will operate in accordance with laws and regulations regarding at-sea discharges of vessel waste, thereby preventing the release of contaminants into the waters surrounding the submarine export cable corridor. Additionally, the Applicant will develop and implement an OSRP that details proposed measures to avoid inadvertent releases and spills and protocols to be implemented in the event of a spill. Therefore, the potential for inadvertent leaks and spills during construction is anticipated to be limited to isolated occurrences, and potential impacts to sea turtles are expected to be short term and negligible. Potential impacts to water quality are further discussed in **Section 4.3**.

4.14.2.2 Operations and Maintenance

As previously stated, NY Project O&M vessel traffic will be very low volume and infrequent relative to the average traffic observed in the vicinity of the submarine export cable corridor (see **Exhibit E-6**). Therefore, noise from NY Project vessel traffic is not anticipated to affect the background vessel noise levels in New York State waters. During O&M, the presence of new buried submarine export cables may result in the following impacts to sea turtles:

- Modification of benthic habitat;
- Minor potential impacts from NY Project-related EMF; and
- Short-term increased risk of vessel strike due to increase in vessel traffic.

In addition, while unlikely due to the implementation of avoidance, minimization, and mitigation measures, the following impacts also have a low probability of occurring:

- Incidental, short-term impacts associated with potential NY Project-related marine debris; and
- Incidental short-term direct and indirect impacts associated with temporary changes in water quality, due to inadvertent leaks and spills.

Modification of habitat. Installation of cable protection along the submarine export cable route will result in the conversion of some of the seafloor from soft bottom to hard bottom habitat. This conversion has the potential effect of reducing the available soft bottom habitat and prey species that utilize these mobile, fine-grained habitats. No long-term impacts to seagrass or other SAV are anticipated as these habitats are not found within the immediate vicinity of the submarine export cable corridor. The artificial hard bottom habitat created by the cable protection may even attract sea turtles as it may provide beneficial conditions for foraging as well as providing some shelter and may serve as a structure for removing biological build-up from their carapace (CH2M Hill 2018).

Minor potential impacts from NY Project-related EMF. The operation of submarine export cables will emit magnetic fields extending into the seafloor and water in proximity to the buried cable however, such increases in magnetic field levels will only occur in the immediate vicinity of the cable. EMF modeling for the submarine export cables found that magnetic fields will reach ambient levels at approximately 21 ft (6 m) from the submarine export cables at 3.3 ft (1 m) above the seabed. Modern submarine cables are properly shielded to prevent electrical fields from emanating from buried cables (see **Section 4.6** for additional information). Magnetic levels are predicted to decrease exponentially with increasing distance from the cables and therefore do not pose a serious risk to sea turtles (Geo-Marine 2010).

While sea turtles do forage on benthic species in the neritic zone, sea turtles in the vicinity of the submarine export cable corridor are expected to be swimming or in transit near the water surface (Smolowitz et al. 2015; Burke et al. 1993). Based on modeled EMF levels, the sheathing and burial of cables, and the limited time sea turtles spend on the seafloor in proximity to cables, the risk of EMF effects on sea turtles is expected to be low.

Indirect effects on sea turtles from alterations in prey availability due to EMF are also unlikely, as fish and invertebrate species consumed by sea turtles would not be substantially affected by the EMF associated with the submarine export cables (see **Section 4.12**).

Short-term increased risk of vessel strikes from NY Project-related vessel traffic. NY Project vessel traffic for O&M activities will be significantly less in volume than NY Project-related construction vessel traffic (see **Exhibit E-6** for additional information). All NY Project vessels will abide by vessel operating practices designed to minimize vessel interactions with marine protected species.

Incidental, short-term impacts associated with potential NY Project-related marine debris. As previously noted, since offshore personnel will be required to implement appropriate practices and protocols, the release of significant marine debris into submarine export cable corridor waters is not anticipated.

Incidental short-term changes in water quality. Based on the measures to be taken to prevent the unintentional release of contaminants from NY Project vessels during O&M activities, potential impacts from unanticipated spills or release will be minimized. The Applicant will develop an OSRP that details the measures proposed to avoid inadvertent releases and spills and a protocol to be implemented should a spill occur.

4.14.3 Summary of Avoidance, Minimization, and Mitigation Measures

The Applicant will implement the following measures to avoid, minimize and mitigate potential impacts to sea turtles during construction and O&M of the NY Project:

- Site the submarine export cable corridor away from sensitive habitats that sea turtles prefer to the extent practicable, (e.g., SAV);
- Continue to engage with regulatory agencies on best practices, as appropriate;
- Develop and enforce an OSRP;
- Implement federal vessel strike avoidance measures for all NY Project vessels including speed restrictions and separation distance from all sea turtles (i.e., 164 ft [50 m]);
- Train vessel crew members in sea turtle identification and to report sightings to the vessel captain to help reduce the risk of accidental strikes with sea turtles;
- Operate NY Project-related vessels in accordance with laws regulating the at-sea discharges of vessel-generated waste; and,
- Report any dead/injured sea turtles (regardless of cause) to NOAA Fisheries Protected Resources Division.

4.15 Important Habitat Areas and Protected Species

This section addresses the requirements of 16 NYCRR § 86.5 and provides a summary of important habitats and protected species that have been observed, or have the potential to occur, in or near the NY Project Area. Additional information about important habitats and protected species, as well as potential impacts and measures that the Applicant will implement to avoid, minimize and mitigate those potential impacts, is provided in the respective resource-specific sections of **Exhibit 4** as indicated in Tables Table 4.15-1 and Table 4.15-2.

4.15.1 Important Habitat Areas

Important habitats within and around the NY Project Area were identified using a combination of agency consultation with the NYNHP and USFWS, and desktop analyses of publicly available data from the following sources: the NYSDOS, NYSDEC (NYSDEC 2020), National Audubon Society (NAS n.d.), and NOAA (NOAA 2021a; NOAA 2021b). With respect to habitat within or directly adjacent to the NY Project, no areas were designated by the USFWS as critical habitat for threatened and endangered species. **Table 4.15-1** provides a list of important habitat areas, the significance or defining characteristics, location with respect to the NY Project Area, and respective sections in **Exhibit 4** where more information can be found. These important habitat areas are also depicted on **Figure 4.15-1**.

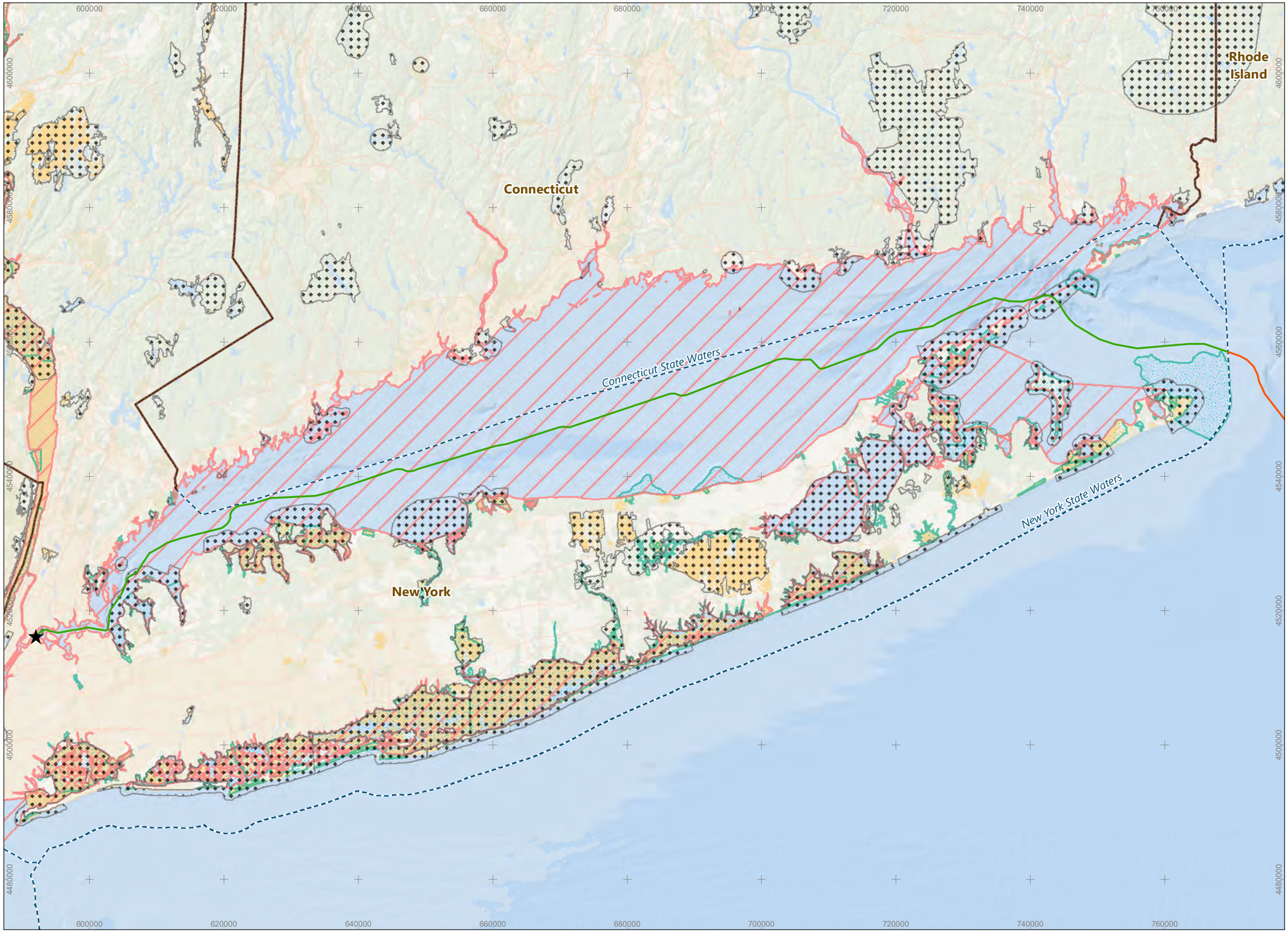
TABLE 4.15-1. IMPORTANT HABITAT AREAS WITHIN 1 MILE OF THE NY PROJECT AREA

Important Habitat Area	Source	Description/Significance	Approximate Distance from NY Project	Respective Section in Exhibit 4
Significant Coastal Fish and Wildlife Habitat				
North and South Brother Islands	New York Department of State, Division of Coastal Resources	North and South Brother Islands, located in the East River provide an undisturbed upland area environment for wildlife that is rare in coastal areas of the New York City Metropolitan area (NYSDOS 2022). This area provides nesting habitat for many avian species including gulls, herons, cormorants, and geese (NYSDOS 2022).	Approximately 283 and 440 ft (86 and 134 m) north and south, respectively, of the submarine export cable corridor	4.10
Montauk Point Shoals	New York Department of State, Division of Coastal Resources	Located in Long Island Sound off Montauk Point, this area supports a diverse assemblage of marine and coastal species rare in the United States (NYSDOS 2022). This area provides key feeding grounds for listed marine mammal and sea turtle species (e.g., northern right whale, leatherback, loggerheads,) haul-out habitat for gray seals, and wintering habitat for waterfowl (NYSDOS 2022).	Approximately 858 ft (262 m) south of the submarine export cable corridor	4.13 4.14
Little Neck Bay	New York Department of State, Division of Coastal Resources	This embayment, located in the western portion of Long Island Sound, is a shallow coastal bay that provides wintering habitat for waterfowl, as well as nursery and feeding grounds for fish species (e.g., striped bass, scup, bluefish) (NYSDOS 2022). Little Neck Bay is also a key area for hard clam production (NYSDOS 2022).	Approximately 1,440 ft (439 m) southeast of the submarine export cable corridor	4.10 4.12
Manhasset Bay	New York Department of State, Division of Coastal Resources	This embayment, located in the western portion of Long Island Sound, is a shallow coastal bay that provides wintering habitat for waterfowl, as well as nursery and feeding grounds for fish species (e.g., striped bass, scup, bluefish) (NYSDOS 2022).	Approximately 2,392 ft (729 m) southeast of the submarine export cable corridor	4.12

Important Habitat Area	Source	Description/Significance	Approximate Distance from NY Project	Respective Section in Exhibit 4
Great Gull Island	New York Department of State, Division of Coastal Resources	Located in Long Island Sound, this area provides key nesting habitat for shorebirds, including the endangered roseate tern and threatened common tern (NYSDOS 2022). Additionally, the exposed rock on this island provides haul-out habitat for harbor seals (NYSDOS 2022).	Approximately 3,835 ft (1,169 m) south of the submarine export cable corridor	4.10 4.13
Prospect Point	New York Department of State, Division of Coastal Resources	Located along Long Island Sound, this beach and marsh complex is one of the few remaining wetland ecosystems of its kind along the north shore of Nassau County, New York (NYSDOS 2022). This area provides important feeding, nesting, and loafing habitat for many bird species, including threatened species like least terns and common terns. The beaches of Prospect Point also provide nesting habitat for diamondback terrapins, which are uncommon along the northern shore of Long Island (NYSDOS 2022). The waters surrounding Prospect Point provide productive habitat for finfish and shellfish.	Approximately 4,528 ft (1,380 m) southeast of the submarine export cable corridor	4.10 4.12
Significant Natural Communities				
Marine Rocky Intertidal – David's Island	New York State Department of Environmental Conservation	This community has a very limited distribution and can be characterized as the community occupying rocky shorelines that are washed by rough, high-energy ocean waves (NYNHP 2022). This community is typically rich in species and can consist of marine algae, mussels, sea stars, urchins, and barnacles (NYNHP 2022).	Approximately 4,998 ft (1,523 m) north of the submarine export cable corridor	4.12

Important Habitat Area	Source	Description/Significance	Approximate Distance from NY Project	Respective Section in Exhibit 4
Important Bird Areas				
North Brother/ South Brother Islands	National Audubon Society	Located in the East River, these two uninhabited islands provide a mix of deciduous forest, scrub, and grassy patches that provide nesting and breeding habitat for wading birds (e.g., egrets, herons, ibis) (NAS 2022a).	Approximately 283 and 440 ft (86 and 134 m) north and south, respectively, of the submarine export cable corridor	4.10
Little Neck Bay to Hempstead Harbor	National Audubon Society	Located along the shorelines of Long Island Sound, this site consists of waters and wetlands, extending from Little Neck Bay to Hempstead Harbor, that provide wintering, breeding, and migration stopover habitat for numerous species (NAS 2022b). This site also provides key breeding habitat to state and federally listed species such as piping plover and least terns (NAS 2022b).	Approximately 2,698 ft (822 m) south of the submarine export cable corridor	4.10
Essential Fish Habitat				
Essential Fish Habitat	NOAA Fisheries	EFH can be found for a variety of species throughout Long Island Sound. EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” (50 CFR § 600.10).	Within submarine export cable corridor	4.12
Habitat Areas of Particular Concern – Summer Flounder	NOAA Fisheries	HAPC represent areas that exhibit one or more of the following traits: rare, stressed by development, provide important ecological functions for federally managed species, or are especially vulnerable to anthropogenic degradation (NOAA 2022). HAPC for summer flounder may occur in portions of Long Island Sound and the East River where SAV is present (NOAA 2021a).	May be present in shallow portions of the submarine export cable corridor in the East River where areas of SAV exist within adult and juvenile summer flounder EFH.	4.12

Figure 4.15-1. Important Habitat Areas



Beacon Wind 1 Project

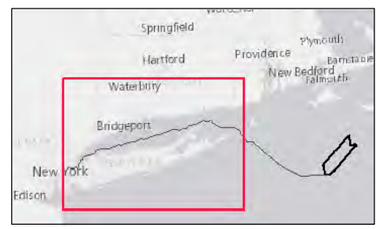
Long Island Sound, New York

Article VII Application

- Habitat Areas of Particular Concern
- Important Birding Area
- Significant Coastal Fish and Wildlife Habitat
- Significant Natural Community

Project Components

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary



0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022
Data Sources: BOEM, NOAA, Long Island Sound Blue Plan.
Basemap: Esri ArcGIS Online "World Ocean Base" map service.

4.15.2 Protected Species

Data on protected species that may occur in the NY Project Area were compiled using the following sources: USFWS IPaC, NYNHP consultation, BBA surveys (eBird 2022a), CBC surveys (NAS 2022c), eBird hotspot observations (eBird 2022b), NOAA Fisheries ESA Section 7 mapper (NOAA 2019), and Duke's Cetacean Density mapping tool (Halpin et al. 2021). **Table 4.15-2** lists federal- and state-listed protected species that may occur in the NY Project Area. Additional information on these species can be found in the respective resource-related sections in **Exhibit 4**.

TABLE 4.15-2. STATE AND FEDERALLY LISTED SPECIES WITH POTENTIAL PRESENCE IN THE NY PROJECT AREA

Common Name (Species Name)	New York Status b/	Federal Status b/	Regulatory Protection	Respective Section in Exhibit 4
Plants a/				
Seabeach amaranth (*Amaranthus pumilus*) c/	T	T	6 NYCRR §193 ESA	4.8
Birds				
Bald eagle (*Haliaeetus leucocephalus*)	T		6 NYCRR §182	4.10
Black tern (*Chlidonias niger*)	E		6 NYCRR §182	4.10
Common tern (*Sterna hirundo*)	E		6 NYCRR §182	4.10
Loggerhead shrike (*Lanius ludovicianus*) c/	E		6 NYCRR §182	4.10
Peregrine falcon (*Falco peregrinus*)	E		6 NYCRR §182	4.10
Pied-billed grebe (*Podilymbus Podiceps*)	E		6 NYCRR §182	4.10
Piping plover (*Charadrius melodus*) c/	E	T	6 NYCRR §182 ESA	4.10
Northern harrier (*Circus cyaneus*)	T		6 NYCRR §182	4.10
Red knot (*Calidris canutus*)[1]	T	T	6 NYCRR §182 ESA	4.10
Roseate tern (*Sterna dougallii*)	E	E	6 NYCRR §182 ESA	4.10
Sedge wren (Cistothorus platensis) c/	T		6 NYCRR §182	4.10
Short-eared owl (*Asio flammeus*)	E		6 NYCRR §182	4.10

Common Name (Species Name)	New York Status b/	Federal Status b/	Regulatory Protection	Respective Section in Exhibit 4
Marine Mammals d/				
Fin whale (*Balaenoptera physalus physalus*)	E	E, D	6 NYCRR §182 MMPA ESA	4.13
Humpback whale (*Megaptera novaeangliae*)	E		6 NYCRR §182 MMPA ESA	4.13
North Atlantic right whale (*Eubalaena glacialis*)	E	E, D	6 NYCRR §182 MMPA ESA	4.13
Sea Turtles				
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	T	E	6 NYCRR §182 ESA	4.14
Green sea turtle (*Chelonia mydas*)	T	T	6 NYCRR §182 ESA	4.14
Leatherback sea turtle (*Demochelys coriacea*)	T	E	6 NYCRR §182 ESA	4.14
Loggerhead sea turtle (*Caretta caretta*)	T	T	6 NYCRR §182 ESA	4.14
Finfish				
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)		E	ESA	4.12
Shortnose sturgeon (*Acipenser brevirostrum*)	E	E	6 NYCRR §182 ESA	4.12

a/Plant species provided in this table reflect those that may potentially occur in the vicinity of the Onshore Project Area. No threatened or endangered aquatic plants were identified as having potential presence along the submarine export cable corridor.
b/ T – threatened, E – endangered, D – depleted,
c/ Given the habitat requirements for the species, their presence in the NY Project Area is not expected.
d/ Though discussed in **Exhibit 4.13**, the blue whale and sei whale were not included in this table due to their lack of occurrence in the NY Project Area based on spatial analysis published by Duke University (Duke University 2021).

4.16 Cultural Resources

This section addresses the requirements of 16 NYCRR § 86.5 and describes potential effects to cultural resources resulting from the construction and O&M of the NY Project. Measures adopted by the Applicant to avoid, minimize, and/or mitigate potential effects to cultural resources are also described.

BOEM is the lead federal agency for BW1, which is considered an undertaking pursuant to Section 106 (54 U.S.C. § 300101) of the National Historic Preservation Act (NHPA) and the *Programmatic Agreement Among The U.S. Department of the Interior, Bureau of Ocean Energy Management, The State Historic Preservation Officers of New Jersey and New York, The Shinnecock Indian Nation, and The Advisory Council on Historic Preservation Regarding Review of Outer Continental Shelf Renewable Energy Activities Offshore New Jersey and New York Under Section 106 of the National Historic Preservation Act* (the *Programmatic Agreement*; BOEM 2016a). In July 2021, the Applicant contacted the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) in its capacity as the New York State Historic Preservation Office (NYSHPO) by telephone to offer preliminary outreach and a BW1 overview presentation. The NYSHPO indicated that a presentation was not necessary at that time, and that consultation would be initiated during the Section 106 review process. In December 2021, the BW1 permitting team conducted an additional pre-Section 106 consultation meeting with the NYSHPO, at which time the NYSHPO stated that while BW1 would receive a single identification number in its Cultural Resources Information System (CRIS) online database, submissions would need to be clearly differentiate between federal BOEM/Section 106 filings and New York State Article VII filings. As project details mature, BOEM as the lead federal agency for BW1 will initiate formalized Section 106 consultation with the NYSHPO, as well as state and federally recognized Native American Tribes.

Section 106 of the NHPA requires federal agencies (in this instance, BOEM) to consider the potential effect of their undertakings (i.e., the review and approval of BW1) on historic properties. In the Section 106 regulations (36 CFR § 800.16(l)(1)), historic properties are defined as “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places [NRHP] maintained by the Secretary of the Interior.” Specific to the NY Project, potentially affected historic properties can include marine archaeological resources (see **Section 4.16.1**), terrestrial archaeological resources (see **Section 4.16.2**), and above ground historic properties (see **Section 4.16.3**) – including Traditional Cultural Properties.

Assessments detailed within this section that are related to cultural resources include the following:

- Marine Archaeological Resources Assessment (MARA);
- Terrestrial Archaeological Resources Assessment (TARA; **Appendix F**; AECOM 2021a); and
- Analysis of Visual Effects to Historic Properties (AVEHP; **Appendix G**; AECOM 2021b).

A portion of BW1 is located in federal waters. The summary and discussion included herein only addresses NY Project elements (i.e., the submarine export cable corridor and the Onshore Project Area within New York State jurisdictional boundaries), as required by 16 NYCRR § 86.5 regarding historic areas.

4.16.1 Marine Archaeological Resources

This section describes potential effects to marine archaeological and cultural resources resulting from construction and O&M of the NY Project. Measures adopted by the Applicant to avoid, minimize, and/or mitigate potential effects to previously identified or unknown archaeological resources are also described.

For the purposes of this section, the Marine Archaeological Study Area includes the portion of the submarine export cable corridor in State of New York waters, and a 1-mi (1.6 km) buffer surrounding this corridor. This includes buffers surrounding alternative route segments identified as Route Variants A, B, and C located in eastern Long Island Sound and Route Variants A and D at Execution Rock in the Western Narrows (**Figure 4.16-1**).

A phased approach is being undertaken to identify marine archaeological and cultural resources within the Marine Archaeological Study Area that are listed in, eligible for listing in, or potentially eligible for listing in the State or National Register of Historic Places (S/NRHP). This approach includes a literature review of previous investigations and external data sources as well as ongoing analysis of geophysical, geotechnical, and other field and lab-collected data to identify unknown marine archaeological and cultural resources and to identify areas within the Study Area that have a high potential to contain unknown marine archaeological and cultural resources.

The following external data sources were consulted for the marine archaeological analysis:

- BOEM *Commercial Wind Lease Issuance and Site Assessment Activities on the Outer Continental Shelf Offshore New York: Revised Environmental Assessment* (BOEM 2016b);
- Site file and shipwreck data from the NYSHPO;
- NOAA Automated Wreck and Obstruction Information System (NOAA 2021a); and
- NOAA Electronic Navigational Charts (NOAA 2021b).

Field data collection and analysis efforts are ongoing and include utilizing data from the high-resolution geophysical (HRG) survey campaign and the geotechnical boring campaign. The HRG survey campaign for the Lease Area and the submarine export cable corridor is complete. HRG survey instruments included multibeam echo sounder, side-scan sonar, sub-bottom profiler, and magnetometer data collection to identify shipwrecks, submerged aircraft, and other maritime resources and aid in reconstructing paleolandscapes. The geotechnical survey campaign for the Lease Area and submarine cable corridor is ongoing and collected data will be utilized in conjunction with the HRG data to develop a paleolandscape model for the APE and identify geomorphic features with potential to contain prehistoric archaeological sites. Identification of potential historic marine archaeological resources will rely heavily on magnetometer and side-scan data, while identification of pre-contact submerged archaeological resources will rely heavily on sub-bottom profiler imagery and geotechnical data. All work is coordinated with, and overseen by, a Qualified Marine Archaeologist (QMA).

All marine archaeological and cultural resources investigations and analyses are being performed pursuant to 30 CFR § 585.626(a)(5); 30 CFR § 585.627(a)(6); BOEM's *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585* (BOEM 2020); the

Programmatic Agreement (BOEM 2016a); Section 106 of the NHPA (54 U.S.C. § 300101) and its implementing regulations at 36 CFR 800; the Secretary of the Interior's Standards and Guidelines (48 FR44738-44739); the Archaeological Resources Protection Act (ARPA) of 1979; and the Abandoned Shipwrecks Act of 1988 (43 U.S.C. 2101-2106).

Detailed studies to assess potential effects to marine archaeological and cultural resources, as well as potential avoidance, minimization, and mitigation measures, will be discussed in the forthcoming Marine Archaeological Resources Assessment (MARA), which is currently under development.

4.16.1.1 Existing Conditions

The Marine Archaeological Study Area in State of New York waters extends through Long Island Sound. Glaciation created ravinement surfaces that now exist as buried estuaries, paleochannels, lagoons, and other geomorphic features on the seabed of Long Island Sound that have the potential to include Native American archaeological resources. The seabed within the Marine Archaeological Study Area also has the potential to contain the archaeological wreckage of many vessel types including European sailing vessels and steamships engaged in a variety of activities such as fishing, Nantucket whaling, and coastal or transoceanic trade. The MARA will contain more specific information about those portions of the Marine Archaeological Study Area that have the highest, and lowest, potential to contain potentially significant marine archaeological and cultural resources.

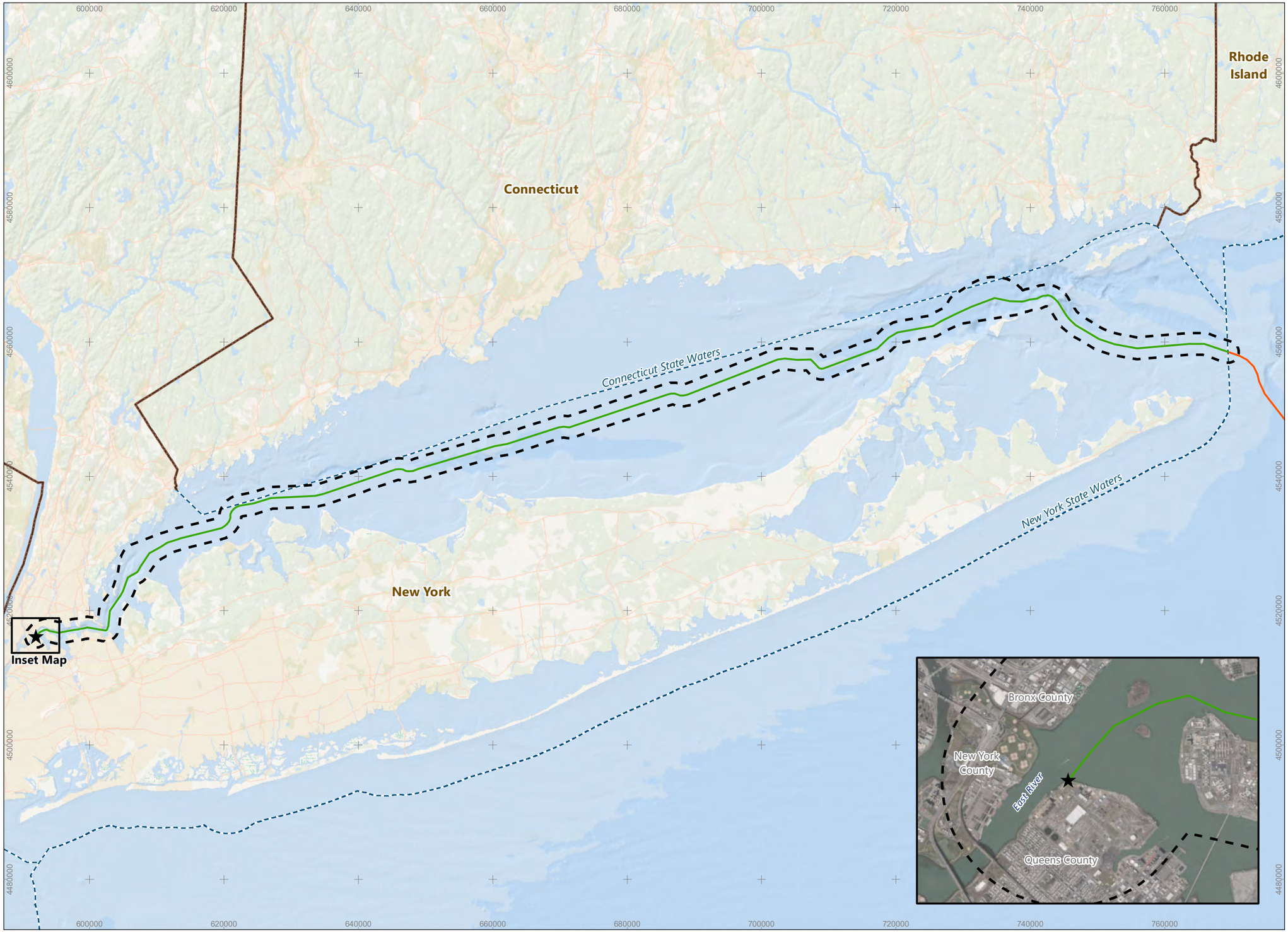
4.16.1.2 Potential Impacts

Construction and O&M of the NY Project has the potential to disturb previously identified and/or unidentified marine archaeological and cultural resources on the seabed within the submarine export cable corridor. Disturbance to the seabed can potentially result in the partial or total loss of integrity to marine archaeological and cultural resources.

When evaluating potential impacts to marine archaeological and cultural resources, a Marine Archaeological Area of Potential Effects (APE)[11] is defined. Federal regulations define the APE as "the geographic area or areas within which an undertaking may directly or indirectly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR § 800.16[d]). When used in reference to archaeological resources, the term PAPE commonly refers to the PAPE for direct effects within which anticipated ground-disturbing activities associated with the NY Project's construction and O&M are likely to occur.

[11] Since the Area of Potential Effects (APE) is typically developed in consultation with the involved SHPOs as part of the Section 106 review process, and because formal consultation with the NYSHPO has not yet been initiated, the APE for marine archaeological and cultural resources in this document is referred to as the preliminary APE (PAPE).

Figure 4.16-1. Study Area for Marine Archaeological and Cultural Resources

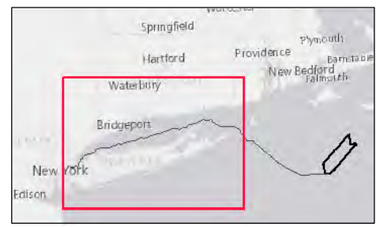


Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

- Landfall Site
- Submarine Export Cable Route
- Federal Waters Submarine Export Cable Route
- State Landward Boundary
- State Waters Boundary
- Marine Archaeological and Cultural Resources 1-Mile Study Area



0 5 10 Miles

0 10 20 Kilometers

equinor

EDR

Prepared May 5, 2022

Basemap: Esri ArcGIS Online "World Ocean Base" map service.

The Marine Archaeological PAPE includes the entirety of the proposed submarine export cable corridor, based on the design that results in the maximum potential impacts. **Table 4.16-1** summarizes the potential maximum horizontal and vertical (i.e., depth) disturbance associated with the submarine export cable corridor and anchor corridor in State of New York waters.

TABLE 4.16-1. MAXIMUM DISTURBANCE WITHIN THE MARINE ARCHAEOLOGICAL PAPE

NY Project Component	Maximum Horizontal Area of Disturbance	Maximum Depth of Disturbance (ft [m])
Submarine Export Cable Corridor		
Submarine Export Cable Corridor	115 nm (213 km) × 1,640 ft (500 m)	15 (4.6)
Dredging and Pre-Sweeping a/	115 nm (213 km) × 1,640 ft (500 m)	15 (4.6)
Submarine Export Cable b/	115 nm (213 km) × 33 ft (10 m)	15 (4.6)
Cable Protection Measures c/	36 ft (11 m) × 11.5 nm (21.3 km)	5 (1.5)
HDD Cofferdam	32 ft (10 m) × 98 ft (30 m)	16.4 (5)
Anchor Corridor Width		
Anchoring Width d/	3,000 ft (914 m)	18 (5.5)

a/ The maximum horizontal and vertical effects from dredging and pre-sweeping will vary depending on the location in which these activities occur but will not exceed the maximum width and depth of the submarine export cable corridor dimensions.

b/ Maximum horizontal area of disturbance for the submarine export cable is 33 ft (10 m) per trench.

c/ It is estimated that approximately 10 percent of the submarine export cables will require cable protection measures. In areas where cable crossings occur, the maximum horizontal width of disturbance increases to 118 ft (36 m)

d/ The area in which a submarine export cable installation vessel may anchor in support of installation activities; distance measured from the edge of the siting corridor. Corridor width may increase or decrease where site constraints exist. The extent of the anchor corridor will be limited to the area of survey coverage that has been cleared of constraints.

The maximum possible disturbance to the seabed within State of New York waters would likely occur during the construction phase of the NY Project, during installation of the submarine export cables, anchoring of installation vessels, and from the legs of jack-up vessels. It is anticipated that any potential effects associated with O&M activities associated with the NY Project, such as repair of submerged cables, will be minimal and occur within areas previously impacted by construction activities.

4.16.1.3 Summary of Avoidance, Minimization and Mitigation Measures

Identification of potentially significant marine archaeological and cultural resources is currently ongoing under the supervision of the QMA and will be detailed in the forthcoming MARA (anticipated Summer 2022). The MARA will include recommendations for avoidance and minimization of potential effects to potentially significant marine archaeological and cultural resources. These recommendations will be implemented in design plans for the NY Project. Additional investigation may be necessary for any potentially significant marine archaeological and cultural resources that cannot be practicably avoided by construction, and impacts to any such resources will not occur without additional consultation. The Applicant will also prepare an Unanticipated Discoveries Plan (UDP),

which will be implemented by cable installers should any unknown marine archaeological and cultural resources be accidentally impacted during construction.

In order to mitigate the potential for effects to potentially significant marine archaeological and cultural resources from the construction and O&M activities described above, the NY Project has agreed to implement the following avoidance, minimization, and mitigation measures for marine archaeological resources:

- Adhere to QMA-recommended 164 ft (50 m) avoidance buffers of significant or potentially significant marine archaeological and cultural resources through engineering design measures, as practicable;
- Undertake additional phased archaeological research prior to construction as determined necessary in consultation with BOEM, NYSHPO, and other cultural resource stakeholders and tribal governments; and
- Implement a UDP developed in consultation with BOEM, NYSHPO, and other cultural resource stakeholders and tribal governments. Such a plan will outline specific communication and reporting procedures to follow if marine archaeological materials or cultural resources are discovered during construction.

Additional measures may be recommended based on review of NY Project-specific data as detailed in the forthcoming MARA (anticipated Summer 2022).

4.16.2 Terrestrial Archaeological Resources

This section describes terrestrial archaeological resources within and around the Onshore Project Area. Potential effects to archaeological resources resulting from NY Project construction and O&M activities, as well as proposed measures adopted by the Applicant to avoid, minimize, and/or mitigate effects to potential archaeological resources associated with the NY Project are also described.

For the purposes of this section, the Terrestrial Archaeological Study Area consists of a 0.25 mi (0.4 km) buffer around the proposed site for the NY Project's proposed onshore export and interconnection cable routes and onshore substation facility. The parcel is referred to in the TARA as the New York Power Authority (NYPA) site (see **Figure 4.16-2**)[12]. Because the area where the NY Project activities will be located is developed and zoned for manufacturing and industrial use, with existing onshore electric infrastructure including the proposed POI, the Terrestrial Archaeological Study Area buffer was limited to include a 0.25 mi (0.4 km) buffer around the proposed onshore substation facility site.

A Phase IA archaeological survey (**Appendix F Terrestrial Archaeological Resources Assessment;** AECOM 2021a) was completed to assess potential impacts to previously documented archaeological resources and to assess the potential of the Terrestrial Archaeological Study Area to contain undocumented archaeological resources potentially eligible for inclusion on the NRHP.

[12] It should be noted that four potential onshore substation locations were evaluated as part of the TARA (Appendix F; AECOM 2021a); however, two locations (i.e., Eastern Generation FOTF and Eastern Generation Powerhouse) were subsequently eliminated from Project consideration. Since the preparation of the TARA, the NYPA site has been selected as the primary site under consideration, while the Luyster Creek site is considered an alternative.

AECOM prepared the TARA in accordance with New York Archaeological Council Standards for archaeological investigations (NYAC 1994).

Preparation of the TARA included the following:

- A literature review and background research of the Terrestrial Archaeological Study Area to provide a basis for evaluating the archaeological sensitivity of the Onshore Project Area;
- A review of relevant archaeological site files and cultural resource survey reports held by the NYSHPO by means of the OPRHP's CRIS online database; and
- A desktop review of current conditions within the primary substation location under consideration and an alternative landfall and substation site (Luyster Creek).

The information presented in the following subsections is summarized from the results and recommendations found in the TARA (**Appendix F Terrestrial Archaeological Resources Assessment**; AECOM 2021a).

4.16.2.1 Existing Conditions

Existing conditions within the Onshore Project Area feature a graded, artificially elevated, post-industrial landscape mantled with sparse grassy vegetation and gravel or asphalt paving at the two proposed landing locations. Visible infrastructural elements are present including storage tanks, monitoring wells, drainage ditches, paved roadways, outdoor lighting, storm drains, and concrete reinforced rip-rap revetments.

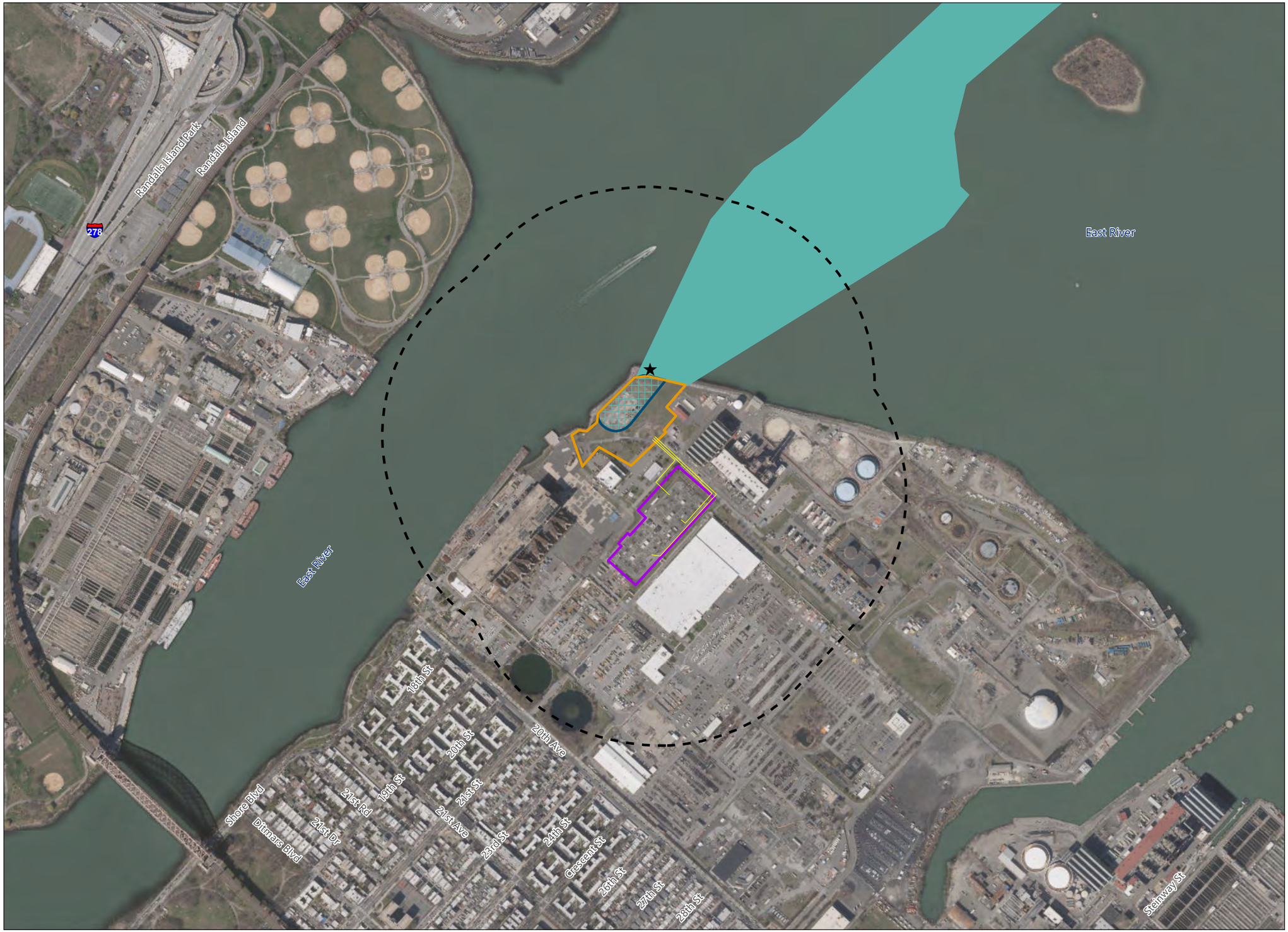
A review of the NYSHPO's CRIS database identified no recorded terrestrial archaeological sites within the Terrestrial Archaeological Study Area. Three sites with no formal determination of NRHP eligibility (i.e., their NRHP eligibility status in CRIS is listed as "undetermined") have been recorded within 1.5 mi (2.4 km) of the Study Area (see **Table 4.16-2**).

TABLE 4.16-2. PREVIOUSLY RECORDED SITES WITHIN 1.5 MILE OF THE TERRESTRIAL ARCHAEOLOGICAL STUDY AREA

Site Name	Site Number	Summary Description
Ranachqua Site	00501.000027	Identified 1920s, featured "fireplaces, and shell-pits with pottery," likely destroyed by Triborough Bridge construction between 1929 and 1936[1]
Bruckner Site	00501.000031	Current state of site unknown[2]
Parker # 9 Site	08101.000102	Described in 1922 as a "village site" associated with "large deposits of shells," was reported destroyed around 1940[3]

Source: NYSHPO 2022
[1] (Bolton 1920: 303; Kardas 1977b: 2)
[2] (DeLeuw Cather/Parsons n.d.)
[3] (Kardas 1977a: 1-2; Parker 1922: 630)

Figure 4.16-2. Study Area for Terrestrial Archaeological Resources

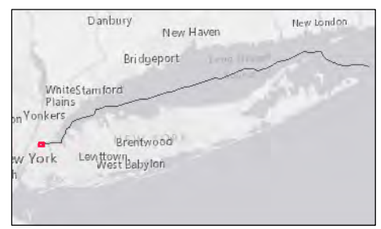


Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

- Landfall Site
- Interconnection Cables
- Onshore Substation Facility (NYPA Site)
- Astoria West POI
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- Terrestrial Archaeological Resources Quarter-Mile Study Area



0 300 600 Feet

0 100 200 Meters

equinor

EDR

Prepared May 5, 2022
Data Sources: Esri StreetMap North America, 2008.
Basemap: NYSDOP "2020" orthoimagery map service.

Prior to the completion of the TARA (**Appendix F Terrestrial Archaeological Resources Assessment**; AECOM 2021a), four previous archaeological surveys were conducted in or intersected with the Terrestrial Archaeological Study Area:

- In 1999, TRC Garrow Associates, Inc. (TRC) completed a Phase IA archaeological survey for the proposed Charles B. Poletti Power Project in Astoria, Queens, New York. The study area consisted of a 4.0 ac (1.6 ha) parcel of undeveloped land located approximately 200 ft (70 m) southeast of the onshore substation facility. Based on map research and geotechnical investigations, TRC concluded that "no significant cultural resources [were] present" within the project area (Thomas 2000).
- In 2020, TRC completed a Phase IA archaeological assessment for the Champlain-Hudson Power Express Project's proposed converter station site in Astoria, Queens, New York. The study area for the project measured 47.5 ac (19.2 ha) and encompassed the proposed converter station location as well as a deviation zone. Based on the development history of the area, TRC concluded that the proposed converter station and the deviation area possessed "no archaeological sensitivity" and recommended no additional archaeological investigations (Mack and Dunning 2019).
- In 2020, TRC completed a Phase IA archaeological assessment for the Champlain-Hudson Power Express Project Harlem Rail Yard preferred alternative route in Queens County (TRC 2020). The APE for the project measured approximately 2.1 mi (3.37 km) long and 50 ft (15.24 m) wide. The eastern terminus of the route was located on the northeast side of Lawrence Point approximately 550 ft (167.64 m) north of the Eastern Generation FOTF location. Although TRC noted that the project area was naturally inundated prior to 1897 and subsequently infilled, and that intact archaeological resources were unlikely to be present, they also recognized that anticipated project activities had the potential to impact natural soils "below the artificial material" present onsite. To mitigate the effects of the project on unanticipated archaeological resources, TRC recommended the implementation of an "inadvertent discovery protocol" that would (presumably) include archaeological construction monitoring (Mack and Dunning 2020).
- In 2021, Hudson Valley Cultural Resource Consultants completed a Phase IA archaeological survey of the NYPA Lawrence Point Parcel. The parcel surveyed encompassed the northeastern half of the NYPA site. Hudson Valley Cultural Resource Consultants assessed the parcel to have low potential for intact prehistoric archaeological resources to be present due to "the extant of historic shoreline modification and modern disturbance" (Selig and Gilleland 2021).

Together, these four archaeological surveys preceding the TARA concluded that existing conditions within portions of the Terrestrial Archaeological Study Area were highly disturbed, and that the areas studied had a low potential to contain significant and/or intact archaeological resources.

Specific to the parcel that is under consideration for the NY Project's onshore substation facility, the results of the TARA stated the following:

- Despite its relative proximity to several documented Native American archaeological sites, the NYPA site was assessed to possess negligible potential for intact Native American archaeological resources to be present owing to its distance from potable surface streams (greater than 2.75 mi [4.4 km]) and its recent history of extensive shoreline modification and disturbance.

- The southern portions of the onshore NY Project Area possess moderate potential for intact archaeological deposits and features associated with the eighteenth-century Woolsey Estate to be present beneath the human-transported sediments that exist onsite. Such features might include foundations, cellar holes, wells, privies, and midden deposits in addition to docks, roadbeds, and other waterfront structures. Moreover, because above ground elements of the Astoria Light, Heat, and Power gasification plant survived intact as late as 2008, below ground elements of the plant may be present at or near the ground surface. Archaeological remains associated with the plant at the NYPA site may include timber and stone revetments, building foundations, and mechanical components of the facility as well as railroad and utility infrastructure.

In summary, when discussing the parcel that is under consideration for the NY Project's onshore substation facility, the results of the TARA conclude that the overall archaeological sensitivity of the location is low due to the effects of nineteenth- and early twentieth-century land reclamation activities and the subsequent industrial development of Lawrence Point. However, areas may still possess relatively elevated potential for intact historic-era archaeological resources to be present beneath the human-transported sediments that exist onsite.

4.16.2.2 Potential Impacts

Construction and O&M of the NY Project has low potential to disturb previously identified and/or unidentified terrestrial archaeological and cultural resources within the Onshore Project Area. Ground disturbance is unlikely to result in the partial or total loss of integrity to terrestrial archaeological and cultural resources.

The potential impacts resulting from the construction and O&M of the NY Project are based on the design that results in the maximum possible impact. For the terrestrial archaeological resources, the design that results in the greatest amount of potential ground-disturbing activities is summarized in **Table 4.16-3**. This design concept incorporates the full build-out of onshore structures, including the onshore substation facility, export cable landfall, and interconnection cable, representing the greatest possible extent of horizontal and vertical ground disturbance within the Terrestrial Archaeological PAPE (**Figure 4.16-3**).

TABLE 4.16-3. MAXIMUM DISTURBANCE WITHIN THE TERRESTRIAL ARCHAEOLOGICAL PAPE

NY Project Component	Maximum Horizontal Effect	Maximum Vertical Effect (ft [m])
Submarine Export Cable Landfall	328 ft × 164 ft (100 m × 50 m)	120 ft (37 m)
Interconnection Cables (Total length of 0.93 mi [1.5 km])	75 ft (22.9 m)	16 ft (5 m)
Onshore Substation Facility	11 ac (4.5 ha)	120 ft (37 m)[1]
Onshore HDD Crossing	328 ft × 168 ft (100 m x 50 m)	16 ft (5 m)

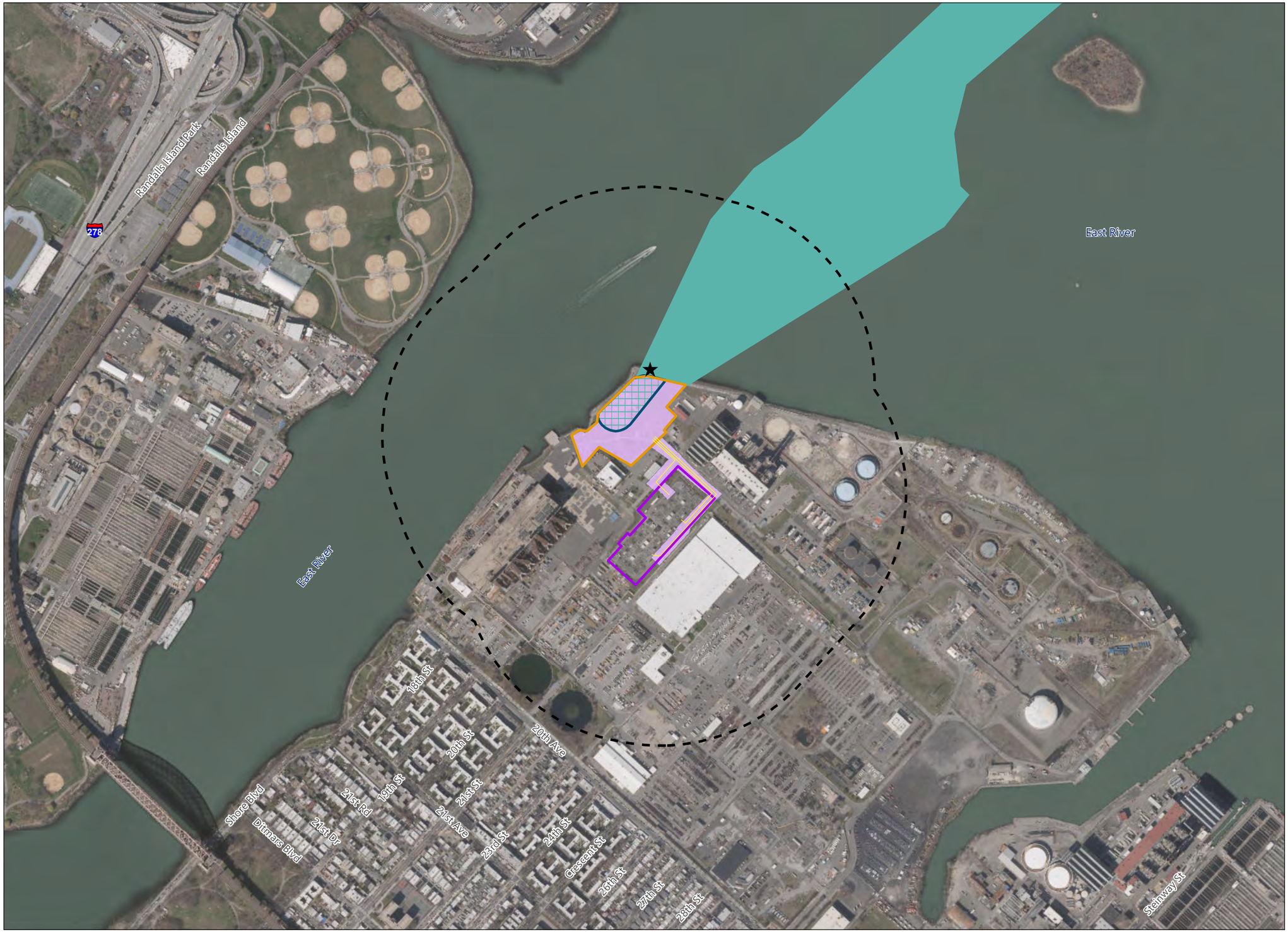
Note:
[1] This value represents the maximum vertical effect of the cables entering and leaving the Onshore Substation Facility.

The preliminary terrestrial archaeological APE (PAPE) includes the areas where ground-disturbing activities are proposed and include the onshore export and interconnection cable construction corridors and onshore parcels. The maximum possible ground disturbance within the Terrestrial Archaeological PAPE would likely occur during the construction phase of the NY Project. NY Project activities with the potential to impact terrestrial archaeological resources may include the following:

- Construction of the onshore export and interconnection cables, including splice bays (installation techniques include open cut trenching and HDD);
- Staging activities and assembly of NY Project components at applicable facilities or areas; and
- Construction of the new onshore substation facility.

During O&M, no impacts to terrestrial archaeological resources are anticipated, as additional ground-disturbing activities are not proposed. Indirect impacts to terrestrial archaeological resources in the form of operational noise, emissions, or visibility are not anticipated, based on the absence of recorded sites within the Terrestrial Archaeological Study Area and the Terrestrial Archaeological PAPE.

Figure 4.16-3. PAPE for Terrestrial Archaeological Resources

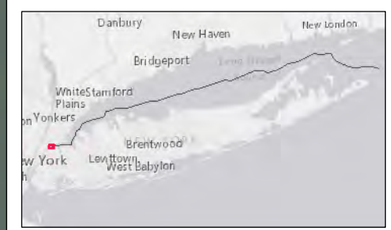


Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

- Landfall Site
- Interconnection Cables
- Onshore Substation Facility (NYPA Site)
- Astoria West POI
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- PAPE
- Terrestrial Archaeological Resources Quarter-Mile Study Area



0 300 600 Feet

0 100 200 Meters

equinor

EDR

Prepared May 5, 2022
Data Sources: Esri StreetMap North America, 2008.
Basemap: NYSDOP "2020" orthoimagery map service.

4.16.2.3 Summary of Avoidance, Minimization and Mitigation Measures

Construction activities have the potential to uncover and impact previously unrecorded and buried archaeological resources; however, the risk of such a discovery in the Onshore Project Area is very low based on past archaeological studies. The Applicant will comply with applicable permitting standards and best practices to limit environmental impacts from NY Project-related activities. The Applicant will implement the following measures to avoid, minimize, or mitigate impacts:

- Avoid culturally sensitive terrestrial archaeological resources by siting all NY Project components in existing rights-of-way and previously disturbed areas; and,
- Develop and implement a UDP, in consultation with federal and state agencies and tribal governments. The UDP will be in accordance with state laws and will outline the procedures to follow if archaeological materials or human remains are discovered during construction activities, including contact information and reporting protocols if unanticipated discoveries are identified.

A Phase IB archaeological testing plan, a Construction Monitoring Plan, and/or an UDP may be developed in consultation with BOEM, the NYSHPO, and other cultural resource stakeholders and tribal governments based on up-to-date design details. It will be responsive to the specific construction impacts anticipated, and appropriate to the archaeological sensitivity of the selected location.

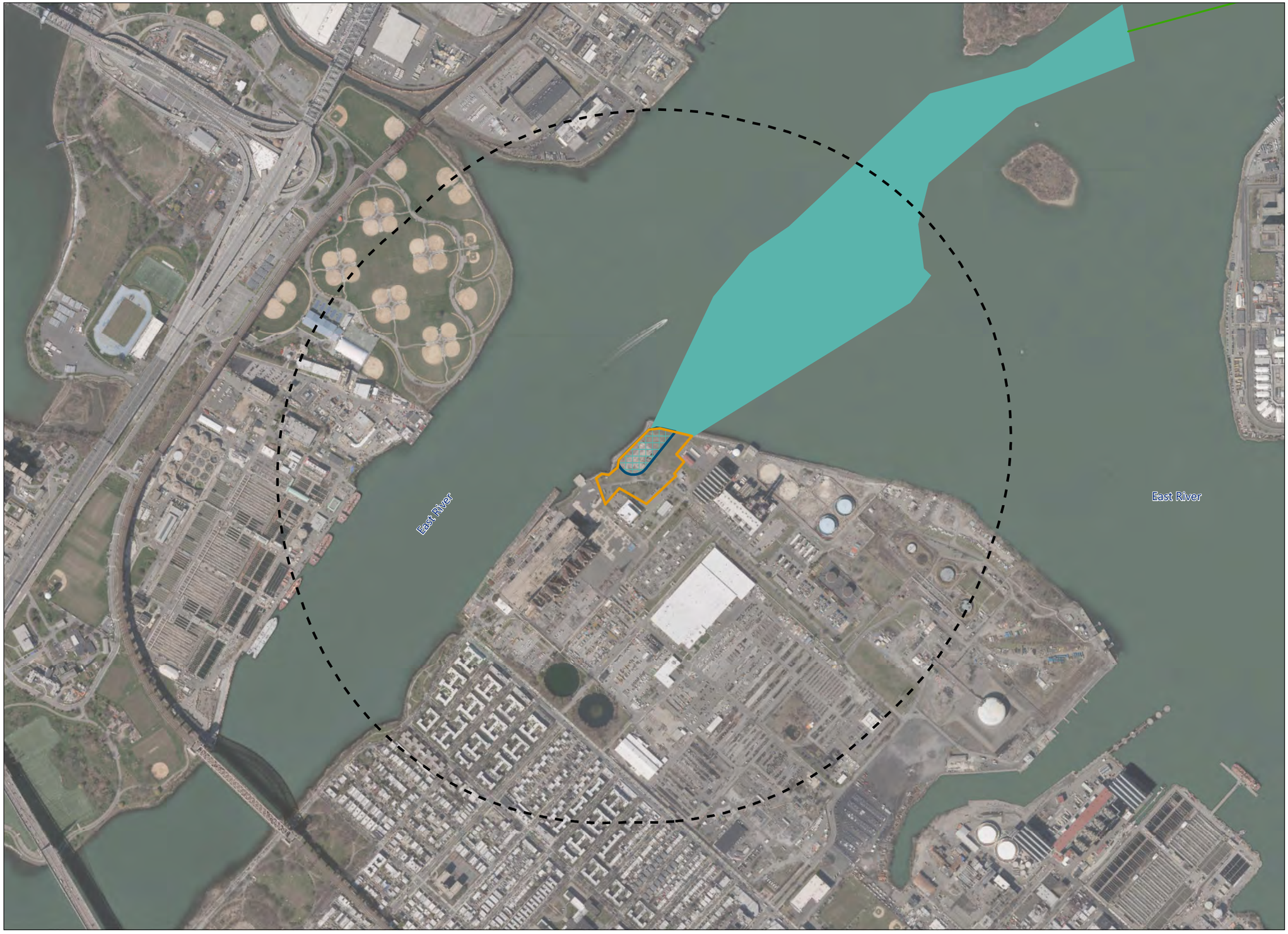
4.16.3 Above Ground Historic Properties

This section describes potential effects to above ground historic properties resulting from construction and O&M of the NY Project. Measures adopted by the Applicant to avoid, minimize, and/or mitigate potential effects to above ground historic properties are also described.

For the purposes of this section, the above ground historic properties study area consists of a 0.5-mi (0.8 km) radius around the site proposed for the NY Project's onshore substation facility and the associated cable landing (see **Figure 4.16-4**). Because offshore NY Project components located in New York waters, such as submarine export cables, will be installed below ground or below the ocean surface and installation activities will not be visible except temporarily during construction, they were not considered in the development of the historic properties study area. Onshore export cables from the landfall location to the onshore substation facility and interconnection cables from the onshore substation facility to the POI are also proposed to be underground and, therefore, are also excluded from consideration in the development of the study area.

An AVEHP (**Appendix G Analysis of Visual Effects to Historic Properties**; AECOM 2021b) was completed to assess the potential visual effects of NY Project construction and O&M on historic properties that will have full or partial views of NY Project components. AECOM prepared the AVEHP in accordance with BOEM's *Guidelines for Providing Archaeological and Historic Properties Information Pursuant to 30 CFR Part 585* (BOEM 2020) and the National Park Service's *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation* (NPS 1995). The effects evaluation follows the guidance for applying the Criteria of Adverse Effect found in 36 CFR 800.5 of Section 106 of the NHPA, with specific focus on visual effects.

Figure 4.16-4 Onshore PAPE for Above Ground Historic Properties



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

- Submarine Export Cable Route
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- Project Area
- PAPE

0 300 600 Feet

0 100 200 Meters

equinor

EDR

Prepared May 5, 2022
Data Sources: Esri StreetMap North America, 2008.
Basemap: NYSDOP "2020" orthoimagery map service.

Preparation of the AVEHP included the following:

- Development of proposed Preliminary Areas of Potential Effects (PAPEs) for Above Ground Historic Properties[13] (see **Figure 4.16-4**) for visual effects from offshore and onshore NY Project components, based on a viewshed analysis. The Onshore PAPE for Above Ground Historic Properties consists of the 0.5-mi (0.8 km) radius area around the proposed location of the onshore landfall and onshore substation facility;
- Desktop research, including a search of the NYSHPO's online CRIS database, to identify historic properties within the PAPEs that are listed in or eligible for listing in the State and National Register for Historic Places (S/NRHP);
- Field survey to confirm existing conditions of historic resources within the PAPEs; and
- Assessment of potential effects to historic resources identified within the PAPEs.

The information presented in the following subsections is summarized from the AVEHP (**Appendix G Analysis of Visual Effects to Historic Properties**; AECOM 2021b).

4.16.3.1 Existing Conditions

Above ground historic properties are defined herein to include buildings, districts, objects, structures and/or sites that have been listed in the S/NRHP, as well as those properties that the NYSHPO has formally determined are eligible for listing in the S/NRHP. Criteria set forth by the NPS for evaluating historic properties (36 CFR 60.4) state the following regarding the historic significance (i.e., eligibility for listing in the S/NRHP) of historic properties (per NPS 1995):

(A) that are significant in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

(B) that are associated with events that have made a significant contribution to the broad patterns of our history; or

(C) that are associated with the lives of persons significant in our past; or

(D) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(E) that have yielded, or may be likely to yield, information important in prehistory or history.

Desktop research and field investigation identified four above ground historic properties within the Onshore PAPE for Above Ground Historic Properties, including three bridges slightly outside the 0.5-mi (0.8 km) radius study area that may be assumed to have views of the onshore substation facility components due to their height relative to the surrounding cityscape and their being directly across

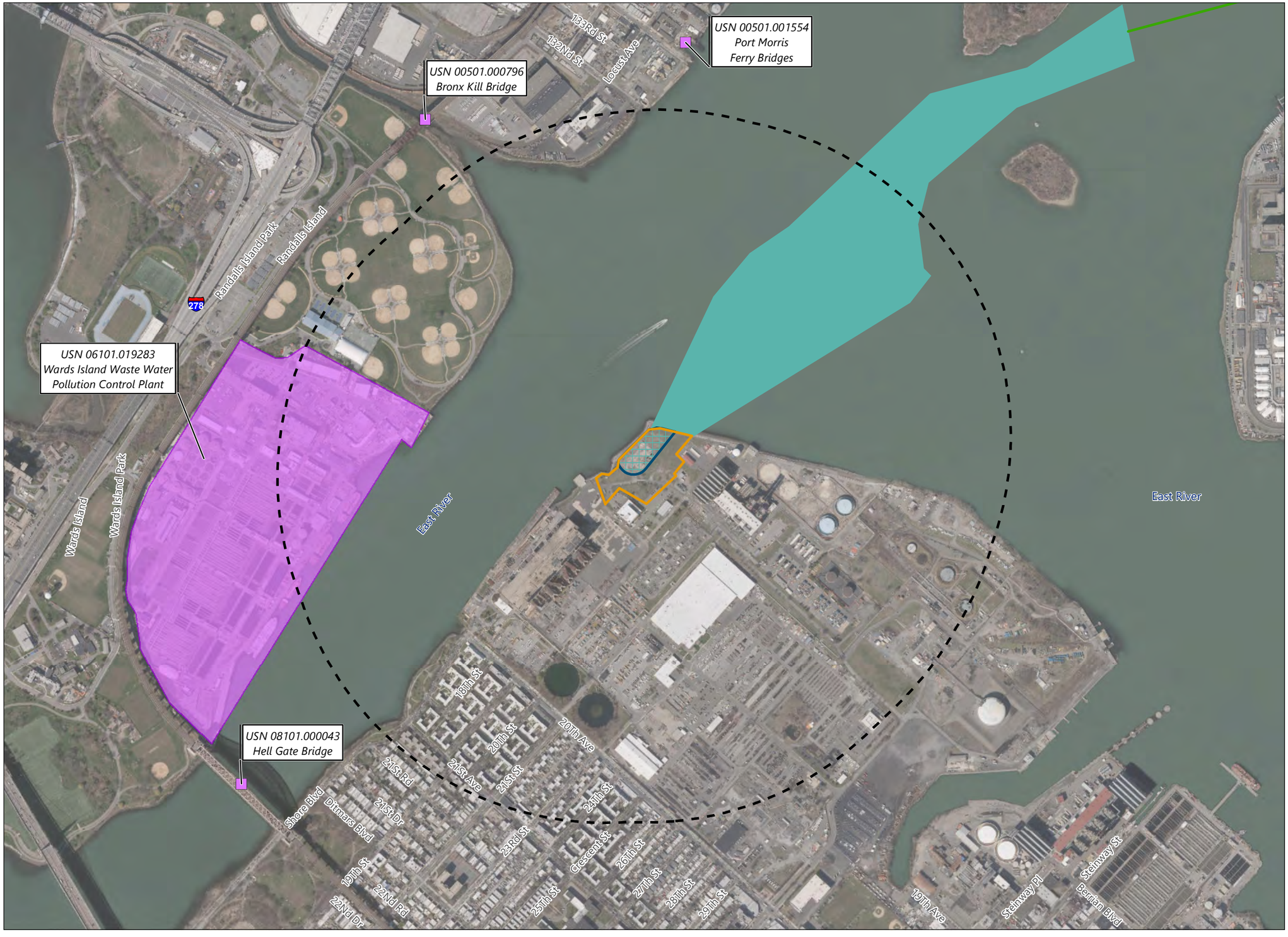
[13] Since the APE is typically developed in consultation with the involved SHPOs as part of the Section 106 review process, and because formal consultation with the NYSHPO has not yet been initiated, the APE for above ground historic properties in this document is referred to as the preliminary APE (PAPE).

the East River with an unobstructed view of the proposed onshore substation facility site. These four properties are depicted on **Figure 4.16-5** and enumerated in **Table 4.16-4**.

TABLE 4.16-4. ABOVE GROUND HISTORIC PROPERTIES WITHIN THE ONSHORE PAPE

Identification Number	Property Name	Description	S/NRHP Status	Distance to NY Project (mi [km])
USN 00501.000796	Bronx Kill Bridge	A circa-1915 steel Warren truss railroad bridge	S/NRHP-Eligible	0.5 (0.8)
USN 00501.001554; 13NR06490	Port Morris Ferry Bridges	A pair of 1948 steel and copper truss ferry bridges	S/NRHP-Listed	0.6 (0.9)
USN 08101.007332	Hell Gate Bridge	A 1917 steel through arch railroad bridge with concrete towers	S/NRHP-Eligible	0.7 (1.2)
USN 06101.019283	Wards Island Waste Water Pollution Control Plant	A large-scale sewage treatment facility opened in 1937 including four original Neoclassical-style buildings	S/NRHP-Eligible	0.3 (0.5)

Figure 4.16-5 Above Ground Historic Properties Within the Onshore PAPE



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

Historic Property

Project Components

- Submarine Export Cable Route
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- Project Area
- PAPE

0 300 600 Feet

0 100 200 Meters

equinor

EDR

Prepared May 5, 2022
Data Sources: Esri StreetMap North America, 2008.
Basemap: NYSDOP "2020" orthoimagery map service.

4.16.3.2 Potential Impacts

The construction and O&M of the NY Project will not result in any direct physical impacts to any of the previously referenced historic properties. However, above ground historic properties may be indirectly affected by visual changes to their setting. It should be noted that NY Project visibility, in and of itself, is not an adverse effect to above ground historic properties. Rather, a historic property that derives significance from its visual setting may be adversely affected if the integrity of its setting, feeling, or association is diminished by NY Project visibility.

The AVEHP concluded that the introduction of NY Project components into the existing dense industrial landscape within the Onshore PAPE will not affect the integrity of the setting, feeling, or association of the four above ground historic properties located within the Onshore PAPE for Above Ground Historic Properties. Therefore, the NY Project is not anticipated to have any adverse effects upon above ground historic properties.

4.16.3.3 Summary of Avoidance, Minimization and Mitigation Measures

The Applicant has sited onshore NY Project components within an existing highly developed and non-historic industrial setting. Because the NY Project will not have any adverse effects on above ground historic properties, a mitigation plan for above ground historic properties in New York State is not anticipated to be requested by BOEM or the NYSHPO.

4.17 Visual and Aesthetic Resources

This section addresses the requirements of 16 NYCRR § 86.5 and describes and analyzes visual and aesthetic resources within and surrounding the NY Project Area. Potential impacts to visual resources resulting from construction and operation of the NY Project are discussed. This section also describes the Project-specific measures that the Applicant will implement to avoid, minimize, and/or mitigate potential visual and aesthetic impacts.

4.17.1 Existing Conditions

4.17.1.1 Data Sources

Information and analyses included in this section of the Article VII Application are drawn primarily from the Visual Impact Assessment (VIA) prepared for the Beacon Wind Project by AECOM Technical Services, Inc. and Ramboll Group. The VIA is included as **Appendix H**. The VIA focuses on the NY Project, which is the portion of the BW1 Project in New York State and the subject of the Article VII Application; this assessment does not address the offshore wind farm itself. Because the offshore submarine export cables and the onshore cables included in the NY Project will be entirely submerged underwater or buried underground and therefore not visible, the VIA focuses on the visual effects resulting from aboveground components of the onshore substation facility. Aboveground components of the onshore substation facility will consist of enclosed buildings and/or walled structures which will contain various equipment, such as switchgears, control equipment, converter station, batteries, and a designated outside area to house outdoor equipment like reactive compensation equipment and harmonic filters, transformers, and reactors.

The objectives of the VIA are to identify potential visibility of the NY Project from a range of viewer locations and conditions and objectively characterize and evaluate how the addition of the visible elements of the proposed NY Project to the view (above-ground onshore NY Project components including onshore substation facility and possible infrastructure between the onshore substation facility and the POI) would change the seascape and landscape character of the area, as well as the composition of the views, and how those changes would affect people's experience of the view.

The VIA includes a detailed description of the NY Project component that was evaluated (see Section H.2 of the VIA); a summary of the regulatory requirements and drivers behind the assessment conducted (see Section H.3 of the VIA), a detailed discussion of the methods used to identify the Visual Study Area (a 4-mi [6.4-km] buffer drawn around the aboveground onshore substation), and an inventory of visual and aesthetic resources potentially affected by the construction and operation of the NY Project (see Section H.4 of the VIA).

The VIA also includes the following studies and analyses:

- A baseline assessment of visual conditions against which visual change resulting from the NY Project can be evaluated;
- A digital surface model (DSM) viewshed analysis to document the area within which NY Project elements are likely to be visible based on screening provided by topography existing vegetation, and structures;

- Identification and description of landscape and seascape character types (i.e., areas with similar natural and cultural features);
- Quantification of the area within the landscape/seascape character types where the NY Project would be potentially visible;
- Identification of representative Key Observation Points (KOPs) which encompass the range of viewer experiences, conditions, and characteristics under which the NY Project may be seen;
- Selection of a subset of KOP locations for development of representative visual simulations of the NY Project;
- Evaluation of the potential effect of the NY Project on viewer experience from different locations based on review of visual simulations and other data;
- Evaluation of potential visual impact based on viewer sensitivity with the visual contrast of NY Project elements; and
- Identification of potential mitigation measures to reduce visual effects.

This section of the Article VII Application provides a summary of the visual impact analysis conducted for the NY Project components, as detailed in the VIA.

4.17.1.2 Regional Landscape

The EPA Level IV ecoregions of New York (Bryce et al. 2010) were used to develop a description of the existing landscape and seascape character within the region. Ecoregions provide a useful starting point for describing visual character at a regional level because they are defined based on multiple elements, including physiographic features, such as landform, vegetation, and water, and cultural modifications such as urban development. Level IV ecoregions occurring within the area include the Long Island Sound Coastal Lowland and the Southern New England Coastal Plains and Hills. These ecoregions are described in more detail herein.

Long Island Sound Coastal Lowland

The western portion of Long Island and a portion of the southern coast of New York are located within the Long Island Sound Coastal Lowland ecoregion. This ecoregion is characterized by flat to irregular plains, coastal beaches, bays, tidal flats, and low gradient streams. Elevations are less than 250 ft (76.2 m) amsl. Vegetation types consist of oak-hickory or oak-tulip forests in upland areas, with red maple, sweet gum, and pin oak occurring in wetter areas. Coastal bluffs consist of pitch pine, eastern red cedar, oaks, and hickory. Low dunes consist of beach grass and goldenrod, and low marshes consist of cordgrass and spike grass.

Southern New England Coastal Plains and Hills

The western portion of the region is within the Southern New England Coastal Plains and Hills ecoregion. This ecoregion is characterized by irregular plains with some low hills, ponds, small lakes, streams and wetlands throughout (Bryce et al. 2010). Elevations in this ecoregion range between 40 to 800 ft (12.2 to 243.8 m) amsl. Vegetation type consists of Appalachian oak-pine forests, swamps, and vegetation associated with small river floodplains including oak, sycamore and maple trees.

In both the Long Island Sound Coastal Lowland and Southern New England Coastal Plains and Hills ecoregions very little of the original vegetation cover remains within the Visual Study Area. Cultural modifications which have impacted this cover include intensive urban and suburban development. Coastal resorts and development associated with coastal tourism and sport and commercial fishing also occur in these ecoregions. Current land cover conditions are illustrated in Figure H.4-4 of the VIA (**Appendix H**).

4.17.1.3 Project Site and Visual Study Area

The proposed onshore substation facility is located on the north end of Lawrence Point within the Astoria power complex in Astoria, New York (see Figure H.2-1 in the VIA). The entire Astoria power complex is zoned M3-1 (Heavy Manufacturing District), which permits the use of buildings/structures associated with the generation, transmission, or distribution of electricity. The Applicant proposes to locate the onshore substation facility within or immediately adjacent to the POI, if possible. This would also minimize additional disturbance for installation of the onshore interconnection cables between the onshore substation facility and the existing POI. An alternative substation site, referred to as the Luyster Creek site is located on the eastern side of the Astoria power complex, fronting Luyster Creek, which flows into the East River. This site is addressed in **Exhibit 3** of this Application.

The onshore substation facility parcel occupies just over 1,000 ft (305 m) of shoreline along the East River and is bordered by a NYPA administration building to the southwest, NYPA electric plants to the southwest, and the riprap shorelines of the East River to the northwest and northeast. The site is approximately 7.7 acres (ac) (3.1 hectares [ha]) in size and relatively flat. On the opposite shore of the East River, on and adjacent to Randall's Island, is a recreation area with sports fields and an area of industrial uses, including buildings, a wastewater treatment plant, and commercial waste, recycling and environmental services.

The VIA considers a Visual Study Area that extends 4 mi (6.4 km) in all directions from the proposed substation facility location. Within this area, an Onshore "Area of Potential Seascape, Landscape and Visual Impact" or APSLVI, was defined. The Onshore APSLVI is the NY Project's theoretical viewshed. It defines the area within which the onshore components of the Project may be visible and, therefore could contribute a level of visual change within an existing setting.

For the purposes of delineating the Onshore APSLVI, a DSM analysis was completed, which considers potential screening provided by intervening topography, vegetation, and structures. The viewshed analysis assumes maximum structure height at the substation of 87 ft (26.5 m) above existing grade. Based on this analysis, the Onshore APSLVI for the NYPA onshore substation facility extends to the Bronx neighborhood of Crotona to the north, Manhattan to the west, and the Queens neighborhoods of College Point and Corona to the east and southeast, and Maspeth to the south. The Onshore APSLVI includes the neighborhoods of Astoria, Jackson Heights, and Rikers Island and is comprised of dense urban development adjacent to the East River with a mixture of inner city residential, industrial, commercial, and airport land uses. The Onshore APSLVI indicates that views of the onshore substation facility would be substantially interrupted by other structures and limited to sections of the East River between Hells Gate Bridge, Randall's Island eastern seaboard, the waterfront of the South Bronx, and from locations at Rikers Island and La Guardia Airport. Views from locations elsewhere on the East River and inland would be restricted by a combination of intervening topography, vegetation,

and built structures. The extent of the Onshore APSLVI is 4 mi (6.4 km) in each direction from above ground NY Project components and is presented in Figure H.4-2 of the VIA.

The Onshore APSLVI was used to assess the potential visibility of the onshore substation facility from common and known significant visual and aesthetic resources and sensitive viewer locations. It is worth noting that, due to the dense patterns of development within the Onshore APSLVI, actual perceptual views of the onshore substation are likely to be less extensive than indicated in Figure H.4-2. Furthermore, the Onshore APSLVI does not capture potential views from privately accessible high-rise buildings where residential receptors would have elevated views towards the onshore substation site.

The VIA baseline information presented in the following discussion describes the physical condition and seascape/landscape character areas that fall within the Onshore APSLVI and, therefore, have the potential to be impacted by the NY Project.

Physical Characteristics

The Onshore APSLVI is characterized by generally flat and low-lying land on the waterfront of the East River. The East River is the primary waterway within the Onshore APSLVI and passes directly north and west of Lawrence Point where the proposed onshore substation facility will be located. East of Lawrence Point, Luyster Creek is a waterway that extends south from the East River. Roosevelt Island, Randall's Island and Rikers Island form three large land masses within the East River to the south, west and north, respectively.

The Onshore APSLVI is located within the northern portion of New York City within the Ditmars Steinway neighborhood of Queens. The area is typified by a densely developed urban cityscape with associated large structures arranged on an extensive gridwork of roads (see Figure H.1-2 in the VIA). Transportation infrastructure (including rail and airport infrastructure) is also a key characteristic. However, most of the waterfront of the East River in this area consists of light industrial land uses, with limited open parkland/green spaces and residential areas also present. Areas of green space within the Onshore APSLVI include public parks of varying sizes, such as Ralph Demarco Park, Barretto Point Park, and Randall's Island in Queens; Soundview Park, Pugsley Creek Park, and Ferry Point Park in the south Bronx; and Morningside Park, St. Nicholas Park, and Jackie Robinson Park in northern Manhattan. Within the neighborhoods surrounding the Onshore APSLVI, tree lined streets are commonplace, especially in the western and northern sections of the Onshore APSLVI.

Seascape and Landscape Character Units

To understand the nature of the impact of the onshore elements of the Project on the landscapes found in New York City, the VIA conducted a more refined characterization of distinct Seascape and Landscape Character Units (SLCUs) within the Visual Study Area. Five SLCUs were identified within the APSLVI that could potentially have views of the onshore substation. The location and extent of the SLCUs are depicted in Figure H.4-5 in the VIA and are described as follows.

River Corridor. This character unit represents a significant navigable watercourse and transportation corridor within the APSLVI. It totals approximately 4,093 ac (1,656 ha) within the Visual Study Area,

of which 1,621 ac (656 ha), or 40 percent, fall within the substation viewshed. Key characteristics of this SLCU include the following:

- Broad expanse of essentially simple horizontal form and sheltered open water enclosed by a highly complex and variable shoreline and skyline backdrop consisting of a variety of urban forms and vegetation;
- Presence of islands of varying size and character (see description of River Islands character units);
- Substantial influence of industrial areas in all directions;
- Road and rail bridges that increase visual and noise disturbance within the River Corridor;
- Dynamic character highly influenced by changeable weather patterns and tidal action;
- Contrasting texture from smoothness of open water and coarser texture of adjoining built forms;
- Seasonal and time-related variations in color, arising from different light and weather conditions. Contrast between colors of open water and adjacent urban forms;
- Significant boat activity; and
- Night-time character is influenced by reflections of light across the water, including moonlight and lights from adjacent urban development and boats.

River Islands. This character unit is located within the River Corridor and occurs as four distinct land masses (Randall's Island, Riker's Island, and North and South Brother Islands) that form notable features within the East River. Key characteristics of this SLCU include the following:

- Randall's Island is located east of the substation sites and splits the East River from the Harlem River. It is comprised of Green Open Space, including ball parks, along with Light Industrial and Transportation Areas. The character of this island, when viewed from the neighboring River Corridor and the receptor locations on the eastern side of the East River (e.g., Ralph Demarco Park), is of an industrial waterfront. Randall's Island is approximately 561 ac (227 ha) in size, of which 92.5 ac (37 ha), or 16 percent, fall within the substation viewshed;
- Riker's Island is located north and northeast of the substation sites and is linked to the mainland by the Francis R. Buono Memorial Bridge. Riker's Island is comprised of prison facilities/buildings coupled with areas of open grassland and parking. Seen from the adjoining East River and mainland, the island is characterized by a low horizontal land mass overtopped by large-scale rectangular buildings. The concentration of car parking around the edges of the island adds considerable complexity to the island's appearance. Riker's Island is approximately 430 ac (174 ha) in size, of which 74.5 ac (30 ha), or 17 percent, fall within the substation viewshed; and
- North and South Brother Islands are two small islands north of Lawrence Point. These small islands are low irregular shaped land masses in the East River. They are distinct from Randall's and Riker's Islands, being extensively wooded with narrow shelving beaches. North Brother Island also includes the remains of a lighthouse and an abandoned hospital and

waterfront gantry. The islands are currently a sanctuary for herons and other wading shorebirds and are off-limits to the public. Together, they total approximately 45 ac (18 ha), of which 21 ac (8.5 ha), or 47 percent, fall within the substation viewshed.

Urban/Residential/Commercial Areas. A high proportion of the Onshore APSLVI consists of urban residential neighborhoods. These areas total approximately 17,888 ac (7,239 ha), of which 113 ac (46 ha), or 1 percent, fall within the onshore substation facility viewshed. This SLCU is often enclosed by Light Industrial and Transportation Areas, but there is a small number of locations where Residential Areas occur along the East River waterfront that offer potential views of the substation site. Elsewhere, restricted views toward the substation site are available from a limited number of locations at the northern extent of the Ditmars Steinway neighborhood along 20th Avenue. Key characteristics of this SLCU include the following:

- In the neighborhoods of Ditmars Steinway, Astoria Heights and Astoria, and at a greater distance, Jackson Heights and Sunnyside Gardens, properties are generally two- or three-story terraced buildings. However, these are occasionally interspersed with larger blocks of apartment buildings which reach to five stories or more. Buildings are laid out in a dense grid pattern along linear streets. Streets run in a northeast/southwest alignment, with an industrial site located at the northern end of the streets that separates these neighborhoods from the East River. Small scale commercial development is present within the interior of these neighborhoods and is screened from views of the substation site by intervening housing;
- Residential Areas also occur on Randall's Island. These areas are concentrated on the western side of the island where views of the onshore substation facility are obscured by intervening topography, buildings and vegetation;
- Farther west, separated from the substation sites by the East River and Randall's Island, lie the neighborhoods of Manhattan, including East Harlem, the Upper East Side, and Lennox Hill. Manhattan is typified by a predominance of high-rise buildings and skyscrapers. Tall apartment blocks of 20 stories or greater are located throughout Manhattan but are interspersed with areas similar in character to Ditmars Steinway and Astoria. Manhattan also includes extensive commercial and retail land uses. Additionally, large areas of Open Green Space occur between apartment buildings and in Central Park; and
- To the north, beyond the large areas of industry which occupy the north shore of the East River, are the neighborhoods of Harlem, Mott Haven, and Hunt's Point. Blocks of residential properties are densely laid out along a gridded pattern of streets. High-rise apartment buildings are located amongst areas of terraced four- and five-story walkups. Areas of Open Green Space are positioned around the high-rise buildings, and street trees are present along the neighborhood roadways.

Light Industrial and Transportation Areas. This is an extensive character unit occurring around the edges of the East River corridor. Of approximately 6,384 ac (2,584 ha) occurring within the Study Area, 597 ac (242 ha), or 9 percent, occur within the viewshed of the onshore substation facility. Key characteristics of this SLCU include the following:

- The characteristics of the Light Industrial and Transportation Areas vary somewhat across the Onshore APSLVI but typically include large-scale rectilinear industrial buildings and

commercial properties, large open expanses of asphalt parking, and wide roads. Many of these areas are in relatively poor condition and associated with extensive security fencing and overhead power infrastructure. The Light Industrial and Transportation character unit often forms the backdrop and skyline in views from the neighboring River Corridor character unit.

Open Green Space. This character unit includes approximately 2,524 ac (1,021 ha), of which 16.5 ac (7 ha), or 1 percent, fall within the substation viewshed. The primary Open Green Space Areas with potential views of the onshore substation facility include the Randall's Island Fields and Barretto Point Park. Key characteristics include the following:

- Randall's Island Fields are formal ball parks set within an open grassland area. A key characteristic of this area is the presence of the East River and the complexes of industrial structures that occupy the skylines in the background within views to the east; and
- Barretto Point Park is characterized by areas of open grassland with dense tree belts and a shallow shelving beach. The park provides amenities such as tennis courts, an amphitheater and a floating pool. Views across the East River are available from the amphitheater as well as the beach and floating pool.

4.17.1.4 Visual Receptors/Viewers

In general, the types of viewers present within the Onshore APSLVI are classified as residents, transportation-based receptors (road and rail users), tourists and recreational users. The following discussion summarizes these types of viewers. Additional detail can be found in the VIA.

Residential Receptors

Residential development is located to the south, southeast, west, and north of the Onshore APSLVI. Properties to the south and southeast of the onshore substation facility site would be the closest to the development, in the neighborhoods of Ditmars Steinway, Astoria Heights, and Astoria (and at a greater distance, Jackson Heights and Sunnyside Gardens). Properties are generally two- or three-story terraced buildings, although these are occasionally interspersed with larger blocks of apartment blocks which reach to five stories or more. Buildings are set out in a dense grid pattern along straight street. Streets run in a northeast/southwest alignment, with the industrial site at Ditmars Steinway located at the northern end of the street.

Local residents may view the Project from their yards, homes, businesses, and local roads. Except when involved in local travel, these viewers are likely to be stationary, and could have frequent and/or prolonged views of the surrounding landscape. Local residents may view the Project from ground level or elevated vantage points. However, the opportunities for such views are limited by the general orientation of residential structures toward the adjacent street and the screening provided by other buildings and trees. The sensitivity of residents to visual quality is variable and may be tempered by the urban setting of their neighborhoods, which include large existing industrial and transportation-related facilities. However, residents know the local landscape and may be sensitive to changes in views that are important to them.

Transportation-Based Receptors

The Astoria power complex is set within a dense network of various modes of transportation including roads, railways, and airports (see Figure H.4-6 in the VIA). Receptors on each of these modes of transportation will experience the landscape differently than static observers. These viewers pass through the Visual Study Area on a regular basis in automobiles or public transportation on their way to work or other destinations. Within the local neighborhood, most views will be from street level, while travelers on the RFK Bridge, subway, and railroad are afforded elevated views of the surrounding area. Travelers on area roadways are typically moving, have a narrow field of view, and are pre-occupied with traffic and the roadway network. Consequently, their views of the surrounding landscape are peripheral (generally to the side and partially screened) and brief. Being destination-oriented and focused on driving conditions, their sensitivity to visual quality and changes in the visual environment is likely to be low. Train and subway passengers have a better opportunity to view scenery located alongside the rail lines. However, these individuals are often more focused on activities inside the train. Additionally, factors such as the configuration of seating, speed and direction of travel further characterize the experiences of observers utilizing public transportation within the Onshore APSLVI.

Recreational Receptors and Tourists

Neighborhoods within the Onshore APSLVI contain a high number of pocket parks and neighborhood parks, which provide open space for residents. Parks in proximity to the onshore substation facility are likely to be used by tourists including, Randall's Island Park, Wards Island Park and Recreational Fields, and Astoria Park. Other large parks, including Central Park, Herman A MacNeil Park, Soundview Park, Crotona Park, and Flushing Meadows Corona Park, are located within the 4 mi (6.4 km)-radius Visual Study Area but are unlikely to have views of the onshore substation facility due to the screening effect of intervening built forms. Due to its poor water quality, the East River is not used for swimming. However, kayaking, sailing, and boating are popular recreational water-based activities on the East River. Views from the water are bounded by a dense, urban environment ranging from industrial waterfront development to residential apartment blocks and occasional landmark buildings.

Recreational receptors include ball players, tennis players, children, joggers, recreational boaters, fishermen and those involved in more passive recreational activities (picnicking, walking, etc.). Visual quality may or may not be an important part of the recreational experience for these viewers, but their expectations are likely tempered by the urban/industrial character of the East River shoreline. Recreational users, especially those involved in more passive activities, have opportunities for continuous views of the surrounding landscape over longer periods. Most recreational viewers will only view the surrounding landscape/seascape from ground-level and water-level vantage points.

Tourists are individuals who come to the New York City area specifically to enjoy its cultural and scenic resources. Most tourists will pass through the Visual Study Area on the RFK Bridge and the Grand Central Parkway on their way to and from Manhattan and LaGuardia Airport, or from the Northeast Corridor railroad. Their sensitivity to visual quality and landscape character will be variable, depending on their reason for visiting the area; however, the exposure will be brief. Tourists will generally expect to see a variety of urban and industrial uses in and around New York City.

4.17.1.5 Resources of Scenic and Aesthetic Significance

As required by Article VII of the PSL and its implementing regulations at 16 NYCRR §§ 86 and 88, the components of a major electrical transmission system must be evaluated for potential impacts to visual resources. This review of visual impacts under Article VII is typically conducted in accordance with the New York State Department of Environmental Conservation (NYSDEC) Policy DEP-00-2: Assessing and Mitigating Visual Impacts provides guidance for the evaluation of visual impacts of proposed projects (NYSDEC 2019). Per this policy, scenic and aesthetic resources of statewide significance include the following:

- Properties on or eligible for inclusion in the National Register of Historic Places or State Register of Historic Places;
- State Parks;
- New York State Heritage Areas (formerly Urban Cultural Parks);
- State Forest Preserve Lands;
- National Wildlife Refuges, State Game Refuges, and State Wildlife Management Areas;
- National Natural Landmarks;
- Sites on the National Park System, including Recreation Areas, Seashores, and Forests;
- National or State Wild, Scenic, or Recreational Rivers;
- Sites, areas, lakes, reservoirs, or highways designated or eligible for designation as scenic;
- Scenic Areas of Statewide Significance (SASS);
- State or federally designated trails, or one proposed for designation;
- Adirondack Park Scenic Vistas;
- State Nature and Historic Preserve Areas;
- Palisades Park;
- Bond Act Properties purchased under Exceptional Scenic Beauty or Open Space Category; and
- National Heritage Areas.

Significant aesthetic resources in the vicinity of the NY Project were inventoried in accordance with the NYSDEC's Program Policy DEP-00-2 (NYSDEC 2019) and are listed in Attachment H-1 of the VIA. The Applicant evaluated those inventoried resources for the purposes of assessing the visual impacts and identifying KOPs.

The majority of the types of aesthetic resources of statewide significance listed in the NYSDEC's Program Policy DEP-00-2 are not found within the highly urbanized Visual Study Area. However, the inventory of aesthetic resources of statewide significance includes historic resources listed or eligible for inclusion in the State or National Register of Historic Places (S/NRHP) and New York State Heritage Areas (formerly Urban Cultural Parks). Multiple local parks, considered as potential aesthetic

resources of local concern, were also identified within the Visual Study Area. Resources with potential views of the NY Project are presented as follows.

Historic Properties

Four historic properties listed or eligible listing in the S/NRHP occur within the APSLVI and have either direct or partial views of the site across the East River. These properties are listed below and include historic municipal and energy infrastructure and bridges.

- Bronx Kill Bridge (USN# 00501.000796);
- Port Morris Ferry Bridge (USN# 00501.001554, NR# 13NR06490);
- Hell Gate Bridge (USN# 08101.000043); and
- Wards Island Waste Water Pollution Control Plant Historic District (USN# 06101.019283).

Other historic resources inventoried within the Visual Study Area will be screened from any views of the substation.

Parks and Recreational Facilities

Although the APSLVI does not include any state or national parks, one New York State Heritage Area was identified within the APSLVI, identified as Harbor Park by the New York State Office of Parks and Historic Preservation (NYSOPRHP). The Heritage Area System (formerly known as the Urban Cultural Park System) is a state-local partnership established to preserve and develop areas that have special significance to New York State. A total of 22 local parks identified within the APSLVI are considered to be potential aesthetic resources of local concern. Notable examples include the following:

- Randall's Island Park – located at least 0.2 mi (0.4 km) to the west of the proposed onshore substation facility site. Randall's Island Park comprises most of an island in the East River, between East Harlem, the South Bronx, and Astoria, Queens. It is one of New York City's main recreational hubs. It contains a stadium, a track and field facility, a golf center, 9 ac (3.6 ha) of restored wetlands, a 20-court tennis center, over 60 playing fields, and over 8 mi (12.9 km) of waterfront bicycle and pedestrian pathways. The majority of these paths run along the waterfront perimeter of the island;
- Wards Island Park and Recreational Fields – an extension of Randall's Island Park that contains sports fields and recreational pathways which run along the water's edge;
- Ralph Demarco Park – located approximately 0.4 mi (0.7 km) south of the onshore substation facility site, the narrow park offers bicycle and walking paths, sitting areas, and tree-lined areas for passive recreation. Views from the park extend across the East River towards Randall's Island, the Triborough Bridge, and Hell Gate Bridge; and
- Barretto Point Park – located approximately 1.45 mi (2.34 km) to the northeast of the onshore substation facility site on the East River waterfront in the Bronx. It offers fishing piers and boat launches as well as a volleyball net, basketball court, and a playground.

Other large parks located within the Onshore APSLVI include Soundview Park, Pugsley Creek Park, and Ferry Point Park in the south Bronx; and Morningside Park, St. Nicholas Park, and Jackie Robinson Park in northern Manhattan. Although the APSLVI suggests theoretical visibility of the NY Project from these areas, field reconnaissance at these parks indicated that views of the onshore substation facility site are unlikely due to distance and the screening effect of intervening built forms.

Heavily Used Transportation Corridors

Although not considered scenic and aesthetic resources of statewide significance, heavily used transportation corridors can be considered visually sensitive due to the number of potential viewers they accommodate on a daily basis. Major roads which are likely to have views of the onshore substation facility site are located to the south and west of the Onshore APSLVI. These include the following:

- Grand Central Parkway is a 14.61 mi (23.51 km) long route that stretches from the RFK Bridge in New York City to Nassau County on Long Island. The parkway routes through the neighborhoods of Queens and passes LaGuardia Airport. As it routes to the south of the development area, the road begins to rise in elevation to cross the RFK Bridge, and views across the tops of buildings in the direction of the proposed onshore substation facility site would be possible;
- Bruckner Expressway is a freeway located in the borough of the Bronx. It routes from the RFK Bridge to the south end of the New England Thruway at the Pelham Parkway interchange. The highway loosely follows the course of the East River and connects to several major freeways, and
- The Franklin D. Roosevelt East River Drive (FDR Drive) is a 9.68-mi (15.58-km) limited-access, 6-lane parkway on the east side of the New York City borough of Manhattan (west of the East River). It starts near South and Broad Streets and routes north along the East River to the 125th Street/RFK Bridge/Willis Avenue Bridge interchange, where it becomes the Harlem River Drive. The FDR Drive features a mix of below-grade, at-grade, and elevated sections, as well as three partially covered tunnels; however, as it passes in proximity to the proposed onshore substation facility site, it is at grade.A railway line located on a viaduct runs above the properties at Ditmars Steinway before crossing the East River and through Randall's Island, will likely provide views to the onshore substation facility site. The line is located to the south and west of the onshore substation facility site and would provide elevated views for train passengers.

4.17.1.6 Visual Resource Inventory and Analysis

As discussed in **Section 4.17.2.2**, the Onshore APSLVI indicates that the onshore substation facility would have a relatively constrained viewshed that is mainly confined to locations across the East River and adjoining the river corridor due to the screening effect of built structures.

The inventory of aesthetic resources in the VIA was reviewed to determine which resources should be considered as potential KOPs. In regard to the S/NRHP-listed or eligible properties, an Analysis of Visual Effects to Historic Properties (AVEHP) evaluated potential visual effects on historic properties within a 0.5 mi (0.8 km) preliminary area of potential effect (see **Appendix H VIA**). Based on desktop

studies and/or field survey, the AVEHP concluded that the addition of NY Project structures at the substation location would not alter any characteristics of these NRHP-listed or NRHP-eligible properties, as the new NY Project components would be added to an existing dense industrial landscape and as such would not affect these properties' integrity of setting, feeling, or association. Based on this analysis, no NRHP properties were identified as KOPs and simulated for impact analysis.

As part of the VIA, field evaluations of the inventoried aesthetic resources within the APSLVI were completed in April 2021, November 2021, and March 2022. Observations were made from the inventoried resources to document seascape/landscape character, viewer groups, sensitivity, and to evaluate the potential visibility of the NY Project.

In order to understand the range of visibility of the proposed onshore substation facility, KOPs were selected for the development of visual simulations and assessment of the impact of the substation on the character and visual quality of the area. KOPs were selected from those inventoried resources from which visibility of the NY Project was considered likely. The KOPs represent different visual receptor types and SLCUs that have the greatest potential visibility of the onshore substation facility. The selected KOPs are located in different directions relative to the onshore substation facility. KOP locations were confined to publicly accessible locations and therefore do not reflect visibility from private dwellings or private buildings.

Views from park and recreational facilities, as well as vessels and water-based receptors on the East River, are represented by shore-based KOPs at Randall's Island Field 27 (KOP-NY01) and Field 27 (KOP-NY02), and Barretto Point Park (KOP-NY03), which afford open views across the river, toward the onshore substation facility site. Views within the Harbor Park New York State Heritage Area are also represented by these shore-based KOPs. Characteristics of the selected KOPs are summarized in **Table 4.17-1**. The location of these KOPs is illustrated in Figure H.4-6 in the VIA.

TABLE 4.17-1. ONSHORE KOPS

KOP ID	Name	Location		Receptor Type	Receptor Sensitivity	KOP Elevation (ft [m]) Distance to Substation Site (mi [km])	View Orientation
		Longitude	Latitude				
NY01	Randall's Island Field 27	-73.915699	40.791792	Open Green Space Character Unit Recreational receptors	SLCU - High Visual Receptor – High	6.5 (2) 0.39 (0.6)	SE
NY02	Randall's Island Field 31	-73.914117	40.793715	Open Green Space Character Unit Recreational receptors	SLCU -High Visual Receptor – High	6.5 (2) 0.3 (0.5)	SE
NY03	Barretto Point Park	-73.888744	40.805303	Open Green Space Character Unit Recreational receptors	SLCU -High Visual Receptor – High	14.5 (4.4) 1.5 (2.4)	SW
NY04	ICYP Youth Program Fields	-73.903163	40.779648	On boundary of Urban/Residential/Commercial Areas and Light industrial and Transportation Areas	SLCU – Medium Visual Receptors – High (residential receptors) and medium (road users and pedestrians)	13.1 (4) 0.75 (1.2)	NW
NY05	Ralph Demarco Park	-73.915382	40.786006	At confluence of Open Green Space, Urban/Residential/Commercial and Light industrial, and Transportation Character Units. Recreational, road users, and residential receptors	SLCU -High Visual Receptor - High	6.5 (2) 0.4 (0.6)	NE

Photographic simulations of the onshore substation facility were developed to illustrate the potential change in visual conditions. For the purposes of this analysis, substation buildings and structures were modeled at a maximum height of 87 ft (26.5 m) above grade. A representative onshore substation layout utilized for the visual simulations is shown in Figure H.2-1 of the VIA. The simulations are included as Attachment H-2 of the VIA.

4.17.2 Potential Impacts

4.17.2.1 Construction

During construction of NY Project facilities, potential impacts to visual resources may include construction activities for installation of the submarine export cables and onshore cables, and construction of the onshore substation facility.

Visual Impacts During Offshore Construction

Project-related vessels will be present within and transiting along the submarine export cable route. As vessel traffic is common in the area, it is anticipated that the vessels required for installation of the cable will not substantially increase boat traffic around New York Harbor or along the southern and eastern coasts of New York within Long Island Sound. Most of the vessels used for NY Project construction will be similar in size and form to existing commercial vessels. Installation of the submarine export cables in nearshore waters will introduce Project-related vessels relatively close to shore in the areas near the cable landfall. While these vessels will be easily visible from shore, it is not uncommon to see vessel traffic in this area and they will not remain in any area for more than several weeks. Due to the short duration of offshore construction activity, these NY Project-related installation vessels are not anticipated to adversely affect onshore visually sensitive aesthetic resources. The presence of these vessels and nighttime construction activities will also add navigation lighting and lights necessary to perform construction activities that may be visible from coastal vantage points. However, numerous sources of light are already present in the area, and any visual effects resulting from lighting on construction vessels will occur in discrete locations, and be short term (i.e., limited to the duration of cable installation).

Visual Impacts During Onshore Construction

Short-term visual effects will occur during construction of the onshore substation facility due to the presence of construction equipment and work crews. Construction activities will include surveying; clearing the construction site (of either pavement, existing buildings and/or vegetation depending on the site); stockpiling top soil; grading; forming and construction of the buildings and outdoor electrical equipment foundations; placement and erection of buildings and electrical equipment; placement of perimeter security fencing; and restoration and landscaping installation (if required). It is anticipated that contrast will be introduced during construction primarily for viewers adjacent to the site and underground export and interconnection cables, where the presence of construction equipment, materials, and crews will be visible in the foreground. The onshore export and interconnection cables will be installed underground primarily within existing roadways present within the Astoria energy complex. Roads will be restored upon completion of construction. Views of Project construction from areas not immediately adjacent to the onshore substation facility will be mostly screened by residential, commercial or industrial buildings, vegetation and/or topography. Visual effects to these viewers will generally be limited to seeing construction traffic on local roads. Visual impact associated with onshore

construction operations, in general, would be minor as construction equipment would only be in use temporarily during the construction and decommissioning periods.

4.17.2.2 Operations and Maintenance

Long-term visual effects during operation of the NY Project will be limited to the visibility of the onshore substation facility. The substation will introduce tall, rectangular forms and vertical and geometric structures into the landscape setting already highly developed with similar forms and structures. The onshore interconnection cables will be placed under an existing roadway and will, therefore, have no significant long-term effects. Maintenance workers will also be required to work at the onshore substation facility at times, which could cause some minor temporary visual effects from the presence of equipment and disturbance of ground and/or pavement during work activities.

The onshore substation facility site, as well as the surrounding landscape setting in which it would be located, has been heavily modified by industrial development. Based on the results of the viewshed analysis and field verification, potential views of the onshore substation facility will be primarily available from the East River and open fields on Randall's Island.

In order to understand the level of visual change caused by the operating NY Project, an analysis of visual compatibility (type of setting, intactness, and unity) was compared to the visual contrast elements of form, line, color, texture, horizontal and vertical scale, motion, and lighting to define the level of visible change (weak-strong) based on the Bureau of Land Management's (BLM's) Visual Resource Contrast Rating Handbook H-8431-1 (BLM 1986).

A modified BLM visual resources assessment and contrast rating form (see VIA Attachment H-3) was used to guide the analysis and determine the degree of change. The rating scale used was based on a system developed for offshore wind turbine visibility (Sullivan and Cothren 2013) and is summarized in Table H.5-1 in the VIA. Visual contrast Level 6 indicates substantial impact, 5 indicates a very large impact, 4 indicates a large impact, 3 indicates a moderate impact, 2 indicates a small impact, 1 indicates a negligible impact, and 0 indicates no impact. However, impact is also dependent on other factors, including the number of viewpoints affected and viewer sensitivity.

Visual Sensitivity

The proposed substation site is located within an existing power generating complex that is zoned for heavy manufacturing and is set within the densely developed cityscape of New York City. Adjacent areas within the Onshore APSLVI include River Corridor and Open Green Space. Factors such as types of users, amount of use, demonstrated public interest, and protective designations (i.e., conservation or historic sites) suggest that most people who will view the onshore substation facility from these areas (i.e., residents, commuters, recreational users, tourists, and others) fall into a low to medium viewer sensitivity category. Viewers may value the waterfront setting, are aware of the surroundings, and will likely be aware of changes in the visual environment but their expectations for scenery in this setting are expected to be low.

A second component of visual sensitivity is the sensitivity of the visual resource being altered. Higher levels of resource/view sensitivity may be evident based on level of protection afforded the visual resource and/or the relative rarity of the visual resource. The visual resource of the project site has

been characterized as low, given its highly developed to industrial uses, with a low degree of naturalness and/or historical character. For the purposes of the onshore VIA for the NY Project, visual sensitivity is assumed to be low to medium for most viewers. Some viewers may be engaged in recreation (i.e., walking, boating, etc.) or other activities that are more view sensitive, but most viewers likely do not fit this description. This determination of visual sensitivity was based primarily on lack of natural character or intactness of the landscape; limited open space or recreational areas in proximity; and the commercial and industrial character of the sites.

Visual Impact Characterization

As described in Section H.5-3 of the VIA, the combination of visual change and visual sensitivity characterizes the potential for impact associated with a proposed action; the potential for impact can be characterized as No Impact, Negligible, Small, Moderate, Large, Very Large, or Substantial. As previously noted, visual sensitivity within the Onshore APSLVI was characterized as Medium.

Views of the onshore substation facility parcel (NYPA parcel) would be substantially constrained and limited to sections of the East River between Hells Gate Bridge, Randall's Island eastern seaboard, the waterfront of the South Bronx, and from locations at Rikers Island. Views from locations elsewhere on the East River and inland would be restricted by a combination of intervening topography, vegetation and built structures. Most views originate from the East River and extend between Randall's Island, South Bronx and Rikers Island, as well as parts of La Guardia Airport.

A total of five KOPs were utilized for the assessment of impacts arising from onshore elements of the Project. The KOPs selected are located within, or on the boundary of, a number of seascape/landscape character units, including Open Green Space, Urban/Residential/Commercial and Light industrial and Transportation. KOPs at Randall's Island Field 27 (KOP-NY01) and Field 31 (KOP-NY02), and Barretto Point Park (KOP-NY03) are also representative of likely impacts on the River Corridor and River Islands character units. Visual simulations were prepared and evaluated for each of the selected onshore KOPs (see Attachment I-2 of the VIA for Onshore Photo Simulations). The following discussion provides descriptions for the existing and proposed views at each of these KOPs.

KOP-NY01 – RANDALL'S ISLAND FIELD 27

Existing View. This KOP is located on the side of the Sunken Meadow Loop at the northeastern edge of Randall's Island. This area is utilized by recreational receptors (both those engaged in sports as well as those using the site for walking) and affords open expansive views across the East River. The KOP is in an area of Open Green Space on Randall's Island, which is part of the River Islands character unit but is subject to the considerable influence of the neighboring River Corridor character unit. Key characteristics of this KOP include the following:

- This KOP is situated in a low lying, essentially flat area of managed Open Green Space that is typified by sports fields, asphalt tracks, streetlights, and occasional street furniture;
- The horizontal form of the landscape at the KOP and the simplicity and openness of the adjoining East River contrast with the numerous vertical structures visible on the skyline in all directions;

- Neighboring industrial buildings, power stations and road flyovers and rail viaducts form prominent features on the skyline of views from this KOP;
- Scenic integrity is moderate. While the condition of the landscape at the KOP is generally good, the prevalence of transportation infrastructure and industrial structures constitute notable detractors; and
- During hours of darkness, the character of the seascape/landscape/cityscape at the KOP is subject to the influence of extensive lighting within neighboring urban areas and industrial areas abutting the East River. Vehicle and train lights on elevated roads/viaducts are especially conspicuous across the night sky.

Proposed View. While not located in the Open Green Space character unit, with the proposed NY Project in place, the onshore substation facility building would be clearly visible on the western side of Lawrence Point, presenting a prominent new feature in the view from this location. However, it would be set against a backdrop of the power station, and would have a form, scale and character that is consistent with the existing context of existing industrial facilities that characterize the background of the view. Nonetheless, its presence would add to the massing and extent of industrial development on the skyline to the east of this KOP, reinforcing enclosure of the view by such elements. The onshore substation facility would not affect the line, form, or pattern of elements in the Open Green Space but would add to the pattern of industrial/energy related developments and introduce a further large-scale rectangular structure to the skyline in the background of the view to the east of this KOP. Overall, its visual impact is considered moderate, as it represents a prominent, albeit localized change that is readily apparent after even a brief look and would be visible to most casual observers. However, although the onshore substation facility represents a visible new feature, it is consistent with the wider context, and would not compete with the characteristic seascape/landscape/cityscape elements already present in the view.

KOP-NY02 – RANDALL'S ISLAND FIELD 31

Existing View. Like KOP-NY01, this KOP is located on the side of the Sunken Meadow Loop at the northeastern edge of Randall's Island. The location is utilized by recreational receptors (both those engaged in sports as well as those using the site for walking) and affords open expansive views across the East River. The KOP is in an area of Open Green Space on Randall's Island, which is part of the River Islands character unit but is subject to the considerable influence of the neighboring River Corridor character unit. Key characteristics of this KOP include the following:

- This KOP is situated in a low lying, essentially flat area of managed Open Green Space that is typified by sports fields, asphalt tracks, streetlights, and occasional street furniture;
- The horizontal form of the landscape at the KOP and the simplicity and openness of the adjoining East River contrast with the numerous vertical structures visible on the skyline in all directions;
- Neighboring industrial buildings, power stations and road flyovers and rail viaducts form prominent features on the skyline of views from this KOP;

- Scenic integrity is moderate. While the condition of the landscape at the KOP is generally good, the prevalence of transportation infrastructure and industrial structures constitute notable detractors; and
- During hours of darkness the character of the seascape/landscape/cityscape at the KOP is subject to the influence of extensive lighting within neighboring urban areas and industrial areas abutting the East River. Vehicle and train lights on elevated roads/viaducts are especially conspicuous across the night sky.

Proposed View. With the proposed NY Project in place, the onshore substation facility would form a new feature in the view from this location. The onshore substation facility building would be clearly visible on the western side of Lawrence Point but would be set against a backdrop of the Astoria Power Station. Despite its prominence in the view from this KOP, the onshore substation facility would be of a scale, form and character that is consistent with the existing context of existing power stations and industrial land that characterize the background of the view. However, its presence would add to the massing and extent of industrial development on the skyline to the east of this KOP, reinforcing enclosure of the view by such elements. The onshore substation facility would not affect the characteristic line, form, or pattern of elements in the Open Green Space but would add to the pattern of industrial/energy related developments and introduce a further large-scale rectangular structure to the skyline in the background of the view to the east of this KOP. Overall, its visual impact is considered moderate, as it represents a prominent, albeit localized change that is readily apparent after even a brief look and would be visible to most casual observers. However, although the onshore substation facility represents a visible new feature, it is consistent with the wider context, and would not compete with the characteristic seascape/landscape/cityscape elements already present in the view.

KOP-NY03 – BARRETTO POINT PARK

Existing View. This KOP is located on the southern edge of the park where recreational receptors are provided clear, unencumbered views across the East River. It is located in an area of Open Green Space character unit but is subject to the influence of the neighboring industrial areas to the north and east of the park, and the maritime influences of the River Corridor to the south and west. Key characteristics of this KOP include the following:

- This KOP is situated in a low lying, essentially flat area of managed Open Green Space that is typified by open grasslands, extensive tree cover, a network of paths and tracks, vantage points, sports fields, and street furniture. The waterfront of the park is characterized by a combination of shallow graded beaches and revetments in the form of rip-rap;
- The low horizontal form, simplicity, and openness of the East River, that forms a crucial constituent of the park's scenic quality and character, contrast with the complex assemblage of the city skyline in the background;
- The park is enclosed on all sides by tree cover that separates the park from the neighboring industrial buildings;
- Scenic integrity is moderate. While the condition of the landscape at the KOP is generally good, the prevalence of maritime, industrial structures and urban forms exerts considerable influence on the character and scenic quality at the KOP; and

- During hours of darkness, the character of the seascape/landscape/cityscape at the KOP is subject to the influence of extensive lighting within neighboring urban areas and industrial areas abutting the East River.

Proposed View. The onshore substation facility would not be located within the Open Green Space character unit but would be seen in the background of the view in front of the Astoria Power Station. While clearly visible, the onshore substation facility structures would not be evident in the skyline and would have a form, scale and character that is consistent with the context of existing power stations and industrial land that characterizes the background. The new structure would not affect the characteristic line, texture, form, or pattern of the Open Green Space but would introduce an additional large-scale rectangular structure, coarse texture, straight lines, and industrial/energy related development to the background of the view to the east from this KOP. Overall, the onshore substation facility has a small effect on the scenic quality of the existing view from this KOP due to its distance and the small proportion of the view it would occupy, as well as its consistency with the established industrial skyline.

KOP-NY04 – ICYP YOUTH PROGRAM FIELDS

Existing View. This KOP is located on the sidewalk of 20th Avenue, opposite the junction with 35th Street, looking across the ICYP Program Youth Fields. It is representative of views available to by recreational users, pedestrians, road users as well as nearby residential receptors. The KOP is located on the boundary of the Urban/Residential/Commercial Areas and Light Industrial/Transportation character units. Key characteristics of the KOP include a complex cityscape comprised of contrasting residential streets dominated by two- or three-story terraced buildings, interspersed with larger blocks of apartment buildings which reach to five stories or more and where buildings are set out in a dense grid pattern along linear streets. Streets run in a northeast/southwest alignment, with industrial uses at the northern end of 20th street creating separation from the East River. Small scale commercial development is present within the interior of these settled areas and is screened from views of the substation by intervening housing. The KOP provides small scale views dominated by urban forms, but with linking views across playing fields to the north. Buildings are softened by street trees that line the sides of 20th Avenue and 35th Street.

Proposed View. The onshore substation facility would not be visible from this KOP and, therefore, would have no impact on the line, form, texture, pattern or character of the cityscape at the KOP.

KOP-NY05 – RALPH DEMARCO PARK

Existing View. This KOP is located on a bicycle path at the northern edge of the park along the western side of Shore Boulevard. The KOP is frequented by recreational receptors and is also representative of views obtained by road users on the boulevard and nearby residential receptors. The KOP is located on the northern boundary of a narrow area of Open Green Space at a confluence of the Light Industrial and Transportation Areas of Lawrence Point, the Urban/Residential/Commercial Areas of Astoria, and the East River Corridor character areas. The landscape has complex variations in form, texture, and pattern, reflecting the different character units evident at the KOP. Rectilinear lines predominate, including those of residential properties to the east of the KOP, and the industrial structures of the Astoria Power Station. The visual context of this KOP is dynamic and changeable in

nature, reflected in the patterns of recreational use and the frequency and number of recreational visitors and road users. The scale of the view from this KOP and views across the East River dominates and forms a crucial aspect of the scenic quality at this KOP, as does the Astoria Generating Station, which dominates views to the north from this KOP. Key characteristics of the KOP include the following:

- This KOP is situated in a low lying, essentially flat area of managed Open Green Space that forms a promenade and vantage point as well as providing a dedicated bicycle path. The park is characterized by open grasslands, extensive tree cover, a network of paths and tracks, vantage points, and street furniture. The waterfront of the park comprises a narrow rocky foreshore; and
- Given the proximity of neighboring character units, the KOP is substantially influenced by the contrasting characters of industrial areas, residential areas, and the river.

Proposed View. The onshore substation facility would be completely screened by intervening buildings and would, therefore, have no effect on the scenic quality or character of this KOP. Based on the analysis conducted in the VIA, the magnitude of impact reported for the selected KOPs was low to medium, despite the proximity of the onshore substation facility site to seascape and landscape character units and visual receptors. Due to the existing industrial and urbanized forms of the cityscape and waterfront at the KOPs, impacts on seascape/landscape character, as well as visual quality would range from low to medium. The onshore substation facility would be consistent in character, form and scale with the urban forms in the immediate vicinity of the NY Project. **Table 4.17-2** presents the contrast ratings for each of the simulated KOPs, and Attachment I-3 of the VIA includes the completed contrast rating sheets for the simulations.

TABLE 4.17-2. SUMMARY OF SEASCAPE AND LANDSCAPE CONTEXT AND VISUAL RESOURCE CONTRAST RATING FOR VISUAL SIMULATIONS FROM ONSHORE KOPS

KOP Number	KOP Name	Borough	Contrast Rating*	
			Seascape & Landscape Context	Visual Resource
NY01	Randall's Island Field 27	Manhattan	3	3
NY02	Randall's Island Field 31	Manhattan	3	3
NY03	Barretto Point Park	Bronx	2	2
NY04	ICYP Youth Program Fields	Queens	0	0
NY05	Ralph Demarco Park	Queens	0	0

*Contrast rating: 0 (No Impact); 1 (Negligible); 2 (Small); 3 (Moderate); 4 (Large); 5 (Very Large); 6 (Substantial)

4.17.3 Summary of Avoidance, Minimization and Mitigation Measures

Based on the assessments described in the VIA, development of the onshore substation facility at the Astoria power complex will result in minimal impacts to nearby visual resources. The proposed onshore substation facility is located in an area already defined by heavy manufacturing and dense urban development. Although the onshore substation facility structures would be visible from a few sensitive receptor locations, the proposed facility would not significantly change the seascape/landscape character or visual quality of the area due to the surrounding industrial and power generation land uses. The appropriate siting of the facility has avoided and minimized adverse visual

impacts. In addition, certain onshore substation facility layout and design options will be considered, with the emphasis of keeping the scale, form, and appearance of structures on site consistent with existing industrial and power station structures nearby to further mitigate any potential adverse visual impacts from the onshore components of the NY Project.

4.18 Land Use

This section addresses the requirements of 16 NYCRR § 86.5 and describes the NY Project's consistency with applicable land use plans, zoning districts, and present and future planned land uses for the onshore portions of the NY Project. Potential impacts to land use resulting from onshore construction and O&M of the NY Project are discussed, as well as proposed measures to avoid, minimize, and/or mitigate potential impacts related to present and future land use.

As the submarine export cables will be located entirely underwater and installed within the seabed, the submarine cables will not conflict with present or future land use and are not discussed further in this section. However, the submarine export cables were evaluated for consistency with New York State coastal management requirements and local land use plans including the New York State CMP and the New York City LWRP (see **Appendix I Coastal Consistency Determination**). A detailed assessment of local ordinances for New York City is included in **Exhibit 7**.

4.18.1 Existing Conditions

This section describes the existing land uses and plans for the onshore portions of the NY Project, including the onshore substation facility, cable landfall, and the onshore export and interconnection cable routes to the POI, referred to hereafter as the "Onshore Project Area."

4.18.1.1 Land Use Studies and Analysis

Existing land uses in the vicinity of the Onshore Project Area were reviewed based on a desktop assessment using aerial imagery, the National Land Cover Dataset (NLCD) (USGS 2019), and Queens County land use and zoning data. Zoning maps were obtained from New York City's Zoning and Land Use Maps. As indicated above, the Applicant also evaluated the NY Project's consistency with New York State Coastal Zone Management requirements and land use plans (see **Appendix I Coastal Consistency Determination**), local comprehensive plans, and the New York City LWRP.

4.18.1.2 Land Use Plans and Policies

A summary and description of the state and local land use plans generally applicable to the Onshore Project Area in Queens County, New York, is provided in **Table 4.18-1**. Discussion of consistency and conformance with state and local land use plans and policies is included in **Section 4.18.2.3**.

TABLE 4.18-1. SUMMARY OF LAND USE PLANS AND POLICIES

Land Use Plans	Land Use Plan Description
State Land Use Plans	
2016 New York State Open Space Conservation Plan	The Open Space Conservation Plan is a comprehensive statewide plan that describes current open space conservation goals, actions, tools, resources, and programs administered by the state and federal agencies and conservation nonprofits. The Plan was developed by NYSDEC and NYSOPRHP in conjunction with regional advisory committees and other state agencies, and its goals include protecting water quality, outdoor recreation, habitat, education, and scenic, historic, and cultural resources. The Plan also identifies priority conservation projects for each of NYSDEC's administrative regionals. Queens County is located within Region 2 and Project #14 (Brooklyn/Queens East River Waterfront) addresses open spaces and greenways along the 20-mi waterfront from Brooklyn Army Terminal to the Astoria Power Station. Project #140 (Statewide Small Project) aims to preserve waterway access.

Land Use Plans	Land Use Plan Description
2015 New York State Energy Plan (New York State Energy Planning Board 2015), updated in 2020.	The State Energy Plan serves as a roadmap to New York's energy policy, Reforming the Energy Vision. It is meant to guide the state's efforts to advance new energy technologies, promote clean energy financing, and modernize energy infrastructure, including offshore wind, for a clean energy economy. The Plan was adopted by the New York State Energy Planning Board and is guided by statutory requirements of Article 6 of the Energy Law. An Amendment to the 2015 State Energy Plan was adopted on April 8, 2020.
New York State Coastal Management Program (NYSDOS 1982)	New York's CMP, run by the NYSDOS, manages the state's coastal resources under the federal Coastal Zone Management Act of 1972. The CMP contains 44 statewide policies to prevent impairment of coastal resources and promote their beneficial use. New York State's Waterfront Revitalization of Coastal Areas and Inland Waterways Act, passed in 1981, enables local communities to adopt their own Local Waterfront Revitalization Programs. The New York City Waterfront Revitalization Program, which provides a refinement of the state coastal policies to reflect considerations specific to New York City, including Queens County, is discussed further below.
Local Land Use Plans	
Offshore Wind NYC: Equitable Opportunity for a Sustainable Future	With NYC committed to 100-percent clean electricity by 2040 and carbon neutrality by 2050, the City recognizes that offshore wind energy is a vital part of the shift to renewable energy. NYC has committed to a $191 million investment in offshore wind energy development over the next 15 years.
One City: Built to Last	One City: Built to Last is NYC's long term strategic plan aimed at transforming buildings for a low-carbon future. To reach an 80 percent reduction of greenhouse gases by 2050, NYC aims to reduce GHG emissions from the energy used to heat, cool, and power NYC buildings by 35 percent by 2025 from 2005 levels.
NYC Local Waterfront Revitalization Program (NYCDEP 2016)	Local governments may participate in New York State's CMP by preparing and adopting an LWRP that has been approved by NYSDOS (pursuant to the New York State Waterfront Revitalization of Coastal Areas and Inland Waterway Act with authorization under the Federal Coastal Zone Management Act). The Program is used to maximize the benefits derived from economic development, environmental conservation, and public use of the waterfront, while promoting activities appropriate to varying waterfront locations. The New York City LWRP is the City's principal Coastal Zone Management tool. This LWRP was first approved by NYSDOS and incorporated into the state's CMP in 1982 and has subsequently undergone multiple updates, with the most recent amendment approved in 2016.
OneNYC 2050: Building a Strong and Fair City (City of New York 2015)	OneNYC is NYC's long-term strategic plan, created under the requirements of Local Law 94 in 2013. The Plan is an extension of the City's previously implemented strategic plan, PlaNYC, which was created under the Bloomberg administration in 2007. OneNYC focuses on environmental sustainability, economic equality, and social justice, and consists of several goals and initiatives that together comprise a strategy to prepare New York City for the future.

Land Use Plans	Land Use Plan Description
New York City Comprehensive Waterfront Plan (NYSDCP 2011)	NYC's Comprehensive Waterfront Plan, released every 10 years, provides guidance on expanding the use of New York City waterfront areas for parks, housing, and economic development and opening up the waterways for transportation, recreation, and natural habitat. The current plan provides citywide policies and site-specific recommendations and is organized into eight specific overarching goals with strategies for achieving them. NYC is in the process of its 10-year update and started public outreach for the waterfront plan in May 2019. Public workshops were held on February 10, 2020, for Queens Bays and on November 10, 2020, for Queens: East River. Draft goals and strategies for the 2030 plan were published in April 2021 (NYCDCP 2021).

4.18.1.3 Existing Land Use

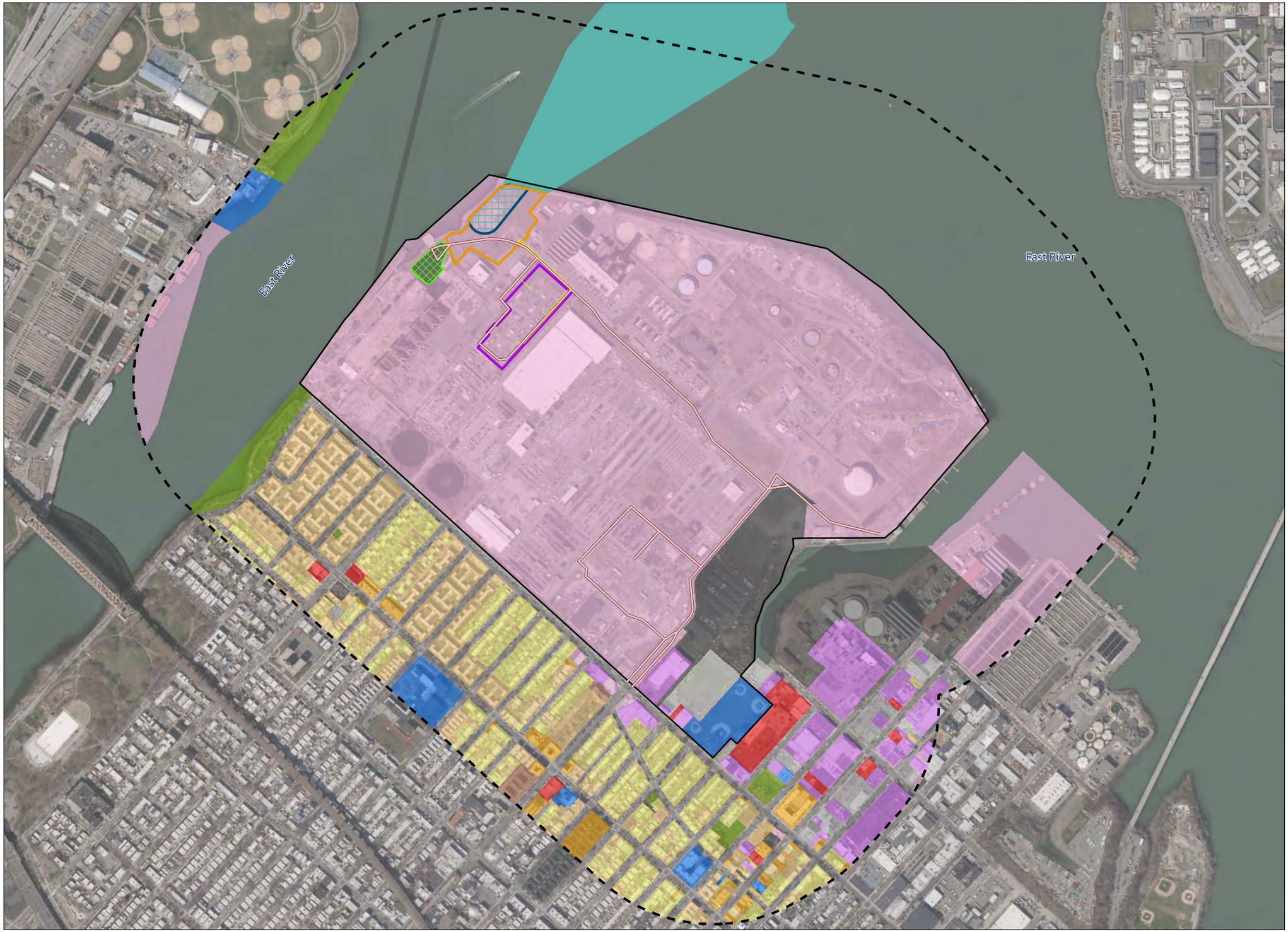
The Onshore Project Area is located in a highly developed urban area of Astoria, Queens County, New York, within the approximately 300 ac (121.4 ha) Astoria power complex site, a privately owned, industrial energy complex which is primarily used for various utility purposes including power generation, indoor storage, oil storage, liquified natural gas storage, vehicle storage and servicing, and office space. This land has been dedicated to utility use for over 100 years. The Astoria power complex is bordered by the East River to the north and west and Luyster Creek to the east. Properties within the Astoria power complex are privately owned, and current landowners include Eastern Power Generating Company, Astoria Generating Company Acquisitions, LLC, NYPA, ConEdison, NRG Energy, Luyster Creek LLC, Prime Storage Astoria, LLC, ASCMA Building Supplies LTD, Kamar 20th Avenue LLC, and TGH Realty LLC.

The onshore substation facility will be sited within a NYPA-owned parcel within the Astoria power complex due its proximity to the existing ConEdison-owned Astoria West 138-kV Substation which offers the NY Project direct interconnection into Zone J of the NYISO transmission network. The NYPA Site, is an approximately 8 ac (3.2 ha) parcel and is bordered by the East River to the north, Astoria Generating Company Acquisitions, LLC properties to the west and east, and ConEdison properties to the south and east.

Land use data available within 0.25 mi (0.4 km) of the Astoria power complex, referred to hereafter as the "0.25-Mi Onshore Study Area," includes the NYC Planning Department's Zoning and Land Use (ZOLA) mapping and the NLCD. The NYC ZOLA mapping indicates that the primary land use within the Astoria power complex is Transportation and Utility. Directly west of Luyster Creek is mapped as vacant land, and a small area to the southwest of Luyster Creek along 20th Avenue is mapped as industrial and manufacturing. Outside of the Astoria power complex, south of 20th Avenue, consists of dense, one- to two-family buildings, multi-family walk-ups, open space and outdoor recreation, and industrial and manufacturing uses (**Figure 4.18-1**).

According to the NLCD, the Onshore Project Area is predominantly classified as "Developed, High Intensity." This area is generally comprised of impervious surfaces with limited natural vegetation. **Section 4.8** provides more detail on land cover types within the Onshore Project Area and NLCD mapping is depicted in **Figure 4.8-2**.

Figure 4.18-1. NYC Land Use in the Vicinity of the Onshore Project Area



Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

New York City Land Use
- One & Two Family Buildings
- Multi-Family Walk-Up Buildings
- Multi-Family Elevator Buildings
- Mixed Residential & Commercial Buildings
- Commercial & Office Buildings
- Industrial & Manufacturing
- Transportation & Utility
- Public Facilities & Institutions
- Open Space & Outdoor Recreation
- Parking Facilities
- Vacant Land
- Other

Project Components
- Access Road
- Submarine Export Cable Route
- Interconnection Cables
- Staging Area
- Astoria West POI
- Onshore Substation Facility
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- 0.25-Mile Onshore Study Area

0 600 1,200 Feet

0 150 300 Meters

equinor EDR

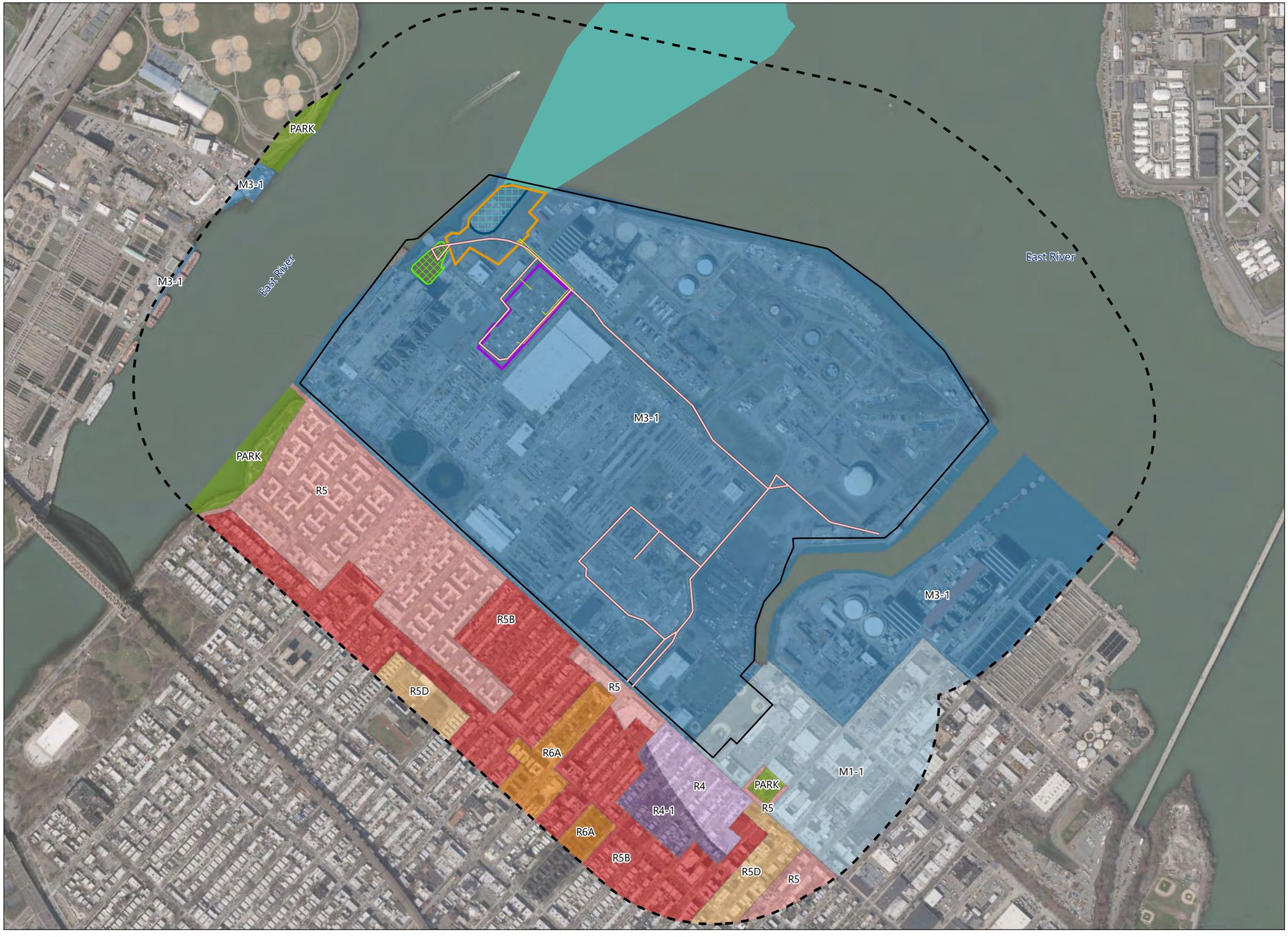
Prepared May 5, 2022
Data Sources: NYC Dept. of City Planning, IT Division.
Basemap: NYSDOP "2020" orthoimagery map service.

4.18.1.4 Zoning Districts

NYC ZOLA mapping within the 0.25-Mi (0.4 km) Onshore Study Area is depicted in **Figure 4.18-2**. The entire Astoria power complex, including the NYPA Site hosting the onshore components, is located within a New York City Zoned Heavy Manufacturing District (M3-1), an M3 district that is zoned specifically for heavy industries including power plants, solid waste transfer facilities and recycling plants, and fuel supply depots. Parcels adjacent to the Astoria power complex are zoned for lighter manufacturing uses (M1-1), three- or four-story residential buildings (R5), and parks (PARK). These districts are described in more detail as follows:

- M3 districts are designated for areas with heavy industries that generate noise, traffic or pollutants. M3 districts are usually located near the waterfront and buffered from residential areas. Typical uses include power plants, solid waste transfer facilities and recycling plants, and fuel supply depots. Electric substations and utilities of any size are permitted as-of-right in M3 districts. In M3 districts, uses with potential nuisance effects are required to conform to minimum performance standards.
- M1 districts are designated for areas with light industries. M1 districts are often buffers between M2 or M3 districts and adjacent residential or commercial districts. M1 districts typically include light industrial uses, such as woodworking shops, repair shops, and wholesale service and storage facilities. Most industrial uses are allowed in M1 districts if they meet the stringent M1 performance standards. Offices, hotels and most retail uses are also permitted. Certain community facilities, such as hospitals, are allowed in M1 districts only by special permit, but houses of worship are allowed as-of-right (i.e., complies with all applicable zoning regulations and does not require any discretionary action by the City Planning Commission or Board of Standards and Appeals).
- R5 districts are for residential uses that are higher density than single-family; the floor area ratio requirement in these districts typically results in the development of three- and four-story attached houses and small apartment buildings.
- PARKS include any park, playground, beach, parkway, or roadway within the jurisdiction and control of the New York City Commissioner. Typically, public parks are not subject to zoning regulations.

Figure 4.18-2. NYC Zoning Districts in the Vicinity of the Onshore Project Area



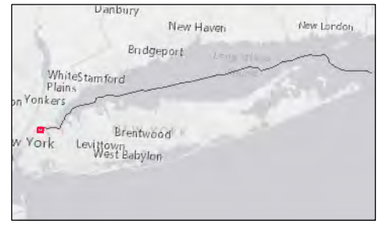
Beacon Wind 1 Project

Long Island Sound, New York

Article VII Application

NYC Zoning Districts
- M1-1
- M3-1
- PARK
- R4
- R4-1
- R5
- R5B
- R5D
- R6A

Project Components
- Access Road
- Submarine Export Cable Route
- Interconnection Cables
- Staging Area
- Astoria West POI
- Onshore Substation Facility
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- 0.25-Mile Onshore Study Area



0 600 1,200 Feet

0 150 300 Meters

equinor EDR

Prepared May 5, 2022
Data Sources: NYC Dept. of Planning, 2021.
Basemap: NYSDOP "2020" orthoimagery map service.

4.18.1.5 Floodplains

Federal Emergency Management Agency data indicate that the Onshore Project Area is situated within SFHAs associated with the East River, including Zones AE and VE (i.e., 1 percent annual chance flood hazard or 100-year flood), and Shaded Zone X (0.2 percent annual chance flood hazard). Floodplains are described in more detail in **Section 4.9** and depicted in **Figure 4.9-2**.

Zoning for Coastal Flood Resiliency is a set of recommendations for a zoning text amendment to foster flood-resistant buildings and incorporate sea level rise in their designs as projected by the New York City Panel on Climate Change. The initiative was designed to improve upon and make permanent zoning provisions that were temporarily adopted in 2013, following Hurricane Sandy, to reduce flood risks in the city's most vulnerable areas. The recommendations include allowing building owners to measure height standards from a higher reference plane to account for future sea level rise projections (NYCDCP 2021). The temporary zoning rules applied to buildings located wholly or partially within the 1-percent-annual-chance floodplain and Zoning for Coastal Flood Resiliency expands the applicability to the 0.2-percent-annual-chance floodplain. The preliminary recommendations were published in 2019. The New York City Department of City Planning completed a Final Environmental Impact Statement in March 2021, and the City Planning Commission approved Zoning for Coastal Flood Resiliency on March 17, 2021. The text amendment went into effect May 12, 2021, upon adoption by the City Council.

4.18.1.6 Agricultural Districts

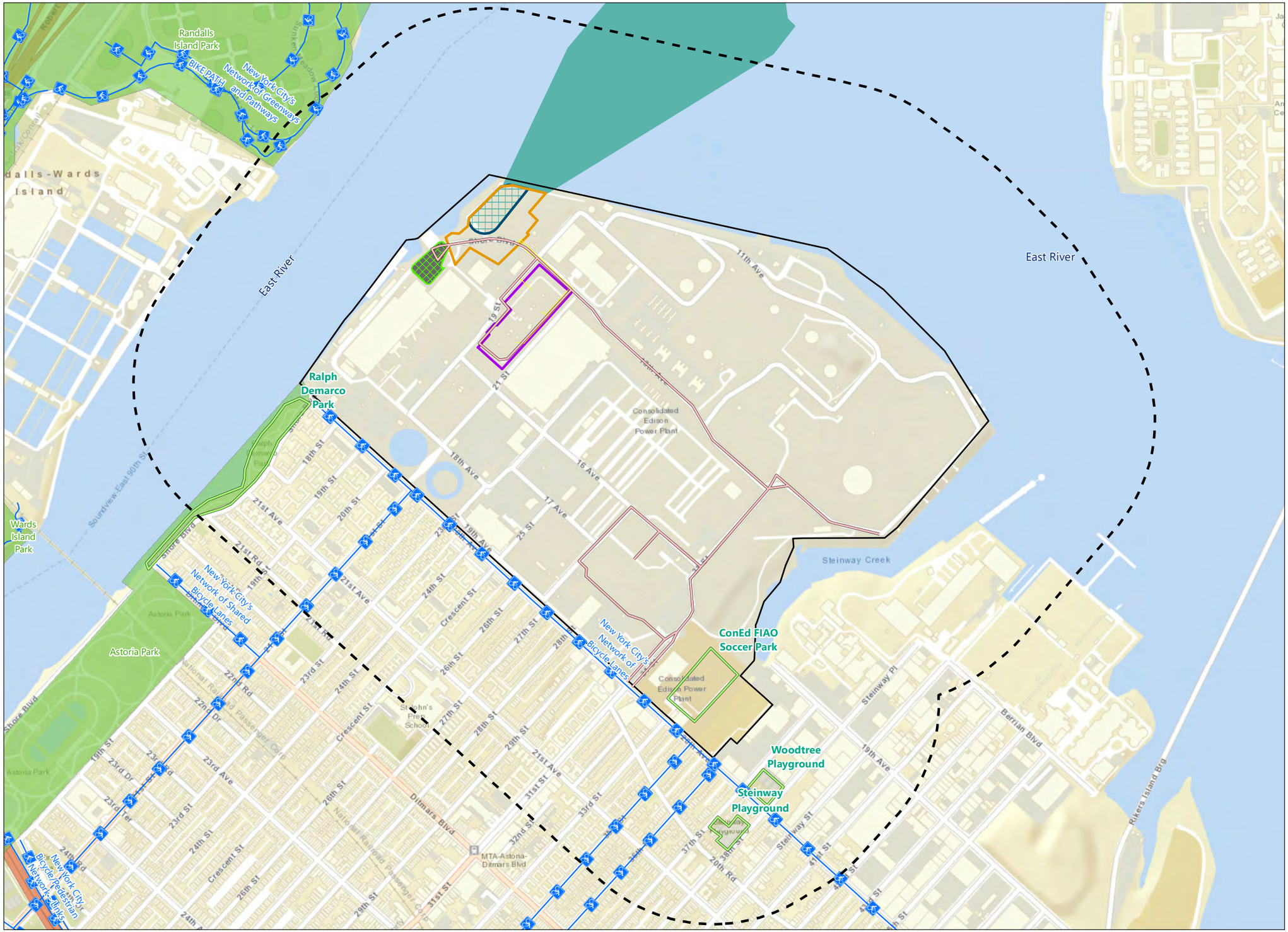
Article 25-AA of the Agriculture and Markets Law authorizes the creation of local agricultural districts to encourage land improvements and use for production of food and other products. The Agricultural Districts Law and the Agricultural and Farmland Protection programs have influenced municipal comprehensive plans and zoning regulations and protect farmers against local laws that may unreasonably restrict farm operations located within an agricultural district. No agricultural districts occur in the vicinity of the Onshore Project Area (Cornell IRIS and NYS Department of Agriculture and Markets 2019).

4.18.1.7 Parks and Recreation Resources

No parks or recreational areas occur within the Onshore Project Area; however, several parks and recreational resources occur within the 0.25-Mi (0.4 km) Onshore Study Area (see **Figure 4.18-3**), including the following:

- ConEdison FIAO Soccer Park;
- Woodtree playground;
- Steinway playground; and
- Ralph Demarco Park.

Figure 4.18-3. Parks and Recreational Resources in the Vicinity of the Onshore Project Area



Beacon Wind 1 Project

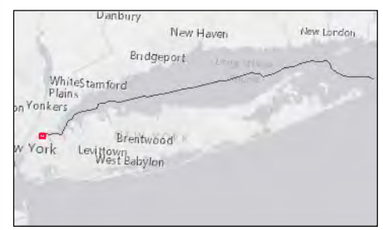
Long Island Sound, New York

Article VII Application

- Bike Route/Path
- Municipal Recreation Area
- Other Recreational Lands

Project Components

- Access Road
- Submarine Export Cable Route
- Interconnection Cables
- Staging Area
- Astoria West POI
- Onshore Substation Facility
- Astoria Power Complex
- Submarine Export Cable Landfall Area
- Onshore Export Cable Route Area (HDD)
- 0.25-Mile Onshore Study Area



0 600 1,200 Feet

0 150 300 Meters

equinor EDR

Prepared May 5, 2022
Data Sources: NYSGIS, NYSDEC, ESRI.
Basemap: Esri ArcGIS Online "World Street Map" map service.

4.18.2 Potential Impacts

The NY Project will not conflict with any current or planned land uses within the 0.25-Mi Study Area and will have no more than a minimal impact on any future planned uses. This section discusses potential land use impacts related to construction and O&M of the NY Project. Measures to avoid, minimize, and/or mitigate these potential impacts are summarized in **Section 4.18.3**.

4.18.2.1 Construction

Construction of the onshore components may result in a short-term increase in construction vehicle traffic and activity, as well as the short-term restrictions due to implementation of safety zones.

Increase in construction vehicle traffic and activity. An increase in NY Project-related construction, support, and workforce vehicle traffic along the onshore export and interconnection cable routes, the onshore substation facility, and construction staging areas is anticipated during construction. However, the onshore cable routes, onshore substation facility, and POI will occur within the gate-controlled Astoria power complex which will minimize the NY Project footprint and potential off-site conflicts. As the Onshore Project Area utilizes existing roads, rights-of-way, and infrastructure, new impacts resulting from construction activities will be minimized to the extent practicable and are anticipated to be similar in nature to other utility installations or road improvement works currently carried out in these locations. This increase in vehicle traffic and activity is expected to be temporary and localized to the active construction sites; therefore, the increased traffic will be consistent with the existing uses.

To further minimize potential construction effects, adjacent landowners will be provided timely information regarding the planned construction activities and schedule, and work will be coordinated with New York State Department of Transportation and New York City authorities. Areas temporarily disturbed during installation of the onshore export and interconnection cables will be restored, where necessary. **Exhibit E-6** includes a more detailed discussion of potential transportation impacts and proposed minimization and mitigation measures.

Implementation of safety zones. Safety zones will also be implemented around all construction activities, restricting public access. All construction activities will occur within the private access-controlled Astoria power complex which will greatly limit exposure of members of the public to construction activities. Since the Onshore Project Area utilizes existing roads, rights-of-way, and infrastructure, new impacts resulting from construction activities will be minimized to the extent practicable. Existing land uses may be restricted by the application of these safety zones; however, these restrictions will only be temporary.

4.18.2.2 Operations and Maintenance

During operations, no impacts are anticipated to land use and zoning, as the onshore export and interconnection cables will be underground and will utilize existing roads, rights-of-way, and infrastructure, to the extent practicable. In addition, as stated previously, the Onshore Project Area is sited within the heavily developed Astoria power complex site which is zoned for heavy industry and primarily comprised of energy infrastructure. Therefore, the onshore substation facility is an allowable use within this zoning district and is consistent with the surrounding existing land uses. With the exception of the onshore substation facility and some minor features of the onshore export and interconnection cables (e.g., link boxes), the onshore cable system will be predominantly located underground. As such, the existing landscape will be preserved. The NY Project is not anticipated to

conflict with present or future planned uses within the Onshore Project Area and will have at most a minimal impact on any future planned uses.

The onshore substation facility will include concrete foundations, gravel lots, fencing, and associated structures in FEMA SFHAs. Changes in elevations and grades and the placement of structures have the potential to impact flood flows and flood storage. However, the onshore substation facility will be designed and constructed in conformance with applicable laws and flood zone management requirements.

4.18.2.3 Compliance with State and Local Plans and Policies

2016 New York State Open Space Conservation Plan

The NY Project will be consistent with the 2016 NYS Open Space Conservation Plan. The onshore components are located entirely within a privately owned site that does not contain public access to the waterfront or park. The Onshore Project Area will not impact public access to State waters or result in any adverse impacts on groundwater or surface water (see **Sections 4.3** and **4.4**).

2015 New York State Energy Plan

In January 2021, NYSERDA chose BW1 as one of two winners of its second competitive offshore wind energy solicitation The BW1 Project will contribute to New York State's achievement of its Climate Leadership and Community Protection Act renewable energy mandates, including the requirements that the state obtain 70 percent of its electricity from renewable sources by 2030 and 100 percent by 2040, and that New York have 9 gigawatts of offshore wind capacity by 2035.

The State Energy Plan contains initiatives designed to help New York State meet its energy goals, including a strong focus on renewable energy. The Plan seeks to encourage the private sector market to provide clean energy solutions to communities and individuals in New York State, create jobs, and drive local economic growth. The NY Project will provide a local source of clean, affordable energy to local communities, and will provide additional economic benefits via short- and long-term job creation and materials purchasing (see **Exhibit 6**). As such, the NY Project is consistent with the State Energy Plan's goals of renewable energy, sustainable and resilient communities, and energy infrastructure.

New York State Coastal Management Program

The New York State Coastal Management Program contains 44 statewide policies to prevent the impairment of coastal resources and promote their beneficial use. The NY Project is consistent with each of these policies as detailed in **Appendix I Coastal Consistency Determination**.

NYC Local Waterfront Revitalization Program

The LWRP defines the City's policies regarding use of the waterfront from a development and recreational perspective and provides a framework for determining the appropriateness of proposed uses. The NY Project is consistent with each of these policies, as detailed in **Appendix I Coastal Consistency Determination**.

OneNYC

The NY Project will be consistent with the goals and initiatives of the OneNYC 2050 long-term strategic plan. OneNYC focuses on environmental sustainability, economic equality, and social justice. The renewable energy provided by the NY Project will directly support Initiative 20: "Achieve carbon neutrality and 100 percent clean electricity." In addition, the economic benefits provided by the NY Project are in alignment with Initiative 22: "Create economic opportunities for all New Yorkers through climate action" and Initiative 5: "Grow the economy with good-paying jobs and prepare New Yorkers to fill them" (see **Exhibit 6**).

NYC Comprehensive Waterfront Plan

The City's current Comprehensive Waterfront Plan includes eight goals for the waterfront area, such as increasing attractiveness and public access, improving wetlands and water quality, supporting economic development, and pursuing resilience to climate change. The Onshore Project Area is located in an industrial area and is aligned with Goal 3: "Support economic development activity on the working waterfront."

Additionally, the NY Project is consistent with the draft goals and strategies published in April 2021, for the upcoming Comprehensive Waterfront Plan under development. In particular, the NY Project directly supports investments in waterfront areas and a twenty-first century working waterfront and promotes long-term climate mitigation by curbing greenhouse gas emissions and providing clean, renewable energy.

4.18.3 Summary of Avoidance, Minimization and Mitigation Measures

The Applicant will implement the following measures to avoid, minimize, and mitigate potential impacts during construction:

- Design the onshore substation facility to address NYSDEC requirements governing the construction within mapped floodplains, including locating above ground structures at base flood elevation plus 2 ft (0.6 m);
- Design the onshore components to address New York City's flood-resistant construction standards;
- Install onshore components within existing rights-of-way and within previously developed areas designated for such uses, to the extent practicable;
- Develop a Traffic Management Plan in coordination with, and approved by, the affected local communities, as applicable;
- Implement security measures to monitor active construction site and properly mark such sites, as deemed necessary; and
- Provide regular updates to the local community through social media, public notices, and/or other appropriate communications tools.

In addition, the following measures will also be implemented to avoid, minimize, and mitigate potential impacts from the long-term presence of structures during O&M:

- Coordinate with appropriate local and municipal agencies, officials, and stakeholders, in consideration of future land development plans;
- Ensure onshore components are properly marked; and
- Restore the Onshore Project Area to conditions consistent with approvals from local authorities and/or property owners, as applicable.

4.19 References

4.2 Physical Oceanographic Conditions References

AECOM. 2020. Geology and Geomorphology. Existing Offshore Conditions for Focus Export Cable Route Area 2 and Lease Area.

Ashley, G.M., Halsey, S.D., and C.B. Buteux. 1986. New Jersey's Longshore Current Pattern. Journal of Coastal Research, 2(4): 453-463.

BOEM. 2013. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts. Revised Environmental Assessment. Office of Renewable Energy Programs. OCS EIS/EA. BOEM 2013-1131.

Burton, W. H. 1993. Effects of bucket dredging on water quality in the Delaware River and the potential for effects on fisheries resources. Versar, Inc., 9200 Rumsey Road, Columbia, Maryland 21045.

Cathie Group. 2021. Beacon Wind Project Export Cable Route Preliminary Study. November 15, 2021.

Elliot, J., K. B. Smith, D. R. Gallien, and A. A. Khan. 2017. Observing Cable Laying and Particle Settlement During the Construction of the Block Island Wind Farm. Bureau of Ocean Energy Management Office of Renewable Energy Programs. OCS Study BOEM 2017-027. March 2017.

ESS Group. 2013. Modelling of Sediment Dispersion during Installation of the Submarine Cable for Poseidon Project. September 2013.

ESS Group, Inc. 2008. Upstate NY Power Corp. Upstate NY Power Transmission Line. Exhibit E-3: Underground Construction Submitted to NYSDEC.

FHWA (Federal Highway Administration). 2012. Tappan Zee Hudson River Crossing Project. Final Environmental Impact Statement. August 2012.

Latham, P., W. Fiore, M. Bauman, and J. Weaver. 2017. Effects Matrix for Evaluating Potential Impacts of Offshore Wind Energy Development on U.S. Atlantic Coastal Habitats. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2017-014.

Luo, Y., L. Rothstein, Q. Liu, S. Zhang. Climatic variability of the circulation in the Rhode Island Sound: A modeling study. Journal of Geophysical Research: Oceans, Vol. 118, 4072-4091, 2013.

Marine Cadastre. 2021. https://marinecadastre/viewers/

New York State Technical and Operational Guidance Series (TOGS) 5.1.9 of the In-Water and Riparian Management of Dredged Material (NYSDEC 2004)

NOAA, 2021. Admiralty Charts New York and Connecticut.

NOAA. 2003. NOAA Technical Memorandum NOS CS 2 – The Residual Circulation in Long Island Sound: Gyral Structure in the Central and Western Basins

NOAA National Oceanographic Data Center World Ocean Atlas 2013 (NOAA 2013)

NOAA National Data Buoy Center assets (NOAA 2019; NOAA 2020a, b, c, d)

NOAA. 2019. Tidal Current Tables 2019 – Atlantic Coast of North America. Available online at: https://tidesandcurrents.noaa.gov/tidetables/2019/acct2019FullBook.pdf

NOAA Tides & Currrents. 2022. New Haven, CT - Station ID: 8465705. Data available online at: https://tidesandcurrents.noaa.gov/stationhome.html?id=8465705

NOAA National Data Buoy Center (https://www.ndbc.noaa.gov/)

NPCC (New York City Panel on Climate Change). 2015. Building the Knowledge Base for Climate Resiliency: New York City Panel on Climate Change 2015 Report. Available online at: https://nyaspubs.onlinelibrary.wiley.com/doi/10.1111/nyas.12591

NYC (New York City). 2020. Climate Resiliency Design Guidelines Version 4.0. Mayor's Office of Recovery and Resiliency. Available online at: https://www1.nyc.gov/assets/orr/pdf/NYC_Climate_Resiliency_Design_Guidelines_v4-0.pdf

Oceanweather Inc. 2018. Global Reanalysis of Ocean waves U.S. East Coast (GROW-FINE EC28km & EC5km) (2008 & 2018).

O'Donnell, James & McCardell, Grant & Horwitz, Rachel & Howard-Strobel, Mary. (2015). Physical Oceanography of Eastern Long Island Sound Region: Sediment Transport. 10.13140/RG.2.1.4885.4648.

OSAMP (Ocean Special Area Management Plan). 2010. Rhode Island Ocean SAMP Project. 2009-2010. Historical data hosted by University of Maine. Available online at: http://gyre.umeoce.maine.edu/GoMoos/php/mooring_file_info.php?report=historical_files. Accessed November 4, 2021.

Poppe, L.J., Cohen-DiGiacomo, M.L., Smith, S.M., and Norfinski, N.A. (2006). Seafloor character and sedimentary processes in eastern Long Island Sound and western Block Island Sound. Published at Geo-Marine Letters.

Poppe, L.J., Williams, S.J, Moser, M.S., Forfinski, N.A., Stewart, H.F., and Doran, E.F. (2008). Quaternary Geology and Sedimentary Processes in the Vicinity of Six Mile Reef, Eastern Long Island Sound. Published at Journal of Coastal Research.

Tetra Tech (Tetra Tech, Inc.). 2015. Virginia Offshore Wind Technology Advancement Project (VOWTAP) Research Activities Plan. Available online at: https://www.boem.gov/VOWTAP-RAP/. Accessed March 8, 2019.

Tetra Tech. 2012. Block Island Wind Farm and Block Island Transmission System Environmental Report/Construction and Operations Plan. Available online at: https://offshorewindhub.org/resource/1385. Accessed December 17, 2019.

United Kingdom Hydrographic Office's (UKHO) "Admiralty Sailing Directions, East Coast of the United States Pilot" (2009).

USACE (United States Army Corps of Engineers). 2015. New York and New Jersey Harbor Deepening Project. Dredge Plume Dynamics in New York/New Jersey Harbor. Summary of Suspended Sediment Plume Surveys Performed During Harbor Deepening. April 2015.

USGS,1997. Physical Processes Affecting the Sedimentary Environments of Long Island Sound. 5th International Conference on Estuarine and Coastal Modelling. Accessed at: https://pubs.usgs.gov/of/1998/of98-502/chapt6/physprop.htm

USGS (United States Geological Survey). 1999 Contaminant Distribution and Accumulation in Sediments of Long Island Sound. USGS Fact Sheet 113-99.

USGS 2012. Sea Floor Stress and Sediment Mobility Database: Middle Atlantic Bight. Accessed at: https://cmgds.marine.usgs.gov/data/whcmsc/data-release/doi-P999PY84/MiddleAtlanticBight/index.html

Vinhateiro, C., C. Galagan, D. Crowley, and T. Isaji. 2013. Results from modelling of sediment dispersion during installation of the proposed West Point Transmission Project power cable. ASA Project 2013–003. Final Report June 2013. Prepared for ESS Group, Inc.

Peterson, T. U. 2014. Scour around Offshore Wind Turbine Foundations. Technical University of Denmark. Department of Mechanical Engineering.

Whitehouse, Richard J. S, J. M. Harris, J. Sutherland, and J. Rees. 2011. The Nature of Scour Development and Scour Protection at Offshore Windfarm Foundations. Marine Pollution Bulletin. 62(1), 73-88.

4.3 Water and Sediment Quality References

BOEM (Bureau of Ocean Energy Management). 2021. Vineyard Wind Offshore Wind Energy Project Final Environmental Impact Statement. OCS EIS/EA BOEM 2021-0012. March 2021.

Burton, W. H. 1993. Effects of bucket dredging on water quality in the Delaware River and the potential for effects on fisheries resources. Versar, Inc., 9200 Rumsey Road, Columbia, Maryland 21045.

CT DEEP (Connecticut Department of Energy and Environmental Protection), Interstate Environmental Commission (IEC), and United States Environmental Protection Agency (EPA). 2019. 2019 Long Island Sound Hypoxia Season Review. Available online at: https://longislandsoundstudy.net/wp-content/uploads/2017/12/FINAL_2019-Combined-Report_april2020-1-revised.pdf.

Elliot, J., K. B. Smith, D. R. Gallien, and A. A. Khan. 2017. Observing Cable Laying and Particle Settlement During the Construction of the Block Island Wind Farm. Bureau of Ocean Energy Management Office of Renewable Energy Programs. OCS Study BOEM 2017-027. March 2017.

EPA. 2021. National Coastal Condition Assessment 2020. Quality Assurance Project Plan. Version 1.2. February 2021. Available online at: https://www.epa.gov/system/files/documents/2021-09/ncca-2020-qapp-version-1.2_20210324.pdf. Accessed November 4, 2021.

EPA. 2015a. National Coastal Condition Assessment 2010. Office of Water and Office of Research and Development. EPA 841-R-15-006. Washington, DC. December 2015. Available online at: https://www.epa.gov/national-aquatic-resource-surveys/ncca. Accessed June 14, 2020.

EPA. 2015b. Physical and Chemical Properties of Sediments Eastern Long Island Sound. Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Site(s) in Eastern Long Island Sound, Connecticut and New York. Available online at: https://www.epa.gov/sites/default/files/2016-04/documents/elis_dseis_appendix_g_-_physical_and_chemical_properties_of_sediments_in_eastern_long_island_sound.pdf.

EPA. 2012. Gowanus Canal Superfund Site Kings County, New York Superfund Proposed Plan. December 2012. Report 160890.EPA. 2012b. National Coastal Condition Report IV. Office of Research and Development/Office of Water. EPA-842-R-10-003. April 2012.

EPA. 2004. National Coastal Condition Report II. EPA/620/R-03/002. December 2004. Available online at: https://www.epa.gov/sites/production/files/2014-10/documents/nccriicomplete.pdf.

ESS Group. 2013. Modelling of Sediment Dispersion during Installation of the Submarine Cable for Poseidon Project. September 2013.

FHWA (Federal Highway Administration). 2012. Tappan Zee Hudson River Crossing Project. Final Environmental Impact Statement. August 2012.

Harris, John M., R. J. S. Whitehouse, and J. Sutherland. 2011. Marine scour and offshore wind – lessons learnt and future challenges. Proceedings of the AMSE 2011 20th International Conference

of Ocean, Offshore and Arctic Engineering, OMAE2011, June 19-24, 2011, Rotterdam, The Netherlands.

HEP (Harbor Estuary Program). 2012. The State of the Estuary 2012: Environmental Health and Trends of the New York-New Jersey Harbor Estuary.

HEP. 2011. Harbor-Wide Water Quality Monitoring Report for the New York-New Jersey Harbor Estuary. June 2011. In partnership with New Jersey Harbor Dischargers Group and New York City Department of Environmental Protection.

Latham, P., W. Fiore, M. Bauman, and J. Weaver. 2017. Effects Matrix for Evaluating Potential Impacts of Offshore Wind Energy Development on U.S. Atlantic Coastal Habitats. Final Report to the

LISS (Long Island Sound Study). 2022. Available online at: https://longislandsoundstudy.net/about-the-sound/by-the-numbers/

LISS 2021a. Ecosystem Targets and Supporting Indicators – Sediment Quality Improvement. Available online at: https://longislandsoundstudy.net/ecosystem-target-indicators/sediment-quality-improvement/. Accessed November 4, 2021.

LISS. 2021b. Ecosystem Targets and Supporting Indicators - Extent of Hypoxia. Available online at: https://longislandsoundstudy.net/ecosystem-target-indicators/lis-hypoxia/. Accessed May 28, 2021.

NYCDEP (New York City Department of Environmental Protection). 2018. 2018 New York Harbor Water Quality Report. Available online at: https://www1.nyc.gov/assets/dep/downloads/pdf/water/nyc-waterways/harbor-water-quality-report/2018-new-york-harbor-water-quality-report.pdf.

NYSDEC. 2014. Long Island Resiliency and Clean Water Infrastructure. New York State and Stony Brook University.

Peterson, T. U. 2014. Scour around Offshore Wind Turbine Foundations. Technical University of Denmark. Department of Mechanical Engineering.

Ramboll. 2021. Final Coastal Processes Report. Massachusetts Wind Energy Lease Area OCS-A-0520.

Steinberg, N., D. J. Suszkowski, L. Clark, and J. Way. 2004. Health of the Harbor: The first comprehensive look at the state of the NY/NJ Harbor Estuary. A report to the NY/NJ Harbor Estuary Program. Hudson River Foundation, New York, NY.

Temple, J. van der, M. B. Zaaijer, and H. Subroto. 2004. The Effects of Scour of the Design of Offshore Wind Turbines. Delft University of Technology, the Netherlands.

USACE (United States Army Corps of Engineers). 2015. New York and New Jersey Harbor Deepening Project. Dredge Plume Dynamics in New York/New Jersey Harbor. Summary of Suspended Sediment Plume Surveys Performed During Harbor Deepening. April 2015.

USACE and The Port Authority of New York and New Jersey (PANYNJ). 2016. Hudson-Raritan Estuary Comprehensive Restoration Plan. Volume 1. Version 1. June 2016. In partnership with the New York – New Jersey Harbor Estuary Program.

USGS (United States Geological Survey). 1999 Contaminant Distribution and Accumulation in Sediments of Long Island Sound. USGS Fact Sheet 113-99.

Whitehouse, Richard J. S, J. M. Harris, J. Sutherland, and J. Rees. 2011. The Nature of Scour Development and Scour Protection at Offshore Windfarm Foundations. *Marine Pollution Bulletin*. 62(1), 73-88.

4.4 Air Quality References

American Legal Publishing. 2022. The Rules of the City of New York. Available online at: https://codelibrary.amlegal.com/codes/newyorkcity/latest/NYCrules/0-0-0-1. Accessed January 7, 2022.

Environmental Protection Agency (EPA). n.d. Fact Sheet: New Source Review (NSR). Available online at: https://www.epa.gov/sites/default/files/2015-12/documents/nsrbasicsfactsheet103106.pdf. Accessed January 18, 2022.

EPA. 2020a. "Frequent Questions about General Conformity." Last updated October 7, 2020. Available online at: https://www.epa.gov/general-conformity/frequent-questions-about-general-conformity. Accessed January 7, 2022.

EPA. 2020b. What are Hazardous Air Pollutants? Last updated February 3, 2020. Available online at: https://www.epa.gov/haps/what-are-hazardous-air-pollutants. Accessed January 7, 2022.

EPA. 2020c. Health and Environmental Effects of Hazardous Air Pollutants Last updated February 3, 2020. Available online at: https://www.epa.gov/haps/health-and-environmental-effects-hazardous-air-pollutants. Accessed January 7, 2022.

EPA. 2021a. NAAQS Table. Last updated February 10, 2021. Available online at: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed January 7, 2022.

EPA. 2021b. What is Ozone? Last updated June 16, 2021. Available online at: https://www.epa.gov/ozone-pollution-and-your-patients-health/what-ozone. Accessed January 3, 2022.

EPA. 2021c. Clean Air Act Permitting for Greenhouse Gases. Available online at: https://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases. Accessed January 18, 2022.

EPA. 2021d. New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines. Available online at: https://www.epa.gov/stationary-engines/new-source-performance-standards-stationary-compression-ignition-internal-0. Accessed January 18, 2022.

EPA. 2021e. Green Book National Area and County-Level Multi-Pollutant Information. Available online at: https://www.epa.gov/green-book/green-book-national-area-and-county-level-multi-pollutant-information. Accessed August 6, 2021.

New York City Administrative Code (NYCAC). 2022. NYC Administrative Code. Available online at: https://nycadmincode.readthedocs.io/index.html. Accessed January 7, 2022.

NYC Planning. 2021. Zoning Resolution. Available online at: https://zr.planning.nyc.gov/. Accessed January 7, 2022.

New York State Department of Environmental Conservation (NYSDEC). 2020. Chapter III-Air Resources. Available online at: https://www.dec.ny.gov/regs/2492.html. Accessed January 7, 2022.

NYSDEC. 2021. 2021 Annual Monitoring Network Plan. NYSDEC – Bureau of Air Quality Surveillance, Division of Air Resources. Available online at: https://www.dec.ny.gov/docs/air_pdf/2021plan.pdf. Accessed January 7, 2022.

NYSERDA (New York State Energy Research and Development Authority). 2019. "New York State Greenhouse Gas Inventory: 1990-2016." NYSERDA in collaboration with NYSDEC. Published July 2019. Available for download at: https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Energy-Statistics. Accessed January 7, 2022.

4.5 Acoustics References

American National Standards Institute (ANSI). 2014. ANSI/ASA Standard S1.4-2014: American National Standard Specification for Sound Level Meters.

Cowan, J.P. 1994. Handbook of Environmental Acoustics. New York: Wiley.

Edison Electrical Institute. 1984. Electric Power Plant Environmental Noise Guide, 2nd Edition.

Federal Highway Administration (FHWA). 2006. FHWA Roadway Construction Noise Model User's Guide, Final Report. Report No. FHWA-HEP-05-054, Washington, DC: Federal Highway Administration.

Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. Report No. 123, Washington, DC: Federal Transit Administration.

Harris, C.M. 1998. Handbook of Acoustical Measurements and Noise Control, Third Edition, New York: McGraw-Hill.

International Organization for Standardization (ISO). 2016. ISO 1996-1:2016. Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures.

ISO. 2017. ISO 1996-2:2017. Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of sound pressure levels.

New York Department of Environmental Conservation (NYSDEC). 2001. Assessing and Mitigating Noise Impacts.

NYSDPS (New York State Department of Public Service). 2020. General Recommendations for Applications for Substations, Stations, and Converter Stations under Article VII

Simmonds, M., S. Dolman, and L. Weilgart. 2004. Oceans of Noise – A WDCS Science Report.

Wahlberg, Magnus. 2008. Contribution of Biological Sound Sources to Underwater Ambient Noise Levels. Bioacoustics. 17:1-3, 30-32, doi: 10.1080/09524622.2008.9753754.

Wartsila. 2012. Confidential Radiator Noise Data Sheet W20V32-34DF-34SG. Document DBAC307180 Revision A.

4.6 EMF

Chulliat, A., W. Brown, P. Alken, C. Beggan, M. Nair, G. Cox, A. Woods, S. Macmillan, B. Meyer, and M. Paniccia. 2020. The US/UK World magnetic model for 2020-2025: Technical report. National Oceanic and Atmospheric Administration, National Centers for Environmental Information. doi: 10.25923/ytk1-yx35.

ICNIRP. 2010. ICNIRP guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz). Health Physics. 99:818-836. Available at: https://doi.org/10.1097/hp.0b013e3181f06c86. International Commission on Non-ionizing Radiation Protection.

ICES. 2019. IEEE standard for safety levels with respect to human exposure to electromagnetic fields, 0 to 300 GHz. IEEE Std C95.1-2019 (Revision of IEEE Std C95.1-2005/Incorporates IEEE Std C95.1-2019/Cor 1-2019). Available at: https://standards.ieee.org/standard/C95_1-2019.html. International Committee on Electromagnetic Safety, Piscataway, NJ.

NYPSC. 1990. Statement of interim policy on magnetic fields of major electrical transmission facilities. Cases 26529 and 26559 – Proceedings on Motion of the Commission to Regulations Regarding Electric and Magnetic Field Standards for Transmission Lines. New York Public Service Commission, NY. September.

4.7 Onshore Topography, Geology, Soils, and Groundwater References

Bryce, S.A., G.E. Griffith, J. M. Omernik, G. Edinger, S. Indrick, O. Vargas, and D. Carlson. 2010. Ecoregions of New York (color poster with map, descriptive text, summary tables, and photographs): USGS, Reston, Virginia.

Garrison, L.E. and RL McMaster. 1966. Sediments and Geomorphology of the Continental Shelf Off Southern New England. Marine Geology, 4(4): 273-289.

Needell, S.W. and RS Lewis. 1984. Geology of Block Island Sound, Rhode Island and New York. U.S. Geological Survey Miscellaneous Field Studies Map MF-1621.

National Conservation Training Center. 2021. Geomorphic Provinces and Sections of the New York Bight Watershed. Available online at: https://nctc.fws.gov/pubs5/web_link/text/geolsect.htm. Accessed June 28, 2021.

Natural Resources Conservation Service (NRCS, United States Department of Agriculture). 2021. Web Soil Survey. Available online at the following link: http://websoilsurvey.sc.egov.usda.gov/. Accessed July 26, 2021.

Poppe, L.J., KY McMullen, SJ Williams, and VF Paskevich, eds., 2014, USGS east-coast sediment analysis: Procedures, database, and GIS data (ver. 3.0, November 2014): U.S. Geological Survey Open-File Report 2005-1001, http://pubs.usgs.gov/of/2005/1001/.

Siegel, J., B Dugan, D Lizarralde, M Person, W DeFoor, and N Miller. 2012. Geophysical evidence of a late Pleistocene glaciation and paleo-ice stream on the Atlantic Continental Shelf offshore Massachusetts, USA. Marine Geology, 303, 63-74.

The Nature Conservancy (TNC). 2010. Seabed Forms. Raster digital data. http://portal.midatlanticocean.org/static/data_manager/metadata/html/seabed_form.html

Soren, J. 1978. Subsurface geology and paleogeography of Queens County, Long Island, New York, Water Resources Investigations 77-34. U.S. Geological Survey In cooperation with the New York State Department of Environmental Conservation.

USGS. 2014. U.S. Geological Survey East Coast Sediment Texture Database. https://woodshole.er.usgs.gov/project-pages/sediment/data/gis_data/ecstdb14/ecstdb2014.html

USGS. 2018. Seismic Hazard Map of State of New York. 2014a. Retrieved July 2021 from https://www.usgs.gov/media/images/2014-seismic-hazard-map-new-york

USGS. 2021. Mineral Resources Online Spatial Data. Accessed June 28, 2021. Available online at: https://mrdata.usgs.gov/#geologic-data

4.8 Terrestrial Vegetation and Wildlife References

ERM. 2021. Environmental Resource Mapper. Available online at: https://gisservices.dec.ny.gov/gis/erm/. Accessed August 10, 2021.

NYSDEC. 2014. New York State Prohibited and Regulated Invasive Plants. Available online at: https://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf. Accessed August 27, 2021.

NYSDEC. 2021. 2020 Half-Foot 4 Band Long Island Zone NYC Aerial Ortho-Photography. Accessed August 24, 2021. Available online at: https://orthos.dhses.ny.gov/.

NYSDEC. 2021a. New York Nature Explorer. Available online at: https://www.dec.ny.gov/natureexplorer/app/location/county. Accessed August 10, 2021.

NYSDEC. 2021b. Request Natural Heritage Information for Project Screening. Available online at: https://www.dec.ny.gov/animals/31181.html#How. Accessed August 24, 2021.

USGS. 2019. National Land Cover Database. Available online at: https://www.mrlc.gov/data. Accessed August 24, 2021.

4.9 Wetland and Waterbodies References

Brown, S., S. Latham, D. Goetke, N. Heaslip, T. Kerpez, K. Kogut, S. Sanford, D. Spada. 1995. New York State Freshwater Wetlands Delineation Manual. July 1995.

Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U. S. Department of the Interior, Fish and Wildlife Service FWS/OBS-79/31. Washington, D.C. 131 pp.

FEMA. 2021a. Federal Emergency Management Agency. Features of flood insurance rate maps in coastal areas. Accessed August 2, 2021. Available URL: https://www.fema.gov/flood-maps/coastal/insurance-rate-maps.

FEMA. 2021b. FEMA Flood Map Service Center. Available URL: https://msc.fema.gov/portal/advance Search. Accessed August 5, 2021.

NRCS. 2021. Web Soil Survey Report. Available URL: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed July 30, 2021.

NYSDEC. 2005. Tidal Wetlands - NYC and Long Island - 1974 (NYSDEC). Available URL: https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1139. Accessed August 5, 2021

NYSDEC. 2013. Index of New York State Regulatory Freshwater Wetlands – Queens and Bronx Counties. Available URL: https://cugir.library.cornell.edu/catalog/cugir-008187. Accessed August 5, 2021.

NYSDEC. 2019. Waterbody Inventory / Priority Waterbodies List. Available URL: https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1117. Accessed August 5, 2021.

NYSDEC. 2021. Tidal Wetland Categories. Available URL: https://www.dec.ny.gov/lands/5120.html. Accessed July 30, 2021.

USACE. 1987. Corps of Engineers Wetlands Delineation Manual. Environmental Laboratory U.S. Army Corps of Engineers, Waterways Experiment Station, Wetlands Research Program Technical Report Y-87-1. Vicksburg, MS. USACE. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands: An Interagency Cooperative Publication.

USACE. 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. Version 2.0. ERDC/EL TR-12-1. January 2012.

USFWS. 2021. U.S. Fish and Wildlife Service, National Wetlands Inventory - Version 2 - Surface Waters and Wetlands Inventory. Available URL: https://www.fws.gov/wetlands/Data/Mapper.html. Accessed August 5, 2021.

USGS. 2021. National Hydrography Dataset (NHD) - USGS National Map Downloadable Data Collection. Available URL: https://www.usgs.gov/core-science-systems/ngp/national-hydrography/access-national-hydrography-products. Accessed August 5, 2021.

4.10 Avian Species References

Audubon New York. 2022. Where to See Bald Eagles in New York. Available online at: https://ny.audubon.org/news/where-see-bald-eagles-new-york. Accessed January 28, 2022.

Benson, J. 2019. Blue Plan. Published in Connecticut State of the Birds – An Improved Long Island Sound Faces Unpredictable Change. Available online at: https://www.ctaudubon.org/wp-content/uploads/2020/01/CTAUDUBON_StateOftheBirds2019.pdf. Accessed January 17, 2021.

Burger J., C Gordon, J Lawrence, J Newman, G Forcey, and L Vlietstra. 2011. Risk evaluation for Federally listed (Roseate Tern, Piping Plover) or candidate (Red Knot) bird species in offshore waters: A first step for managing the potential impacts of wind facility development on the Atlantic Outer Continental Shelf. Renewable Energy. 36:338-351.

eBird. 2022a. New York State Breeding Bird Atlas III. Cornell Lab of Ornithology, Ithaca, New York. Available at: https://ebird.org/atlasny (Accessed January 2022).

eBird. 2022b. Hotspots. Cornell Lab of Ornithology, Ithaca, New York. Available at: https://ebird.org/hotspots (Accessed January 2022).

Environment Canada. 2015. Best Practices for Stranded Birds Encountered Offshore Atlantic Canada. Available online at: https://www.cnlopb.ca/wp-content/uploads/mg3/strandbird.pdf. Accessed January 31, 2022.

Fox, A.D. and IK Peterson. 2019. Offshore Wind Farms and Their Effects on Birds. Dansk Orn. Foren Tidsskr. 113: 86-101.

Gjerdrum, C, RA Ronconi, KL Turner, and TE Hamer. 2021. Bird strandings and bright lights at coastal and offshore industrial sites in Atlantic Canada." Avian Conservation and Ecology. 16(1):22. https://doi.org/10.5751/ACE-01860-160122.

Hutchison ZL, P Sigray, H He, A.B. Gill, J King, and C Gibson. 2018. Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables. U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-003. Available at: https://espis.boem.gov/final%20reports/5659.pdf. Accessed January 27, 2022.

Loring, P.H., P.W.C. Paton, J.D. McLaren, H. Bai, R. Janaswamy, H.F. Goyert, C.R. Griffin, and P.R. Sievert. 2019. Tracking Offshore Occurrence of Common Terns, Endangered Roseate Terns, and Threatened Piping Plovers with VHF Arrays. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2019-017. 140 p. Accessed January 27, 2022.

National Audubon Society. 2022a. The Christmas Bird Count Historical Results. Available at: https://www.audubon.org/conservation/science/christmas-bird-count (Accessed January 2022).

National Audubon Society. 2022b. Important Bird Areas – New York. Available online at: https://www.audubon.org/important-bird-areas/state/new-york. Accessed January 17, 2022.

New York City (NYC) Audubon. 2020. Migratory Shorebirds. Available online at: https://www.nycaudubon.org/our-work/conservation/birds-of-ny-harbor/migratory-shorebirds. Accessed January 13, 2022.

New York Natural Heritage Program (NYNHP). 2022. Online Conservation Guide. Available from: https://guides.nynhp.org/common-tern/. Accessed January 14, 2022.

New York State Department of Environmental Conservation (NYSDEC). 2014. Species Status Assessment – Red Knot. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnredknot.pdf. Accessed January 13, 2022.

NYSDEC. 2017. Species Assessment – Piping Plover. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnpipplover.pdf. Accessed January 14, 2022.

NYSDEC. 2018. 2018 Long Island Colonial Waterbird and Piping Plover Update. Available online at: https://www.hudsonriver.org/wp-content/uploads/2017/11/Jennings_NYSDEC-Region1_LI-Update_2018.pdf. Accessed January 14, 2022.

NYSDEC. 2022a. Black Tern. Available online at: https://www.dec.ny.gov/animals/60683.html. Accessed January 28, 2022.

NYSDEC. 2022b. Common Tern. Available online at: https://www.dec.ny.gov/animals/7100.html. Accessed January 14, 2022.

NYSDEC. 2022c. Pied-Billed Grebe. Available online at: https://www.dec.ny.gov/animals/85203.html. Accessed January 28, 2022.

NYSDEC. 2022d. Bald Eagle. Available online at: https://www.dec.ny.gov/animals/74052.html. Accessed January 28, 2022.

NYSDEC. 2022e. Piping Plover. Available online at: https://www.dec.ny.gov/animals/7086.html. Accessed January 14, 2022.

NYSDEC. 2022f. Roseate Tern. Available online at: https://www.dec.ny.gov/animals/7084.html. Accessed January 13, 2022.

NYSDEC. 2022g. Loggerhead Shrike. Available online at: https://www.dec.ny.gov/animals/7092.html. Accessed January 28, 2022.

NYSDEC. 2022h. Northern Harrier. Available online at: https://www.dec.ny.gov/animals/7090.html. Accessed January 28, 2022.

NYSDEC. 2022i. Peregrine Falcon. Available online at: https://www.dec.ny.gov/animals/7294.html. Accessed January 14, 2022.

NYSDEC. 2022j. Peregrine Falcon Program. Available online at: https://www.dec.ny.gov/animals/7059.html. Accessed January 14, 2022.

NYSDEC. 2022k. Sedge Wren. Available online at: https://www.dec.ny.gov/animals/59556.html. Accessed January 28, 2022.

NYSDEC. 2022l. Short-eared Owl. Available online at: https://www.dec.ny.gov/animals/7080.htm. Accessed January 28, 2022.

New York State Department of State (NYSDOS). 2022. Significant Coastal Fish and Wildlife Habitat. Available online at: https://dos.ny.gov/significant-coastal-fish-wildlife-habitats. Accessed March 15, 2022.

O'Brian B. 2016. Enriching Habitat for Roseate Terns in the Northeast. USFWS. Available online at: https://www.fws.gov/refuges/refugeupdate/JanFeb_2016/roseate_terns.html. January 13, 2022.

Save the Sound. 2012. Audubon Connecticut: Partnering to Protect Connecticut's Coastal Birds. Available online at: https://www.savethesound.org/2012/07/13/audubon-connecticut-partnering-to-protect-connecticuts-coastal-birds/. Accessed January 28, 2022.

Schwemmer, P., B Mendel, N Sonntag, V Dierschke, and S Garthe. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications. 21: 1851–1860.

Silber E. 2015. Flock Together – The Cutest Things at 693 Feet. Published by the Audubon Society. Available online at: https://www.audubon.org/news/the-cutest-things-693-feet. Accessed January 14, 2022.

Taormina B, N Quillien, M Lejart, A Carlier, N Desroy, M Laurans, J-F D'Eu, M Reynaud, Y Perignon, H Erussard, et.al. 2021 Characterisation of the potential impacts of subsea power cables associated with offshore renewable energy projects. Plouzané: France Energies Marines Editions, 2020. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Taormina-et-al-2021-Impacts-of-Subsea-Power-Cables.pdf. Accessed January 31, 2022.

Tavares, A. 2019. If fish are Healthy and Plentiful, so are the Birds. Published in Connecticut State of the Birds – An improved Long Island Sound Faces Unpredictable Change. Published by The Connecticut Audubon Society. Available online at: https://www.ctaudubon.org/wp-content/uploads/2020/01/CTAUDUBON_StateOftheBirds2019.pdf. Accessed January 7, 2022.

The Cornell Lab. 2022. All About Birds. Available Online at: https://www.allaboutbirds.org/news/. Accessed January 28, 2022.

Woodruff DL, IR Schultz, KE Marshall, JA Ward, VI Cullinan. 2012. Effects of Electromagnetic Fields on Fish and Invertebrates, Task 2.1.3: Effects on Aquatic Organisms Fiscal Year 2011 Progress Report. Prepared for U.S. Department of Energy. Richland, Washington: Pacific Northwest National Laboratory.

Woodruff DL, IR Schultz, KE Marshall, JA Ward, VI Cullinan. 2013. Effects of Electromagnetic Fields on Fish and Invertebrates, Task 2.1.3: Effects on Aquatic Organisms, Fiscal Year 2012 Progress Report. PNNL-22154. Prepared for U.S. Department of Energy. Richland, Washington: Pacific Northwest National Laboratory.

4.11 Bat Species References

Adams MD and JP Hayes. 2000. Use of Bridges as Night Roosts by Bats in the Oregon Coast Range. Journal of Mammalogy. 81(2): 402-407.

AECOM. 2022. Offshore Bat Survey Report. Attached as Appendix Q to the Beacon Wind Project Construction and Operations Plan.

Bailey LA, RM Brigham, SJ Bohn, JG Boyles, B Smit. 2019. An experimental test of the allotonic frequency hypothesis to isolate the effects of light pollution on bat prey selection. Oecologia 190(2):367–74.

Biodiversity Works. 2016. "Northern Long-eared Bats." Available online at: http://biodiversityworksmv.org/our-projects/northern-long-eared-bats/. Accessed February 1, 2022.

Bureau of Ocean Energy Management (BOEM). 2014. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment. OCS EIS/EA BOEM 2014-603. U.S. Department of the Interior. June 2014. Available online at: https://www.boem.gov/Revised-MA-EA-2014/. Accessed December 6, 2021.

Brack V, JO Whitaker, and SE Pruitt. 2004. Bats of Hoosier National Forest. Proceedings of the Indiana Academy of Science. 113(1): 76-86.

Broders HG and GJ Forbes. 2004. Interspecific and intersexual variation in roost-site selection of northern long-eared and little brown bats in the Greater Fundy National Park ecosystem. The Journal of Wildlife Management. 68:602-610.

Brooks RT and WM Ford. 2005. Bat activity in a forest landscape of central Massachusetts. Northeastern Naturalist. 12: 447-462.

Bunkley JP, CJ McClure, NJ Kleist, CD Francis, JR Barber. 2015. Anthropogenic noise alters bat activity levels and echolocation calls. Global Ecology and Conservation 3:62–71.

Cravens ZM, JG Boyles. 2019. Illuminating the physiological implications of artificial light on an insectivorous bat community. Oecologia 189(1):69–77.

Cryan PM. 2003. Seasonal Distribution of Migratory Tree Bats (Lasiurus and Lasionycteris) in North America. Journal of Mammalogy, 84(2):579–593.

Cryan, PM and AC Brown. 2007. Migration of bats past a remote island offers clues toward the problem of bat fatalities at wind turbines. Biological Conservation. 139: 1-11. Available online at: https://doi.org/10.1016/j.biocon.2007.05.019.

Dowling Z, PR Sievert, E Baldwin, L Johnson, S von Oettingen, and J Reichard. 2017. Flight Activity and Offshore Movements of Nano-Tagged Bats on Martha's Vineyard, MA. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, Virginia. OCS Study BOEM 2017-054. Available online at:

https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/Flight-Activity-and-Offshore-Movements-of-Nano-Tagged-Bats-on-Martha%27s-Vineyard%2C-MA.pdf. Accessed February 1, 2022.

Fleming TH. 2019. Bat Migration. Encyclopedia of Animal Behavior 2(3): 605-610.

Grady FV and SL Olson. 2006. Fossil bats from quaternary deposits on Bermuda (chiroptera: vespertilionidae). Journal of Mammalogy. 87: 148-152. Available online at: https://doi.org/10.1644/05-MAMM-A-179R1.1.

Griffin D. 1945. Travels of banded cave bats. Journal of Mammalogy. 26:15-23.

Haddock JK, CG Threlfall, B Law, DF Hochuli. 2019. Light pollution at the urban forest edge negatively impacts insectivorous bats. Biological Conservation 236:17–28.

Hale JD, A.J. Fairbrass, TJ Matthews, G Davies, and JP Sadler. 2015. The Ecological Impact of City Lighting Scenarios: Exploring Gap Crossing Thresholds for Urban Bats. Global Change Biology. 21: 2467-2478.

Harvey MJ, JS Altenbach, and TL Best. 2011. Bats of the United States and Canada. Baltimore: The Johns Hopkins University Press.

Hatch SK, EE Connelly, TJ Divoll, IJ Stenhouse, and KA Williams. 2013. Offshore observations of eastern red bats (Lasiurus borealis) in the mid-Atlantic United States using multiple survey methods. PLoS ONE. 8:1–8. Available online at: https://doi.org/10.1371/journal.pone.0083803.

International Bat Conservation. 1991. How North America. Volume 9, Issue 3. Available online at: https://www.batcon.org/article/how-north-america/. Accessed February 1, 2022.

Johnson, J. B., J. E. Gates, and N. P. Zegre. 2011. Monitoring seasonal bat activity on a coastal barrier island in Maryland, USA. Environmental Monitoring and Assessment. 173: 1-4. Available online at: https//doi.org/10.1007/s10661-010-1415-6.

Menzel MA, SF Owen, WM Ford, JW Edwards, PB Wood, BR Chapman, and KV Miller. 2002. Roost tree selection by northern long-eared bat (Myotis septentrionalis) maternity colonies in an industrial forest of the central Appalachian Mountains. Forest Ecology and Management. 155: 107-114. Available online at: http://dx.doi.org/10.1016/S0378-1127(01)00551-5.

Nicholls B and PA Racey. 2007. Bats Avoid Radar Installations: Could Electromagnetic Fields Deter Bats from Colliding with Wind Turbines? PLOS ONE. 2: e297. Available online at: https://doi.org/10.1371/journal.pone/0000297.

Nicholls B and PA Racey. 2009. The Aversive Effect of Electromagnetic Radiation on Foraging Bats – A Possible Means of Discouraging Bats from Approaching Wind Turbines. PLOS ONE. 4: e6246. Available online at: https://doi.org/10.1371/journal.pone.0006246.

New York Natural Heritage Program (NYNHP). 2022. Online Conservation Guide for Myotis sodalis. Available online at: https://guides.nynhp.org/indiana-bat/. Accessed January 13, 2022.

New York State Department of Environmental Conservation (NYSDEC). 2017. Species Status Assessment. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnindiansmyotis.pdf. Accessed January 13, 2022.

Pelletier S, K Omland, K Watrous, T Peterson. 2013. Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities – Final Report. U.S. Dept of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, VA. OCS Study BOEM 2013-01163. 119 pp. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/BOEM_Bat_Wind_2013.pdf.

Peterson TS, SK Pelletier, SA Boyden, and KS Watrous. 2014. Offshore Acoustic Monitoring of Bats in the Gulf of Maine. Northeastern Naturalist. 21: 86-107.

Russo D, F Cosentino, F Festa, F De Benedetta, B Pejic, P Cerretti, L Ancillotto. 2019. Artificial illumination near rivers may alter bat-insect trophic interactions. Environmental Pollution 252:1671–7.

Rydell J. 1992. Exploitation of Insects Around Streetlamps by Bats in Sweden. Functional Ecology. 6(6): 744-750.

Schimpp SA, H Li, MC Kalcounis-Rueppell. 2018. Determining species specific nightly bat activity in sites with varying urban intensity. Urban Ecosystems 21(3):541–550.

Schoeman M. 2015. Light Pollution at Stadiums Favors Urban Exploiters. Animal Conservation. 19(2): 120-130.

Silvis A, R Perry and W Ford. 2016. “Relationships of Three Species of Bats Impacted by White-Nose Syndrome to Forest Condition and Management.” Available online at: http://www.treesearch.fs.fed.us/pubs/download/52250.pdf. Accessed February 1, 2022.

Sjollema AL, JE Gates, RH Hildebrand, and J Sherwell. 2014. Offshore Activity of Bats Along the Mid-Atlantic Coast. Northeastern Naturalist. 21: 154–163.

Stegemann E and A Hicks. 2008. Bats of New York. NYSDEC. Available online at: https://www.dec.ny.gov/docs/administration_pdf/batsofny.pdf. Accessed January 12, 2022.

Stone EL, S Harris, G Jones. 2015. Impacts of artificial lighting on bats: a review of challenges and solutions. Mammalian Biology 80(3):213–9.

Stone EL, G Jones, S Harris. 2009. Street lighting disturbs commuting bats. Current Biology 19:1123–1127.

Svedlow A.B., L Gilpatrick, B Agius, M Andrews, and P Myers. 2012. Pre-construction Avian and Bat Assessment: 2009-2011. Block Island Wind Farm, Rhode Island State Waters. Prepared for Deepwater Wind, LLC. Providence, Rhode Island.

Tetra Tech, Inc. 2002. Biological Assessment: Effects to Indiana Bat from Ongoing and Anticipated Future Military Activities – Draft. Available at: https://training.fws.gov/courses/csp/csp3152/resources/army_national_guard/Camp%20Atterbury/01_ba_and_correspondance.pdf. Accessed January 21, 2022.

United States Fish and Wildlife Service (USFWS). 2016. "Final 4(d) rule for northern long-eared bat." Federal Register. 81: 1900-1922.

USFWS. 2018. Indiana Bat Project Review Fact Sheet. Available online at: https://www.fws.gov/northeast/nyfo/es/Ibat_fact_Sheet_March_2018.pdf. Accessed January 13, 2022.

Voigt CC, M Roeleke, L Marggraf, G Pētersons, SL Voigt-Heucke. 2017. Migratory bats respond to artificial green light with positive phototaxis. PLoS ONE 12(5):e0177748.

Voigt CC, K Rehnig, O Lindecke, G Pētersons. 2018. Migratory bats are attracted by red light but not by warm-white light: Implications for the protection of nocturnal migrants. Ecology and Evolution 8(18):9353–61.

Whitaker JO Jr. 1998. Life history and roost switching in six summer colonies of eastern pipistrelles in buildings. Journal of Mammalogy 79(2):651–9.

Whitaker JO Jr., DW Sparks, V Brack Jr. 2004. Bats of the Indianapolis International Airport Area, 1991 – 2001. Proceedings of the Indiana Academy of Science. 113(2): 151-161.

White-Nose Syndrome Response Team (WNSRT). 2021. "What is White-nose Syndrome?" Available online at: https://www.whitenosesyndrome.org/static-page/what-is-white-nose-syndrome. Accessed February 1, 2022.

Wildlife NYC. 2022. Bats. Available online at: https://www1.nyc.gov/site/wildlifenyc/animals/bats.page. Accessed January 12, 2022.

4.12 Fisheries and Benthic Resources References

Adams PB. 1980. Life history patterns in marine fishes and their consequences for management. NOAA – Fisheries Bulletin. 78(1).

Adams TP, RG Miller, D Aleynik, and MT Burrows. 2014. Offshore marine renewable energy devices as stepping stones across biogeographical boundaries. Journal of Applied Ecology. 51(2): 330-338.

Anderson M, and N Frohling. 2015. The Long Island Sound Ecological Assessment. The Nature Conservancy. Available Online at: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/marine/namera/lis/Pages/default.aspx. Accessed February 18, 2022.

Andersson, M. H., S. Andersson, J. Ahlsén, B. L. Andersson, J. Hammar, L. K. G. Persson, J. Pihl, P. Sigray, and A. Wikström. 2017. A framework for regulating underwater noise during pile driving. A technical Vindval report. Stockholm, Sweden, Swedish Environmental Protection Agency.

Applied Science Associates, Inc (ASA). 2008. Results from Modeling of Sediment Dispersion during Installation of the Proposed Bayonne Energy Center Submarine Cable. Narragansett (RI): ASA Project 2007-025. http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=28172. Accessed March 1, 2022.

Atlantic States Marine Fisheries Commission (ASMFC). 2009 Atlantic Coast Diadromous Fish Habitat: A Review of Utilization, Threats, Recommendations for Conservation, and Research Needs. Available online at: http://www.asmfc.org/files/Habitat/HMS9_Diadromous_Habitat_2009.pdf. Accessed March 14, 2022.

ASMFC. 2017. 2017 Atlantic Sturgeon Benchmark Stock Assessment and Peer Review Report: Available online at: https://www.asmfc.org/uploads/file/59f8d5ebAtlSturgeonBenchmarkStockAssmt_PeerReviewReport_2017.pdf. Accessed March 1, 2022.

Auster PJ, J Lindholm, S Schaub, G Funnell, LS Kaufman, and PC Valentine. 2003. Use of sand wave habitats by silver hake. Journal of Fish Biology. 62(1): 143-152.

Babbs I, C Conroy, N Govert, C Schneeberger, O Walton, P Aster, R Zajac. 2021. Preliminary Map Products from an Ecological Characterization of Eastern Long Island Sound and Fishers Island Sound Regions: Long Island Sound Cable Fund Phase II Survey Area. Available Online at: https://lismap.uconn.edu/products/. Accessed March 1, 2022.

Battista T. 2015. Discussion. Section 2.5, p. 37 in: “Seafloor Mapping of Long Island Sound – Final Report: Phase 1 Pilot Project.” (Unpublished project report). U. S. Environmental Protection Agency, Long Island Sound Study, Stamford, CT.

Bergstrom L, F Sundqvist, and U Bergstrom. 2013. Effects of an offshore wind farm on temporal and spatial patterns in the demersal fish community. Marine Ecology Progress Series. 485: 199-210.

Blumberg A and D Pritchard. 1997. Estimates of the Transport Though the East River, New York. Journal of Geophysical Research. 102(C3): 5685-5703.

Brooks RA, Bell SS, Purdy CN, Sulak KJ. 2004. The benthic community of offshore sand banks: a literature synopsis of the benthic fauna resources in potential MMS OCS sand mining areas.

Gainesville (FL): USGS Florida Integrated Science Center, Center for Aquatic Resource Studies. USGS Scientific Investigation Report No. 2004-5198.

Brooks RA., CN Purdy, SS Bell, and KJ Sulak. 2006. The benthic community of the eastern US continental shelf: A literature synopsis of benthic faunal resources. Continental Shelf Research. 26(6): 804-818.

Bureau of Ocean Energy Management (BOEM). 2015. Virginia Offshore Wind Technology Advancement Project on the Atlantic Outer Continental Shelf Offshore Virginia Revised Environmental Assessment: 239.

BOEM. 2019. Vineyard Wind Offshore Wind Energy Project Essential Fish Habitat Assessment. Available online at: https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Vineyard-Wind/Vineyard_EFH_2019_04_19_Final_posted.pdf. Accessed March 1, 2022.

BOEM. 2020. Vineyard Wind 1 Offshore Wind Energy Project Supplement to the Draft Environmental Impact Statement. OCS EIS/EA BOEM 2020-025.

BOEM. 2021. South Fork Wind Farm and South Fork Export Cable Project Draft Environmental Impact Statement. Sterling (VA): BOEM; OCS EIS/EA BOEM 2020-057.

Brooks, R. A., C. N. Purdy, S. S. Bell, and K. J. Sulak. 2006. The benthic community of the eastern US continental shelf: A literature synopsis of benthic faunal resources. Continental Shelf Research. 26(6): 804-818.

Buehler PE, R Oestman, J Reyff, K Pommerenck, and B. Mitchell. 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. California Department of Transportation, Division of Environmental Analysis. CTHWANP-RT-15-306.1.1.

Cargnelli, LM, SJ Griesbach, DB Packer, and E Weissberger. 1999. Essential Fish Habitat Source Document: Atlantic Surfclam, Spisula solidissima, Life History and Habitat Characteristics. Woods Hole, Massachusetts: 22 pages.

Casper BM, TJ Carlson, MB Halvorsen, and A.N. Popper. 2016. Effects of Impulsive Pile-Driving Exposure on Fishes. The Effects of Noise on Aquatic Life II. A. N. Popper and A. Hawkins. New York, NY, Springer New York: 125-132.

Charifi, M., M. Sow, P. Ciret, S. Benomar, and J. C. Massabuau. 2017. The sense of hearing in the Pacific oyster, Magallana gigas. PLOS ONE. 12(10): 19.

Clarke DG and DH Wilbur. 2000. Assessment of potential impacts of dredging operations due to sediment resuspension. DOER Technical Notes Collection (ERDC TN-DOER-E9). Vicksburg, Mississippi, U.S. Army Engineer Research and Development Center.

Connecticut Department of Energy and Environmental Protection (CT DEEP). 2019a. Long Island Sound Blue Plan (LISBP). Available online at: https://portal.ct.gov/DEEP/Coastal-Resources/LIS-Blue-Plan/Long-Island-Sound-Blue-Plan-Home. Accessed March 3, 2022.

CT DEEP. 2019b. 2019 Long Island Sound Trawl Survey. Available online at: https://portal.ct.gov/DEEP/Fishing/Fisheries-Management/Long-Island-Sound-Trawl-Survey. Accessed March 1, 2022.

CSA Ocean Sciences Inc. and Exponent. 2019. Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Sterling, VA. OCS Study BOEM 2019-049. 59 pp.

Day, R. D., R. D. McCauley, Q. P. Fitzgibbon, K. Hartmann, and J. M. Semmens. 2017. Exposure to seismic air gun signals causes physiological harm and alters behavior in the scallop Pecten fumatus. Proceedings of the National Academy of Sciences of the United States of America. 114(40): E8537-E8546.

de Soto NA. 2016. Peer-Reviewed Studies on the Effects of Anthropogenic Noise on Marine Invertebrates: From Scallop Larvae to Giant Squid. Effects of Noise on Aquatic Life II. A. N. Popper and A. Hawkins. Berlin, Springer-Verlag Berlin. 875: 17-26.

Edmonds, N. J., C. J. Firmin, D. Goldsmith, R. C. Faulkner, and D. T. Wood. 2016. A review of crustacean sensitivity to high amplitude underwater noise: Data needs for effective risk assessment in relation to UK commercial species. Marine Pollution Bulletin. 108(1-2): 5-11.

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

Environmental Protection Agency (EPA). 2004. National Coastal Condition Report II. EPA/620/R-03/002. Available online at: https://www.epa.gov/sites/production/files/2014-10/documents/nccriicomplete.pdf. Accessed March 4, 2022.

Gill A.B. and M Descender. 2020. Chapter 5: Risk to Animals from Electromagnetic Fields Emitted by Electric Cables and Marine Renewable Energy Devices. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/OES-Environmental-2020-State-of-the-Science-Ch-5_final_hr.pdf. Accessed March 2, 2022.

Goldberg, R., R. Mercaldo-Allen, J. M. Rose, P. Clark, C. Kuropat, S. Meseck, and J. Pereira. 2012. Effects of hydraulic shellfish dredging on the ecology of a cultivated clam bed. Aquaculture Environment Interactions 3(1): 11-21. Available online at: https://www.int-res.com/articles/aei2013/3/q003p011.pdf.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, E. Estela-Gomez. 2017. Habitat Mapping and Assessment of Northeast Wind Energy Areas. Sterling, VA: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. 312 p.

Hallenbeck TR, RG Kvitek, and J Lindholm. 2012. Rippled scour depressions add ecologically significant heterogeneity to soft-bottom habitats on the continental shelf. Marine Ecology Progress Series. 468: 119-133.

Hawkins A.D. and A.N. Popper. 2016. A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates. ICES Journal of Marine Science. 1-17.

Hawkins A.D. and A.N. Popper. 2018. Directional hearing and sound source localization by fishes. Journal of the Acoustical Society of America .144(6): 3329-3350.

Hiddink, J.G., S. Jennings, M. Sciberras, C.L. Szostek, K.M. Hughes, N. Ellis, A.D. Rijnsdorp, R.A. McConnaughey, T. Mazor, R. Hilborn, J.S. Collie, C.R. Pitcher, R.O. Amoroso, A.M. Parma, P. Suuronen, and M.J. Kaiser. 2017. Global analysis of depletion and recovery of seabed biota after bottom trawling disturbance. Proceedings of the National Academy of Sciences of the United States of America 114(31): 8301-8306. Available online at: https://doi.org/10.1073/pnas.1618858114.

Hunters Point Parks Conservancy. 2020. Explore the East River. Available online at: https://www.hunterspointparks.org/hppc-blog/2020/7/10/learn-about-the-east-river. Accessed March 1, 2022.

Hutchison ZL, P Sigray, H He, A.B. Gill, J King, and C Gibson. 2018. Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-003.

Iafrate, J. D., S. L. Watwood, E. A. Reyier, M. Gilchrest, and S. E. Crocker. 2016. Residency of Reef Fish During Pile Driving Within a Shallow Pierside Environment. Effects of Noise on Aquatic Life II. A. N. Popper and A. Hawkins. New York, NY, Springer New York. 875: 479-487.

Johnson A. 2018. The Effects of Turbidity and Suspended Sediments on ESA-Listed Species from Projects Occurring in the Greater Atlantic Region. Greater Atlantic Region Policy Series 18-02. NOAA Fisheries Greater Atlantic Regional Fisheries Office.

Kaiser MJ and JG Hiddink. 2007. Food subsidies from fisheries to continental shelf benthic scavengers. Marine Ecology Progress Series. 350, 267-276. doi:10.3354/meps07194.

Kjelland ME, CM Woodley, TM Swannack, DL Smith. 2015. A review of the potential effects of suspended sediment on fishes: potential dredging-related physiological, behavioral, and transgenerational implications. Environmental Systems and Decisions 35:334–350. DOI 10.1007/s10669-015-9557-2.

Knebel HJ and LJ Poppe. 2000. Sea-floor environments within Long Island Sound: A regional overview. Journal of Coastal Research. 16: 533-550.

Kuykendall KM, EN Powell, JM Klinck, PT Moreno, and RT Leaf. 2019. The effect of abundance changes on a management strategy evaluation for the Atlantic surfclam (Spisula solidissima) using a spatially explicit, vessel-based fisheries model. Ocean and Coastal Management. 169: 68-85.

Kraus C and L Carter. 2018. Seabed recovery following protective burial of subsea cables - Observations from the continental margin. Ocean Engineering. 157: 251-261.

Lamont – Doherty Earth Observatory Collaborative, Long Island Sound Mapping and Research Collaborative, and NOAA's Ocean Service Collaborative. 2015. Seafloor Mapping of Long Island Sound – Final Report: Phase I Pilot Project. Available online at: https://longislandsoundstudy.net/wp-content/uploads/2010/02/LISCF_PilotMappingProject_Report_Final_June2015-reduced-file-size.pdf. Accessed February 28, 2022.

Lock, M. C. and D. B. Packer. 2004. Essential Fish Habitat Source Document: Silver Hake, Merluccius bilinearis, Life History and Habitat Characteristics Second Edition. Woods Hole, Massachusetts: 78.

Long Island Sound Cable Fund Steering Committee. 2015. Seafloor Mapping of Long Island Sound – Final Report: Phase 1 Pilot Project. U. S. Environmental Protection Agency Long Island Sound

Study, Stamford, CT. Available Online at: https://lismap.uconn.edu/products/. Accessed March 1, 2022.

Long Island Sound Study (LISS). 2010. Inside the Long Island Sound Food Web. Available at: https://longislandsoundstudy.net/2010/03/inside-the-long-island-sound-food-web/. Accessed March 4, 2022.

LISS. 2020. How Deep is the Sound? Available online at: https://longislandsoundstudy.net/2020/02/how-deep-is-the-sound/. Accessed March 3, 2022.

LISS. 2021. Open Water: Drifters and Swimmers. Available online at: https://longislandsoundstudy.net/wp-content/uploads/2021/06/8_LivingTreasures2021_Open_Water_LoRes.pdf. Accessed March 3, 2022.

LISS. 2022a. What Makes Long Island Sound Special? Available online at: https://longislandsoundstudy.net/about-the-sound/what-makes-it-special/. Accessed February 28, 2022.

LISS. 2022b. Eelgrass Extent. Available online at: https://longislandsoundstudy.net/ecosystem-target-indicators/eelgrass-extent. Accessed March 1, 2022.

LISS. 2022c. Game Fish. Available online at: https://longislandsoundstudy.net/ecosystem-target-indicators/game-fish/. Accessed March 4, 2022.

McMullen KY, LJ Poppe, WW Danforth, DS Blackwood, JD Schaer, KA Glomb, and EF Doran. 2012. Sea-floor geology of Long Island Sound north of Duck Pond Point, New York Open-File Report 2011-1149.

Munroe, D. M., D. Haidvogel, J. C. Caracappa, J. M. Klinck, E. N. Powell, E. E. Hofmann, B. V. Shank, and D. R. Hart. 2018. Modeling larval dispersal and connectivity for Atlantic sea scallop (Placopecten magellanicus) in the Middle Atlantic Bight. Fisheries Research. 208: 7-15.

NOAA Fisheries. 2010. Biological Assessment of Shortnose Sturgeon (Acipenser brevirostrum). Available online at: https://repository.library.noaa.gov/view/noaa/17811. Accessed March 2, 2022.

NOAA Fisheries. 2015. Endangered Species Section 7 Consultation: Biological Opinion: Deepwater Wind: Block Island Wind Farm and Transmission System: NER-2015-12248.

NOAA Fisheries. 2019. Resilient New England Coral Is Teaching Us About the Future of Reefs. Available online at: https://www.fisheries.noaa.gov/feature-story/resilient-new-england-coral-teaching-us-about-future-reefs. Accessed March 1, 2022.

NOAA Fisheries. 2021a. Ecology of the Northeast US Continental Shelf. Available online at: https://apps-nefsc.fisheries.noaa.gov/nefsc/ecosystem-ecology/zooplankton.html. Accessed March 4, 2022.

NOAA Fisheries. 2021b. Juvenile Fish Communities Are in Transition on a Long Island Sound Reef. NOAA Fisheries. Available online at: https://www.fisheries.noaa.gov/feature-story/juvenile-fish-communities-are-transition-long-island-sound-reef. Accessed March 1, 2022.

NOAA Fisheries. 2021c. Essential Fish Habitat – Data Inventory. Available Online at: https://www.habitat.noaa.gov/application/efhinventory/index.html. Accessed March 2, 2022.

NOAA Fisheries. 2021d. Essential Fish Habitat. Available online at: https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat. Accessed March 2, 2022.

NOAA Fisheries. 2022a. Species Directory. Available online at: https://www.fisheries.noaa.gov/species-directory. Accessed March 2, 2022.

NOAA Fisheries. 2022b. Section 7 Species Presence Table: Atlantic Sturgeon in the Greater Atlantic Region. Available online at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-presence-table-atlantic-sturgeon-greater. Accessed March 2, 2022.

NOAA Fisheries. 2022c. New York Bight Distinct Population Segment of Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) 5-Year Review: Summary and Evaluation. Available online at: https://www.fisheries.noaa.gov/resource/document/new-york-bight-distinct-population-segment-atlantic-sturgeon-5-year-review. Accessed March 2, 2022.

NOAA Fisheries. 2022d. Section 7 Species Presence Table: Shortnose Sturgeon in the Greater Atlantic Region. Available online at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-presence-table-shortnose-sturgeon-greater. Accessed March 2, 2022.

NOAA Fisheries. 2022e. Essential Fish Habitat Mapper. Available Online at: https://www.habitat.noaa.gov/apps/efhmapper/. Accessed March 2, 2022.

NOAA. 2019. ESA Section 7 Mapper. Available online at: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=1bc332edc5204e03b250ac11f9914a27. Accessed March 1, 2022.

NOAA. 2021. What are pelagic fish? Available online at: https://oceanservice.noaa.gov/facts/pelagic.html. Accessed March 1, 2022.

NOAA. 2022. Milford Lab's GoPro Aquaculture Project. NOAA Fisheries. Available online at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/aquaculture/milford-labs-gopro-aquaculture-project#preliminary-results. Accessed February 25, 2022.

New York City (NYC). 2019. Final Environmental Impact Statement – East Side Coastal Resiliency (ESCR) Project. Available online at: https://www1.nyc.gov/site/escr/about/environmental-review.page. Accessed February 24, 2022.

New York State Department of Environmental Conservation (NYSDEC). 2014. Species Status Assessment. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnshortnosesturg.pdf. Accessed March 14, 2022.

NYSDEC. 2020. Final Supplementary Generic Environmental Impact Statement for New York State Department of Environmental Conservation Artificial Reef Program. Available online at: https://www.dec.ny.gov/docs/fish_marine_pdf/dmrreeffsgeis.pdf. Accessed February 18, 2022.

NYSDEC. 2022. Shellfish Closures. Available online at: https://www.dec.ny.gov/outdoor/103483.html. Accessed March 2, 2022.

New York State Energy Research and Development Authority (NYSERDA). 2017. New York State Offshore Wind Master Plan: Fish and Fisheries Study Final Report: 202 pages.

Normandeau, Exponent, T. Tricas, and A. Gill. 2011. Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2011-09.

Normandeau. 2014. Understanding the Habitat Value and Function of Shoal/Ridge/Trough Complexes to Fish and Fisheries on the Atlantic and Gulf of Mexico Outer Continental Shelf: Draft Literature Synthesis for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management.

Northeast Ocean Data. 2017. Shellfish Management Area. Available online at: https://www.northeastoceandata.org/data-explorer/?aquaculture|aquaculture-and-shellfish. Accessed March 2, 2022.

Northeast Ocean Data. 2018. Commercial Fishing. Available online at: https://www.northeastoceandata.org/data-explorer/?commercial-fishing|vessel-activity. Accessed March 2, 2022.

Northeast Ocean Data. 2019. Aquaculture. Available online at: https://www.northeastoceandata.org/data-explorer/?aquaculture|aquaculture-and-shellfish. Accessed March 2, 2022.

Park PJ, C Girgenti, I Del Bello, C Tobitsch, D Gorsen, K Stanner, D Van Horn, K Wilding, L Gonzalez, J Wu, J Adams, E Reeve, M Bender, C Bowser, M Turrin, and T Lake. 2020. New York City East River Fish Species Inventory and Emergence of a Unique Fish Community Science Network. Urban Naturalist, 38:1-27. Available online at: https://www.eaglehill.us/urna-pdfs-regular/urna-038-Park.pdf. Accessed March 1, 2022.

Patten VP, JY Li, GH Wikfors. 2012. A Student's Guide to Phytoplankton of Long Island Sound. Available online at: https://seagrant.uconn.edu/2012/03/29/a-students-guide-to-the-phytoplankton-of-long-island-sound/. Accessed March 4, 2022.

Patten PV, M Moore, E O'Muin. 2009. Sound Facts. Connecticut Sea Grant. Available online at: https://seagrant.uconn.edu/wp-content/uploads/sites/1985/2020/09/SoundFactsFinal.2009.pdf. Accessed March 1, 2022.

Pellegrino P and W Hubbard. 1983. Baseline Shellfish Data for the Assessment of Potential Environmental Impacts Associated with Energy Activities in Connecticut's Coastal Zone. Volumes I II. Report to the State of Connecticut, Department of Agriculture, Aquaculture Division, Hartford, Connecticut.

Pineda J, JA Hare, and S Sponaugle. 2007. Larval Transport and Dispersal in the Coastal Ocean and Consequences for Population Connectivity. Oceanography. 20(3): 22-39. doi:doi.org/10.5670/oceanog.2007.27.

Popper A.N. and MC Hastings. 2009. The effects of anthropogenic sources of sound on fishes. Journal of Fish Biology. 75(3): 455-489.

Popper A.N., A.D. Hawkins, RR Fay, DA Mann, S Bartol, TJ Carlson, S Coombs, WT Ellison, RL Gentry, MB Halvorsen, S Lokkeborg, PH Rogers, B.L. Southall, DG Zeddies, and WN Tavolga. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. New York: 16.

Popper AN and A Hawkins. 2016. The Effects of Noise on Aquatic Life II: Advances in Experimental Medicine and Biology. New York, Springer.

Ramsay K, MJ Kaiser, PG Moore, and RN Hughes. 1997. Consumption of fisheries discards by benthic scavengers: utilization of energy subsidies in different marine habitats. Journal of Animal Ecology. 66(6): 884-896. doi:10.2307/6004.

Reid N, A.B. Frame, and AF Draxler. 1979. Environmental Baselines in Long Island Sound, 1972-1973. NOAA Technical Report NMFS SSRF-738.

Roberts L and M Elliott. 2017. Good or bad vibrations? Impacts of anthropogenic vibration on the marine epibenthos. Science of The Total Environment. 595: 255-268.

Roberts, L., H. R. Harding, I. Voellmy, R. Bruintjes, S. D. Simpson, A.N. Radford, T. Breithaupt, and M. Elliott. 2016. Exposure of benthic invertebrates to sediment vibration: From laboratory experiments to outdoor simulated pile-driving. Proceedings of Meetings on Acoustics: Fourth International Conference on the Effects of Noise on Aquatic Life. 27: 1-10.

Roberts L, HR Harding, I Voellmy, R Bruintjes, SD Simpson, A.N. Radford, T Breithaupt, and M Elliott. 2016. Exposure of benthic invertebrates to sediment vibration: From laboratory experiments to outdoor simulated pile-driving. Proceedings of Meetings on Acoustics: Fourth International Conference on the Effects of Noise on Aquatic Life. 27: 1-10.

Sabatini M. 2007. Spisula solida: A surf clam. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [online]. Plymouth: Marine Biological Association of the United Kingdom. [cited 08-07-2019]. Available online at: https://www.marlin.ac.uk/species/detail/2030. Accessed March 1, 2022.

Sciberras M, JG Hiddink, S Jennings, CL Szostek, KM Hughes, B Kneafsey, and MJ Kaiser. 2018. Response of benthic fauna to experimental bottom fishing: A global meta-analysis. Fish and Fisheries. 19(4): 698-715. doi:10.1111/faf.12283.

Smalling, K. L., A. D. Deshpande, H. S. Galbraith, B. L. Sharack, D. Timmons and R. J. Baker. 2016. Regional assessment of persistent organic pollutants in resident mussels from New Jersey and New York estuaries following Hurricane Sandy. Marine Pollution Bulletin. 107(2): 432-441. Available online at: https://doi.org/10.1016/j.marpolbul.2016.02.077

Solé M, M Lenoir, JM Fortuno, M van der Schaar, and M Andre. 2018. A critical period of susceptibility to sound in the sensory cells of cephalopod hatchlings. Biology Open. 7(10): 13. doi:10.1242/bio.033860.

Stefaniak L, P Auster, I Babb. 2014. Loss of an erect sponge on a rock reef in Long Island Sound (north-west Atlantic). Marine Biodiversity Records. 7(115): 1-6. Available online at: https://lismap.uconn.edu/wp-content/uploads/sites/2333/2019/01/Stefaniak-et-al_sponge-loss-at-LIS-rock-reef_MBR-2014.pdf. Accessed March 1, 2022.

Swanson R, C Parker, M Meyer, M Champ. 1983. Is the East River, New York as River or Long Island an Island? International Hydrographic Review. 60(1). Available online at: https://journals.lib.unb.ca/index.php/ihr/article/view/23538/27311/. Accessed February 28, 2022.

Taormina B, N Quillien, M Lejart, A Carlier, N Desroy, M Laurans, J-F D'Eu, M Reynaud, Y Perignon, H Erussard, S Derrien-Courtel, A Le Gal, R Derrien, A Jolivet, S Chauvaud, V Degret, D Saffroy, J-P Pagot, and A Barillier. Characterization of the potential impacts of subsea power cables associated

with offshore renewable energy projects. Plouzané: France Energies Marines Editions, 2020. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Taormina-et-al-2021-Impacts-of-Subsea-Power-Cables.pdf. Accessed February 28, 2022.

Tethys. 2022. Demersal Fish. Available online at: https://tethys.pnnl.gov/receptor/demersal-fish. Accessed March 1, 2022.

The Nature Conservancy (TNC). 2016. Soft Sediments by Grain Size [GIS dataset]. Available online at: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/marine/data/Pages/default.aspx. Accessed March 14, 2022.

United States Army Corps of Engineers. 2015b. New York and New Jersey Harbor Deepening Project. Migratory Finfish Survey Summary Report. Part I: Spatial and Temporal Trends in Abundance for Mid-Water Species; Part II: River Herring. NY, NY.

United States Department of Energy, Minerals Management Service (USDOE). (2009). Final Environmental Impact Statement for the Proposed Cape Wind Energy Project, Nantucket Sound, Massachusetts (Adopted), DOE/EIS-0470. Available online at: https://www.boem.gov/Cape-Wind-FEIS/. Accessed March 2, 2022.

United States Geological Survey (USGS). 1998. Sedimentary Environments in Long Island Sound: A Guide to Sea-Floor Management in a Large Urbanized Estuary. USGS Fact Sheet 041-98. Available Online at: https://pubs.usgs.gov/fs/fs41-98/. Accessed February 25, 2022.

University of Connecticut (UCONN). 2022. Submerged Aquatic Vegetation. Available online at: https://climate.uconn.edu/coastal-resources/sav/.

Vallejo GC, K Grellier, EJ Nelson, RM McGregor, SJ Canning, FM Caryl, and N McLean. 2017. Responses of two marine top predators to an offshore wind farm. Ecology and Evolution. 7(21): 8698-8708.

Wahle L and N Balcom. 2020. Living Treasures: The Plants and Animals of Long Island Sound. Available online at: https://seagrant.uconn.edu/wp-content/uploads/sites/1985/2021/01/LivingTreaasures_2020.pdf. Accessed March 1, 2022.

Wilber DH and DG Clarke. 2001. Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries. North American Journal of Fisheries Management, 21: 4, 855-875.

Woodruff DL, IR Schultz, KE Marshall, JA Ward, VI Cullinan. 2012. Effects of Electromagnetic Fields on Fish and Invertebrates, Task 2.1.3: Effects on Aquatic Organisms Fiscal Year 2011 Progress Report. Prepared for U.S. Department of Energy. Richland, Washington: Pacific Northwest National Laboratory.

Woodruff DL, IR Schultz, KE Marshall, JA Ward, VI Cullinan. 2013. Effects of Electromagnetic Fields on Fish and Invertebrates, Task 2.1.3: Effects on Aquatic Organisms, Fiscal Year 2012 Progress Report. PNNL-22154. Prepared for U.S. Department of Energy. Richland, Washington: Pacific Northwest National Laboratory.

4.13 Marine Mammals References

Abend, A.G., and T.D. Smith. 1999. Review of distribution of the long-finned pilot whale (*Globicephala melas*) in the North Atlantic and Mediterranean. NOAA Technical Memorandum NMFS-NE-117, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Baker, C.S., Herman, L.M., Bays, B.G. and Bauer, G.B., 1983. The impact of vessel traffic on the behavior of humpback whales in southeast Alaska: 1982 season. Seattle, WA: National Marine Mammal Laboratory Contract No. 81-ABC-00114.

Baird, R.W., and P.J. Stacey. 1990. Status of Risso's dolphin, *Grampus griseus*, in Canada. Canadian Field-Naturalist 105:233–242.

Benjamins, S. 2014. Understanding the potential for marine megafauna entanglement risk from marine renewable energy developments. Scottish Natural Heritage Commissioned Report. Report number: 791.

Best, P.B., P.A.S. Canham, and N. Macleod. 1984. Patterns of reproduction in sperm whales, *Physeter macrocephalus*. Report International Whaling Commission (Special Issue 8):51–79.

Bulloch, D.K. 1993. The Whale-Watcher's Handbook, A Field Guide to the Whales, Dolphins, and Porpoises of North America. Rowman and Littlefield Publishers, Inc., New York, New York.

BOEM (Bureau of Ocean Energy Management). 2014. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts, Revised Environmental Assessment. OCS EIS/EA, BOEM 2014-603.

Caldwell, D.K., and M.C. Caldwell. 1966. Observations on the distribution, coloration, behavior and audible sound production of the spotted dolphin, *Stenella plagiodon* (Cope). Los Angeles County Museum Contribution to Science 104:1–28.

Cetacean and Turtle Assessment Program (CeTAP). 1981. A characterization of marine mammals and turtles in the mid- and north-Atlantic areas of the U.S. outer continental shelf, Annual Report for 1979. Cetacean and Turtle Assessment Program, University of Rhode Island. Contract AA551-CT8-48 to the Bureau of Land Management, Washington, DC. NTIS# PB-81-243289.

Cetacean and Turtle Assessment Program (CeTAP). 1982. A characterization of marine mammals and turtles in the mid- and North Atlantic areas of the U.S. outer continental shelf, Annual Report for 1980. Cetacean and Turtle Assessment Program, University of Rhode Island. Final Report #AA551-CT8-48 to the Bureau of Land Management, Washington, D.C. 538 p.

Clapham, P.J., S.B. Young, and R.L. Brownell, Jr. 1999. Baleen whales: conservation issues and the status of the most endangered populations. Mammal Review 29(1):35–60.

CT DEEP (Connecticut Department of Energy and Environmental Protection). 2022. Long Island Sound Blue Plan Map Viewer. Available online at: https://cteco.uconn.edu/viewer/index.html?viewer=blueplan

CT DEEP. 2018. Long Island Sound Blue Plan Webinars. Available online at: http://www.ct.gov/deep/cwp/view.asp?a=2705&q=593814&deepNav_GID=1635

CT DEEP. 2019. Long Island Sound Blue Plan 2019. Available online at: https://portal.ct.gov/-/media/DEEP/coastal-resources/LIS_blue_plan/blueplanfinaldraftversion12september2019pdf.pdf

Copping, A., N. Sather, L. Hanna, J. Whiting, G. Zydlewski, G. Staines, A.B. Gill, I. Hutchison, A. O'Hagan, et al. 2016. Annex IV 2016 state of the science report: Environmental effects of marine renewable energy development around the world. Report by Pacific Northwest National Laboratory for US Department of Energy (the Annex IV Operating Agent) and other partnering nations under the International Energy Agency (IEA) Ocean Energy Systems Initiative (OES). 224 p. https://tethys.pnnl.gov/sites/default/files/publications/Annex-IV-2016-State-of-the-Science-Report_LR_0.pdf.

Cronin, T.W., J.I. Fasick, L.E. Schweikert, S. Johnsen, L.J. Kezmoh, and M.F. Baumgartner. 2017. Coping with copepods: do right whales (Eubalaena glacialis) forage visually in dark waters?. Philosophical Transactions of the Royal Society B: Biological Sciences. 372(1717). Available online at: https://doi.org/10.1098/rstb.2016.0067

Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2019. Marine-life Data and Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data and Analysis Team (MDAT). Accessed at: http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report.pdf.

DiGiovanni RA and Sabrosky AM. 2010. A note on seal watching in the Northeast United States. NAMMCO Scientific Publication; 8: 373-377.

DiGiovanni Jr., R. A., K. F. Durham, J. N. Wocial, and A. M. Chaillet. 2009. An increase in gray seal (Halichoerus grypus) sightings and strandings in New York waters. Eighteenth Biennial Conference on the Biology of Marine Mammals, October 2009. Québec City, Canada. DiGiovanni Jr., R. A., S. A. Wood, G. T. Waring, A. Chaillet, and E. Josephson. 2011. Trends in harbor and gray seal counts and habitat use at southern New England and Long Island index sites. 9th Biennial Conference on the Biology of Marine Mammals, December 2011. Tampa, Florida.

Douglas, A. B., Calambokidis, J., Raverty, S., Jefries, S. J., Lambourn, D. M., and Norman, S. A. 2008. Incidence of ship strikes of large whales in Washington State. Journal of the Marine Biological Association of the United Kingdom, 2008, 88(6), 1121–1132. doi:10.1017/S0025315408000295

Durham, K. 2009. Sound Update. Newsletter of the Long Island Sound Study. "Dolphin Diaries: Following the Dolphin Pod Around the Sound." Fall 2009. Available online at: http://longislandsoundstudy.net/wp-content/uploads/2010/03/fall2009.pdf

Fritts, T.H., A.B. Irvine, R.D. Jennings, L.A. Collum, W. Hoffman, and M.A. McGehee. 1983. Turtles, birds, and mammals in the northern Gulf of Mexico and nearby Atlantic waters. U.S. Fish and Wildlife Service, Division of Biological Services, Washington, D.C., FWS/OBS-82/65, 455 pp.

Fulling, G.L., K.D. Mullin, and C.W. Hubard. 2003. Abundance and distribution of cetaceans in outer continental shelf waters of the U.S. Gulf of Mexico. Fishery Bulletin 101:923–932.

Gaskin, D. E. 1992. Status of the harbour porpoise, Phocoena phocoena, in Canada. Canadian Field-Naturalist 106: –36 - 54.

Gaskin, D. E. et al. 1984. Reproduction in the porpoises (Phocoenidae): implications for management. Reports to the International Whaling Commission (special issue 6): –35 - 148.

Gill, A.B., I. Gloyne-Philips, J. Kimber, and P. Sigray. 2014. Marine renewable energy,

electromagnetic (EM) fields and EM-sensitive animals. In Shields, M. and A. Payne (eds.).

Humanity and the Sea: Marine Renewable Energy Technology and Environmental Interactions.

Springer. pp. 61-79.

Godard-Codding, C.A. and Collier, T.K., 2018. The effects of oil exposure on cetaceans. In Marine Mammal Ecotoxicology (pp. 75-93). Academic Press.

Guida V, Drohan A, Welch H, McHenry J, Johnson D, Kenter V, Brink J, Timmons D, Estela-Gomez E. 2017. Habitat Mapping and Assessment of Northeast Wind Energy Areas. Sterling, VA: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. 312 p.

Hain, J.H.W., M.A. Hyman, R.D. Kenney, and H.E. Winn. 1985. The role of cetaceans in the shelf-edge region of the northeastern United States. Marine Fisheries Review 47(1):13–17.

Hamazaki, T. 2002. Spatiotemporal prediction models of cetacean habitats in the mid-western North Atlantic Ocean (from Cape Hatteras, No. Carolina, USA to Nova Scotia, Canada). Marine Mammal Science 18(4):920–939.

Harnois, V., Smith, H. C. M., Benjamins, S., Johanning, L., 2015. Assessment of entanglement risk to marine megafauna due to offshore renewable energy mooring systems. Elsevier International Journal of Marine Energy. Volume 11, September 2015, Pages 27-49. Available at: https://doi.org/10.1016/j.ijome.2015.04.001

Harris, D.E., B. Lelli, and G. Jakush. 2002. Harp seal records from the southern Gulf of Maine: 1997-2001. Northeastern Naturalist 9(3):331–340.

Hayes, S.A., E. Josephson, K. Maze-Foley, and P.E. Rosel, eds. 2017. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2016. NOAA Tech Memo NMFS NE 241, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Hayes, S.A., E. Josephson, K. Maze-Foley, and P.E. Rosel, eds. 2019. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2018. NOAA Tech Memo NMFS-NE 258, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Hayes, S.A., Josephson, E., Maze-Foley, K., Rosel, P.E. 2020. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2019. Published July 2020. NOAA Tech Memo NMFS-NE-264.

Hiltunen, K. H. 2006. Mixed-stock analysis of harbor porpoises (Phocoena phocoena) along the U.S. mid-Atlantic coast using microsatellite DNA markers. MS thesis. The College of Charleston, Charleston, SC. 92 pp.

Jefferson, T.A., S. Leatherwood, and M.A. Webber. 1993. FAO Species Identification Guide; Marine Mammals of the World. United Nations Environment Programme, Food and Agriculture Organization of the United Nations, Rome. viii + 320 pp.

Jefferson, T.A., M.A. Webber, and R.L. Pitman. 2015. Marine mammals of the world: A comprehensive guide to their identification. Amsterdam: Elsevier. 573 pp.

Jefferson, T.A., C.R. Weir, R.C. Anderson, L.T. Balance, J. Barlow, R.D. Kenney, and J.J. Kiszka. 2014. Global distribution of Risso's dolphin *Grampus griseus*: A review and critical evaluation. Mammal Review 44:56–68.

Katona, S.K., and J.A. Beard. 1990. Population size, migrations, and feeding aggregations of the humpback whale (*Megaptera novaeangliae*) in the western North Atlantic Ocean. Reports of the International Whaling Committee Special Issue 12:295–306.

Kenney, R.D., and K.J. Vigness-Raposa. 2010. Marine Mammals and Sea Turtles of Narragansett Bay, Block Island Sound, Rhode Island Sound, and Nearby Waters: An Analysis of Existing Data for the Rhode Island Ocean Special Area Management Plan. RICRMC (Rhode Island Coastal Resources Management Council) Ocean Special Area Management Plan (SAMP), Volume 2. Appendix, Chapter 10. (Rhode Island Coastal Resources Management Council) Ocean Special Area Management Plan (SAMP), Volume 2. Appendix, Chapter 10.

Kenney, R.D., and H.E. Winn. 1986. Cetacean high-use habitats of the northeast United States continental shelf. Fishery Bulletin 84(2):345–357.

Kopelman, A. H. 2022a. Cetaceans. Coastal Research and Education Society of Long Island, Inc. Available at: https://www.cresli.org/common/news/articles/article_detail.cfm?QID=10929&clientID=12000&subsection=sidebar

Kopelman, A. H. 2022b. Pinnipeds. Coastal Research and Education Society of Long Island, Inc. Available at: https://www.cresli.org/common/news/articles/article_detail.cfm?QID=10936&clientID=12000&topicID=0&subsection=sidebar

Kraus, S.D., J.K.D. Taylor, B. Wikgren, R.D. Kenney, C. Mayo, L. Ganley, P. Hughes, C.W. Clark, and A.N. Rice. 2013. Field Surveys of Whales and Sea Turtles for Offshore Wind Energy Planning in Massachusetts. 2011-2012. Massachusetts Clean Energy Center.

Kraus, S.D., S.M. Leiter, B. Wikgren, R.D. Kenney, C. Mayo, P. Hughes, J.T. Tielens, B.J. Estabrook, and A.N. Rice. 2014. Aerial and Acoustic Surveys for Large Whales and Sea Turtles for Offshore Wind Energy Planning in Massachusetts. Year 2 Report. Massachusetts Clean Energy Center.

Kraus, S.D., S. Leiter, K. Stone, B. Wikgren, C. Mayo, P. Hughes, R.D. Kenney, C.W. Clark, A.N. Rice, B. Estabrook, and J. Tielens. 2016. Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles. U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2016-054. Sterling, Virginia.

Kirschvink, J.L. 1990. Geomagnetic Sensitivity in Cetaceans: An Update with Live Strandings Recorded in the US. In: Sensory Abilities of Cetaceans: An Update with Live Stranding Records in the United Sates. Springer: Boston, Massachusetts. Available online at: https://doi.org/10.1007/978-1-4899-0858-2_45

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2012. Collisions between ships and whales. Marine Mammal Science 17(1):35-75.

Lavigne, D.M., and K.M. Kovacs. 1988. Harps and hoods: Ice breeding seals of the Northwest Atlantic. University of Waterloo Press, Waterloo, Ontario, Canada. 174 pp.

Leatherwood, S., D.K. Caldwell, and H.E. Winn. 1976. Whales, dolphins, and porpoises of the western North Atlantic. A guide to their identification. NOAA Technical Report, NMFS Circulars 396. 176 pp.

Lesage, V., and M.O. Hammill. 2001. The status of the grey seal, *Halichoerus grypus*, in the Northwest

Magalhães, S., R. Prieto, M.A. Silva, J. Gonçalves, M. Afonso-Dias, and R.S. Santos. 2002. Short-term reactions of sperm whales (*Physeter macrocephalus*) to whale-watching vessels in the Azores. *Aquatic Mammals*. 28(3): 267-274. Available online at:

https://aquaticmammalsjournal.org/share/AquaticMammalsIssueArchives/2002/AquaticMammals_

28-03/28-03_Magalhaes.pdfAtlantic. Canadian Field-Naturalist 115(4):653–662.

Marine Geospatial Ecology Lab, Duke University. 2021. Mapping Tool for Cetacean Density for the U.S. Atlantic and Northern Gulf of Mexico. OBIS-SEAMAP. https://seamap.env.duke.edu/models/mapper/USECGOM (Last viewed: March 2022).

Marine Ventures. 2020a. PSO Monthly Report *Stril Explorer* August 2020 (09 – 31 August 2020): 6 pp.

Marine Ventures. 2020b. PSO Monthly Report *Stril Explorer* September 2020 (01 – 30 September 2020): 9 pp.

Marine Ventures. 2020c. PSO Monthly Report *Stril Explorer* October 2020 (01 – 31 October 2020): 11 pp.

Marine Ventures. 2020d. PSO Monthly Report *Stril Explorer* November 2020 (01 – 30 November 2020): 11 pp.

Marine Ventures. 2020e. PSO Monthly Report *Stril Explorer* December 2020 (01 – 31 December 2020): 5 pp.

Marine Ventures. 2021a. PSO Monthly Report *Stril Explorer* January 2021 (01 – 31 January 2021): 7 pp.

Marine Ventures. 2021b. PSO Monthly Report *Stril Explorer* February 2021 (01 – 28 February 2021): 3 pp.

Marine Ventures. 2021c. PSO Monthly Report *Stril Explorer* March 2021 (01 – 31 March 2021): 7 pp.

Marine Ventures. 2021d. PSO Monthly Report *Stril Explorer* April 2021 (01 – 30 April 2021): 8 pp.

Marine Ventures. 2021e. PSO Monthly Report Deep Helder April 2021: 5 pp.

Marine Ventures. 2021f. PSO Monthly Report Deep Helder May 2021 (01 – 31 May 2021): 5 pp.

Marine Ventures. 2021g. PSO Monthly Report Deep Helder June 2021 (01 – 30 June 2021): 4 pp.

Marine Ventures. 2021h. PSO Monthly Report Deep Helder July 2021 (01 – 14 July 2021): 3 pp.

Marine Ventures. 2021i. PSO Monthly Report Dolphin May 2021 (28 April – 31 May 2021): 3 pp.

Marine Ventures. 2021j. PSO Monthly Report Dolphin June 2021 (01 June – 30 June 2021): 3 pp.

Marine Ventures. 2021k. PSO Monthly Report Dolphin July 2021 (01 July – 31 July 2021): 3 pp.

Marine Ventures International, Inc. 2021. Protected Species Observer Technical Report Beacon Wind BOEM Lease OCS-A 0520 (M/V *Stril Explorer*, M/V *Deep Helder*, R/V *Dolphin* 07 August 2020 – 02 August 2021). 225 pp.

McCormack, M. 2015. Assessing the Applicability of Computer Aided Photo-identification for Pinniped Studies Through the Determination of Site Fidelity in Long Island, NY Harbor Seals (*Phoca Vitulina Concolor*). Master's thesis. University of Miami.

Muirhead, C.A., A.M. Warde, I.S. Biedron, A. Nicole Mihnovets, C.W. Clark, and A.N. Rice. 2018. Seasonal acoustic occurrence of blue, fin, and North Atlantic right whales in the New York Bight. Aquatic Conservation: Marine and Freshwater Ecosystems 28:744–753.

Mullin, K.D., and G.L. Fulling. 2003. Abundance and cetaceans in the southern U.S. Atlantic Ocean during summer 1998. Fishery Bulletin 101:603–613.

National Marine Fisheries Service (NMFS). 2010. Final recovery plan for the fin whale (*Balaenoptera physalus*). National Marine Fisheries Service, Silver Spring, Maryland. 121 pp.

NMFS. 2015. Sperm Whale (*Physeter macrocephalus*): 5-Year Review: Summary and Evaluation. (pp. 41). National Marine Fisheries Service, Silver Spring, Maryland.

NMFS. 2019. Fin Whale (*Balaenoptera physalus*) 5-Year Review: Summary and Evaluation. National Marine Fisheries Service. Office Protected Resources. Silver Spring, Maryland.

NMFS. 2021. Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Relocation of the Port of Alaska's South Floating Dock, Anchorage, Alaska. A Notice by the National Oceanic and Atmospheric Administration on 09/07/2021. 86 FR 50057.

National Oceanic and Atmospheric Administration (NOAA). 1993. Stellwagen Bank Management Plan and Final Environmental Impact Statement. http://stellwagen.noaa.gov/management/1993plan.html.

NOAA Fisheries. 2011. Final Recovery Plan for the Sei Whale. Office of Protected Resources NMFS NOAA. December 2011.

NOAA Fisheries. 2018a. Sei Whale (*Balaenoptera borealis*) overview. Retrieved from https://www.fisheries.noaa.gov/species/sei-whale

NOAA Fisheries. 2018b. Sei Whale (*Balaenoptera borealis*) overview. Retrieved from https://www.fisheries.noaa.gov/species/sei-whale

NOAA Fisheries. 2021a. Minke Whale (*Balaenoptera acutorostrata*) overview: Available online at: https://www.fisheries.noaa.gov/species/minke-whale

NOAA Fisheries. 2021b. Gray Seal (*Halichoerus grypus*) overview. Available online at: https://www.fisheries.noaa.gov/species/gray-seal#overview

NOAA Fisheries. 2022. Harp Seal (*Pagophilus groenlandicus*) overview. Available online at: https://www.fisheries.noaa.gov/species/harp-seal

Normandeau, Exponent, T. Tricas, A. Gill. 2011. Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. OCS Study BOEMRE 2011-09. Camarillo, CA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region.

Neilson, J.L., C.M. Gabriele, A.S. Jensen, K. Jackson, and J.M. Straley. 2012. Summary of reported whale-vessel collisions in Alaskan waters. Journal of Marine Biology, 2012.

New York Department of Environmental Conservation (NYSDEC). 2021. List of Endangered, Threatened and Special Concern Fish & Wildlife Species of New York State. Accessed 9 June 2021. https://www.dec.ny.gov/animals/7494.html

NYSDEC. No date. Marine Mammals of New York. Available online at: https://www.dec.ny.gov/animals/108573.html#Porpoises

NYSDEC 2013a. Species Status Assessment – North Atlantic Right Whale. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnnatrightwhale.pdf

NYSDEC 2013b. Species Status Assessment – Fin Whale. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnfinwhale.pdf

NYSDEC 2013c. Species Status Assessment – Sei Whale. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnseiwhale.pdf

NYSDEC. 2013d. Species Status Assessment – Humpback Whale. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnhumpbackwhale.pdf

NYSDEC. 2013e. Species Status Assessment – Harbor Porpoise. Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnharbporpoise.pdf

New York State Department of State (NYSDOS). 2013. Offshore Atlantic Ocean Study. http://docs.dos.ny.gov/communitieswaterfronts/ocean_docs/NYSDOS_Offshore_Atlantic_Ocean_Study.pdf

Normandeau Associates, Inc., T.C. Tricas, and A.B. Gill. 2011. Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. Final Report to US Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region. OCS Study BOEMRE 2011-09, Camarillo, CA.

https://espis.boem.gov/final%20reports/5115.pdf.

NYSDOS. 2002. Montauk Point Shoals Coastal Fish and Wildlife Habitat Assessment Form. Available online at: https://dos.ny.gov/system/files/documents/2020/03/montauk_point_shoals.pdf

Olson, P.A. 2017. Pilot Whales: *Globicephala melas* and *G. macrorhynchus*. pp. 701-705, In: B. Würsig, J.G.M. Thewissen, and K. Kovacs (eds.). Encyclopedia of Marine Mammals (Third Edition). Academic Press, San Diego, California.

Pace, R. M., E. Josephson, S.A. Wood, K. Murray, and G. Waring. 2019. Trends and patterns of seal abundance at haul-out sites in a gray seal recolonization zone. National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts NOAA Technical Memorandum NMFS-NE-251.

Parks SE, Warren JD, Stamieszkin K, Mayo CA, Wiley D. Dangerous dining: surface foraging of North Atlantic right whales increases risk of vessel collisions. Biol Lett. 2012 Feb 23;8(1):57-60. doi: 10.1098/rsbl.2011.0578. Epub 2011 Aug 3. PMID: 21813549; PMCID: PMC3259960.

Payne, P.M., L.A. Selzer, and A.R. Knowlton. 1984. Distribution and density of cetaceans, marine turtles and seabirds in the shelf waters of the northeast U.S., June 1980 - Dec. 1983, based on shipboard observations. National Marine Fisheries Service, Woods Hole, Massachusetts. NA81FAC00023: 245.

Payne, P.M., D.N. Wiley, S.B. Young, S. Pittman, P.J. Clapham, and J.W. Jossi. 1990. Recent fluctuations in the abundance of baleen whales in the southern Gulf of Maine in relation to changes in selected prey. Fishery Bulletin 88:687–696.

Payne, P.M., and D.W. Heinemann 1993. The distribution of pilot whales (*Globicephala* sp.) in shelf/shelf edge and slope waters of the northeastern United States, 1978-1988. Rep. Int. Whal. Comm. (Special Issue) 14:51–68.

Perrin, W.F. 2017. Common Dolphin *Delphinus delphis*. pp. 205–209, In: B. Würsig, J.G.M. Thewissen, and K. Kovacs (eds.). Encyclopedia of Marine Mammals (Third Edition). Academic Press, San Diego, California.

Perrin, W.F., E.D. Mitchell, J.G. Mead, D.K. Caldwell, M.C. Caldwell, P.J.H. van Bree, and W.H. Dawbin. 1987. Revision of the spotted dolphins, *Stenella* sp. Marine Mammal Science 3(2):99–170.

Perrin, W.F., D.K. Caldwell, and M.C. Caldwell. 1994. Atlantic spotted dolphin. pp. 173-190. In: S.H. Ridgway and R. Harrison (eds.). Handbook of marine mammals, Volume 5: The first book of dolphins. Academic Press, San Diego, 418 pp.

Perry, S. L., D. P. DeMaster, and G. K. Silber. 1999. The great whales: history and status of six species listed as endangered under the U. S. Endangered Species Act of 1973. Marine Fisheries Review 61: 1 – 74.

Prieto, R. et al. 2012. The forgotten whale: a bibliometric analysis and literature review of the North Atlantic sei whale Balaenoptera borealis. Mammal Review 42(3): 235 – 272.

Quintana-Rizzo, E., S. Leiter, T.V.N. Cole, M.N. Hagbloom, A.R. Knowlton, P. Nagelkirk, O. O'Brien, C.B. Khan, A.G. Henry, P.A. Duley, L.M. Crowe, C.A. Mayo, S.D. Kraus. 2021. Residency, demographics, and movement patterns of North Atlantic right whales *Eubalaena glacialis* in an offshore wind energy development in southern New England, USA. Endangered Species Research 45:251–268.

Read, A. J. and A. A. Hohn. 1995. Life in the fast lane: the life history of harbour porpoises from the Gulf of Maine. Marine Mammal Science 11(4): 423 - 440. Reeves RR, McClellan K, Werner TB (2013) Marine mammal bycatch in gillnet and other entangling net fisheries, 1990 to 2011. Endang Species Res 20:71-97. https://doi.org/10.3354/esr00481

Reeves, R.R., B.S. Stewart, P.J. Clapham, and J.A. Powell. 2002. Guide to Marine Mammals of the World. National Audubon Society.

Reeves, R.R., and A.J. Reed. 2003. Bottlenose dolphin, harbor porpoise, sperm whale and other toothed cetaceans *Tursiops truncatus*, *Phocoena phocoena*, and *Physeter macrocephalus*). Pp. 397-424 In: Wild mammals of North American biology, management and conservation. (G.A. Feldhamer, B.C. Thomspon, and J.A. Chapman, eds.). Johns Hopkins Univ. Press, Baltimore, Maryland.

Reichmuth, C., M.M. Holt, J. Mulsow, J.M. Sills, and B.L. Southall. 2013. Comparative assessment of amphibious hearing in pinnipeds. Journal of Comparative Physiology A 199:491–507.

Rice, D.W. 1998. Marine Mammals of the World: Systematics and Distribution D. Wartzok (Ed.), Society for Marine Mammology Special Publication 4, pp. 231. Allen Press, Lawrence, Kansas.

Roberts, J.J. 2020. Revised habitat-based marine mammal density models for the U.S. Atlantic and Gulf of Mexico. Unpublished data files received with permission to use August 2020.

Roberts, J.J., B.D. Best, L. Mannocci, E. Fujioka, P.N. Halpin, D.L. Palka, L.P. Garrison, K.D. Mullin, T.V.N. Cole, C.B. Khan, W.M. McLellan, D.A. Pabst, and G.G. Lockhart. 2016. Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico. Scientific Reports 6:22615.

Roberts, J.J., L. Mannocci, and P.N. Halpin. 2017. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2016-2017 (Opt. Year 1). Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, North Carolina.

Roberts, J.J., L. Mannocci, R.S. Schick, and P.N. Halpin. 2018. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2017-2018 (Opt. Year 2). Document version 1.2 - 2018-09-21. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, North Carolina.

Roberts, J.J., R.S. Schick, and P.N. Halpin. 2021a. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2020 (Option Year 4). Document version 1.0 (DRAFT). Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, North Carolina.

Roberts, J.J., B. McKenna, L. Ganley, and C. Mayo. 2021b. Right Whale Abundance Estimates for Cape Cod Bay in December. Document version 3. Duke University Marine Geospatial Ecology Lab, Durham, North Carolina.

Rone, B.K., I. Pace, and M. Richard. 2012. A simple photograph-based approach for discriminating between free-ranging long-finned (*Globicephala melas*) and short-finned (*G. macrorhynchus*) pilot whales off the east coast of the United States. Marine Mammal Science 28(2):254–275.

Rosel, P. E., S. C. France, J. Y. Wang and T. D. Kocher. 1999. Genetic structure of harbour porpoise Phocoena phocoena populations in the northwest Atlantic based on mitochondrial and nuclear markers. Molecular Ecology 8: S41 - S54.

Sadove, S. S. and P. Cardinale. 1993. Species composition and distribution of marine mammals and sea turtles in the New York Bight. Final Report to U.S. Dept. of the Interior, Fish and Wildlife Service Southern New England-New York Bight Coastal Fisheries Project. Charlestown, RI.

Schlesinger, M.D., A.L. Feldmann, and S.M. Young. 2012. Biodiversity and ecological potential of Plum Island, New York. New York Natural Heritage Program, Albany, New York.

Terwillinger Consulting Inc. and Connecticut Department of Energy and Environmental Protection Bureau of Natural Resources. 2015.Connecticut Wildlife Action Plan. Available online at: https://portal.ct.gov/-/media/DEEP/wildlife/pdf_files/nongame/CTWAP/CTWAPExecutiveSummarypdf.pdf

Todd, Victoria L. G., Ian B. Todd, Jane C. Gardiner, Erica C. N. Morrin, Nicola A. MacPherson, Nancy A. DiMarzio, Frank Thomsen. 2015. A review of impacts of marine dredging activities on marine mammals. ICES Journal of Marine Science, Volume 72, Issue 2, January/February 2015, Pages 328–340, https://doi.org/10.1093/icesjms/fsu187.

Tetra Tech and LGL. 2020. Final Comprehensive Report for New York Bight Whale Monitoring Aerial Surveys, March2017 – February 2020. Technical report prepared by Tetra Tech, Inc. and LGL Ecological Research Associates, Inc. 211 pp. + appendices. Prepared for New York State Department of Environmental Conservation, Division of Marine Resources, East Setauket, NY. May 18, 2020Tyack P (2009) Acoustic playback experiments to study behavioral responses of free-ranging marine animals to anthropogenic sound. Mar Ecol Prog Ser 395:187-200. https://doi.org/10.3354/meps08363

Vanderlaan, A.S.M., and C.T. Taggart. 2007. Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine mammal science 23(1):144-156.

W. A. Walker and J. M. Coe, “Survey of marine debris ingestion by odontocete cetaceans,” in Proceedings of the 2nd International Conference on Marine Debris, R. S. Shomura and M. L. Godfrey, Eds., vol. 1, pp. 747–774, United States Department of Commerce, Honolulu, Hawaii, USA, April 1989.

Walker, M.M., D.E. Diebel, and J.L. Kirschvink. 2003. “Detection and Use of the Earth’s Magnet ic Field by Aquatic Vertebrates.” In *Sensory Processing in the Aquatic Environment*, edited by S.P. Collin and N. Justin Marshall, 53-74. New York: Springer-Verlag.

Wang, J. Y., D. E. Gaskin and B. N. White. 1996. Mitochondrial DNA analysis of harbour porpoise, Phocoena phocoena, subpopulations in North American waters. Canadian Journal of Fisheries and Aquatic Science 53: 1632 - 1645.

Westgate, A. J. and K. A. Tolley. 1999. Geographical differences in organochlorine contaminants in harbour porpoises Phocoena phocoena from the western North Atlantic. Marine Ecology Progress Series 177: 255 - 268.

Westgate, A. J., D. C. G. Muir, D. E. Gaskin and M. C. S. Kingsley. 1997. Concentrations and accumulation patterns of organochlorine contaminants in the blubber of harbour porpoises, Phocoena phocoena, from the coast of Newfoundland, the Gulf of St. Lawrence and the Bay of Fundy/Gulf of Maine. Environmental Pollut. 95: 105 - 119.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel. (eds.). 2009. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2009. NOAA Technical Memorandum NMFS NE 213, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel (eds.). 2016. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2015. NOAA Technical Memorandum NMFS NE 238, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Watkins, W.A., 1986. “Whale reactions to human activities in Cape Cod waters.” Marine mammal science, 2(4):251-262.

Weinrich, M.T., R.D. Kenney, and P.K. Hamilton. 2000. Right whales (*Eubalaena glacialis*) on Jeffreys Ledge: a habitat of unrecognized importance? Marine Mammal Science 16:326–337.

Whale, L. and Balcom, N. 2020 Connecticut Sea Grant College Program. Living Treasures: The Plants and Animals of Long Island Sound. Available online at: https://seagrant.uconn.edu/wp-content/uploads/sites/1985/2021/01/LivingTreaasures_2020.pdf

Whitehead, H. 2003. Sperm Whales: Social Evolution in the Ocean (pp. 431). University of Chicago Press, Chicago, Illinois.

Whitehead, H. 2017. Sperm whale *Physeter macrocephalus*. In: B. Würsig and J.G.M. Thewissen, and K. Kovacs (Eds.), Encyclopedia of Marine Mammals (Third Edition) (pp. 919-925). Academic Press, San Diego, California.

Whitehead, H., S. Brennan, and D. Grover. 1992. Distribution and behaviour of male sperm whales on the Scotian shelf. Canadian Journal of Zoology 70:912–918.

Woo, K.L., and K.L. Biolsi. 2018. In Situ Observations of Pinnipeds in New York City, 2011-2017. Aquatic Mammals 44(3):244-249.

Woods Hole Oceanographic Institution (WHOI). 2021. Robots4Whales. Woods Hole Oceanographic Institution. Accessed 8 June 2021. http://dcs.whoi.edu/

Wynne, K., and M. Schwartz. 1999. Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico. Rhode Island Sea Grant. Narragansett, Rhode Island. 114 pp.

4.14 Sea Turtles References

Burke, V. J., S. J. Morreale, and E. A. Standora. 1994. Diet of the Kemp's ridley sea turtle, *Lepidochelys kempii*, in New York Waters. *Fishery Bulletin*. 92: 26-32.

Burke, V. J., E. A. Standora. and S. J. Morreale 1991. Factors affecting strandings of cold-stunned juvenile Kemp's ridley and loggerhead sea turtles in Long Island, New York. Copeia, 1991 (4), pp. 1136-1138.

Burke, V.J., E.A. Standora, and S.J. Morreale. 1993. Diet of Juvenile Kemp's Ridley and Loggerhead Sea Turtles from Long Island, New York. Copeia 1993(4): 1176-1180. https://www.jstor.org/stable/144710.

CH2M HILL Engineers, Inc. (CH2M HILL) 2018. South Fork Wind Farm Construction and Operation Plan. Report submitted to BOEM September 2018. Available online at: https://www.boem.gov/Volume-I-Construction-and-Operations-Plan/

Connecticut Department of Energy and Environmental Protection (CT DEEP) 2019. Long Island Sound Blue Plan Map Viewer. Available online at: https://cteco.uconn.edu/viewer/index.html?viewer=blueplan

Halpin, P. N., Read, A. J., Fujioka, E., Best, B. D., Donnelly, B., Hazen, L. J., Hyrenbach, K. D. 2009. OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions. Oceanography, 22(2), 104-115.

Hildebrand, J. A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. *Marine Ecology Progress Series*. 395: pp. 5-20.

Hochscheid, S., F. Bentivegna, A. Hamza, and G. C. Hays. 2010. When surfacers do not dive: multiple significance of extended surface times in marine turtles. *Journal of Experimental Biology*. 213(8): pp. 1328-1337.

Geo-Marine. 2010. Ocean/Wind Power Ecological Baseline Studies: January 2008 – December 2009. Final Report. Volume III: Marine Mammal and Sea Turtle Studies. Report by Geo-Marine, Inc. for the New Jersey Department of Environmental Protection, Office of Science. https://tethys.pnnl.gov/sites/default/files/publications/Ocean-Wind-Power-Baseline-Volume3.pdf

Kenney, R. D. and K. J. Vigness-Raposa. 2010. Technical Report 10. Marine Mammals and Sea Turtles of Narragansett Bay, Block Island Sound, Rhode Island Sound, and Nearby Waters: An Analysis of Existing Data for the Rhode Island Ocean Special Area Management Program/Ocean SAMP. In R.I. Council, Rhode Island Coastal Resources Management Program/Ocean Special Area Management Plan (Ocean SAMP).

Kopelman, A.H. 2022. Coastal Research and Education Society of Long Island, Inc. (CRESLI). Sea Turtles. Available online at: https://www.cresli.org/common/news/articles/article_detail.cfm?QID=11244&clientID=12000&topicID=0&subsection=sidebar

Long Island Sound Inventory and Science Subcommittee of the Blue Plan Advisory Committee. 2019. Long Island Sound Resource Use and Use Inventory. Long Island Sound Blue Plan. September 2019.

Lopez, G et al. 2014. Biology and Ecology of Long Island Sound. In J. S. Latimer, M. A. Tedesco, R. L. Swanson, C. Yarish, P. E. Stacey, & C. Garza, *Long Island Sound: Prospects for the Urban Sea* (p. 558). New York: Springer.

Meylan, A. and S. Sadove. 1986. Cold-stunning in Long Island Sound, New York. *Marine Turtle Newsletter*. 37: pp.7-8.

Morreale, S. J., A. B. Meylan, S. S. Sadove, and E. A. Standora. 1992. Annual occurrence and winter mortality of marine turtles in New York waters. *Journal of Herpetology:* Pp. 301-308.

Morreale, S. J., and E. A. Standora. 1998. Early life stage ecology of sea turtles in northeastern U.S. waters. (NOAA Technical Memorandum NMFS-SEFSC 413, pp. 49) U.S. Department of Commerce National Oceanic and Atmospheric Administration.

Murray, K.T. 2011. Interactions between sea turtles and dredge gear in the US sea scallop (*Placopecten magellanicus*) fishery, 2001-2008. Fisheries Research, 107 (1-3), pp 137-146.

National Research Council. 2003. “Ocean noise and marine mammals.” National Academies Press (US). NMFS. 2020.

NMFS and U.S. Fish and Wildlife Service (USFWS). 2015. Kemp’s Ridley Sea Turtle (*Lepidochelys kempii*) 5-Year Review: Summary and Evaluation NMFS Office of Protected Resources, Silver Spring, MD and USFWS Southeast Region, Albuquerque, NM July 2015. 63 pp

NMFS and USFWS. 2007. Loggerhead Sea Turtle (*Caretta caretta*) 5-Year Review: Summary and Evaluation NMFS Office of Protected Resources, Silver Spring, MD and USFWS Southeast Region, Jacksonville, FL. August 2007: 67 pp.

NMFS, USFWS, and SEMARNAT. 2011. Bi-National Recovery Plan for the Kemp’s Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. NMFS. Silver Spring, MD: 156 pp + appendices.

National Marine Fisheries Service (NMFS) Endangered Species Act Section 7 Consultation Biological Opinion on the COP for Vineyard Wind Offshore Energy Project (Lease OCS-A 0501). September 11, 2020: 326 pp.

Nedwell, J.R., J. Langworthy, and D. Howell. 2003. Assessment of Sub-Sea Acoustic Noise and Vibration from Offshore Wind Turbines and Its Impact on Marine Wildlife; Initial Measurements of Underwater Noise during Construction of Offshore Windfarms, And Comparison with Background Noise. Document Number 544 R 0424 Report Number 544 R 0424. Report by Subacoustech Ltd. for the Crown Estates Office. 68 p. http://www.subacoustech.com/wpcontent/

uploads/544R0424.pdf.

New York State Department of Environmental Conservation (NYSDEC). 2015. “List of Endangered, Threatened and Special Concern Fish and Wildlife Species of New York State.” Available online at: https://www.dec.ny.gov/animals/7494.html. Accessed June 2021.

NYSDEC. No date. Sea Turtles of New York. Available online at: https://www.dec.ny.gov/animals/112355.html

NYSDEC. 2013a. Species Status Assessment: Kemp’s Ridley Sea Turtle (*Lepidochelys kempii).* Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnkempridleyturtle.pdf

NYSDEC. 2013b. Species Status Assessment: Loggerhead Sea Turtle (*Caretta caretta*). Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnloggerheadturtle.pdf

NYSDEC. 2013c. Species Status Assessment: Leatherback Sea Turtle (*Dermochelys coriacea*). Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnleatherseaturtle.pdf

NYSDEC. 2013d. Species Status Assessment: Green Sea Turtle (Chelonia mydas). Available online at: https://www.dec.ny.gov/docs/wildlife_pdf/sgcngreeturtle.pdf

NJDEP. 2010. Ocean/Wind Power Ecological Baseline Studies, Final Report Volume 1: Overview, Summary and Application. New Jersey Department of Environmental Protection. Report prepared by Geo-Marine, Inc. July 2010. Available online at: https://www.nj.gov/dep/dsr/ocean-wind/index.htm.

NOAA Fisheries. 2019. ESA Section 7 Mapper. November 2019, Version 2.0. Available online at: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=1bc332edc5204e03b250ac11f9914a27

Rolland, R. M., S. E. Parks, K. E. Hunt, M. Castellote, P. J. Corkeron, D. P. Nowacek, S. K. Wasser, and S. D. Kraus. 2012. Evidence that ship noise increases stress in right whales. Proceedings of the Royal Society B: *Biological Sciences*. 279(1737): pp.2363-2368.

Schuh, J. 2009.The Sound's Seals and Sea Turtles. Sound Update – Newsletter of the Long Island Sound Study. Fall 2009. Available online at: http://longislandsoundstudy.net/wp-content/uploads/2010/03/fall2009.pdf

Smolowitz, R.J., S.H. Patel, H.L. Haas, and S.A. Miller. 2015. Using a remotely operated vehicle

(ROV) to observe loggerhead sea turtle (Caretta caretta) behavior on foraging grounds off the

mid-Atlantic United States. Journal of Experimental Marine Biology and Ecology 471: 84-91.

https://doi.org/10.1016/j.jembe.2015.05.016.

Terwillinger Consulting Inc. and CT DEEP. 2015. 2015 Connecticut Wildlife Action Plan. Available online at: https://portal.ct.gov/DEEP/Wildlife/CT-Wildlife-Action-Plan/CT-WAP-Current-Status#Review

Tethys. 2010. Effects of Electromagnetic Fields on Marine Species: Literature Review. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Effects_of_Electromagnetic_Fields_on_Marine_Species.pdf.

US Coast Guard. 2006. Final Environmental Impact Statement for the Compass Port LLC Deepwater Port License Application. Volume 1 of 2. Document Number USCG 2004-17659.

4.15 Important Habitat Areas and Protected Species References

Duke University Marine Geospatial Ecology Lab. 2021. for the U.S. Atlantic and Northern Gulf of Mexico. OBIS-SEAMAP. Available online at: https://seamap.env.duke.edu/models/mapper/USECGOM. Accessed March 16, 2022.

eBird. 2022a. New York State Breeding Bird Atlas III. Cornell Lab of Ornithology, Ithaca, New York. Available online at: https://ebird.org/atlasny. Accessed January 31, 2022.

eBird. 2022b. Hotspots. Cornell Lab of Ornithology, Ithaca, New York. Available online at: https://ebird.org/hotspots. Accessed January 31, 2022.

Halpin PN, A.J. Read, E Fujioka, BD Best, B Donnelly, LJ Hazen, C Kot, K Urian, E LaBrecque, A Dimatteo, J Cleary, C Good, LB Crowder, and KD Hyrenbach. 2021. OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions. Oceanography 22(2):104-115. Available online at: https://seamap.env.duke.edu/models/mapper/USECGOM. Accessed February 2, 2022.

National Audubon Society (NAS). n.d. ImportantBirdAreas [GIS map server]. Available online at: https://databasin.org/datasets/fdb91971a11d46d39661f0a56c3585ca/. Accessed February 2, 2022.

NAS. 2022a. Northern Brother/South Brothers Islands. Available online at: https://www.audubon.org/important-bird-areas/north-brothersouth-brother-islands/. Accessed February 2, 2022.

NAS. 2022b. Little Neck Bay to Hempstead Harbor. Available online at: https://www.audubon.org/important-bird-areas/little-neck-bay-hempstead-harbor. Accessed February 2, 2022.

NAS. 2022c. 2022. The Christmas Bird Count Historical Results. Available online at: https://www.audubon.org/conservation/science/christmas-bird-count. Accessed January 31, 2022.

National Oceanic and Atmospheric Administration (NOAA). 2019. ESA Section 7 Mapper. Available online at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater. Accessed February 2, 2022.

NOAA. 2021a. GIS Data for Essential Fish Habitat. Available online at: https://www.habitat.noaa.gov/application/efhinventory/. Accessed February 2, 2022.

NOAA. 2021b. GIS Data for Habitat Areas of Particular Concern. Available online at: https://www.habitat.noaa.gov/application/efhinventory/index.html. Accessed February 2, 2022.

NOAA. 2022. Habitat Areas of Particular Concern within Essential Fish Habitat. Available online at: https://www.fisheries.noaa.gov/southeast/habitat-conservation/habitat-areas-particular-concern-within-essential-fish-habitat. Accessed February 2, 2022.

New York Natural Heritage Program (NYNHP). 2022. NYNHP Online Conservation Guides. Available online at: https://guides.nynhp.org/. Accessed February 2, 2022.

New York State Department of Environmental Conservation (NYSDEC). 2020. Critical Environmental Areas [GIS dataset]. Available online at: https://gis.ny.gov/gisdata/inventories/. Accessed February 2, 2022.

NYSDEC. 2022. Critical Environmental Areas. Available online at: https://www.dec.ny.gov/permits/6184.html. Accessed February 2, 2022.

New York State Department of State (NYSDOS). 2022. Significant Coastal Fish and Wildlife Habitat. Available online at: https://dos.ny.gov/significant-coastal-fish-wildlife-habitats. Accessed February 2, 2022.

United States Fish and Wildlife Service (USFWS). 2022. Environmental Conservation Online System (ECOS) – Sandplain gerardia (Agalinis acuta). Available online at: https://ecos.fws.gov/ecp/species/8128. Accessed March 16, 2022.

4.16 Cultural Resources References

AECOM, 2021a. Terrestrial Archaeological Resources Assessment. AECOM Technical Services, Inc. Pocasset, MA. August, 2021 (Revised November, 2021).

AECOM, 2021b. Analysis of Visual Effects to Historic Properties. AECOM Technical Services, Inc. Pocasset, MA. December 2021.

BOEM. 2016a. Programmatic Agreement Among The U.S. Department of the Interior, Bureau of Ocean Energy Management, The State Historic Preservation Officers of New Jersey and New York, The Shinnecock Indian Nation, and The Advisory Council on Historic Preservation Regarding Review of Outer Continental Shelf Renewable Energy Activities Offshore New Jersey and New York Under Section 106 of the National Historic Preservation Act. Available online at: https://www.boem.gov/sites/default/files/documents//Programmatic%20Agreement%20BOEM%20NY%20%26amp%3B%20NJ%20NHPA%202016-06-03.pdf. Accessed August 1, 2021.

BOEM. 2016b. Commercial Wind Lease Issuance and Site Assessment Activities on the Outer Continental Shelf Offshore New York: Revised Environmental Assessment (2016). Available online at: https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/NY/NY_Revised_EA_FONSI.pdf. Accessed August 1, 2021.

BOEM. 2020. Guidelines for Providing Archaeological and Historic Properties Information Pursuant to 30 CFR Part 585. Available online at: https://www.boem.gov/sites/default/files/documents/about-boem/Archaeology%20and%20Historic%20Property%20Guidelines.pdf. Accessed August 1, 2021.

Bolton, Reginald P., 1920. New York City in Indian Possession. Indian Notes and Monographs, Vol. 2, No. 7. Heye Foundation, New York.

DeLeuw Cather/Parsons n.d. Bruckner (A005-01-0031) Archaeological Site Inventory Form. Electronic document, https://cris.parks.ny.gov. Accessed July 12, 2021.

Kardas, Susan. 1977a. Parker #9 (A081-01-0102) Archaeological Site Inventory Form. Electronic document, https://cris.parks.ny.gov. Accessed July 12, 2021.

Kardas, Susan.1977b. Ranachqua (A005-01-0027) Archaeological Site Inventory Form. Electronic document, https://cris.parks.ny.gov. Accessed July 12, 2021.

Mack, K. and S. Dunning. 2019. Phase IA Archaeological Assessment of the Champlain-Hudson Astoria Converter Station and Astoria Preferred Alternative Route, Borough of Queens, New York. Revised April 20, 2020. TRC, Ellsworth, Maine.

Mack, K. and S. Dunning. 2020. Phase IA Archaeological Assessment of the Champlain-Hudson Power Express Project, Harlem Rail Yard Preferred Alternative, Borough of Queens, New York. TRC, Ellsworth, Maine.

National Park Service (NPS). 1995. *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. U.S. Department of the Interior, Washington, D.C. Available online at: https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf. Accessed January 28, 2022.

New York Archaeological Council (NYAC). 1994. Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State. Available online at: https://nysarchaeology.org/wp-content/uploads/2013/12/NYACStandards.pdf. Accessed August 1, 2021.

New York State Office of Parks, Recreation and Historic Properties (NYSHPO). 2021. Cultural Resource Information System (CRIS). Electronic document, https://cris.parks.ny.gov/. Accessed January 2022.

National Oceanic and Atmospheric Administration (NOAA). 2021a. Automated Wreck and Obstruction Information System (AWOIS). Available at https://nauticalcharts.noaa.gov/data/wrecks-andobstructions.html. Accessed November 12, 2021.

NOAA. 2021b. NOAA ENC-Electronic Navigational Charts. Available at https://nauticalcharts.noaa.gov/charts/noaa-enc.html. Accessed November 12, 2021.

Parker, Arthur C. 1922. The Archaeological History of New York. 2 vols. University of the State of New York, Albany.

Thomas, Brian W. 2000. Addendum to Literature Review and Cultural Resource Inventory of the Charles B. Poletti Power Project, Astoria, Queens County, New York. TRC Garrow Associates, Inc., Atlanta, Georgia.

4.17 Visual and Aesthetic Resources References

Bryce, S. A., G. E. Griffith, J. M. Omernik, G. Edinger, S. Indrick, O. Vargas, and D. Carlson. 2010, Ecoregions of New York (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey, map scale 1:1,250,000. Available online at: https://www.epa.gov/eco-research/ecoregion-download-files-state-region-2#pane-30

Bureau of Land Management (BLM). 1986. Visual Resource Management System. Available online at: http://blmwyomingvisual.anl.gov/vr-overview/blm/. Accessed April 2018.

Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA). 2013. Guidelines for Landscape and Visual Impact Assessment, Third Edition.

New York State Department of Environmental Conservation (NYSDEC). 2019. Assessing and Mitigating Visual Impacts. Program Policy DEP-00-2.

Sullivan, R. G. and J. Cothren. 2013. Offshore Wind Turbine Visibility and Visual Impact Threshold Distances. *Environmental Practice*. March 2013.

4.18 Land Use References

New York City Department of City Planning (NYCDCP). 2011. Vision 2020: New York City Comprehensive Waterfront Plan. Available online at: https://www.waterfrontplan.nyc/. Accessed January 2022.

NYCDCP. 2021. Zoning Districts and Tools Overview. Available online at: https://www1.nyc.gov/site/planning/zoning/districts-tools.page. Accessed January 2022.

NYCDCP. 2021. Zoning for Coastal Flood Resiliency. Available online at: https://www1.nyc.gov/site/planning/plans/flood-resilience-zoning-text-update/flood-resilience-zoning-text-update.page. Accessed January 2022.

New York State Department of State (NYSDOS). 1982. New York State Coastal Zone Management Program. Available online at: https://www.dos.ny.gov/opd/programs/pdfs/NY_CMP.pdf. Accessed January 2022.

NYSDOS. 2019. Coastal Waterbodies and Designated Inland Waterways. Available at: https://dos.ny.gov/system/files/documents/2020/06/inland_waterways_12-19.pdf

NYSDOS. 2021. Local Waterfront Revitalization. Available at: https://dos.ny.gov/local-waterfront-revitalization-program

NYSDEC. 2016. New York State Open Space Conservation Plan. Available online at: https://www.dec.ny.gov/docs/lands_forests_pdf/ospsummary.pdf. Accessed January 2022.

New York State Energy Planning Board. 2015. 2015 New York State Energy Plan, amended in 2020. Available online at: https://energyplan.ny.gov/

City of New York. 2015. OneNYC 2050: Building a Strong and Fair City. Available at: https://onenyc.cityofnewyork.us/#:~:text=OneNYC%202050%20is%20a%20strategy,Join%20us.

USGS. 2019. The National Land Cover Database (NLCD) 2019 Land Cover Conterminous United States. Available online at: https://www.mrlc.gov/data